CTE Preliminary Traffic and Revenue Study

Colorado Tolling Enterprise

Colorado Department of Transportation

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

In Association With

HNTB Corporation
Felsburg Holt & Ullevig
Citigroup

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Prepared for

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DOT
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CHAPTER 1

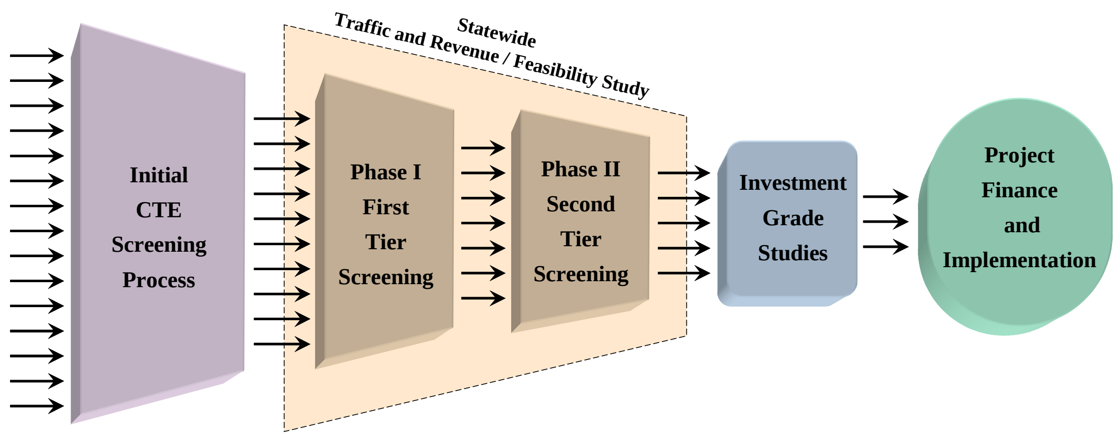
INTRODUCTION

Due to an increasing need to identify new potential sources of transportation funding, the Colorado General Assembly authorized the creation of a Statewide Tolling Enterprise in 2002. This resulted in the formation of the Colorado Tolling Enterprise (CTE), which is now considering a number of potential candidate projects throughout the state as possible toll facilities. While some relatively new toll facilities already exist, primarily in the Denver area, an expanded use of the toll concept is being considered, primarily the "new capacity" added to the highway system. Following its creation, CTE initiated a process of identifying potential toll projects for consideration. At the outset, over 90 candidate projects were considered by CTE, and subjected to a very "broad-brush" review process.

Figure 1-1 provides a graphic representation of the tolling evaluation and study process envisioned by CTE. It is a multi-phase process, with each subsequent step adding an increased level of analytical detail. The process eliminates some candidate projects at each phase, culminating in a reduced number of projects being subjected to progressively more detailed analyses. The initial 90-plus candidate projects were subjected to an initial screening process by CTE based on "broad-brush" evaluation criteria, including:

- Volume/capacity ratios of 0.7 or more, as a measure of relative congestion levels (considered at both 2001 and 2030 levels);
- Average daily traffic volumes in excess of 30,000 vehicles per day (considered at both 2001 and 2030 levels);
- Average daily truck volumes in excess of 1,500 per day (considered at both 2001 and 2030 levels);
- Roadway classification (such as freeway or expressway) as it may effect opportunities for tolling and moving higher volumes of traffic at higher speeds;
- Projected population growth of 100 percent or more between 2000 and 2025;

- Inclusion of the project in the state's 2020/2025 statewide transportation plan (a fiscally constrained plan);
- Projects identified through the 2003 Strategic Investment Plan process as recommended by the Statewide Transportation Advisory Committee;
- Projects sponsored by private entities, including public/private partnerships; and
- Roadway improvement segments with recently completed or ongoing corridor level studies.



COLORADO TOLL CANDIDATE SCREENING AND STUDY PROCESS
FIGURE 1-1

As a result of this screening process, more than half of the projects on the original candidate list were considered "low priority" and were essentially eliminated from further consideration. Approximately 40 of the projects were considered to have "high" or "medium" potential, meriting further consideration in subsequent, more detailed analyses.

TOLL CANDIDATE SCREENING PROCESS AND STUDY PURPOSE

A study team lead by Wilbur Smith Associates (WSA), and including HNTB Corporation (HNTB), Felsburg Holt & Ullevig (FHU), and

Citigroup, was selected by CTE to perform the more detailed and refined traffic and revenue analyses envisioned in Phases I and II of the study process depicted in Figure 1-1. As shown, in Phase I of the overall study, the “first-tier” of the screening process was undertaken, starting with the “high” priority projects and a portion of the “medium” priority projects as identified in the initial CTE screening analysis. This required a new set of screening criteria to be developed by the study team and submitted for approval by CTE.

This first-tier screening was still a generally subjective analytical approach, albeit somewhat more detailed and rigorous than the initial screening process performed previously by CDOT. In performing the first-tier analysis, maximum benefit was derived from the experience of the WSA-led study team, having previously analyzed hundreds of facilities across the nation. A summary of the first-tier screening process and findings are presented in Chapter 2 of this report.

The candidate projects surviving the first-tier screening process were then subjected to a more detailed, although still preliminary, second-tier feasibility analysis and are the subject of this report. Wherever possible, available travel demand models were used to develop preliminary estimates of traffic and revenue potential, optimum toll levels and revenue growth potential in the second-tier analyses. In parallel, the study team also refined project capital, and maintenance and operating cost estimates initially developed during the first-tier screening process. Together with the estimates of toll revenue, capital, and maintenance and operating costs, a financial feasibility assessment was performed in the Phase 2, second-tier analysis.

SCOPE OF WORK

This study was intended to provide the CTE with a preliminary feasibility analysis on the list of second-tier candidate toll projects. In order to complete this analysis, a number of major work tasks were performed and are described below.

Coordination With On-Going NEPA Studies

There are several corridor studies now underway, largely in and around the Denver area. These include projects which may have toll potential, and in some cases have already been proposed by the private sector as new capacity toll projects. Because of this, it was important to coordinate closely with these on-going studies. Representatives of the study team participated in corridor coordination meetings, as required, and provided input on tolling issues at appropriate points during the study process. The team also obtained and used any available data from these studies for input into this preliminary feasibility study.

MODEL DEVELOPMENT

Second-tier candidate toll projects were subjected to more detailed, but still preliminary, traffic and revenue analyses. These analyses made use of travel demand models to make traffic assignments at opening and future year levels, and at alternative toll rates.

At the outset of this task, WSA obtained the latest versions of all available regional travel demand models, including:

- Denver Regional Council of Governments (DRCOG);
- Pikes Peak Area COG (Colorado Springs area);
- North Front Range MPO (Ft. Collins area); and
- I-70 West Mountain Corridor model.

In addition to networks themselves, WSA obtained underlying socioeconomic forecasts at the traffic zone level at all available years. Wherever possible, trip tables for peak and off-peak conditions were obtained. This was important since many of the candidate toll projects involved placing tolls only on “new capacity” on existing toll-free routes.

As required, the specific projects were “recoded” into the respective travel demand models to permit use with WSA’s toll diversion algorithms within its traffic assignment software. This software was developed specifically to estimate the market share of total traffic demand willing to pay tolls for different toll project configurations at different price levels, compared with the best alternative toll-free routing. Hence, project coding was critical to the simulation process.

Since many of the projects would involve the tolling of new capacity only, it was important to disaggregate trip tables to reflect various time periods of the day. In general, this included a.m. peak, a.m. shoulder, midday, p.m. shoulder and p.m. peak conditions. When only the new capacity is priced and toll-free capacity remains available in immediately adjacent lanes, hourly and directional distributions of traffic are important factors in determining the share of traffic willing to use the current lanes. These types of managed-lane facilities typically have higher utilization during peak periods and very low utilization in off-peak hours which require the use of tolls which vary by time of day.

For purposes of this second-tier preliminary analysis, traffic assignments were made for each of the managed-lane projects by principal time period of the day. Alternative toll rates were also tested to determine the sensitive equilibrium point between the toll-free and tolled lanes, on these types of projects. For potential toll candidate projects which are more traditional in nature, such as a stand-alone new toll facility, the same basic, but less complex traffic and toll assignment process was followed.

TRAFFIC AND REVENUE ANALYSIS

For each second-tier project, a series of traffic assignments using the models described above were performed. Traffic assignments were made at opening (2010) and future (2025 or 2030) years. At the outset of the study, it was recognized that most of the projects analyzed would not have advanced through the planning and design phases at a pace fast enough to allow them to open to traffic by the year 2010. However, this year was chosen to allow all projects to have "equal footing," being analyzed over the same time horizon. Additionally, WSA, as requested by CTE, can re-assess the traffic and revenue potential of projects, when DRCOG updated 2030 models become available. Intermediate year revenue forecasts were developed through interpolation. Similar forecasts beyond 2025 were estimated through extrapolation. Thirty-year toll revenue projections were prepared for each project alternative; nominal assumed traffic growth rates were used to extend revenues beyond the horizon year of the assignment process.

At opening and horizon year levels, a range of alternative toll rates for each project were tested. This was particularly critical for projects where only the "new capacity" was being priced. In such cases, it was important to identify optimum toll rates for peak, shoulder and off-peak conditions. Traffic assignment results were then reviewed for reasonableness.

For each of the projects tested, daily traffic estimates, as well as peak hour traffic estimates where needed, were prepared. Annual revenue estimates were developed for each project, extending over a 30-year projection period.

CORRIDOR DEVELOPMENT COST ESTIMATES

This task entailed identifying the improvement characteristics and associated construction and maintenance costs for each candidate toll project to a higher degree of detail than in the first-tier screening. The cost estimate methodologies involved updating and refining the available information from CDOT to establish typical improvement standards and construction cost build-up tables for the various facility types. These standards were then applied to the various corridors based on the definition of each corridor's improvements. The definition of the necessary improvements to each corridor depended on the current configuration of the existing roadway, if applicable, and the nature and extent of the facility upgrades. The associated construction and on-going maintenance cost estimates were based on the application of the typical standards to the identified improvements to each corridor.

Utilizing available bid tab information and cost estimates from earlier corridor studies, cost build-up tables were developed to estimate the construction costs. Overall unit-cost factors were developed from the cost-build up tables at a greater level of detail than in the first tier screening process. These unit-cost factors included items such as paving, grading, and drainage. The unit-cost factors for each improvement type represented typical applications and were adjusted as required for special considerations such as major bridge crossings and interchanges. Appropriate add-ons for "soft" costs associated with design, right-of-way acquisition, and program management and administration were also considered to develop a total capital roadway cost for implementation.

The following items were included:

- Paving, Shoulder and Base;
- Grading;
- Drainage;
- Utility Relocations;
- Lighting, signing and pavement markings;
- Erosion control;
- Interchanges (excluding bridges);
- Bridges/Structures;
- Construction incidentals and miscellaneous items;
- Right-of-way; and
- Project Contingency

Also included in the capital cost estimate for each project is the cost for electronic toll collection (ETC) equipment and installation. The unit costs for ETC equipment and installation were based on recent bid tabulations from other comparable turnpikes and other toll facilities operating in Colorado, as well as previous team experience on other toll projects.

It should be noted that cost estimates prepared for this analysis were based on bid tab data and cost estimates from either prior studies, or in the case of on-going environmental studies, from then-current project cost estimates provided by the corridor study teams. As these project configurations are refined over time, it is highly probable that the cost estimates will also be refined and may differ from those presented in this report.

Financial Feasibility Analysis

Following the development of traffic and revenue forecasts, the study team brought the various analytical results together into an analysis of the financial feasibility of the potential second-tier toll candidate projects. The study team then undertook a financial feasibility assessment, using a discounted cash flow model.

Each potential toll project was evaluated for financial feasibility based upon these initial construction estimates and the traffic and revenue forecasts developed by the study team, and then applying that data to a discounted cash flow analysis. This analysis determined the capacity of the proposed toll project to support debt. The analysis also included setting aside sufficient reserves for unplanned major maintenance or construction, for debt service, and for rate/toll stabilization.

Each project was analyzed as a stand-alone, single asset facility and then, several select projects were analyzed under an integrated system approach to gauge levels of feasibility.

ORDER OF PRESENTATION

The report has been ordered based on the following chapter structure:

Chapter 2 provides an overview and summary of findings for the first-tier screening process. Specifically identified are the initial list of all candidate toll projects, screening objectives and methodology, and the screening evaluation criteria. The list of candidate projects to be evaluated in the second-tier screening process is identified.

Chapter 3 presents preliminary traffic and revenue estimates for the Denver area candidate toll projects included in the second-tier analysis, while Chapter 4 presents similar findings for the Colorado Springs, I-70 Mountain Corridor, and other statewide candidate toll projects. The first portion of these chapters provides a description of the second-tier screening approach and analysis methodologies for traffic modeling and toll collection system design. Following this, a description of each toll project is provided, along with discussions of existing traffic conditions, access locations and tolling concept, and estimates of traffic and annual toll revenue.

Chapter 5 presents preliminary estimates of capital, operating and maintenance costs for each project. Included are those costs associated with both the roadway and the toll collection system. These costs are based on bid tab data and cost estimates from prior studies, or in the case of on-going environmental studies, from current cost estimates provided by these corridor study teams. These costs will likely change as the project concepts are refined. The chapter provides an overview of the general methodology and basic assumptions used in preparing the estimates. Also provided are reserve fund deposit cost estimates, those costs associated with setting aside annual amounts for unplanned major maintenance or reconstruction activities.

Chapter 6 presents the results of the financial feasibility analysis including the methodology and financing assumptions and the feasibility of each project as a stand-alone toll facility. Also included is a feasibility analysis of several projects combined into an integrated system approach.

Finally, Chapter 7 presents a concise set of suggested next steps toward possible implementation of a toll facility system in the state.

CHAPTER 2

FIRST-TIER SCREENING PROCESS AND FINDINGS

Prior to the commencement of WSA's first-tier screening study, the Colorado Tolling Enterprise (CTE) conducted a preliminary evaluation of potential candidate toll facility projects in Colorado. Through its own broad screening approach, 39 candidate projects were selected out of more than 75 potential pojects. These 39 projects, in various configurations, were evaluated by WSA in a first-tier screening, intended to facilitate the selection of projects to be studied in the second-tier phase of evaluation.

The findings of the first-tier evaluation phase resulted from application of 12 first-tier screening criteria developed in "Technical Memorandum No. 1 – Proposed First-Tier Screening Criteria," as well as consideration of public comments. Of necessity, the analytical approach used was largely subjective in nature, making maximum use of available information, such as traffic counts, historical construction costs, information from prior studies, and professional judgments. At this level of study, it was not appropriate to conduct a detailed traffic or engineering analysis of each of the corridors; rather, each project was analyzed using a "broad-brush" approach, with care taken to ensure consistent levels of analysis between projects, to the maximum extent possible.

Twelve "first tier" screening criteria were used, as identified in the aforementioned "Technical Memorandum No.1." These include, in no particular order of importance:

- Potential Safety Impacts;
- Toll Operations Viability Assessment;
- Economic Growth Considerations;
- Consistency with Statewide and Regional Plan Goals;
- Community Impact Assessment;
- Congestion Relief Potential;
- Network Continuity Considerations;
- Order-of-Magnitude Construction Cost Estimates;

- General Constructability Assessment;
- 20th Year Traffic and Revenue Potential;
- Relative Financial Feasibility Index; and
- Other considerations.

Detailed descriptions of these criteria can be found in the previously submitted technical memorandum, "Proposed First-Tier Screening Criteria, Candidate CTE Toll Facility Project."

CANDIDATE PROJECT LIST OVERVIEW

Table 2-1 presents a list of all 39 projects evaluated in this screening. Indication of the type of each project is also given, using the following categories: (1) managed lanes, (2) new toll roads, (3) managed facilities (new limited-access lanes constructed in the right-of-way of an arterial roadway), (4) truck toll lanes, (5) toll tunnels, and (6) conversion of high occupancy vehicle (HOV) lanes to high occupancy toll (HOT) lanes. The distinction between these project types is as follows:

- **Managed Lanes** - These projects typically involve the addition of one or two new lanes per direction along existing freeways, where only those drivers using the new capacity are required to pay a toll.

- **New Toll Roads** - These involve new construction (either within or adjacent to existing roadways) for which all vehicles using any portion of the new roadway would be assessed a toll. In general, competing routes for the new toll roads would be existing two-lane or multi-lane state highways, with any existing traffic signals, lower posted speed limits, and sections passing through various towns and cities.

- **Managed Facilities -** This type of project would generally involve construction of new toll facilities, possibly as elevated roadways, along existing arterial routes. While these would be similar to managed lanes, the immediately competing lanes would usually be signalized and have lower operating speeds, whereas "managed lane"-type projects would involve adding new capacity to existing freeways where the competing lanes would operate under comparable speed limits without signalized intersections.

Table 2-1
First-Tier Screening Projects

No.	Type	Type Description	Roadway	Project Limits
1	1	Managed Lanes	I-25	I-70 to Fort Collins
2	1	Managed Lanes	I-70	C-470 to I-25
3	1	Managed Lanes	I-70	I-25 to E-470
4	1	Managed Lanes	I-25	C-470 to Colorado Springs
5	1,5	Managed Lanes, Tunnel	I-70	Eagle to C-470
6	6	HOT Lanes	U.S. 36	I-25 to Boulder
7	3,6	Managed Facility, HOT Lanes	U.S. 85	I-25 to C-470
8	1	Managed Lanes	C-470	I-70 to I-25
9	1	Managed Lanes	I-25	Colorado Springs to Pueblo
10	1	Managed Lanes	I-76	I-70 to E-470
11	1	Managed Lanes	6th Avenue	C-470 to I-25
12	3	Managed Facility	U.S. 85	I-76 to U.S. 34
13	1	Managed Lanes	I-70	Utah to Eagle
14	1	Managed Lanes	I-225	S.H. 83 to I-70
15	3	Managed Facility	U.S. 40	C-470 to I-25
16	4	Truck Only Lanes	I-76	E-470 to Nebraska
17	2	New Toll Road	U.S. 24	I-25 to Limon (I-70)
18	3	Managed Facility	U.S. 24	S.H. 67 to I-25
19	1	Managed Lanes	I-25	Fort Collins to Wyoming State Line
20	3	Managed Facility	U.S. 285	Conifer to U.S. 85
21	2	New Toll Road	70 Business	SH 340 to I-70
22	3	Managed Facility	U.S. 34	I-25 to S.H. 85
23	6	HOT Lanes	S.H. 82	Glenwood Springs to Aspen
24	3	Managed Facility	U.S. 85	C-470 to I-25
25	4	Truck Only Lanes	I-70	E-470 to Kansas State Line
26	3	Managed Facility	S.H. 83	I-225 to E-470
27	3	Managed Facility	S.H. 119	Boulder to I-25
28	4	Truck Only Lanes	U.S. 287 Bypass	I-25 to Livermore
29	2	New Toll Road	Powers Boulevard	I-25 North to I-25 South
30	3	Managed Facility	S.H. 121	U.S. 36 to C-470
31	3	Managed Facility	S.H. 391	I-70 to U.S. 285
32	2	New Toll Road	U.S. 50	I-25 (Pueblo) to Kansas State Line
33	1	Managed Lanes	S.H. 58	S.H. 93(Golden) to I-70
34	2	New Toll Road	NW Corridor	U.S. 6 to NW Parkway
35	2	New Toll Road	S.H. 9	I-70 to U.S. 40
36	3	Managed Facility	S.H. 9	I-70 to Breckenridge
37	2	New Toll Road	Front Range	Fort Collins to Pueblo
38	2	New Toll Road	Banning-Lewis Parkway	Colorado Springs from I-25 N. to I-25 S.
39	1	Managed Lanes	I-270	US 36 to I-70

- **Truck Toll Roads or Lanes – These** projects would involve either adding a lane in each direction along interstate routes with heavy truck volumes, or constructing new truck lanes (or truck toll roads) to relieve existing arterial routes which currently experience heavy truck volumes. In both cases, use of the new facilities or lanes would be limited to trucks.

- **Tunnels -** These projects (the Eisenhower Tunnel and the Idaho Springs Tunnel on I-70) would involve constructing an additional "bore" to meet the peak traffic demands characteristic of the I-70 corridor.

- **HOT Lanes -** Although essentially identical to managed lanes in physical configuration (i.e. the addition of a tolled lane or two in each direction on an existing freeway), these facilities would offer toll-free access to high-occupancy vehicles. Only single-occupant vehicles would be assessed a toll for use of the new lanes.

Different methodological approaches were used for each of these project types when assessing viability with respect to the aforementioned screening criteria. The particular processes used and factors considered are explained in further detail below, as well as in the previously submitted Technical Memorandum, "First-Tier Screening Process and Findings."

SCREENING METHODOLOGY AND EVALUATION CRITERIA

Presented below is a brief overview describing each of the criteria used to evaluate the 39 candidate toll projects selected as part of the first-tier screening analysis. A more in-depth discussion of these criteria including, the specific data gathered for each criteria and the data sources and application to specific criteria can be found in "Technical Memorandum No. 1 – Proposed First-Tier Screening Criteria," as well as "Technical Memorandum No. 2: First-Tier Screening Process and Findings," both of which have previously been submitted to the Colorado Tolling Enterprise.

Safety Impact - Data on the location and type of accidents on major Colorado highways in 2001 were provided to WSA by CDOT. These were converted into weighted average accident rates per million vehicle miles of travel (VMT) for highway segments within project corridors, and compared to statewide weighted average accident rates for facilities of the same type. Facilities with accident rates substantially greater than the statewide average for the appropriate facility type were determined to have relatively high potential for safety improvement, and the projects located within the associated corridors were given higher safety impact ratings.

***Toll Operations Viability Assessment* -** Toll operations viability ratings were determined by taking into account a particular set of requirements and considerations for any given proposed facility according to its project type. To the extent that a given project could be constructed in such a manner as to fully satisfy all of the specified tolling system requirements, it was assigned a high toll operations viability rating. Projects with critical or fatal barriers to satisfaction of one or more of these requirements would conversely be assigned lower toll operations viability ratings.

***Economic Impacts* -** A project was determined to have positive economic impacts if it would support an area where significant growth was expected or if it would provide access to areas with growth potential not currently well served by the existing highway network. To identify such projects, WSA defined an influence area for each proposed toll facility, examined current and projected socioeconomic conditions for these areas, and determined the extent to which each proposed toll facility could catalyze growth (growth considerations) in areas currently stifled by poor accessibility.

***Consistency with Statewide and Regional Plan Goals* -** Projects were reviewed to assess consistency with other on-going statewide and regional transportation plans. The documents consulted included Corridor Visions being prepared in the 2030 Statewide Transportation Plan, the 2003 list of Strategic projects, select Transportation Improvement Programs (TIPs), and other comments received by the Consultant team. Broad categories of consistency were defined as follows:

- *The proposed project or similar improvement is on the plan or the project provides needed congestion relief or improves freight flow.*

- *The proposed project is not on the plan as such, however, it is consistent with the spirit and goals enumerated for the plan or is not a highly consistent project but has been the subject of a recent EIS.*

- *The project is not on the plan and not consistent with the spirit of the plan*.

The Denver Regional Council of Governments also provided information regarding their future plans and their assessment of the extent to which envisioned projects in their area may not be consistent with future plans.

Community Impact Assessment - This evaluation criterion is a "broad brush" relative measure of the social and environmental impacts that the tolling improvements on a corridor would have on adjoining land uses and communities. Several key factors were considered in this category of impact, including:

- Social Impacts - A general assessment of the need for additional right-of-way and the displacement of residences or businesses along the corridor;

- Aesthetic Impacts - The vertical profile (at-grade versus elevated) and any uniquely sensitive topography through which the project would be constructed;

- Environmental Justice Issues - The potential for disproportionately high and adverse effects on low-income or minority populations;

- Natural Environment Impacts - Assessed on the basis of development of the corridor. If the improvements create a new transportation corridor or expand a corridor through an undeveloped area, it is more likely to have a significant impact on the natural environment. The presence of a unique feature of the natural environment increases the potential for a significant impact; and

- Noise and Air Quality Impacts – Noise assessment is directly related to the density and proximity of development in the corridor, while the assessment of air quality impacts is primarily related to the congestion relief provided by the proposed improvements.

It should be emphasized that in the first-tier screening process, the assessment was qualitative in nature and was not based on detailed quantitative data. It was based largely on the characteristics of the corridor that were either known or could be observed in the field.

Congestion Relief Potential - To assess relative congestion relief potential, each project was divided into segments, delimited by groups of uniform roadway attributes as given in CDOT's geographic information systems (GIS) database. The level of congestion relief for each project was defined as *low*, *medium*, or *high* based upon the percentage of VMT exposed to highly congested roadway segments. For example, toll projects related to a facility with a 2020 VMT of 33 percent or less over the V/C threshold of 0.85 would be expected to provide a low level of congestion relief; projects with 34 to 65 percent would be expected to provide a medium level of congestion relief; and over 65 percent would be expected to provide a high level of congestion relief.

Network Continuity Considerations - Each project was evaluated in terms of its relationship to other toll facility projects, with regard to connectivity and the development of a coherent toll network. For example, a particular project could enhance the performance and viability of a nearby project. A general review was made of each of the facilities to determine the extent to which they would function as an integral element of an overall improved network, or operate in isolation.

Order-of-Magnitude Construction Cost Estimates - The purpose of this evaluation criterion was to identify, given the type of improvements planned in each corridor, order-of-magnitude construction costs for the corridors in question. The construction costs for each project were then compared with a relative measure of the project's projected toll revenue to develop a Relative Feasibility Index.

Constructability Rating - The purpose of this evaluation criterion was to identify a relative measure of the ease or difficulty of constructing a project (apart from cost considerations). The primary elements that would influence the constructability of the corridors involve construction conflicts with existing roadways or development, constraints due to topographic features, and inadequate subsurface soils. The ease of construction of each corridor would be evaluated using a relative rating system. Each corridor would be given a low, medium or high impact rating for constructability, where a high impact rating indicates that there would be higher constructability issues to implement the project. The constructability evaluation would identify characteristics associated with each corridor that may make construction of the corridor difficult or infeasible.

20th Year Traffic and Revenue Potential - An estimate of 20th year traffic and revenue potential was prepared for each of the first tier projects. A generalized assessment was made to estimate traffic demand via generalized toll diversion and toll sensitivity for each of the project corridors using manual traffic assignment and traffic estimation techniques. Regional travel demand models were not used in this phase of study. Instead, maximum use was made of existing datasets and prior studies where available.

For each of the projects a comprehensive set of data was gathered for every individual highway segment using datasets provided by the CDOT. These included but were not limited to existing and 20th year annual average daily traffic, historical traffic counts, hourly traffic profiles, daily and seasonal variations, truck percentages, posted speed limits, functional classifications, number of lanes, and lane widths. The projects were then analyzed using “spreadsheet” models and methodologies appropriate to each proposed improvement.

Financial Feasibility Index - While a more detailed financial feasibility analysis has been undertaken in the second-tier phase of study, the first-tier screening assessment included an attempt to provide a relative index (for comparison between projects) of financial viability. The index, shown in Table 2-2, is a simple and direct comparison between 20th year revenue potential and estimated capital cost. The intent is to provide a relative indication of feasibility, and not to determine if any individual project is actually financially viable. Lower values of this index are given to more viable projects. In fact, this number may be thought of as a general indicator of the number of years required for a project to pay back its construction costs from the toll revenues received.

Table 2-2
Relative Financial Feasibility Index

Relative Financial Feasibility Index	Ranking Factor
>50	Very low
40-50	Low
30-40	Medium-low
20-30	Medium
10-20	Medium-high
<10	High

SUMMARY OF FINDINGS

Table 2-3 presents the final list of project corridors advancing to the second-tier analysis. A total of 12 project corridors are shown, some of which have multiple alternatives. The detailed results of this second-tier analysis are given in the following chapters. While somewhat more detailed than the broad-brush screening analysis documented in this chapter, this analysis is still preliminary in nature. Considerably more detailed studies would be needed, beyond the second-tier analysis, before any of these projects could proceed to actual financing.

Table 2-3
Final Tier 2 Candidate Toll Facilities

Project Number	Roadway	Project Limits
1	I-25	I-70 to Fort Collins
3	I-70	I-25 to E-470
5	I-70	Idaho Springs/Eisenhower Tunnels
6	U.S. 36	I-25 to Boulder
8	C-470	I-70 to I-25
14	I-225	S.H. 83 to I-70
28	U.S. 287	I-25 to Livermore
29	Powers Boulevard	I-25 North to I-25 South
38	Banning-Lewis Parkway	Colorado Springs from I-25 N. to I-25 S.
34	NW Corridor	U.S. 6 to NW Parkway
37	Front Range	Fort Collins to Pueblo
39	I-270	I-70 to U.S. 36

CHAPTER 3

PRELIMINARY ESTIMATES OF TRAFFIC AND TOLL REVENUE DENVER AREA CANDIDATE PROJECTS

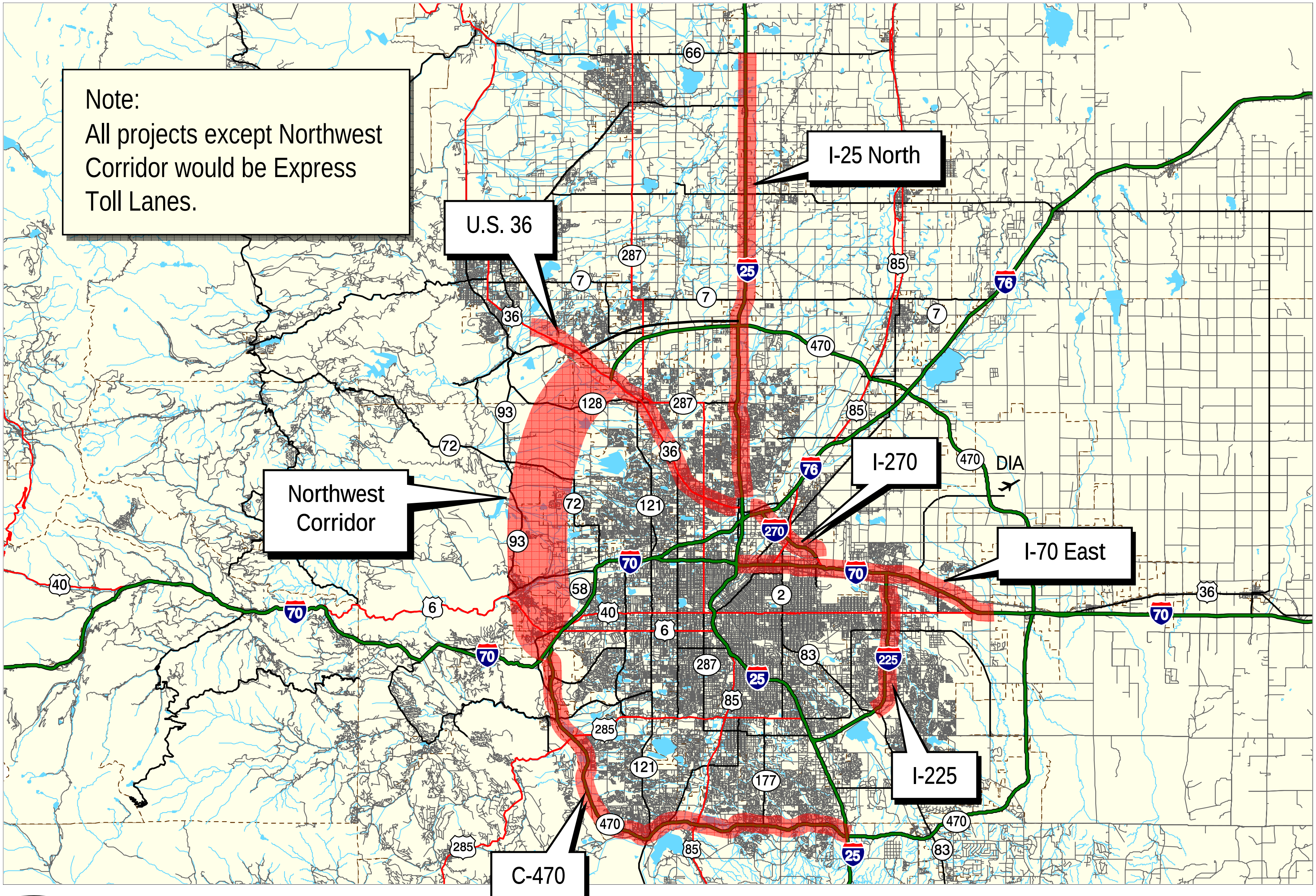
Presented in this chapter are the estimates of traffic and toll revenue for the second-tier toll candidate projects in the Denver area. In total, there are 14 project alternatives in 7 general highway corridors. These project corridors are depicted in Figure 3-1. In addition to the traffic and revenue estimates, existing daily traffic volume data, where available, are discussed, along with the assumed project access points and tolling concepts. Tables showing the estimated optimum toll rates by time period and travel direction are also provided.

SECOND-TIER SCREENING STUDY APPROACH

As discussed in Chapter 2, the first-tier screening process was conducted on a larger set of candidate toll projects and was based largely on a subjective assessment of traffic and revenue potential, and project cost, using readily available information and a more simplified analytical approach. This second-tier analysis has been conducted on a reduced number of project corridors and project scenarios, but made use of the travel demand models of the Denver Region Council of Governments (DRCOG) in developing traffic and revenue estimates. In addition, as will be discussed subsequently, a more detailed analytical approach was also used in developing preliminary estimates of capital, operating and maintenance costs for each candidate toll project. The second-tier analysis also brought together these estimates of revenue and cost to evaluate the financial feasibility of each project as will be described in Chapter 6.

PROJECT OVERVIEW

Presented in Table 3-1 is a list of the 14 second-tier candidate toll projects in the Denver area. The table provides the project location, limits and a



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DENVER AREA SECOND-TIER CANDIDATE PROJECTS

FIGURE 3-1

Table 3-1
Second-Tier Denver Area Candidate Toll Projects

No.	Location	Limits	Project Description (1)
1	U.S. 36 Express Toll lanes	I-25 to Cherryvale Road	Add one ETL/direction Cherryvale Rd. to McCaslin Blvd. and 2 ETL/direction from McCaslin to Pecos St.
2	C-470 Express Toll Lanes Scenario 1	I-25 to Wadsworth Boulevard	Add two ETL/direction I-25 to Wadsworth. Original DRCOG trip tables.
3	C-470 Express Toll Lanes Scenario 1A	I-25 to Wadsworth Boulevard	Add two ETL/direction I-25 to Wadsworth. Alternative trip table growth assumption.
4	C-470 Express Toll Lanes Scenario 2	I-25 to I-70	Add two ETL/direction I-25 to I-70. Original DRCOG trip tables.
5	C-470 Express Toll Lanes Scenario 2A	I-25 to I-70	Add two ETL/direction I-25 to I-70. Alternative trip table growth assumption.
6	I-25 Express Toll Lanes Scenario 1	U.S. 36 to S.H. 66	Add two express toll lanes (ETL) per direction from SH 66 to north of 120th; add two reversible ETL from 120th to 84th.
7	I-25 Express Toll Lanes Scenario 2	U.S. 36 to S.H. 7	Add two reversible ETL from SH 7 to 84th; convert existing HOV to HOT fom 84th to US 36.
8	I-70 East Express Toll Lanes Scenario 1	I-25 to E-470	Add two ETL/direction I-25 to E-470.
9	I-70 East Express Toll Lanes Scenario 2	I-25 to Chambers Road	Add two ETL/direction I-25 to Chambers Rd.
10	I-70 East Express Toll Lanes Scenario 3	Colorado Boulevard to Chambers Road	Add two ETL/direction
11	I-225 Express Toll Lanes	I-70 to S.H. 83	Add two ETL/direction.
12	I-270 Express Toll Lanes	I-25 to I-70	Add two ETL/direction.
13	Northwest Corridor Scenario 1	NW Parkway/U.S. 36 to U.S. 6	New toll road from U.S. 36 to U.S. 6.
14	Northwest Corridor Scenario 2	S.H. 128 to S.H. 58	New four lane freeway from U.S. 36 to U.S. 6, but only tolled from S.H. 128 to S.H. 58.

(1) For analysis purposes only.

brief description of the type of toll facility, either express toll lanes, of which there are 12 analyzed, or new toll roads of which there are two. More detailed descriptions of each project are provided below.

ANALYSIS METHODOLOGY

Presented below is a brief discussion of the methodology used to prepare the traffic estimates for each of the Denver area projects, along with a similar discussion of the methodology and considerations taken into account in developing the toll collection system for each project.

TRAFFIC MODELING

Twelve of the fourteen project scenarios studied within the Denver area are "managed lane" type facilities. In these projects, existing freeways are widened, with tolls charged only on the added new lanes. Existing capacity generally remains toll-free. Toll charges in the managed lanes vary based on demand, to ensure lanes continue to flow freely.

The traffic and revenue estimation process for the managed lanes projects was a multi-step process that incorporated actual traffic counts, travel time information collected from travel time runs, the regional travel demand model, and a micro-model of the corridors. Major work elements of this forecasting process included the following:

- Develop an existing traffic operations profile in each corridor;
- Develop a micro-model of each corridor with estimates of opening and future year global traffic demand;
- Estimate market share under tolled conditions; and
- Estimate annual revenue.

The remaining two projects, the Northwest Corridor Toll Road, Scenarios 1 and 2, used the Denver regional travel demand model for estimation of traffic and revenue. Toll sensitivity analyses were performed at opening and future year levels. Selection of optimum toll rates were made, and traffic and revenue was summarized for each of these two projects on a daily basis.

The most recent version of the travel demand model produced by the DRCOG was used as a starting point in the analytical process. This newer version is based on a TRANSCAD modeling framework, but utilizes socioeconomic data forecasts by traffic zone which had been developed in the previous version of the model. DRCOG is developing an updated future year 2030 version of its TRANSCAD model. Therefore, traffic and revenue estimates presented in this report may be revised in the future based on this updated model through additional analyses, if requested by CTE.

At the outset of the work, discussions were held with DRCOG staff regarding basic network assumptions made when developing travel demand matrices (trip tables), which provide the underlying basis for estimating demand for travel in the region. DRCOG staff indicated that beyond currently committed major capacity expansions, now under construction, primarily along I-25 and any portion of I-225, future capacity expansions on other freeways, such as the various managed lane proposals addressed as part of this study, were not assumed in the distribution process. This would tend to underestimate growth and demand in some of the major freeway corridors. As a result, and with assistance from DRCOG staff, WSA used the TRANSCAD framework to develop updated trip tables, using the same socioeconomic forecasts but reflecting higher nominal capacities along the freeways in which managed lane projects were to be evaluated.

In most cases, this resulted in slightly higher estimates of “global” demand in each of these freeway corridors, than represented by the original DRCOG trip tables. The differences, however, were not that significant, generally between 5 and 15 percent of the baseline demand, by the year 2010.

In addition, the version of the model provided by DRCOG did not include the future “FasTracks” regional rail transit initiative, which was passed as a referendum item in the November elections. However, at the time the information was provided by DRCOG, there was uncertainty about whether the future transit initiatives or initiative program would be approved, and therefore decisions were made to use modeling inputs which did not include the major future new rail initiatives, although other previously committed new transit services were included in the network and distribution process.

Three of the FasTrack planned corridors could potentially affect demand in one or more of the proposed managed lane facilities studied as part of this analysis. In theory, construction of competing rail service in the immediate corridor with managed lanes would tend to reduce the demand for the toll facility; although, the extent of this would need to be evaluated in much more detailed studies. Since this study was not intended to be performed for use in direct support of possible project financing, it was determined to be most reasonable to assume that the program was not in place for purposes of this feasibility study. However, any possible "investment grade" traffic and revenue studies for any of these corridors would, of course, need to more closely examine the impacts of the approved proposed FasTrack program.

Develop Corridor Pricing Micro-Models - Consistent with the preliminary nature of this study, the analysis was performed over a limited time period, and was based primarily on readily available information. Available traffic counts along the study corridors were obtained from previous studies conducted by WSA and other consultants. In addition, WSA staff conducted field reconnaissance to determine roadway characteristics, roadside constraints, and typical travel time and operating conditions during peak and off-peak periods.

A balanced hourly traffic profile along each of the managed lane project corridors was created by using mainline and ramp hourly traffic count data. Based on these hourly variation patterns and the travel time runs, the 24-hours of the day were divided into peak, shoulder, and off-peak time periods. The following represents the time intervals for which the analyses were performed:

- AM "Pre-Shoulder" - 6:00-7:00 a.m.
- AM Peak - 7:00-8:00 a.m.
- AM "Post Shoulder" - 8:00-9:00 a.m.
- Mid Day - 9:00 a.m. - 3:00 p.m.
- PM "Pre-Shoulder" - 3:00-4:00 p.m.
- PM Peak - 4:00-6:00 p.m.
- PM" Post Shoulder" - 6:00-7:00 p.m.

DRCOG regional travel demand model was used to develop the background travel patterns in the corridors, estimate potential diversion from other parallel streets and highways due to the added available capacity, and to identify potential future growth in the corridor. The managed lanes as well as the access/egress points were coded into the regional travel demand model reflecting the current configuration of the managed lane facilities.

The corridor pricing micro-model was extracted as a window from the regional model. Potential diversions to each of the project corridors from other roads were estimated using the regional model by allowing traffic into the managed lanes. The base regional model trip tables were disaggregated and adjusted to represent the analysis periods listed above. These disaggregated trip tables were then adjusted using a matrix adjustment process to match the balanced hourly traffic volumes on the ramps and mainline segments of each study corridor.

Future model runs of the regional travel demand model for the corridor were performed at year 2025 levels to provide growth adjustments to the calibrated base year trip tables by the period.

Optimum Toll Rate Analysis - Traffic and revenue analysis is based on an estimate of the amount of traffic willing to pay a toll of $X to save Y minutes. The pricing micro-model attempts to find the equilibrium point between the amount of time savings and willingness to pay the prevailing toll rate.

Within the model, for each origin-destination pair, the travel time using the managed lanes is compared to the travel time using a toll-free routing (on the freeway or its adjacent streets) to estimate a travel time savings. The toll charged for each movement is compared to its time savings to estimate a ratio of “cost-per-minute-saved.” This cost-per-minute-saved is compared to the value-of-time for travelers. Those travelers with values-of-time higher than the cost-per-minute saved would tend to choose the tolled lanes, while those with lower values-of-time would tend to choose the general purpose lanes.

Drivers’ values-of-time are not uniform, so for any given toll rate/time savings combination, only a portion of those eligible to use the managed lanes would actually choose to use them. As traffic moves from the general purpose lanes to the managed lanes, the time savings advantage offered by the managed lanes is reduced. For each toll rate level, the pricing model finds the equilibrium point between changes in travel time due to traffic shifting to the managed lanes and willingness-to-pay based on value-of-time and travel time savings.

Traffic analyses were performed for years 2010 and 2025. Toll sensitivity tests were conducted for each project, for each time period/direction by running a full range of toll rates from $0.05 to $0.50 per mile and summarizing traffic and revenue for each rate level. Toll rate selection for each time period/direction was based on a combination of criteria, including maximizing revenues. The optimum toll rates selected are discussed below for each candidate toll project.

TOLL COLLECTION SYSTEM CONSIDERATIONS

Toll facilities within the metropolitan area are all assumed to be express toll lanes that supplement existing general purpose lanes except for open road tolling solutions for the unfinished portion of the existing Northwest Corridor. Open road tolling involves the exclusive use of express toll lanes that record either a toll or violation transaction at the prevailing highway speed in non-stop, continuous highway lanes. Tolling is typically accomplished electronically by reading an encoded transponder attached to the vehicle's windshield by an overhead antenna. The inherent assumption when implementing open road tolling is electronic toll collection (ETC) will initially support customer participation to generate sufficient revenue. The CTE projects directly benefit from the identical ETC technology used by both the E-470 Public Highway Authority and the Northwest Parkway Authority.

Another important system implementation consideration is accommodation of either "pre-set" time of day (TOD) or "dynamic" variable pricing to more accurately capture the increasing value of the differential time savings realized during periods of congested flow. Pricing can be transactional based, whereby a user charge is recorded for each transponder read, or trip based, whereby a single user charge consisting of one or more transponder reads is recorded for each directional trip on the express toll lanes. For this analysis, trip based, TOD pricing is assumed for all Express Toll Lanes because it can be posted along the facility, documented in various forms of distributed user information and advertised through the media. This combination is expected to minimize potential confusion regarding the current price to use the toll facility, and thereby reduce the customer service center call volume. For open road tolling projects transactional based, fixed pricing is assumed.

Express Lane Access Points - Effectively, there are two types of access point designs, each with multiple implementation variation, for express lane projects. The two design alternatives are direct connections and slip ramps. Direct connections are accomplished at a common grade, involve a flyover of the general purpose lanes from a connecting ramp with touchdown at the express lane design grade or a tunnel under the general purpose lanes from a connecting ramp day-lighting at the express lane design grade. Unless the direct connection is at an express lane terminus or the direct connection adds or drops a continuous lane, the express lane facility must widen to provide a transition for users to merge or diverge from the express toll lanes to enter or exit, respectively. If the express lane facility is reversible, entry to the direct connection ramp or accessway must be controlled by multiple interspaced gates that are interlocked with gates controlling entry in the opposite direction.

Slip ramp access point design involves at grade entry to or exit from the general purpose lanes to the express toll lanes at either separate locations or at the same location along the express lane facility. Single point express lane entry requires an auxiliary lane diverging from the general purpose lanes and then merging within the express toll lanes along another auxiliary lane in accordance with design standards. Single point express lane exit requires an auxiliary lane diverging from the express toll lanes and then adjoining another auxiliary lane to merge with the general purpose. A variation of the slip ramp design is construction of a transition zone of sufficient length to handle weaving, merging and diverging for both express lane entry and exit from and to the general purpose lanes.

Field Support Structures - Physical implementation of ETC typically involves installation of gantry or bridge and cantilever structures above the mainline express toll lanes and access points, respectively, to mount antennae to transmit signals between either a small toll and communication building or roadside cabinet housing a ETC reader/controller and the vehicle mounted transponder. Gantry or bridge structures provide greater wind stability, which is particularly desirable for image quality from overhead violation enforcement cameras. Lower cost cantilever structures are also used for mounting signs.

Electronic Toll Collection Equipment - Express toll lanes are assumed as all-electronic facilities, with no provisions for manual or automatic coin machine collection. To assure interoperability, the transponder and other ETC equipment will be equivalent to the transponder and equipment used on E-470 and Northwest Parkway. Although one lane controller per lane provides high availability, express toll lanes will be deployed with one lane controller per direction to more efficiently handle cross lane reads, vehicles straddling two lanes and violation trigger messages.

Violation Enforcement Subsystem Equipment - Express toll lanes require the implementation of a violation enforcement subsystem (VES) to capture the license plates of vehicles that fail to record a valid transaction when traveling through a tolling point. This subsystem captures multiple license plate images of violating vehicles traveling in the express lane or adjacent shoulders, if sufficiently wide.

Optical character recognition (OCR) would be performed on the best of the multiple images to automatically extract the license plate characters and assign a level of confidence index to the extracted characters. OCR can be performed at the roadside level or centrally by providing equivalent processing capacity.

Express Lane Signing - Dynamic message signs (DMS) would typically be installed in advanced of the Express Toll Lane facility to notify prospective users of the approaching facility, locations serviced by the facility and selected pricing information. Notification of the current Express Toll Lane trip charges for selected destinations from decision points of diverting to the Express Toll Lanes can be made by overhead fixed, static signs with embedded changeable sign panels. Barrier mounted blankout signs can also be used to display trip charges in affect when entering the facility from various entry locations. Fixed static signs will also be used to inform users of approaching exits, posted speed limits, violator fines, TOD toll schedules, and other pertinent express lane information.

Back Office Processing

- **Host Computer Subsystem** - The host computer system processes, stores and reports transactions and maintenance events received from the lane controllers. In turn, the host computer sends ETC and security account information, time synchronization and configuration data to the lane controllers. A primary function of the host computer system is to support the accounting and reconciliation process needed to accurately report revenues and expenses. The host computer system interfaces with a customer service and account management subsystem to send valid ETC transactions and receive transponder status lists and updates to the list.

- **Customer Service and Account Management Subsystem** - The customer service and account management subsystem supports the back-office operations for ETC including functions such as opening and closing an account, account management, transponder inventory and tracking, generating reports, and interfaces to a credit card clearinghouse, the violation processing subsystem, and the host computer subsystem. These functions would also be available from the a Web site and an interactive voice response (IVR) system. A call center will support customer calls regarding account establishment and management, ancillary issues related to the operation of the managed lanes calls from violators requesting information on violation citations.

- **Violation Processing Subsystem** - The violation processing subsystem processes violations using license plate images and violation transactions transmitted from the violation enforcement subsystem. This subsystem performs functions such as review and confirmation of video images, issuing tracking, and aging citations, processing payments, generating hearing evidence packages and interfacing with the Department of Motor Vehicles, the VES subsystem and customer service subsystem.

PROJECT EVALUATIONS

Presented below is a detailed narrative describing the project alternatives evaluated in the Denver area. For each project, traffic and revenue estimates are provided, along with a discussion identifying assumed project access and egress locations, tolling concepts, and optimum toll rates by time period and direction. These assumptions were used for this preliminary analysis, only. These project configuration assumptions will likely change as corridor studies progress. A total of 14 project alternatives along 7 corridors were evaluated in the Denver area. In four of the corridors multiple alternatives were evaluated.

I-25 NORTH EXPRESS TOLL LANES – SCENARIOS 1 AND 2

Two scenarios were considered for this corridor. Scenario 1 is an approximately 26 mile express toll lane from S.H. 66 to U.S. 36. Scenario 2 is a 12 mile project which extends from S.H. 7 to U.S. 36. The detailed assumptions for each project, along with the analytical findings, are presented below.

The I-25 North Scenario 1 project spans approximately 26 miles between S.H. 66 and U.S. 36. For this analysis, the project was subdivided into two sections with different improvement types. From S.H. 66 to 120th Avenue, I-25 was assumed to have three general purpose lanes and two express toll lanes in each direction. From 120th to U.S. 36, the assumption was that I-25 would have three general purpose lanes in each direction and two reversible express toll lanes. A separate on-going study is looking at the feasibility of converting the existing two-lane reversible high-occupancy vehicle (HOV) facility from U.S. 36 to downtown Denver to a two-lane reversible high-occupancy toll (HOT) facility. This HOV to HOT conversion has been assumed in this analysis.

The I-25 North Scenario 2 project limits extend from S.H. 7 to U.S. 36, a distance of approximately 12 miles. From S.H. 7 to U.S. 36, I-25 was assumed to have three general purpose lanes in each direction and two reversible express toll lanes. As mentioned above, a separate on-going study is evaluating the feasibility of converting the existing two-lane reversible high-occupancy vehicle (HOV) facility from U.S. 36 to downtown Denver to a two-lane reversible high-occupancy toll (HOT) facility. This conversion has also been assumed in this scenario.

CURRENT TRAFFIC CONDITIONS

For the analysis of these project scenarios, the latest regional traffic model was obtained from the DRCOG. The latest available hourly traffic counts at two mainline locations on I-25 were used to aid in the development of existing and future year hourly traffic profiles. The two 2004 traffic count locations were situated between S.H. 52 and S.H. 119, and between 120th and E-470/Northwest Parkway, where the weekday volumes were 75,000 and 85,300, respectively.

Hourly traffic volumes at the two count locations show a generally balanced flow in either travel direction during the morning and evening peak periods, although at the northernmost location volumes are slightly higher in the southbound a.m. and northbound p.m. periods. At the southernmost count location, the southbound volumes are higher in the a.m. peak period. In the p.m. peak period northbound and southbound volumes are similar. These variations are based on a one day count in February. More extensive counts should be performed for a finance-grade study.

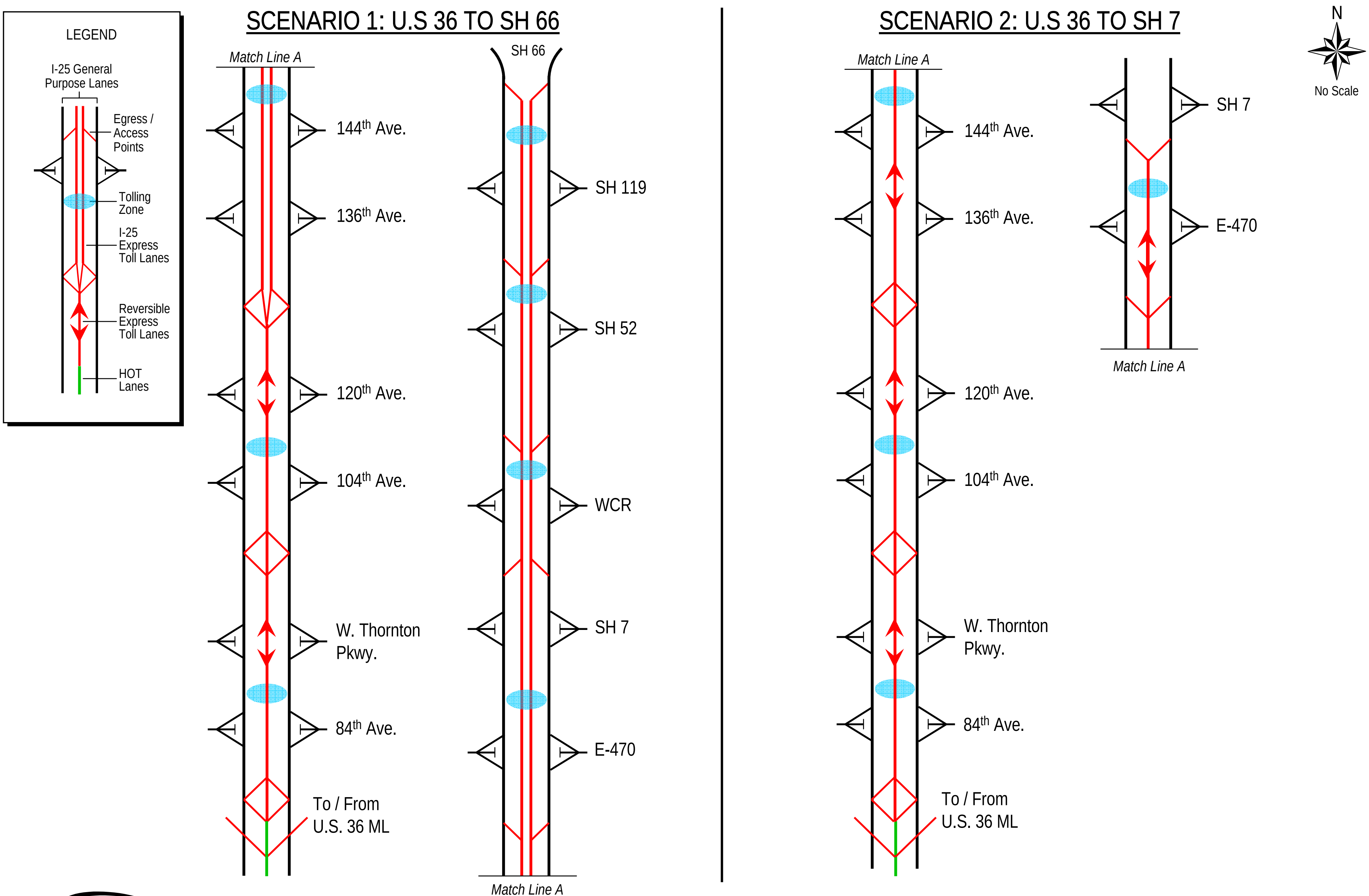
PROJECT ACCESS POINTS AND TOLLING CONCEPT

The assumed points of express toll lane access and tolling for Scenarios 1 and 2 are shown in Figure 3-2. Entry and exit access to the express toll lanes were assumed to be provided via nine locations in Scenario 1 and six locations in the shorter Scenario 2. In Scenario 1 partial access to/from the south was assumed at five locations including:

- North of S.H. 119;
- North of S.H. 52;
- North of S.H. 8;
- North of 144th Avenue; and
- Ramps to/from U.S. 36.

Full directional access was assumed to be provided at three locations, one north of 120th Avenue, another south of 104th Avenue, and another south of E. 84th Avenue. The final access location assumption provides slip ramps to/from the north south of S.H. 8. The transition from two reversible to four express lanes was assumed to be at the full access locations just north of 120th Avenue.

In Scenario 2, except for slip ramps south of S.H. 7, providing the northernmost access to the express toll lanes, all other access points south of E-470 are the same as in Scenario 1. However, in this case, the entire project north to S.H. 7 would be two lane reversible.



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I-25 NORTH PROPOSED ETL ACCESS POINTS AND TOLLING ZONES SCENARIOS 1 AND 2

FIGURE 3-2

Figure 3-2 also identifies the general location of tolling zones for each scenario. There are seven tolling zones identified in Scenario 1 and four in Scenario 2. This number of tolling zones allows for tolls to be levied on a per-mile basis, which would be more equitable for motorists on these longer distance projects.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average weekday traffic for years 2010 and 2025. Volumes shown are by time period and total weekday on the express toll lanes and total weekday on the general purpose lanes. Finally, estimates of the annual number of trips and gross toll revenue for each scenario are provided.

Toll Rates – A toll sensitivity analysis was conducted for each analysis period in years 2010 and 2025 for the two scenarios. A per-mile rate structure was assumed for both scenarios. Per-mile toll rates tested ranged from $0.05 to $0.50. Shown in Tables 3-2 and 3-3 are the optimum passenger car-based per-mile toll rates by time period and travel direction for Scenarios 1 and 2, respectively. Also presented is the toll for a 26 mile, full-length trip by time period and direction. The full-length tolls in Scenario 1 range from $0.70 to $8.00 in year 2010 and from $0.70 to $10.00 in 2025, depending on the time period. For the approximately 12 mile, full-length trip along the reversible toll lanes in Scenario 2, tolls could range from $1.20 to $4.75 in 2010, depending on the time period, and from $2.40 to $6.60 by 2025.

It should be noted that in Scenario 1, two per-mile toll rates are shown for each of the seven time periods. The lower rates apply to the three northernmost tolling zones and are 75 percent of the rates at the southern four tolling zones. This adjustment was applied to account for lower traffic volumes and congestion levels in the northern project segments.

Estimated Traffic – Average toll weekday traffic along I-25 on the general purpose and express toll lanes was summarized for each scenario at the optimum toll rates. Additionally, weekday volumes on the express toll lanes by time period are also provided. These volumes at 2010 and 2025 levels are displayed in Figures 3-3 and 3-4 for Scenario 1 and Figure 3-5 for Scenario 2.

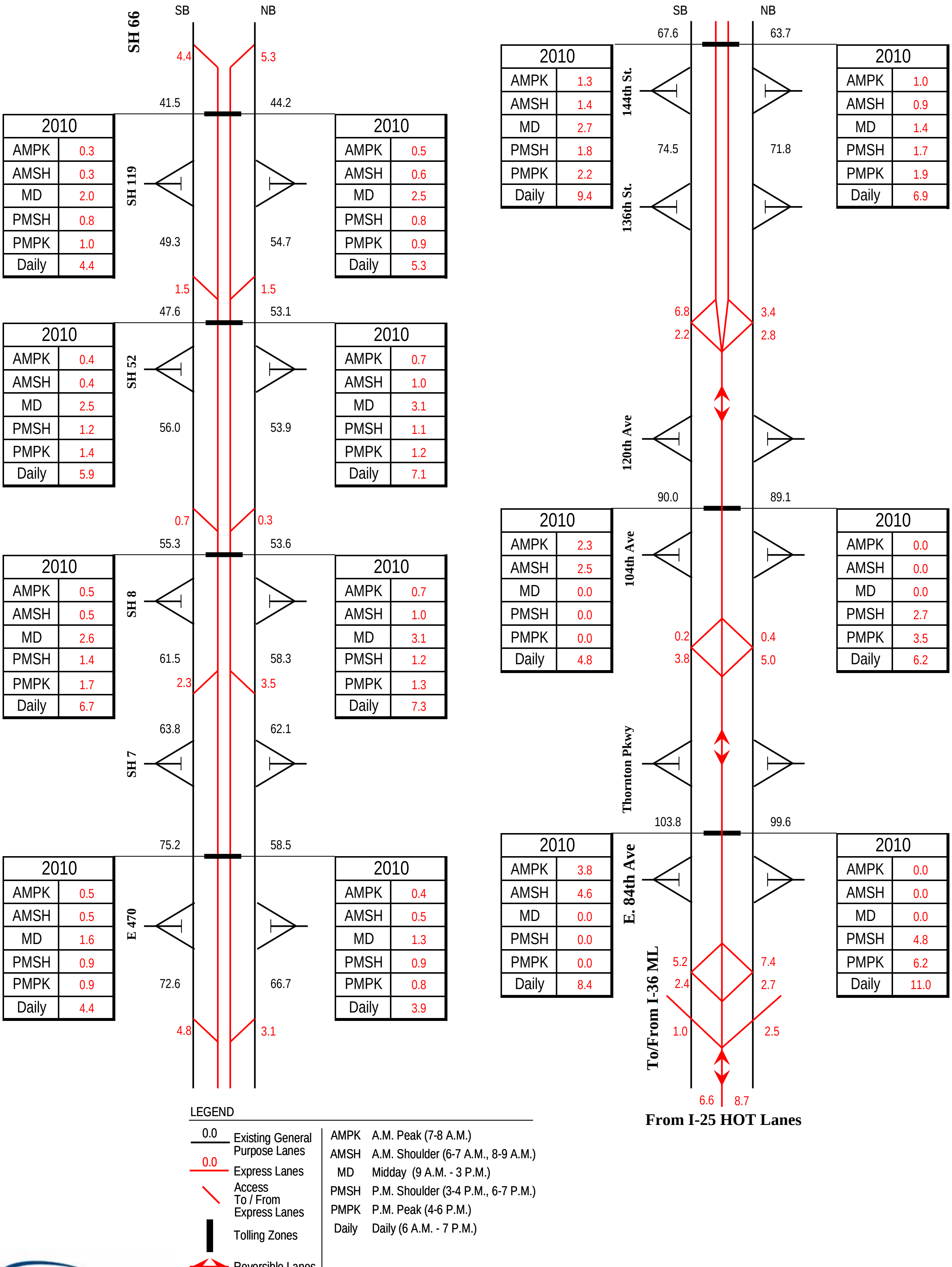
Table 3-2
Toll Rates By Time Period
I-25 Express Toll Lanes
Scenario 1 : U.S. 36 to S.H. 66
(2004 dollars)

		2010				2025			
		Southbound		Northbound		Southbound		Northbound	
Time Period	**Hours**	**Per-Mile(1)**	**Through Trip**	**Per-Mile(1)**	**Through Trip**	**Per-Mile(1)**	**Through Trip**	**Per-Mile(1)**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$.075/.100	$2.05	$.038/.050	$0.70	$.113/.150	$3.00	$.038/.050	$0.70
AM Peak	7 - 8 a.m.	.300/.400	8.00	.075/.100	1.50	.375/.500	10.00	.206/.275	4.00
AM Shoulder	8 - 9 a.m.	.169/.225	1.50	.056/.075	1.10	.319/.425	8.50	.188/.250	3.50
Midday	9 a.m. - 3 p.m.	.056/.075	1.10	.056/.075	1.10	.225/.300	4.50	.225/.300	4.50
PM Shoulder	3 - 4 p.m.	.056/.075	1.10	.113/.150	3.00	.169/.225	3.30	.225/.300	6.00
PM Peak	4 - 6 p.m.	.094/.125	1.85	.300/.400	8.00	.338/.450	6.50	.375/.500	10.00
PM Shoulder	6 - 7 p.m.	.056/.075	1.10	.113/.150	3.00	.169/.225	3.30	.225/.300	6.00

(1) Toll rates at the three northernmost tolling zones are 75 percent of the rates at the southern four tolling zones.

Table 3-3
Toll Rates By Time Period
I-25 Express Toll Lanes
Scenario 2 : U.S. 36 to S.H. 7
(2004 dollars)

		2010				2025			
		Southbound		Northbound		Southbound		Northbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.10	$1.20	$0.00	$0.00	$0.20	$2.40	$0.00	$0.00
AM Peak	7 - 8 a.m.	0.400	5.00	0.000	0.00	0.550	6.50	0.000	0.00
AM Shoulder	8 - 9 a.m.	0.250	3.00	0.000	0.00	0.425	5.00	0.000	0.00
Midday	9 a.m. - 3 p.m.	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
PM Shoulder	3 - 4 p.m.	0.000	0.00	0.150	1.80	0.000	0.00	0.375	4.50
PM Peak	4 - 6 p.m.	0.000	0.00	0.400	5.00	0.000	0.00	0.550	6.50
PM Shoulder	6 - 7 p.m.	0.000	0.00	0.150	1.80	0.000	0.00	0.375	4.50



Note: All volumes shown represent thousands of vehicles.

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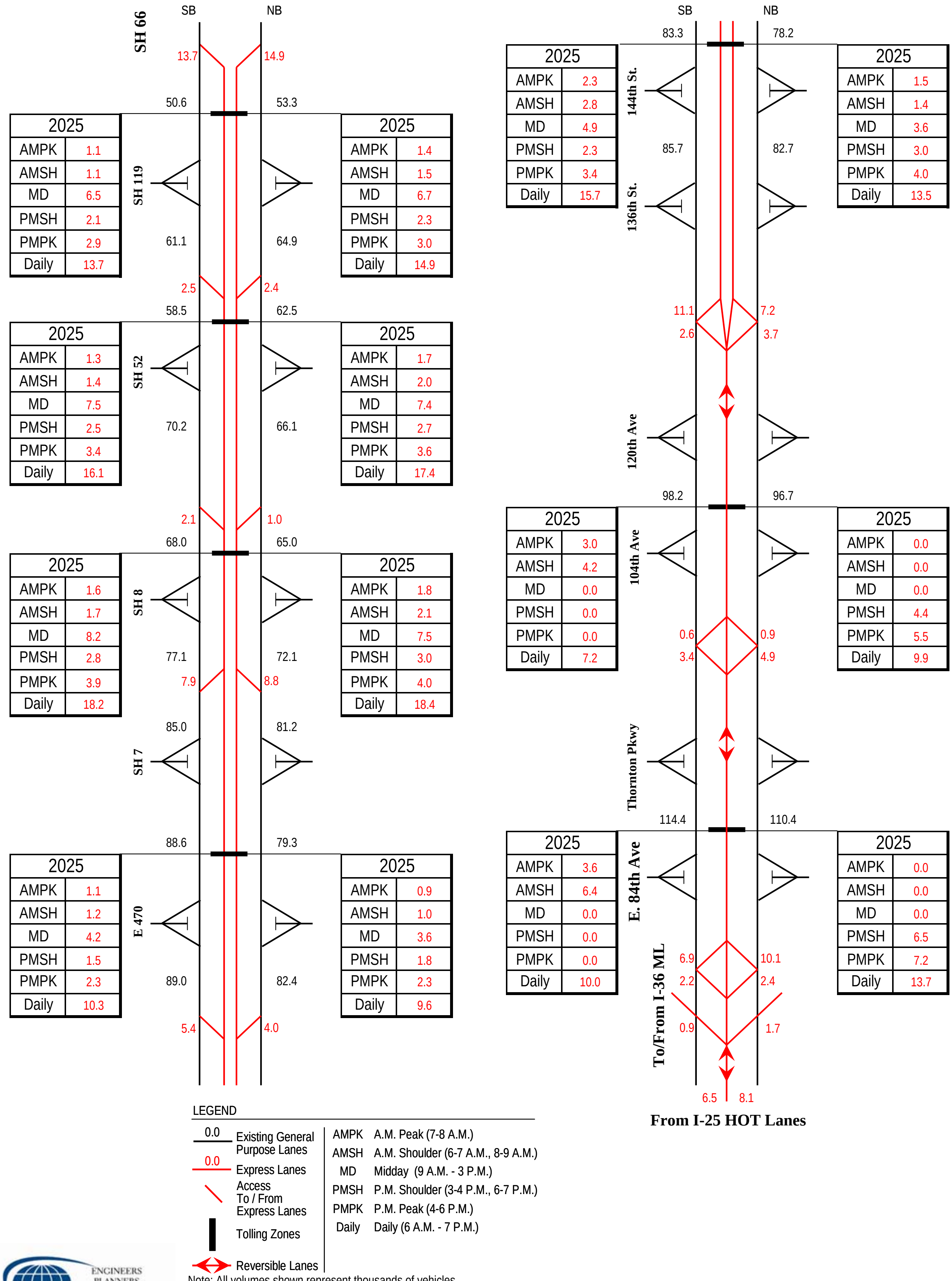
2010 Estimated Weekday Traffic I-25 Scenario 1: US 36 to SH 66

Figure 3-3



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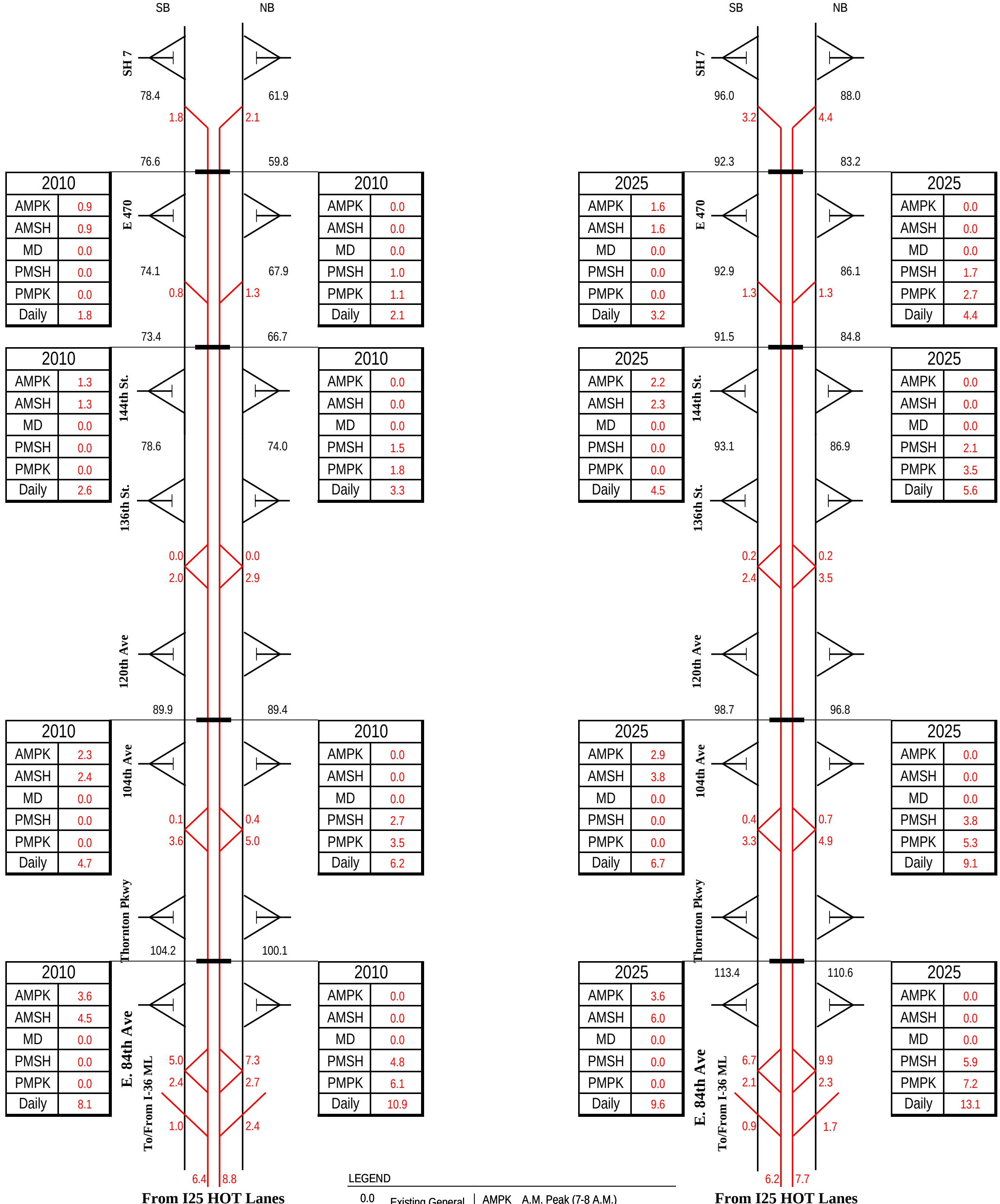
2025 Estimated Weekday Traffic I-25 Scenario 1: US 36 to SH 66

Figure 3-4



E 470:

2010 (SB)		2010 (NB)		2025 (SB)		2025 (NB)	
AMPK	0.9	AMPK	0.0	AMPK	1.6	AMPK	0.0
AMSH	0.9	AMSH	0.0	AMSH	1.6	AMSH	0.0
MD	0.0	MD	0.0	MD	0.0	MD	0.0
PMSH	0.0	PMSH	1.0	PMSH	0.0	PMSH	1.7
PMPK	0.0	PMPK	1.1	PMPK	0.0	PMPK	2.7
Daily	1.8	Daily	2.1	Daily	3.2	Daily	4.4

144th St. / 136th St.:

2010 (SB)		2010 (NB)		2025 (SB)		2025 (NB)	
AMPK	1.3	AMPK	0.0	AMPK	2.2	AMPK	0.0
AMSH	1.3	AMSH	0.0	AMSH	2.3	AMSH	0.0
MD	0.0	MD	0.0	MD	0.0	MD	0.0
PMSH	0.0	PMSH	1.5	PMSH	0.0	PMSH	2.1
PMPK	0.0	PMPK	1.8	PMPK	0.0	PMPK	3.5
Daily	2.6	Daily	3.3	Daily	4.5	Daily	5.6

104th Ave:

2010 (SB)		2010 (NB)		2025 (SB)		2025 (NB)	
AMPK	2.3	AMPK	0.0	AMPK	2.9	AMPK	0.0
AMSH	2.4	AMSH	0.0	AMSH	3.8	AMSH	0.0
MD	0.0	MD	0.0	MD	0.0	MD	0.0
PMSH	0.0	PMSH	2.7	PMSH	0.0	PMSH	3.8
PMPK	0.0	PMPK	3.5	PMPK	0.0	PMPK	5.3
Daily	4.7	Daily	6.2	Daily	6.7	Daily	9.1

E. 84th Ave:

2010 (SB)		2010 (NB)		2025 (SB)		2025 (NB)	
AMPK	3.6	AMPK	0.0	AMPK	3.6	AMPK	0.0
AMSH	4.5	AMSH	0.0	AMSH	6.0	AMSH	0.0
MD	0.0	MD	0.0	MD	0.0	MD	0.0
PMSH	0.0	PMSH	4.8	PMSH	0.0	PMSH	5.9
PMPK	0.0	PMPK	6.1	PMPK	0.0	PMPK	7.2
Daily	8.1	Daily	10.9	Daily	9.6	Daily	13.1

LEGEND

- 0.0 Existing General Purpose Lanes
- 0.0 Express Lanes
- Access To / From Express Lanes
- Tolling Zones

AMPK	A.M. Peak (7-8 A.M.)
AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
MD	Midday (9 A.M. - 3 P.M.)
PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
PMPK	P.M. Peak (4-6 P.M.)
Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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2010 & 2025 Estimated Weekday Traffic I-25 Scenario 2: US 36 to SH 7

Figure 3-5

In Scenario 1, the peak load point on the express toll lanes in year 2010 is 19,400 vehicles north of East 84th Avenue. This volume represents about 9 percent of the total I-25 demand at this location. The lowest load point on the express toll lanes is south of S.H. 7 where 8,300 vehicles use the facility. This represents about 6 percent of the total demand of 142,000 at this location. By 2025, the highest weekday express toll lane load point is located north of S.H. 8 with 36,600 vehicles or 22 percent of the total demand.

In Scenario 2, the peak load point on the express toll lanes in year 2010 is 19,000 vehicles north of East 84th Avenue. As in Scenario 1, this volume represents about 9 percent of the total vehicular demand at this location. The lowest point is south of S.H. 7 with 3,900 vehicles in the express toll lanes. However, this point is at the end of the reversible express toll lane project. By 2025, the highest weekday express toll lane load point is also located north of East 84th Avenue with 22,700 vehicles, or 9 percent of total vehicular demand.

Estimated Annual Trips And Gross Toll Revenue – Annual trips and gross toll revenue for Scenarios 1 and 2 are provided in Tables 3-4 and 3-5, respectively. Scenario 1 produces an estimated $15.2 million in gross toll revenue in year 2010 and grows to an estimated $59.9 million by year 2025. The annual number of trips is estimated at 10.4 million in year 2010, growing to 17.5 million by year 2025.

Gross toll revenue produced by Scenario 2 is estimated at $10.0 million in year 2010 and $23.2 million in year 2025. The annul number of trips in the express toll lanes rises from 5.7 million in year 2010 to 7.0 million in year 2025.

In this and other express toll lane project scenarios, average weekday transactions and revenue for years 2010 and 2025 were annualized. Annual revenue for 2010 and 2025 were calculated using 200 interior weekdays (Monday through Thursday), 52 Fridays, and 113 weekend days. Fridays were assumed to have 20 percent more revenue than the average weekday, and weekend days were assumed to represent 25 percent of the revenue on an average weekday. These Friday and weekend assumptions for I-25 were used since Friday traffic is generally greater than the average weekday, producing greater levels of congestion. Therefore, the revenue generating potential of the project on Friday’s would be greater than the average weekday. Conversely, weekend traffic is generally lower and limited use of express toll lanes would be anticipated. Annual transactions were similarly calculated. Intermediate year transactions and revenue were calculated through interpolation

Table 3-4
Annual Traffic And Revenue Estimates
I-25 Express Toll Lanes
Scenario 1 : U.S. 36 to S.H. 66

Year	Annual Trips (1) (000)	Annual Revenue (1,2) (000)
2010	10,376	$15,192
2011	10,745	16,647
2012	11,127	18,242
2013	11,523	19,989
2014	11,933	21,904
2015	12,357	24,002
2016	12,796	26,301
2017	13,252	28,820
2018	13,723	31,581
2019	14,211	34,606
2020	14,716	37,921
2021	15,240	41,553
2022	15,782	45,534
2023	16,343	49,895
2024	16,924	54,675
2025	17,526	59,912
2026	17,964	62,308
2027	18,413	64,801
2028	18,874	67,393
2029	19,345	70,089
2030	19,829	72,892
2031	20,226	75,079
2032	20,630	77,331
2033	21,043	79,651
2034	21,464	82,041
2035	21,893	84,502
2036	22,112	86,192
2037	22,333	87,916
2038	22,556	89,674
2039	22,782	91,468
2040	23,010	93,297

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

Table 3-5
Annual Traffic And Revenue Estimates
I-25 Express Toll Lanes
Scenario 2 : U.S. 36 to S.H. 7

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	5,668	$10,014
2011	5,750	10,591
2012	5,834	11,201
2013	5,918	11,847
2014	6,004	12,530
2015	6,091	13,252
2016	6,179	14,016
2017	6,269	14,823
2018	6,360	15,678
2019	6,452	16,581
2020	6,546	17,537
2021	6,640	18,547
2022	6,737	19,616
2023	6,834	20,747
2024	6,933	21,942
2025	7,034	23,207
2026	7,132	24,135
2027	7,232	25,101
2028	7,334	26,105
2029	7,436	27,149
2030	7,540	28,235
2031	7,646	29,082
2032	7,753	29,954
2033	7,862	30,853
2034	7,972	31,779
2035	8,083	32,732
2036	8,164	33,387
2037	8,246	34,054
2038	8,328	34,735
2039	8,411	35,430
2040	8,495	36,139

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

between 2010 and 2025. From 2025 to 2030 a 4.0 percent increase in annual revenue was assumed, reducing to 3.0 percent between 2030 and 2035, and 2.0 percent from 2035 to 2040.

Similar assumptions and procedures were used to annualize transactions and revenue for other projects evaluated, although there may have been slight variations used for the assumed weekday to Friday, and weekday to weekend day percentages.

I-70 EAST EXPRESS TOLL LANES – SCENARIOS 1, 2 AND 3

Three I-70 east express toll lane scenarios were evaluated. The scenarios are:

- Scenario 1 – A 12-mile express toll lane project between I-25 and E-470, with the express toll lanes on elevated structure between I-25 and I-270;

- Scenario 2 – A 9-mile express toll lane project between I-25 and Chambers Road, with the express toll lanes on elevated structure between I-25 and I-270; and

- Scenario 3 – A 6-mile express toll lane project between Colorado Boulevard and Chambers Road, without the need for any portion of the express toll lanes to be on elevated structure. The detailed assumptions for each project, along with the analytical findings are presented below.

The I-70 East Scenario 1 project is located between I-25 and E-470. The project is approximately 12 miles and is subdivided into two sections with different improvement types. From I-25 to just east of I-270, the section would have three general purpose lanes in each direction, the majority of which is on elevated structure, and two express toll lanes each direction on elevated structure, located adjacent to the existing I-70 alignment on the north side. From just east of I-270 to just west of E-470, I-70 would vary between two (east of Chambers Road to E-470) and four (east of I-270 to east of Chambers Road) general purpose lanes, plus two express toll lanes in each direction located at-grade.

The I-70 East Scenario 2 project is located between I-25 and Chambers Road. The project is approximately nine miles and is subdivided into two sections with different improvement types. From I-25 to just east of I-270, the section would have three general purpose lanes in each direction, the majority of which is on elevated structure, and two express toll lanes each direction on elevated structure, located adjacent to the existing I-70 alignment on the north side. From just east of I-270 to Chambers, I-70 would have four general purpose lanes and two express toll lanes in each direction located at-grade. Within this section the express toll lanes are assumed to be located in the median of existing I-70 and separated from the general purpose lanes by a concrete barrier.

The I-70 East Scenario 3 project is located between Colorado Boulevard and Chambers Road. The project is approximately six miles and would not have an elevated structure as was assumed in Scenarios 1 and 2. From just east of Colorado Boulevard to I-270, I-70 is assumed to have three general purpose lanes and two express toll lanes in each direction located at-grade. Within this section the express toll lanes are assumed to be located in the median of existing I-70 and separated from the general purpose lanes by a concrete barrier. It was assumed that the existing general purpose lanes would need to be reconstructed between Colorado and Chambers because the current median width is not sufficient to add express toll lanes in the median without impacting the general purpose lanes.

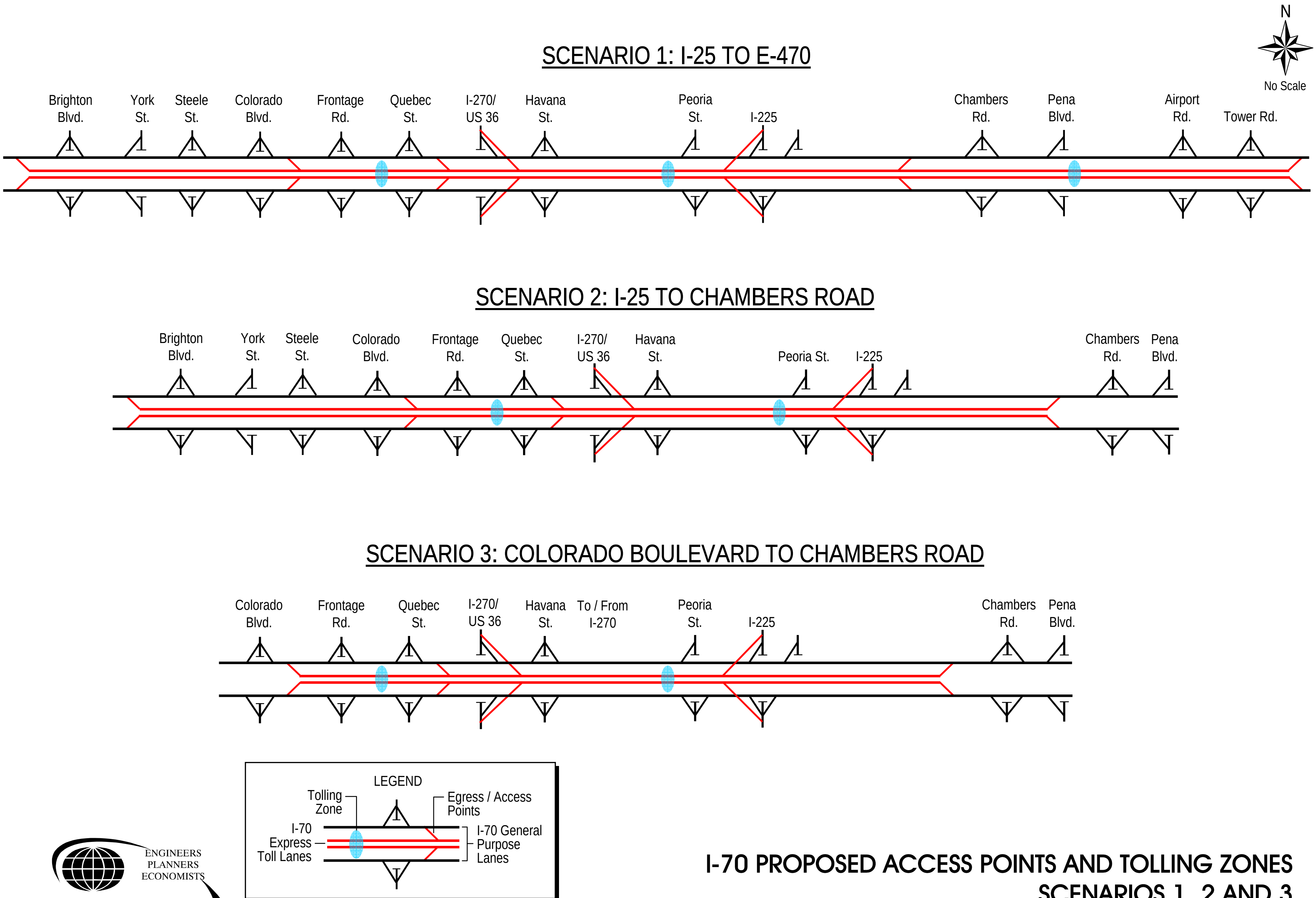
CURRENT TRAFFIC CONDITIONS

For the analysis of these scenarios the latest regional traffic model was obtained for the DRCOG. A collection of hourly traffic counts on all I-70 ramps within the study corridor and at two mainline locations along I-70 were used to create an hourly traffic demand profile for 2002. As expected, the highest volume occurs east of the I-270 ramps where the average weekday traffic is 175,000 vehicles across the eight lane cross-section. West of the I-270 ramps, traffic is heaviest between Brighton Boulevard and York Street at 140,000 vehicles across the six lane cross-section. Traffic levels drop off significantly east of Airport Road to 37,200 vehicles.

Hourly variation patterns along the mainline sections of I-70 showed that the west end of I-70 is the only significant location showing directional peaking patterns. There, traffic is heaviest in the morning eastbound and westbound during the afternoon peak. East of the I-270 ramps both directions are heavily used during the peaks with the westbound peaks starting earlier than the eastbound peaks. There is a significant movement of traffic between I-270 and I-225, along I-70.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

The assumed points of express toll lane access and tolling for Scenarios 1, 2 and 3 are shown in Figure 3-6. Entry to and exit from the express toll lanes are assumed via seven locations in Scenario 1, six locations in



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I-70 PROPOSED ACCESS POINTS AND TOLLING ZONES
SCENARIOS 1, 2 AND 3

FIGURE 3-6

Scenario 2, and five locations in the shorter Scenario 3. In Scenario 1 access is assumed to be provided at the following locations:

- To/from the east, west of Brighton Boulevard;
- To/from the east at Colorado Boulevard;
- To/from the east at Quebec Street;
- To/from the east with direct connection ramps with I-270;
- To/from the west with direct connection ramps with I-225;
- To/from the west, west of Chambers Road; and
- To/from the west, west of E-470.

In Scenario 2, the only assumed access difference is the removal of the access to/from the west, west of E-470 since the project ends at a location west of Chambers Road.

Access in Scenario 3, is assumed to be identical to Scenario 2, with the exception of the removal of the far west access, west of Brighton Boulevard. The project is assumed to begin east of Colorado Boulevard.

Figure 3-6 also identifies the general location of tolling zones for each scenario. There are three tolling zones identified in Scenario 1 and two in Scenarios 2 and 3. Under Scenario 1, the far west tolling zone would cover the distance traveled to the I-270 access, the middle tolling zone would cover the distance traveled from the I-270 access to Chambers Road and the last tolling zone would cover the distance from Chambers Road to E-470. Under Scenarios 2 and 3, the last tolling zone is not needed.

Preliminary Traffic and Revenue Estimates

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average weekday traffic for years 2010 and 2025. Volumes shown are by time period and total weekday on the express toll lanes and total weekday on the general purpose lanes. Finally, estimates of the annual number of trips and gross toll revenue for each scenario are provided.

Toll Rates – A toll sensitivity analysis was conducted for each analysis period in years 2010 and 2025 for the three scenarios. A per-mile rate structure was assumed for all three scenarios. Per-mile toll rates tested ranged from $0.05 to $0.50. Shown in Tables 3-6, 3-7 and 3-8 are the optimum passenger car-based per-mile toll rates by time period and travel direction for Scenarios 1, 2 and 3, respectively. Also presented is the toll

Table 3-6
Toll Rates By Time Period
I-70 Express Toll Lanes
Scenario 1 : I-25 to E-470
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.10	$1.35	$0.13	$1.60	$0.25	$3.25	$0.18	$2.25
AM Peak	7 - 8 a.m.	0.425	5.50	0.350	4.55	0.550	7.15	0.475	6.20
AM Shoulder	8 - 9 a.m.	0.300	3.90	0.125	1.60	0.425	5.50	0.250	3.25
Midday	9 a.m. - 3 p.m.	0.100	1.35	0.075	1.00	0.125	1.60	0.125	1.60
PM Shoulder	3 - 4 p.m.	0.300	3.90	0.250	3.25	0.375	4.90	0.450	5.80
PM Peak	4 - 6 p.m.	0.475	6.20	0.325	4.20	0.550	7.15	0.550	7.15
PM Shoulder	6 - 7 p.m.	0.150	1.95	0.075	1.00	0.225	2.95	0.300	3.90

Table 3-7
Toll Rates By Time Period
I-70 Express Toll Lanes
Scenario 2 : I-25 to Chambers Road
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.10	$0.80	$0.13	$0.95	$0.25	$1.95	$0.18	$1.35
AM Peak	7 - 8 a.m.	0.425	3.25	0.350	2.70	0.550	4.25	0.475	3.70
AM Shoulder	8 - 9 a.m.	0.300	2.30	0.125	0.95	0.425	3.25	0.250	1.95
Midday	9 a.m. - 3 p.m.	0.100	0.80	0.075	0.60	0.125	0.95	0.125	0.95
PM Shoulder	3 - 4 p.m.	0.300	2.30	0.250	1.95	0.375	2.90	0.450	3.45
PM Peak	4 - 6 p.m.	0.425	3.25	0.350	2.70	0.550	4.25	0.550	4.25
PM Shoulder	6 - 7 p.m.	0.150	1.15	0.075	0.60	0.225	1.75	0.300	2.30

Table 3-8
Toll Rates By Time Period
I-70 Express Toll Lanes
Scenario 3 : Colorado Boulevard to Chambers Road
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.10	$0.60	$0.13	$0.70	$0.25	$1.45	$0.18	$1.00
AM Peak	7 - 8 a.m.	0.425	2.40	0.350	2.00	0.550	3.15	0.475	2.75
AM Shoulder	8 - 9 a.m.	0.300	1.70	0.125	0.70	0.425	2.40	0.250	1.45
Midday	9 a.m. - 3 p.m.	0.100	0.60	0.075	0.45	0.125	0.70	0.125	0.70
PM Shoulder	3 - 4 p.m.	0.300	1.70	0.250	1.45	0.375	2.15	0.450	2.55
PM Peak	4 - 6 p.m.	0.425	2.40	0.350	2.00	0.550	3.15	0.550	3.15
PM Shoulder	6 - 7 p.m.	0.150	0.85	0.075	0.45	0.250	1.45	0.300	1.70

for a full-length trip by time period and direction. The full-length tolls in Scenario 1 range from $1.00 to $6.20 in year 2010 and from $1.60 to $7.15 in 2025, depending on the time period. In Scenario 2, a full-length trip along the express toll lanes would range from $0.60 to $3.25 in 2010, depending on the time period, and from $0.95 to $4.25 by 2025. In Scenario 3, a full-length trip along the express toll lanes would range from $0.45 to $2.40 in 2010, and from $0.70 to $3.15 by 2025.

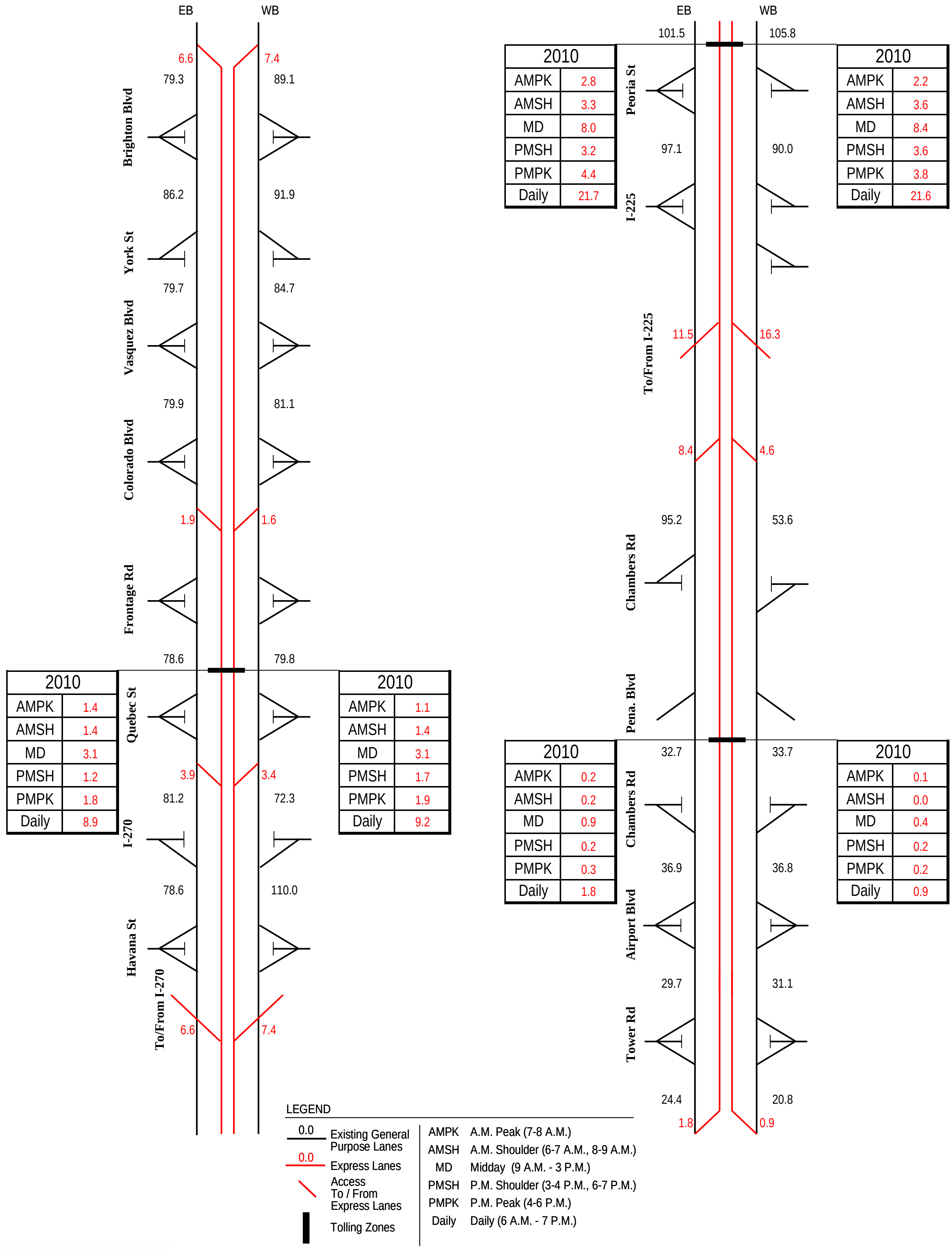
Estimated Traffic – Average toll weekday traffic along I-70 on the general purpose and express toll lanes was summarized for each scenario at the optimum toll rates. Additionally, weekday volumes on the express toll lanes by time period are also provided. These volumes at 2010 and 2025 levels are displayed in Figures 3-7 and 3-8 for Scenario 1, Figures 3-9 and 3-10 for Scenario 2, and Figures 3-11 and 3-12 for Scenario 3.

In reviewing new traffic estimates for the I-70 alternatives, and all of the Express Toll Lane type projects, it should be noted that traffic estimates are shown by analysis time period. The a.m. peak period, for analysis purposes, represents a one hour period, while the a.m. shoulder period represents two hours. Midday represents six hours, while p.m. shoulder and p.m. peak periods represent two hours each. The traffic volumes shown in the following figures, represent the total volumes for the entire period.

For example, in the traffic estimates shown in Figure 3-7, at the tolling zone located east of I-270, the eastbound a.m. peak hour traffic is estimated at 2,800 vehicles. The a.m. shoulder is estimated at 3,000 vehicles, over two hours, 1,750 vehicles per hour. The midday volume is estimated at 8,000 vehicles, but represents six hours; with an average of slightly more than 1,300 vehicles per hour.

It also should be kept in mind that highly variable toll rates are assumed to be used, rates which would optimize revenue while still managing free-flow traffic in peak periods. The toll rate in the midday is one fourth of the rate which would be charged in peak hour conditions; hence midday traffic usage would be lower on a per-hour basis and revenues would be much lower.

In Scenario 1, the peak load point on the express toll lanes in year 2010 is 43,300 vehicles east of I-270 access points. All traffic using the facility has to pass through this point and therefore would have the largest volume. This volume represents about 17 percent of the total I-70 demand at this location. At this same location during the a.m. peak hour, the estimated eastbound volume is 2,800 vehicles on the two express toll



Note: All volumes shown represent thousands of vehicles.

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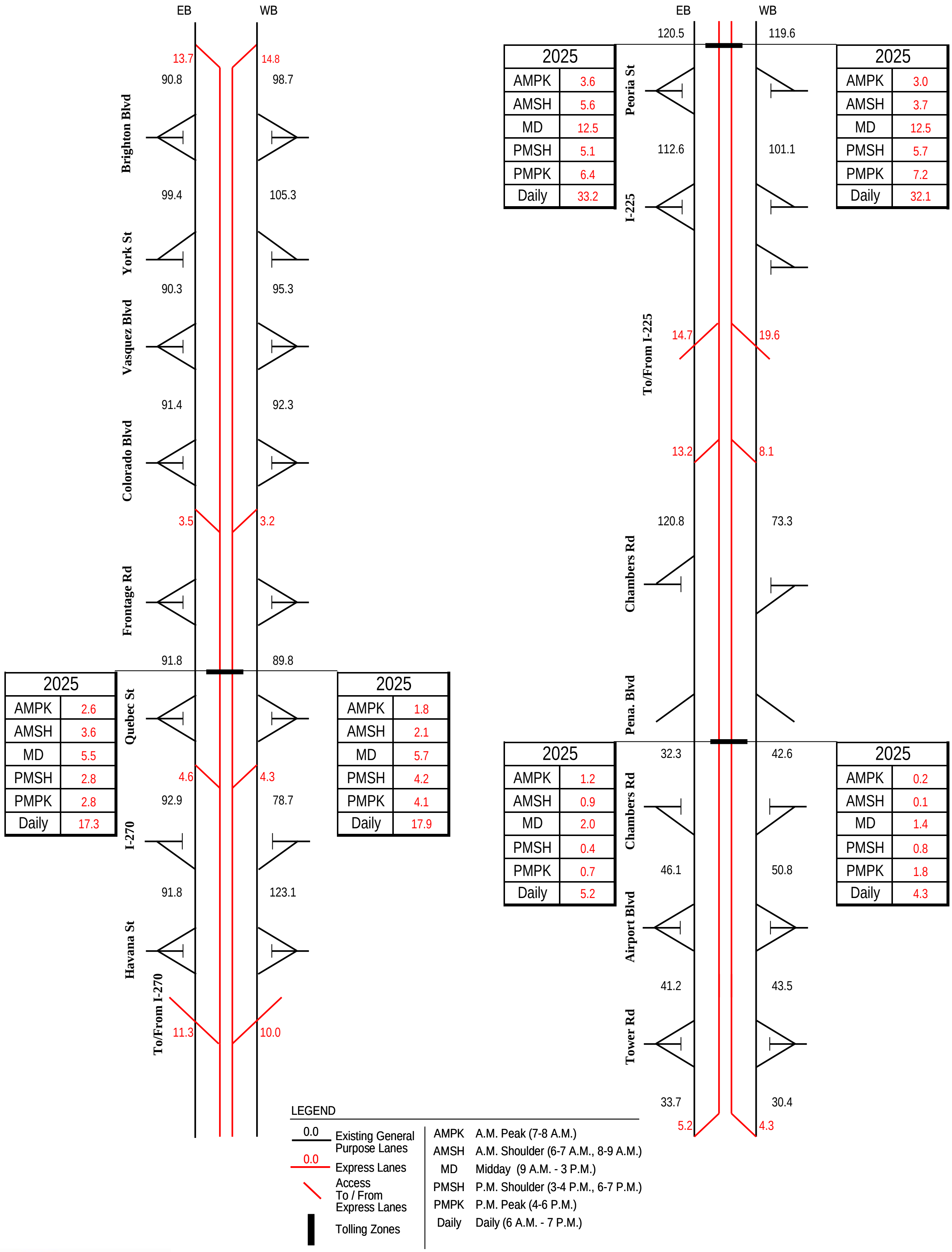
2010 Estimated Weekday Traffic I-70 Scenario 1: I-25 to E-470

Figure 3-7



2025	
AMPK	3.6
AMSH	5.6
MD	12.5
PMSH	5.1
PMPK	6.4
Daily	33.2

2025	
AMPK	3.0
AMSH	3.7
MD	12.5
PMSH	5.7
PMPK	7.2
Daily	32.1

2025	
AMPK	2.6
AMSH	3.6
MD	5.5
PMSH	2.8
PMPK	2.8
Daily	17.3

2025	
AMPK	1.8
AMSH	2.1
MD	5.7
PMSH	4.2
PMPK	4.1
Daily	17.9

2025	
AMPK	1.2
AMSH	0.9
MD	2.0
PMSH	0.4
PMPK	0.7
Daily	5.2

2025	
AMPK	0.2
AMSH	0.1
MD	1.4
PMSH	0.8
PMPK	1.8
Daily	4.3

Note: All volumes shown represent thousands of vehicles.

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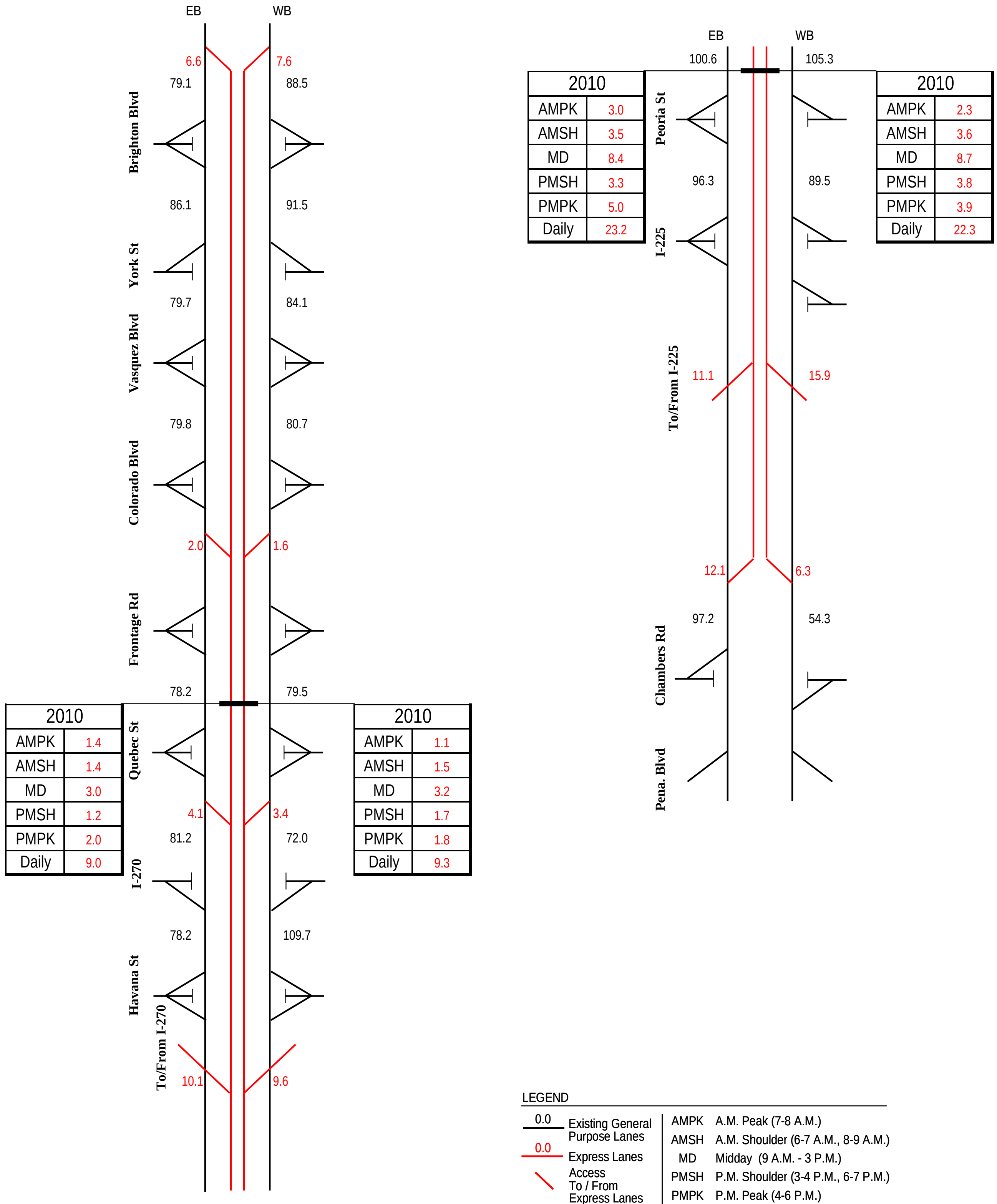
2025 Estimated Weekday Traffic I-70 Scenario 1: I-25 to E-470

Figure 3-8



2010	
AMPK	1.4
AMSH	1.4
MD	3.0
PMSH	1.2
PMPK	2.0
Daily	9.0

2010	
AMPK	1.1
AMSH	1.5
MD	3.2
PMSH	1.7
PMPK	1.8
Daily	9.3

2010	
AMPK	3.0
AMSH	3.5
MD	8.4
PMSH	3.3
PMPK	5.0
Daily	23.2

2010	
AMPK	2.3
AMSH	3.6
MD	8.7
PMSH	3.8
PMPK	3.9
Daily	22.3

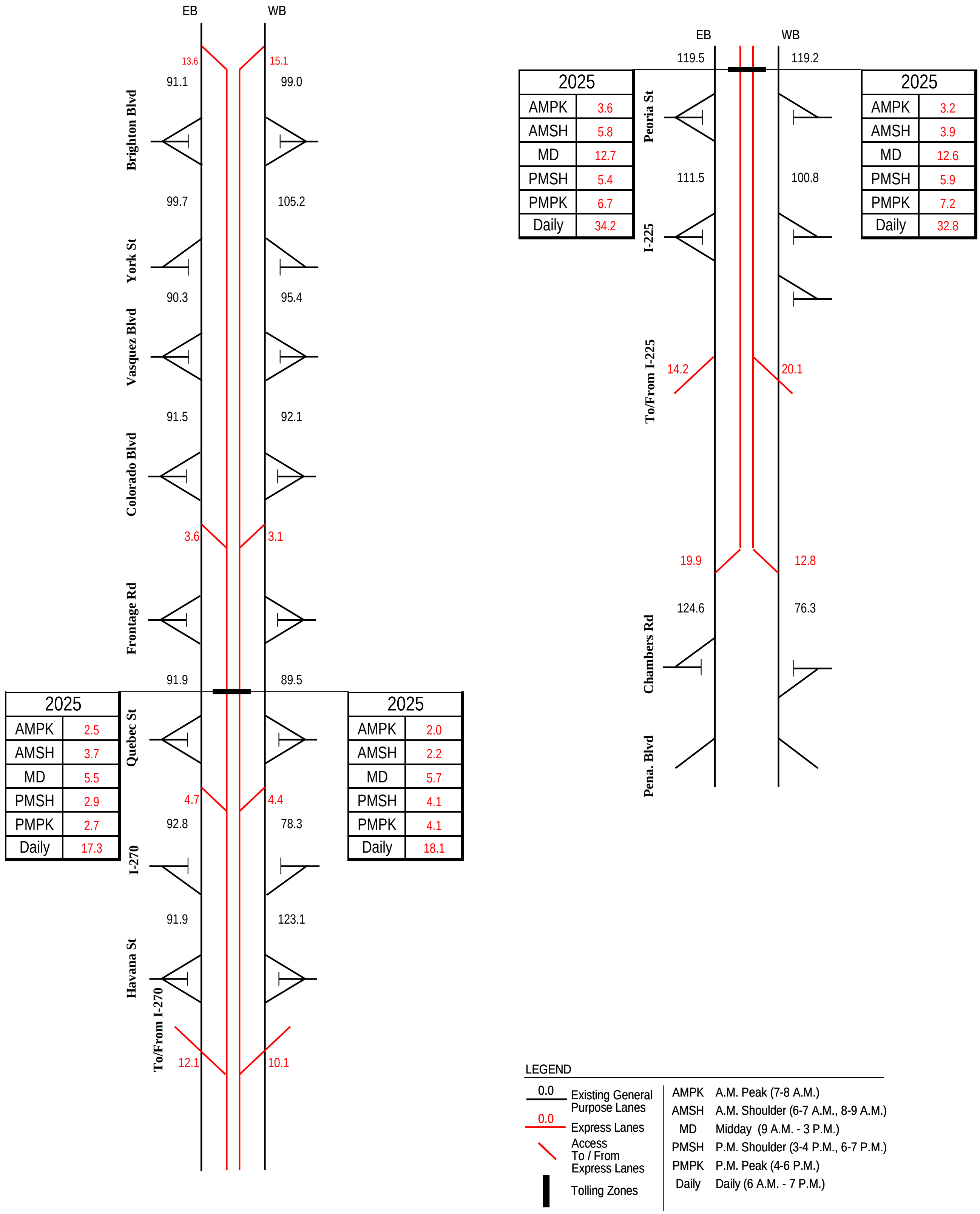
LEGEND

0.0	Existing General Purpose Lanes	AMPK	A.M. Peak (7-8 A.M.)
0.0	Express Lanes	AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
	Access To / From Express Lanes	MD	Midday (9 A.M. - 3 P.M.)
	Tolling Zones	PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
		PMPK	P.M. Peak (4-6 P.M.)
		Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

2010 Estimated Weekday Traffic I-70 Scenario 2: I-25 to Chambers

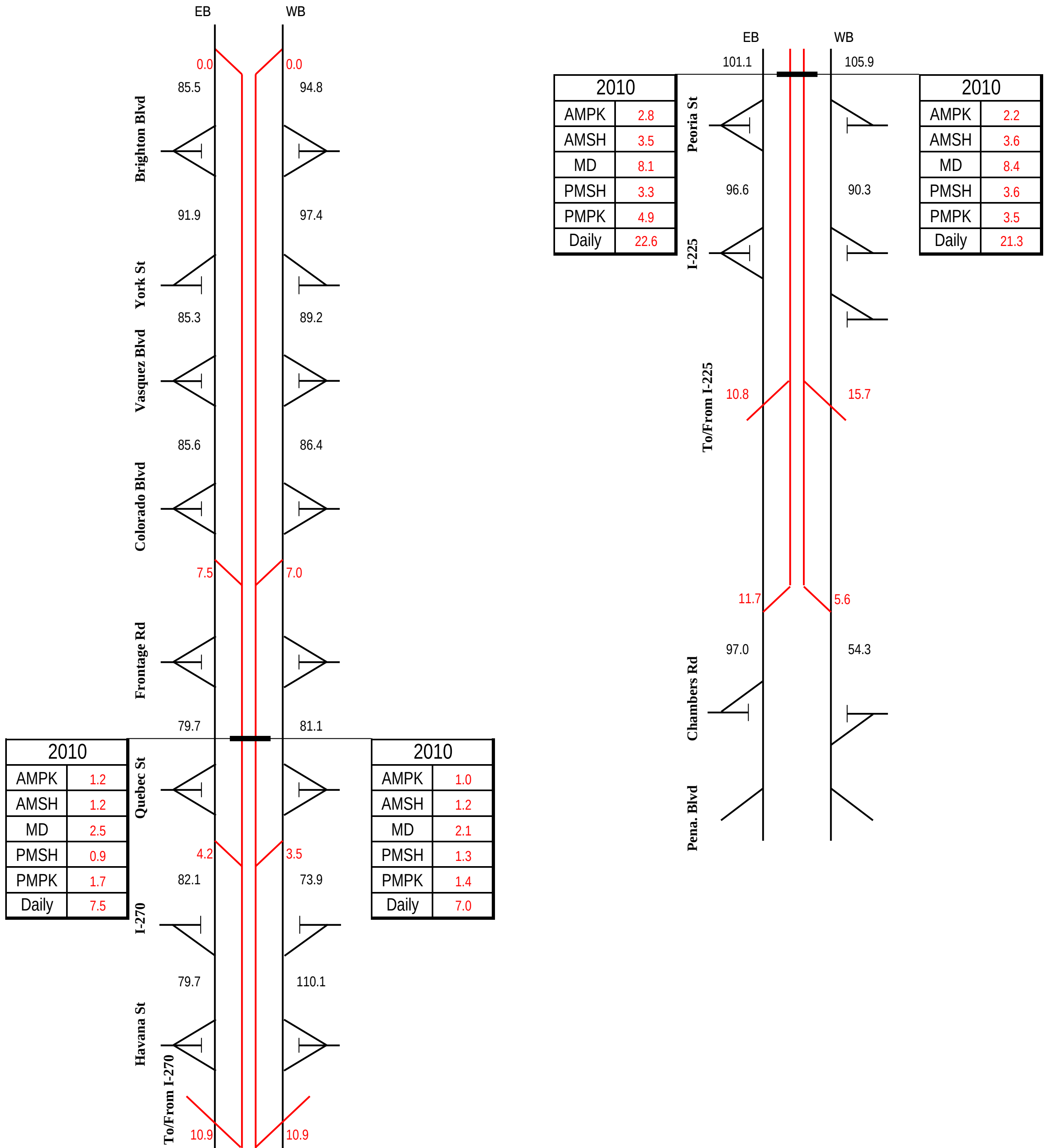
Figure 3-9



Note: All volumes shown represent thousands of vehicles.

2025 Estimated Weekday Traffic I-70 Scenario 2: I-25 to Chambers

Figure 3-10



2010	
AMPK	1.2
AMSH	1.2
MD	2.5
PMSH	0.9
PMPK	1.7
Daily	7.5

2010	
AMPK	1.0
AMSH	1.2
MD	2.1
PMSH	1.3
PMPK	1.4
Daily	7.0

2010	
AMPK	2.8
AMSH	3.5
MD	8.1
PMSH	3.3
PMPK	4.9
Daily	22.6

2010	
AMPK	2.2
AMSH	3.6
MD	8.4
PMSH	3.6
PMPK	3.5
Daily	21.3

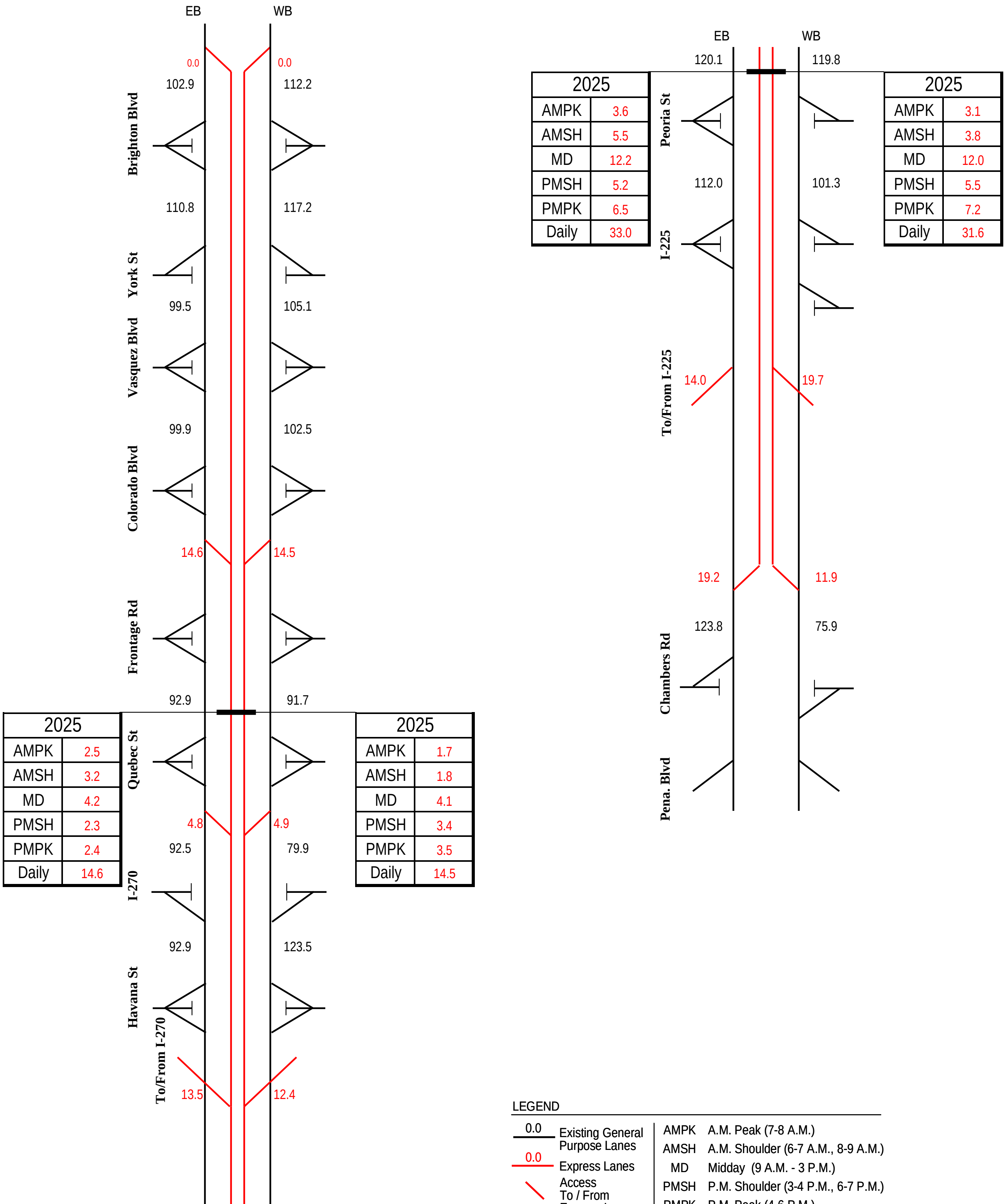
LEGEND

0.0 Existing General Purpose Lanes	AMPK A.M. Peak (7-8 A.M.)
0.0 Express Lanes	AMSH A.M. Shoulder (6-7 A.M., 8-9 A.M.)
Access To / From Express Lanes	MD Midday (9 A.M. - 3 P.M.)
Tolling Zones	PMSH P.M. Shoulder (3-4 P.M., 6-7 P.M.)
	PMPK P.M. Peak (4-6 P.M.)
	Daily Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

2010 Estimated Weekday Traffic I-70 Scenario 3: Colorado Blvd to Chambers

Figure 3-11



2025	
AMPK	2.5
AMSH	3.2
MD	4.2
PMSH	2.3
PMPK	2.4
Daily	14.6

2025	
AMPK	1.7
AMSH	1.8
MD	4.1
PMSH	3.4
PMPK	3.5
Daily	14.5

2025	
AMPK	3.6
AMSH	5.5
MD	12.2
PMSH	5.2
PMPK	6.5
Daily	33.0

2025	
AMPK	3.1
AMSH	3.8
MD	12.0
PMSH	5.5
PMPK	7.2
Daily	31.6

LEGEND

0.0	Existing General Purpose Lanes	AMPK	A.M. Peak (7-8 A.M.)
0.0	Express Lanes	AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
	Access To / From Express Lanes	MD	Midday (9 A.M. - 3 P.M.)
	Tolling Zones	PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
		PMPK	P.M. Peak (4-6 P.M.)
		Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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2025 Estimated Weekday Traffic I-70 Scenario 3: Colorado Blvd to Chambers

Figure 3-12

lanes. By 2025 at this same location, the weekday express toll lane volume is estimated to increase to 65,300 or 23 percent of the total demand. Significant movements between the express toll lanes and the direct connection ramps to I-270 and I-225 are shown. In Scenario 2, similar volumes are shown as compared to Scenario 1. The section of managed lanes east of Chambers Road under Scenario 1 was found not to provide significant added benefit. This section of toll road actually would tend to increase the cost of a through trip with no real added benefit since the time savings advantage of the toll lanes would likely have already occurred west of Chambers Road. Weekday express lane volumes at the peak load point are estimated at 45,500 vehicles in 2010 and growing to 67,000 by 2025.

Scenario 3 would have slightly lower volumes than compared with Scenario 2 because of the shorter project and removal of the far west access. The peak load point shows the toll lanes would still be heavily used, especially within the peak periods.

Estimated Annual Trips And Gross Toll Revenue **–** Annual trips and gross toll revenue for Scenarios 1, 2, and 3 are provided in Tables 3-9, 3-10, and 3-11, respectively. Scenario 1 produces an estimated $17.5 million in gross toll revenue in year 2010 and grows to an estimated $44.5 million by year 2025. The annual number of trips is estimated at 12.6 million in year 2010, growing to 18.7 million by year 2025.

Gross toll revenue produced by Scenario 2 is estimated at $17.3 million in year 2010 and $40.4 million in year 2025. The annul number of trips in the express toll lanes rises from 12.1 million in year 2010 to 18.2 million in year 2025.

Scenario 3 is estimated to produce $15.9 million in gross toll revenue in 2010, growing to $37.9 million by 2025. The annual number of trips for 2010 is estimated at 12.3 million and is estimated to increase to 18.0 million by year 2025. It is interesting to note that the annual revenue growth from 2010 to 2015 is double that of the trip growth on the toll lanes. This is due to toll rate increases which can occur as demand continues to grow within the corridor.

Table 3-9
Annual Traffic And Revenue Estimates
I-70 Express Toll Lanes
Scenario 1 : I-25 to E-470

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	12,571	$17,488
2011	12,908	18,612
2012	13,254	19,808
2013	13,609	21,081
2014	13,973	22,436
2015	14,347	23,878
2016	14,732	25,413
2017	15,126	27,047
2018	15,532	28,785
2019	15,948	30,635
2020	16,375	32,604
2021	16,814	34,700
2022	17,264	36,930
2023	17,727	39,303
2024	18,201	41,829
2025	18,689	44,518
2026	19,063	46,299
2027	19,444	48,151
2028	19,833	50,077
2029	20,230	52,080
2030	20,634	54,163
2031	20,944	55,788
2032	21,258	57,461
2033	21,577	59,185
2034	21,900	60,961
2035	22,229	62,790
2036	22,451	64,046
2037	22,676	65,326
2038	22,902	66,633
2039	23,131	67,966
2040	23,363	69,325

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

Table 3-10
Annual Traffic And Revenue Estimates
I-70 Express Toll Lanes
Scenario 2 : I-25 to Chambers

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	12,096	$17,273
2011	12,429	18,280
2012	12,772	19,345
2013	13,124	20,472
2014	13,486	21,666
2015	13,857	22,928
2016	14,239	24,265
2017	14,631	25,679
2018	15,035	27,175
2019	15,449	28,759
2020	15,875	30,435
2021	16,312	32,209
2022	16,762	34,086
2023	17,224	36,073
2024	17,698	38,175
2025	18,186	40,400
2026	18,550	42,016
2027	18,921	43,697
2028	19,299	45,445
2029	19,685	47,262
2030	20,079	49,153
2031	20,280	50,627
2032	20,482	52,146
2033	20,687	53,711
2034	20,894	55,322
2035	21,103	56,982
2036	21,209	58,121
2037	21,315	59,284
2038	21,421	60,469
2039	21,528	61,679
2040	21,636	62,912

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

Table 3-11
Annual Traffic And Revenue Estimates
I-70 Express Toll Lanes
Scenario 3 : Colorado to Chambers

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	12,263	$15,905
2011	12,582	16,852
2012	12,909	17,855
2013	13,244	18,917
2014	13,588	20,043
2015	13,941	21,236
2016	14,303	22,500
2017	14,675	23,839
2018	15,056	25,258
2019	15,448	26,762
2020	15,849	28,355
2021	16,261	30,042
2022	16,683	31,830
2023	17,117	33,725
2024	17,562	35,732
2025	18,018	37,859
2026	18,288	39,373
2027	18,563	40,948
2028	18,841	42,586
2029	19,124	44,290
2030	19,411	46,061
2031	19,605	47,443
2032	19,801	48,866
2033	19,999	50,332
2034	20,199	51,842
2035	20,401	53,398
2036	20,503	54,466
2037	20,605	55,555
2038	20,708	56,666
2039	20,812	57,799
2040	20,916	58,955

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

U.S. 36 EXPRESS TOLL LANES – SCENARIO 1

The U.S. 36 project extends from Foothills Parkway near the city limits of Boulder to the eastern terminus at I-25. The project is approximately 18 miles long and is subdivided into three sections with different improvement types. From Foothills Parkway to McCaslin Boulevard, the section is assumed to have two general purpose lanes and one express toll lane each direction. From McCaslin Boulevard to Pecos, it is assumed that U.S. 36 would have two general purpose lanes and two express toll lanes in each direction and from Pecos to I-25, the project assumes the conversion of the existing one-lane reversible high-occupancy vehicle (HOV) facility to a two-lane reversible high-occupancy toll (HOT) facility. The section is assumed to have two general purpose lanes in each direction.

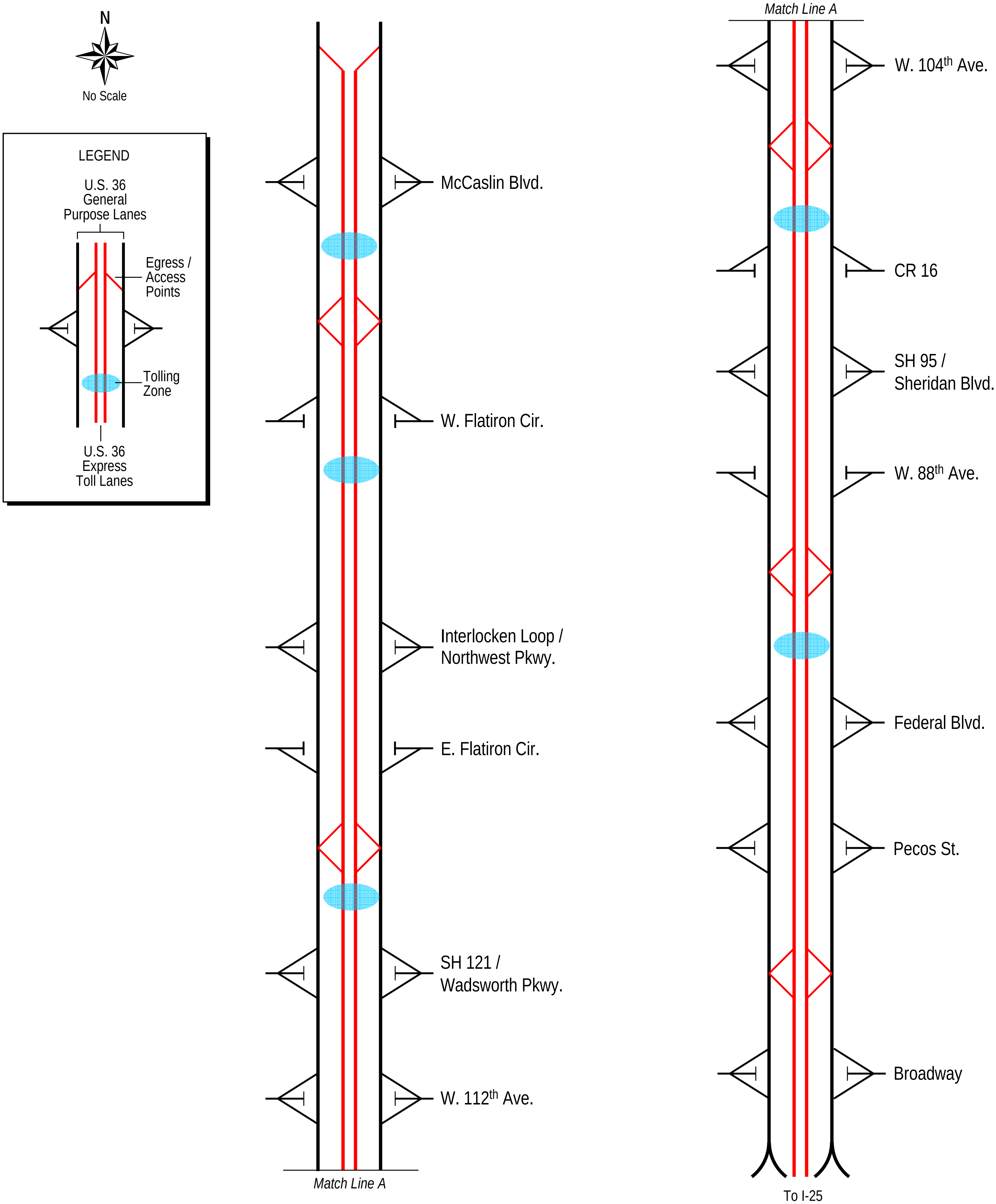
CURRENT TRAFFIC CONDITIONS

For the analysis of these project scenarios the latest regional traffic model was obtained from the DRCOG. The latest available hourly traffic counts at two mainline locations on U.S. 36, one south of McCaslin Boulevard and one south of Wadsworth Parkway, along with hourly counts at all existing ramps, were used to aid in the development of existing and future year hourly traffic profiles. Weekday volumes at the two mainline count locations were 82,700 vehicles south of McCaslin Boulevard and 87,700 vehicles south of Wadsworth Parkway. Average weekday volumes along U.S. 36 are highest at the south end between I-25 and Sheridan Boulevard ranging from 110,000 to 140,000 vehicles, between Sheridan and McCaslin Boulevards traffic drops to between 75,000 and 90,000 vehicles, and north of McCaslin Boulevard volumes are in the 50,000 vehicle range.

Hourly traffic volume counts from the two mainline count locations show a typical condition of peak traffic flow southbound during the morning peak period, with generally higher volumes northbound during the evening peak hours. Southbound a.m. peak hour volumes are generally in the range of 3,500 vehicles at both count locations, with similar but slightly higher volumes during the northbound p.m. peak hours.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

The assumed points of express toll lane access and tolling for Scenario 1 are shown in Figure 3-13. Entry to and exit from the express toll lanes are assumed to be made via seven locations. In addition to the slip ramp access/egress at both the north and south ends of the express toll lanes, full directional access is currently assumed at five locations including:



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U.S. 36 PROPOSED ETL ACCESS POINTS AND TOLLING ZONES
SCENARIO 1: I-25 TO CHERRYVALE ROAD

FIGURE 3-13

- South of McCaslin Boulevard;
- North of Wadsworth Parkway;
- North of 92nd Avenue;
- North of Federal Boulevard; and
- North of Broadway.

Figure 3-13 also identifies the general location of tolling zones. There are five tolling zones identified. This number of tolling zones allows for tolls to be levied on a per-mile basis, which would be more equitable for motorists on this approximately 17 mile project.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average weekday traffic for years 2010 and 2025. Volumes shown are by time period and total weekday on the express toll lanes and total weekday on the general purpose lanes. Finally, estimates of the annual number of trips and gross toll revenue for each scenario are provided.

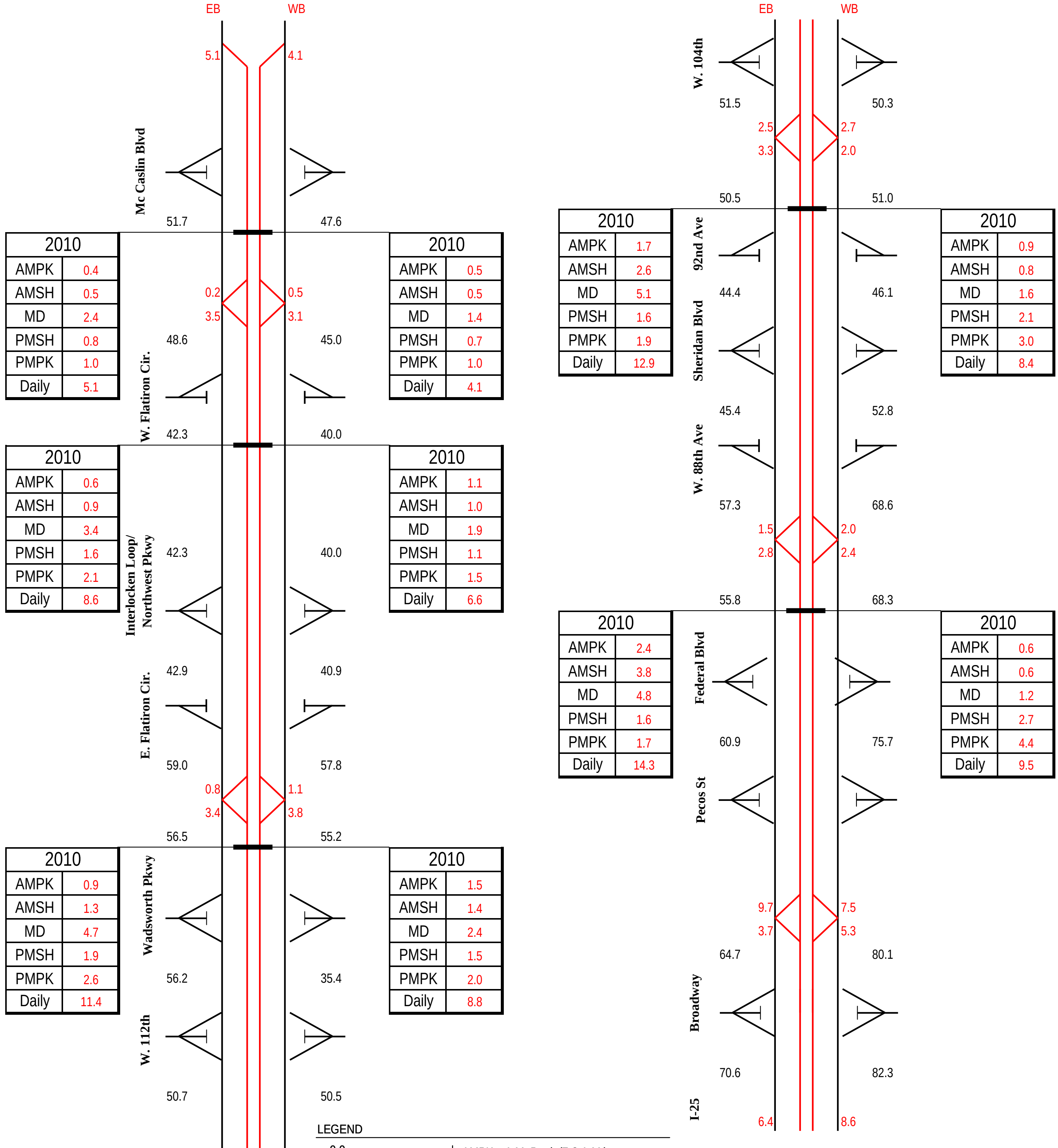
Toll Rates – A toll sensitivity analysis was conducted for each analysis period in years 2010 and 2025. A per-mile rate structure was assumed for the facility. Per-mile toll rates tested ranged from $0.050 to $0.500. Shown in Table 3-12 is the optimum passenger car-based per-mile toll rate by time period and travel direction. Also presented is the toll for an approximately 17 mile, full-length trip by time period and direction. The full-length tolls range from $0.90 to $5.35 in year 2010 and from $2.25 to $8.05 in 2025, depending on the time period.

Estimated Traffic – Average total weekday traffic along U.S. 36 on the general purpose and express toll lanes was summarized for the optimum toll rates. Additionally, weekday volumes on the express toll lanes by time period are also provided. These volumes at 2010 and 2025 levels are displayed in Figures 3-14 and 3-15, respectively.

The peak load point on the express toll lanes in year 2010 is 23,800 vehicles north of Federal Boulevard. This volume represents about 16 percent of the total U.S. 36 traffic demand at this location. The lowest load point on the express toll lanes is south of McCaslin Boulevard where 9,200 vehicles use the facility. This represents about 9 percent of the total demand of 109,000 vehicles at this location. By 2025, the highest weekday express toll lane load point is still located north of Federal Boulevard with 40,100 vehicles or 22 percent of the total demand of

Table 3-12
Toll Rates By Time Period
U.S. 36 Express Toll Lanes
I-25 to Foothills Parkway
(2004 dollars)

		2010				**2025**			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.130	$2.15	$0.05	$0.90	$0.23	$5.00	$0.10	$2.25
AM Peak	7 - 8 a.m.	0.300	5.00	0.225	4.00	0.450	8.00	0.450	8.00
AM Shoulder	8 - 9 a.m.	0.175	3.15	0.150	2.70	0.270	6.00	0.225	5.00
Midday	9 a.m. - 3 p.m.	0.075	1.35	0.050	0.90	0.125	2.70	0.100	2.25
PM Shoulder	3 - 4 p.m.	0.150	2.70	0.150	2.70	0.250	5.50	0.275	6.00
PM Peak	4 - 6 p.m.	0.250	4.50	0.275	5.00	0.450	8.00	0.450	8.00
PM Shoulder	6 - 7 p.m.	0.100	1.80	0.100	1.80	0.225	5.00	0.225	5.00



2010	
AMPK	0.4
AMSH	0.5
MD	2.4
PMSH	0.8
PMPK	1.0
Daily	5.1

2010	
AMPK	0.5
AMSH	0.5
MD	1.4
PMSH	0.7
PMPK	1.0
Daily	4.1

2010	
AMPK	0.6
AMSH	0.9
MD	3.4
PMSH	1.6
PMPK	2.1
Daily	8.6

2010	
AMPK	1.1
AMSH	1.0
MD	1.9
PMSH	1.1
PMPK	1.5
Daily	6.6

2010	
AMPK	0.9
AMSH	1.3
MD	4.7
PMSH	1.9
PMPK	2.6
Daily	11.4

2010	
AMPK	1.5
AMSH	1.4
MD	2.4
PMSH	1.5
PMPK	2.0
Daily	8.8

2010	
AMPK	1.7
AMSH	2.6
MD	5.1
PMSH	1.6
PMPK	1.9
Daily	12.9

2010	
AMPK	0.9
AMSH	0.8
MD	1.6
PMSH	2.1
PMPK	3.0
Daily	8.4

2010	
AMPK	2.4
AMSH	3.8
MD	4.8
PMSH	1.6
PMPK	1.7
Daily	14.3

2010	
AMPK	0.6
AMSH	0.6
MD	1.2
PMSH	2.7
PMPK	4.4
Daily	9.5

LEGEND

- 0.0 Existing General Purpose Lanes
- 0.0 Express Lanes
- Access To / From Express Lanes
- Tolling Zones

AMPK	A.M. Peak (7-8 A.M.)
AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
MD	Midday (9 A.M. - 3 P.M.)
PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
PMPK	P.M. Peak (4-6 P.M.)
Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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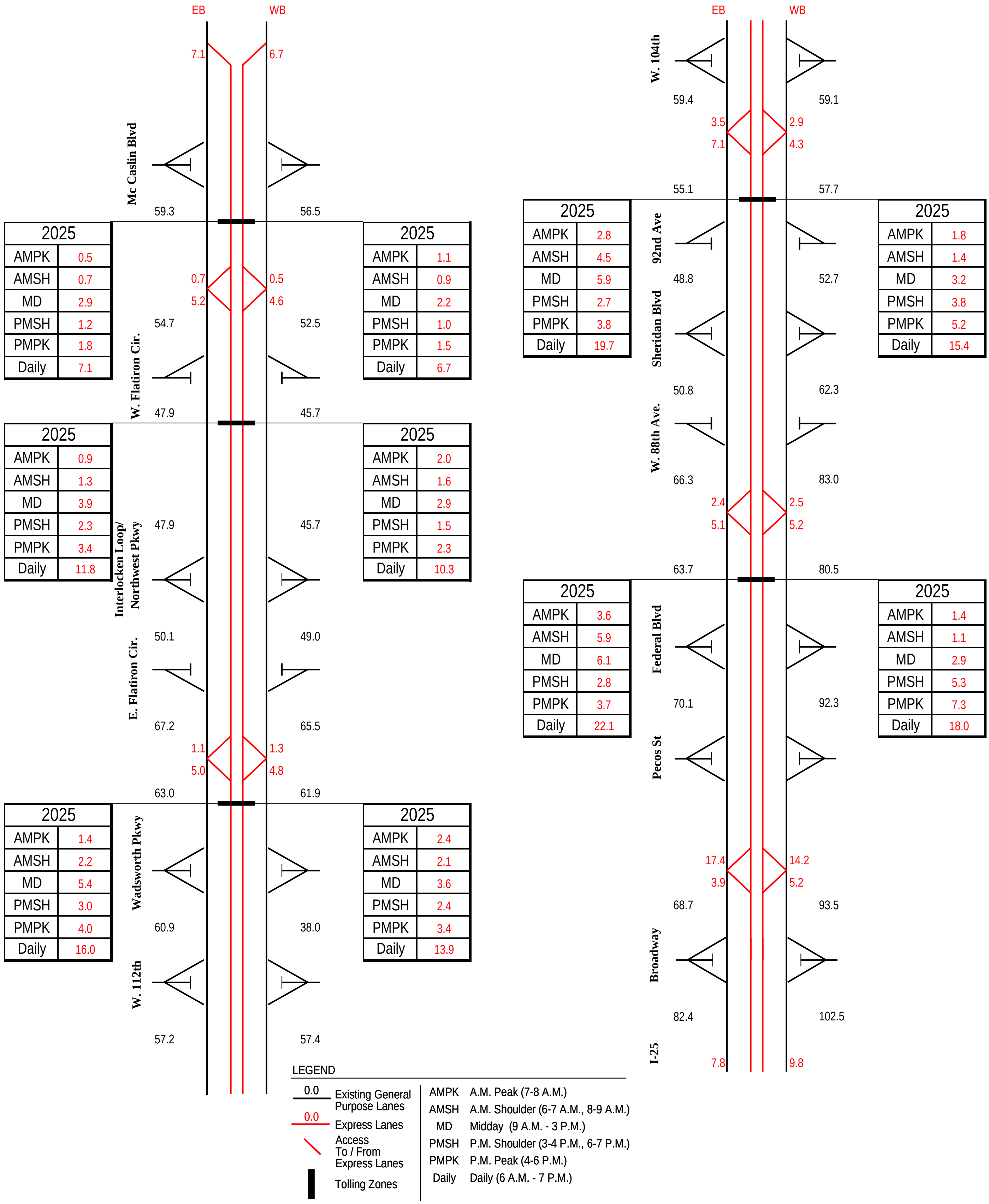
2010 Estimated Weekday Traffic US 36 Scenario 1: I-25 to Cherryvale

Figure 3-14



Note: All volumes shown represent thousands of vehicles.

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2025 Estimated Weekday Traffic US 36 Scenario 1: I-25 to Cherryvale

Figure 3-15

184,300 vehicles. The lowest load point remains south of McCaslin Boulevard where 13,800 vehicles use the facility. This represents about 11 percent of the total demand of 129,600 vehicles.

Estimated Annual Trips And Gross Toll Revenue – Annual trips and gross toll revenue for Scenario 1 are provided in Table 3-13. The U.S. 36 express toll lanes are estimated to generate $13.9 million in gross toll revenue in year 2010, increasing to an estimated $40.1 million by the year 2025. The annual number of trips is estimated at 11.4 million in year 2010, growing to 17.5 million by year 2025.

I-225 EXPRESS TOLL LANES – SCENARIO 1

The I-225 project spans approximately eight miles from I-70 to Parker Road (S.H. 83) and was assumed to consist of two express toll lanes and two general purpose lanes in each direction. The express toll lanes were assumed to be located in the median of the existing roadway and separated from the general purpose lanes by a concrete barrier. The section of the corridor from Parker Road to 6th Avenue has received environmental clearance for constructing six general purpose lanes and is included in the current TIP program; however, the project has not been implemented due to a lack of funding. For the purposes of this study, it was assumed that the improvements identified in the 2000 Environmental Assessment would be implemented in conjunction with the express toll lanes with the exception that only four general purpose lanes would be reconstructed instead of six from Parker Road to 6th Avenue, as originally planned. North of 6th Avenue, a total of six general purpose lanes and four express toll lanes were assumed.

CURRENT TRAFFIC CONDITIONS

For the study of this project, 48-hour interior weekday traffic count information collected over the course of several days in June and July 2002 were used to develop a profile of existing traffic conditions in the corridor. This was the latest data available that covered the entire corridor. Although mainline traffic counts were not collected, a full set of ramp counts at I-70 and I-25 interchanges and all interchanges in between allowed for development of mainline volumes through the entire corridor through addition and subtraction of ramp volumes.

Based on the data collected, total mainline traffic volumes were fairly uniform in the northern half of the corridor, varying from approximately 120,000 to 130,000 vehicles per weekday between I-70 and Alameda Avenue. South of this section, traffic tended to be slightly lower in the

Table 3-13
Annual Traffic And Revenue Estimates
U.S. 36 Express Toll Lanes
I-25 to Foothills Parkway

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	11,423	$13,871
2011	11,751	14,888
2012	12,089	15,980
2013	12,436	17,151
2014	12,793	18,409
2015	13,160	19,758
2016	13,538	21,207
2017	13,927	22,762
2018	14,327	24,431
2019	14,739	26,222
2020	15,162	28,144
2021	15,597	30,208
2022	16,045	32,423
2023	16,506	34,800
2024	16,980	37,351
2025	17,468	40,090
2026	17,905	41,694
2027	18,352	43,361
2028	18,811	45,096
2029	19,281	46,900
2030	19,763	48,776
2031	20,159	50,239
2032	20,562	51,746
2033	20,973	53,298
2034	21,393	54,897
2035	21,820	56,544
2036	22,039	57,675
2037	22,259	58,829
2038	22,482	60,005
2039	22,706	61,205
2040	22,933	62,429

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

100,000 to 115,000 vehicles range. Hourly traffic variations at two locations on I-225 were assessed. The first was between Colfax Avenue and 6th Avenue and the second between Mississippi Avenue and Iliff Avenue. The first location was the highest volume link on the freeway, based on the aforementioned traffic counts.

For the two locations, northbound and southbound traffic levels were very similar to each other for most hours of the day. There was a little more directional peaking near the northern end of I-225, but in the central part of the corridor, the traffic volumes were almost equal for almost all hours of the day. For example, the directional split at the mainline section near Colfax Avenue was 55 percent northbound and 45 percent southbound during the morning peak hour, and 51 percent southbound and 49 percent northbound during the afternoon peak hour.

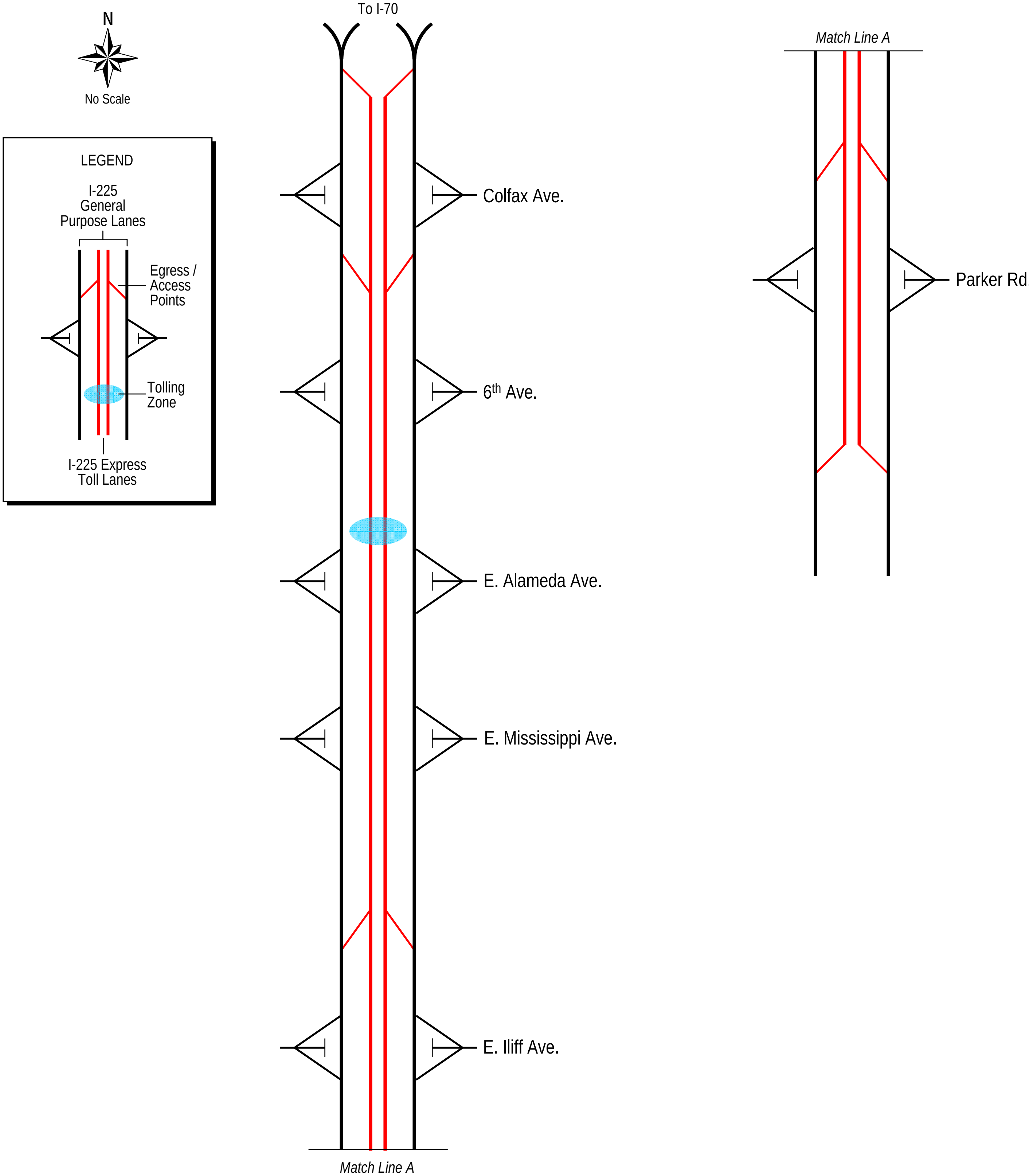
The hourly variations also tended to be fairly flat. The hour with the highest volume during the morning peak period accounted for 7.0 percent of travel in the northbound direction at the Colfax Avenue location. With the exception of two hours, each hour of the 13-hour period from 6:00 a.m. to 7:00 p.m., represented 5.0 to 6.5 percent of the total daily volume at this location.

However, these characteristics could change based on recent highway construction on I-225 and I-25, along with existing and planned land use developments in the corridor.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

The assumed points of express toll lane access and tolling for Scenario 1 are shown in Figure 3-16. Entry to and exit from the express toll lanes were assumed to be made via five locations. Southbound entry/northbound exit ramps were assumed between I-70 and Colfax Avenue, and between Colfax Avenue and 6th Avenue. In addition, southbound exit/northbound entry ramps were assumed between Iliff and Mississippi Avenues, Parker Road and Iliff Avenue, and between Parker Road and Yosemite Street.

Figure 3-16 also identifies the general location of the proposed tolling zone. Only one tolling point was identified since this is a relatively short project with closely spaced interchanges. Toll rate inequities for short distance trips is sometimes a problem encountered with this type of toll collection system on longer projects, where long-distance trips would pay significantly less on a per-mile basis than short-distance trips. These inequities should not be as much a problem on this approximately eight mile project.



I-225 PROPOSED ETL ACCESS POINTS AND TOLLING ZONES
SCENARIO 1: I-70 TO SH 83

FIGURE 3-16

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average weekday traffic for years 2010 and 2025. Volumes shown are by time period and total weekday on the express toll lanes and total weekday on the general purpose lanes. Finally, estimates of the annual number of trips and gross toll revenue for each scenario are provided.

Toll Rates – A toll sensitivity analysis was conducted for each analysis period in years 2010 and 2025. A flat toll rate structure was assumed for the facility. Toll rates tested ranged from $0.50 to $3.00. Shown in Table 3-14 is the optimum passenger car-based toll by time period and direction. The toll has also been shown on a per-mile basis by dividing the optimum toll by the approximately eight mile full project length. The optimum tolls range from $0.75 to $2.00 in year 2010 and from $1.50 to $3.00 in 2025, depending on the time period.

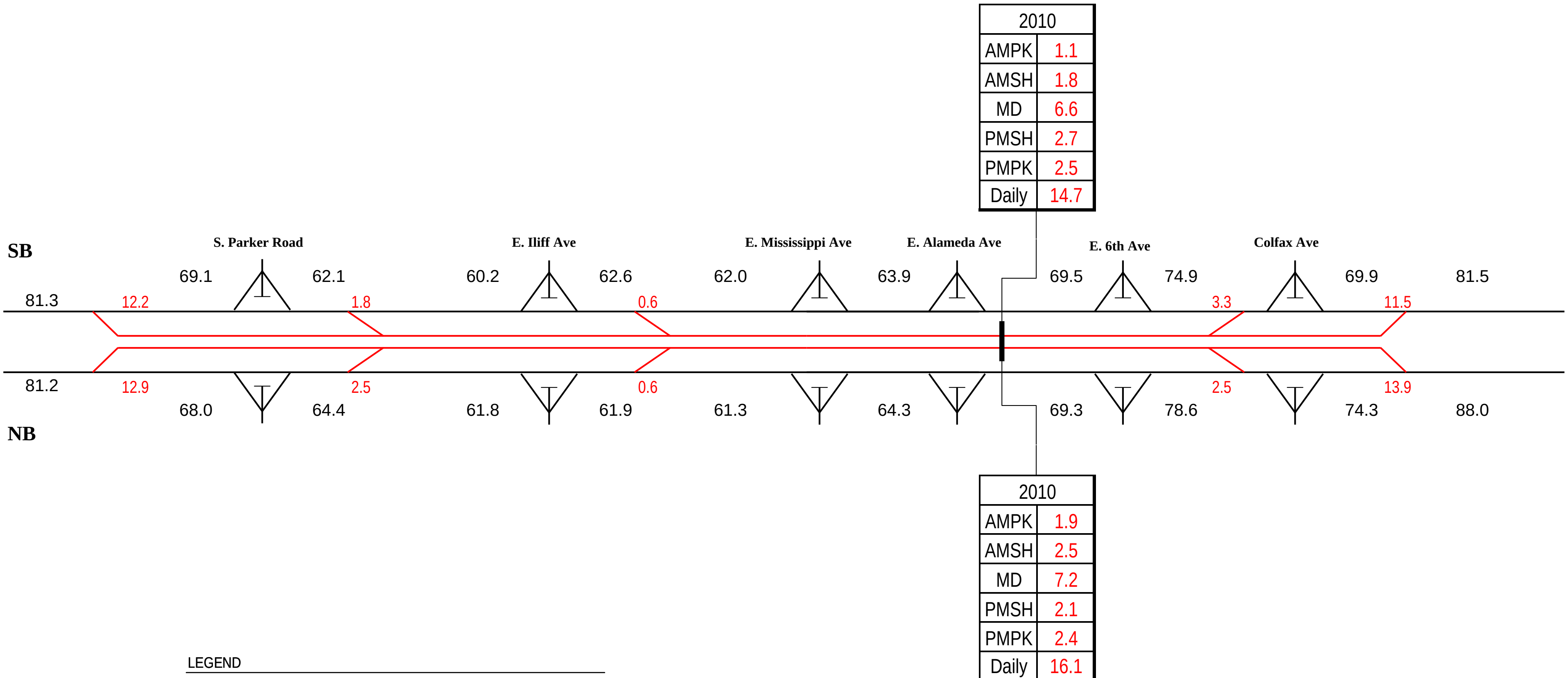
Estimated Traffic – Average total weekday traffic along the project area from south of Parker Road to north of Colfax Avenue on the general purpose and express toll lanes was summarized for the optimum toll rates. Additionally, weekday volumes on the express toll lanes by time period are also provided. These volumes at 2010 and 2025 levels are displayed in Figures 3-17 and 3-18, respectively.

Estimated year 2010 traffic at the tolling zone between Alameda and 6th Avenues on the express toll lanes is 30,800 vehicles. This volume represents about 18 percent of the total I-225 traffic demand of 169,600 vehicles at this location. By 2025, weekday express toll lane volumes are estimated to increase to 39,900 vehicles or 22 percent of the total demand of 184,400 vehicles.

Estimated Annual Trips And Gross Toll Revenue – Annual trips and gross toll revenue for Scenario 1 are provided in Table 3-15. The I-225 express toll lanes are estimated to generate $11.0 million in gross toll revenue in year 2010, increasing to an estimated $25.3 million by the year 2025. The annual number of trips is estimated at 9.0 million in year 2010, growing to 11.5 million by year 2025.

Table 3-14
Toll Rates By Time Period
I-225 Express Toll Lanes
I-70 to U.S. 83
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.16	$1.25	$0.16	$1.25	$0.22	$1.75	$0.22	$1.75
AM Peak	7 - 8 a.m.	0.250	2.00	0.250	2.00	0.380	3.00	0.320	2.50
AM Shoulder	8 - 9 a.m.	0.160	1.25	0.160	1.25	0.250	2.00	0.250	2.00
Midday	9 a.m. - 3 p.m.	0.090	0.75	0.090	0.75	0.190	1.50	0.190	1.50
PM Shoulder	3 - 4 p.m.	0.160	1.25	0.130	1.00	0.250	2.00	0.320	2.50
PM Peak	4 - 6 p.m.	0.250	2.00	0.220	1.75	0.350	2.75	0.380	3.00
PM Shoulder	6 - 7 p.m.	0.160	1.25	0.130	1.00	0.250	2.00	0.250	2.00



LEGEND

0.0	Existing General Purpose Lanes	AMPK	A.M. Peak (7-8 A.M.)
0.0	Express Lanes	AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
	Access To / From Express Lanes	MD	Midday (9 A.M. - 3 P.M.)
	Tolling Zones	PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
		PMPK	P.M. Peak (4-6 P.M.)
		Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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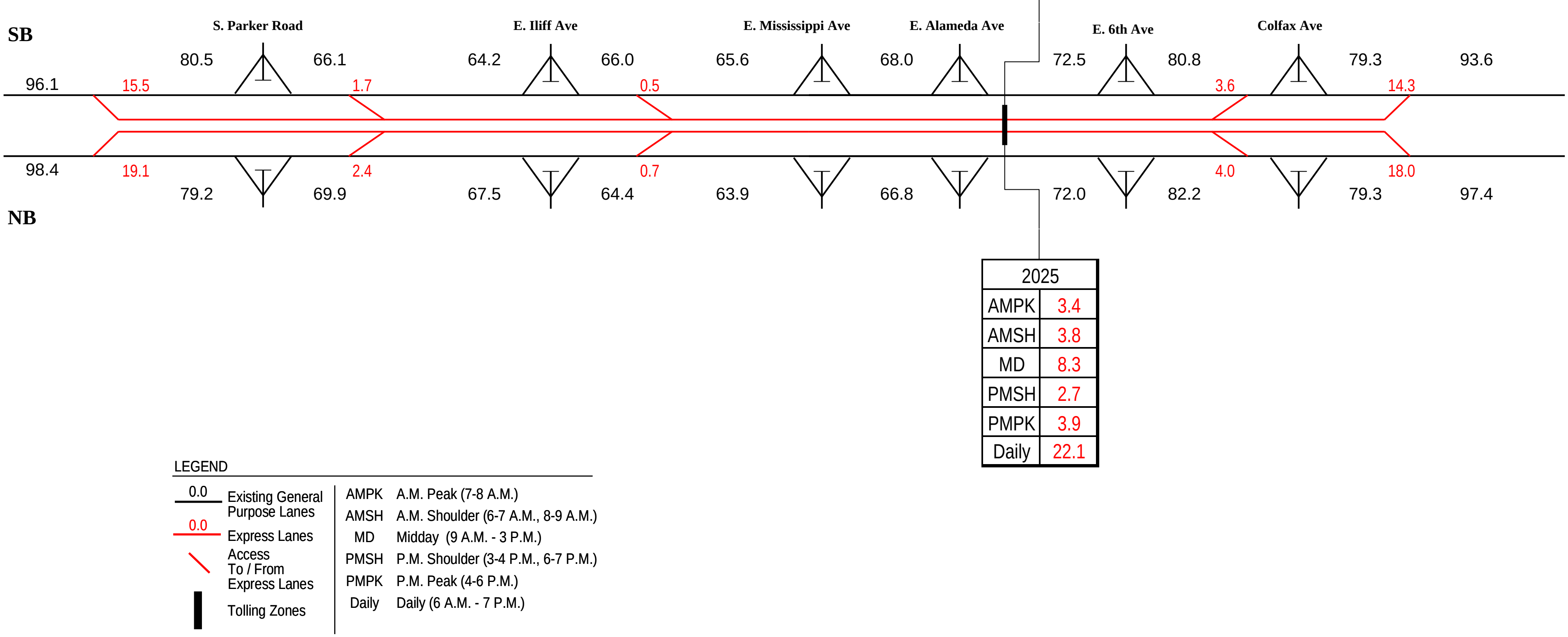
2010 Estimated Weekday Traffic I-225 Scenario 1: I-70 to SH 83

Figure 3-17



2025	
AMPK	1.7
AMSH	2.2
MD	6.8
PMSH	2.9
PMPK	4.2
Daily	17.8

2025	
AMPK	3.4
AMSH	3.8
MD	8.3
PMSH	2.7
PMPK	3.9
Daily	22.1

Note: All volumes shown represent thousands of vehicles.

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2025 Estimated Weekday Traffic I-225 Scenario 1: I-70 to SH 83

Figure 3-18

Table 3-15
Annual Traffic And Revenue Estimates
I-225 Express Toll Lanes

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	9,010	$11,009
2011	9,160	11,638
2012	9,312	12,304
2013	9,467	13,007
2014	9,624	13,751
2015	9,785	14,537
2016	9,947	15,368
2017	10,113	16,247
2018	10,281	17,176
2019	10,452	18,158
2020	10,626	19,196
2021	10,802	20,294
2022	10,982	21,454
2023	11,165	22,680
2024	11,350	23,977
2025	11,539	25,348
2026	11,712	26,362
2027	11,888	27,416
2028	12,066	28,513
2029	12,247	29,654
2030	12,431	30,840
2031	12,555	31,765
2032	12,681	32,718
2033	12,807	33,699
2034	12,936	34,710
2035	13,065	35,752
2036	13,130	36,467
2037	13,196	37,196
2038	13,262	37,940
2039	13,328	38,699
2040	13,395	39,473

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

I-270 EXPRESS TOLL LANES – SCENARIO 1

The I-270 Scenario 1 project spans approximately five miles between I-25 and I-70. I-270 was assumed to have two general purpose and two express toll lanes in each direction. The express toll lanes were assumed to be located in the median of the existing roadway and separated from the general purpose lanes by a concrete barrier.

CURRENT TRAFFIC CONDITIONS

For the analysis of these scenarios the latest regional traffic model was obtained for the DRCOG. A collection of hourly traffic counts on all I-270 ramps within the study corridor were used to create an hourly traffic demand profile for 2002. The highest average weekday volume of 98,500 vehicles on I-270 occurs between U.S. 85 and York Street. Hourly variations along this section show that southbound traffic is highest during the a.m. peak while westbound traffic reaches near capacity levels during the p.m. peak period. The direct connectors to I-70 east carry over 60,000 vehicles on an average weekday.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

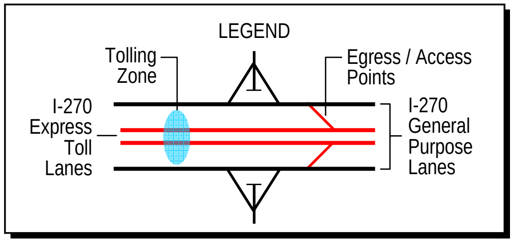
The assumed points of express toll lane access and tolling for the I-270 express toll lanes are shown in Figure 3-19. Entry to and exit from the express toll lanes are assumed to be made via four locations. Access was assumed at the following locations:

- To/from the south, north of I-76;
- To/from the south, south of York Street;
- To/from the north, south of U.S. 85; and
- Direct connectors to I-70.

Figure 3-19 also identifies the general location of the tolling zone. Because the project is only about five miles in total length, it was assumed a flat rate structure would be used, where the toll rate would be assessed at the common location to all express lane traffic located between the York Street and U.S. 86 interchanges. All traffic, no matter entering or exiting point, would be assessed the same toll rate, although the rate would vary by time of day and direction of travel.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average weekday traffic for years 2010 and 2025. Volumes shown are by time period and total weekday on the express toll lanes and



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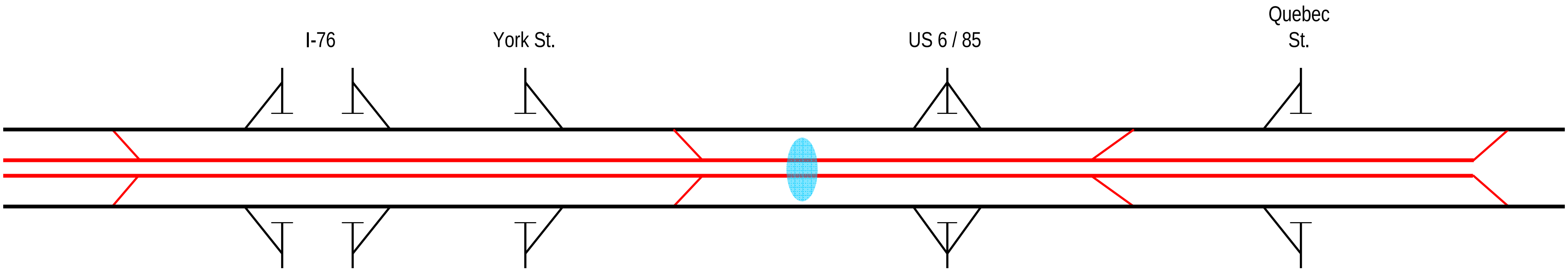

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I-270 PROPOSED ETL ACCESS POINTS AND TOLLING ZONES
SCENARIO 1: I-25 TO I-70

FIGURE 3-19

total weekday on the general purpose lanes. Finally, estimates of the annual number of trips and gross toll revenue are provided.

Toll Rates – A toll sensitivity analysis was conducted for each analysis period in years 2010 and 2025. A flat rate structure as mentioned above was used in which toll rates tested ranged from $0.25 to $5.00. Shown in Table 3-16 are the optimum passenger car-based toll rates by time period and travel direction. The tolls selected range from $0.50 to $2.50 in year 2010 and from $0.75 to $4.00 in 2025, depending on the time period.

Estimated Traffic – Average weekday toll traffic along I-270 on the general purpose and express toll lanes was summarized at the optimum toll rates. Additionally, weekday volumes on the express toll lanes by time period are also provided. These volumes at 2010 and 2025 levels are displayed in Figures 3-20 and 3-21. For year 2010, 25,900 vehicles on an average weekday are estimated to pass through the tolling zone. All traffic using the facility has to pass through this point and, therefore, would have the largest volume along the express toll lanes. This volume represents about 17 percent of the total I-270 demand at this location. At this same location during the a.m. peak hour, the estimated southbound volume is 2,100 vehicles on the two express toll lanes. The northbound p.m. two hour peak period volume is estimated at 4,700 vehicles.

By 2025 at this same location, the weekday express toll lane volume is estimated to increase to 37,500 vehicles or 20 percent of the total demand. The a.m. peak hour southbound traffic on the managed lanes is at its assumed maximum threshold and a high toll rate would be needed to manage demand within the express toll lanes.

Estimated Annual Trips And Gross Toll Revenue – Annual trips and gross toll revenue are provided in Table 3-17. Annual gross toll revenue in year 2010 is estimated to be $10.9 million, growing to $25.8 million by 2025. The annual number of trips is estimated at 7.1 million in year 2010, growing to 10.6 million by year 2025.

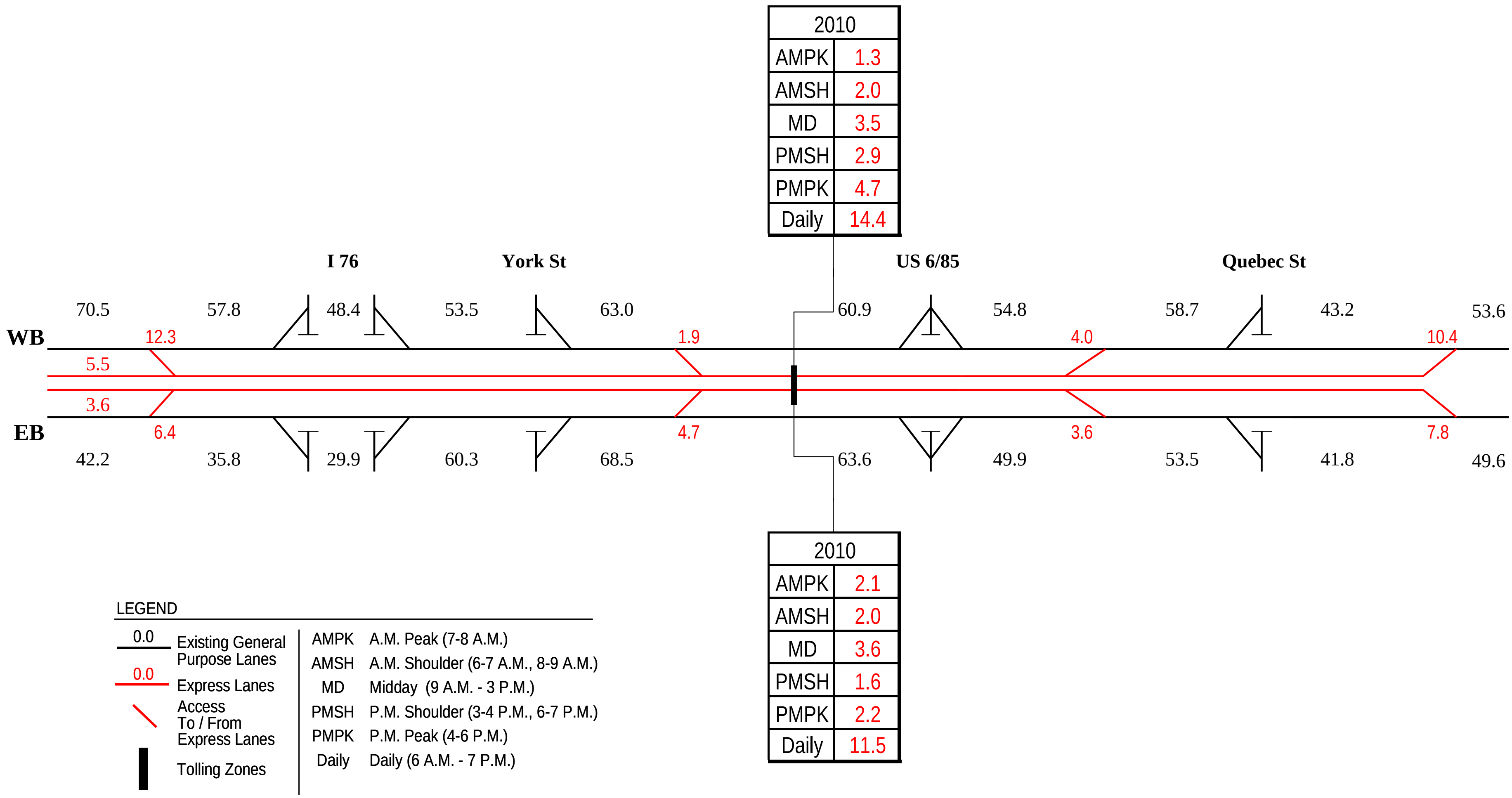
C-470 EXPRESS TOLL LANES – SCENARIOS 1, 1A, 2 AND 2A

Four C-470 express toll lane scenarios have been evaluated. The scenarios are as follows:

- Scenarios 1 and 1A – Both scenarios are approximately 14 miles in length, extending from just east of I-25 to Kipling Parkway; and

Table 3-16
Toll Rates By Time Period
I-270 Express Toll Lanes
I-25 to I-70
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**	**Per-Mile**	**Through Trip**
AM Shoulder	6 - 7 a.m.	$0.18	$1.00	$0.09	$0.50	$0.41	$2.25	$0.14	$0.75
AM Peak	7 - 8 a.m.	0.450	2.50	0.270	1.50	0.730	4.00	0.450	2.50
AM Shoulder	8 - 9 a.m.	0.270	1.50	0.090	0.50	0.450	2.50	0.230	1.25
Midday	9 a.m. - 3 p.m.	0.090	0.50	0.090	0.50	0.140	0.75	0.140	0.75
PM Shoulder	3 - 4 p.m.	0.180	1.00	0.360	2.00	0.320	1.75	0.550	3.00
PM Peak	4 - 6 p.m.	0.270	1.50	0.450	2.50	0.450	2.50	0.640	3.50
PM Shoulder	6 - 7 p.m.	0.140	0.75	0.230	1.25	0.270	1.50	0.450	2.50



Note: All volumes shown represent thousands of vehicles.

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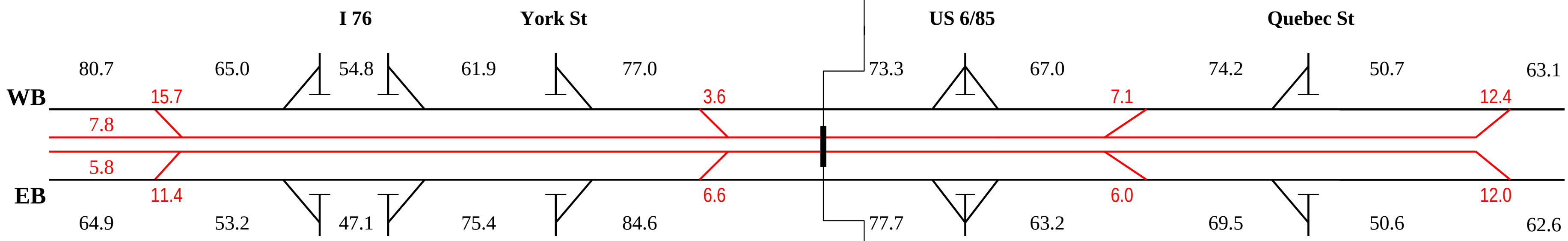
2010 Estimated Weekday Traffic I-270 Scenario 1: I-25 to I-70

Figure 3-20

2025	
AMPK	1.8
AMSH	2.5
MD	4.4
PMSH	4.7
PMPK	6.1
Daily	19.5



2025	
AMPK	3.6
AMSH	4.3
MD	3.8
PMSH	3.2
PMPK	3.1
Daily	18.0

LEGEND

- 0.0 Existing General Purpose Lanes
- 0.0 Express Lanes
- Access To / From Express Lanes
- Tolling Zones

AMPK	A.M. Peak (7-8 A.M.)
AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
MD	Midday (9 A.M. - 3 P.M.)
PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
PMPK	P.M. Peak (4-6 P.M.)
Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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2025 Estimated Weekday Traffic I-270 Scenario 1: I-25 to I-70

Figure 3-21

Table 3-17
Annual Traffic And Revenue Estimates
I-270 Express Toll Lanes

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	7,123	$10,884
2011	7,315	11,530
2012	7,512	12,214
2013	7,715	12,938
2014	7,923	13,706
2015	8,136	14,519
2016	8,355	15,380
2017	8,581	16,292
2018	8,812	17,259
2019	9,049	18,283
2020	9,293	19,367
2021	9,544	20,516
2022	9,801	21,733
2023	10,065	23,022
2024	10,336	24,388
2025	10,615	25,835
2026	10,827	26,868
2027	11,044	27,943
2028	11,265	29,061
2029	11,490	30,223
2030	11,720	31,432
2031	11,837	32,375
2032	11,955	33,346
2033	12,075	34,347
2034	12,196	35,377
2035	12,318	36,439
2036	12,379	37,167
2037	12,441	37,911
2038	12,503	38,669
2039	12,566	39,442
2040	12,629	40,231

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

- Scenarios 2 and 2A – Both scenarios are approximately 26 miles in length and extend from just east of I-25 to I-70.

Traffic and revenue estimates for Scenarios 1 and 2 were derived from the “base” DRCOG trip tables. Traffic and revenue estimates for Scenarios 1A and 2A were developed using an alternative traffic growth scenario between years 2010 and 2025. These and other project assumptions used in the analysis of C-470 express toll lanes, along with the analytical findings are presented in detail below.

The C-470 Scenarios 1 and 1A projects span approximately 14 miles from just east of I-25, connecting to the terminus of the existing E-470 Tollway, to Kipling Parkway. C-470 was assumed to have two general purpose and two express toll lanes in each direction from I-25 to east of Wadsworth Boulevard, and one express toll lane per direction from east of Wadsworth Boulevard to Kipling Parkway. The express toll lanes are assumed to be located in the median of the existing roadway and separated from the general purpose lanes by a concrete barrier, except for the segment between Kipling Parkway and east of Wadsworth which would be separated by a four foot buffer.

The C-470 Scenarios 2 and 2A project limits are from just east of I-25, connecting to the terminus of the existing E-470 Tollway, to I-70. The project is approximately 26 miles long. Scenario 2 was assumed to have two general purpose and two express toll lanes in each direction along its entire length. (This was assumed for analysis purposes only. The WSA study team recognizes that there are currently six general purpose lanes between Morrison Road and I-70, and that Colorado law does not permit tolling of existing capacity.) The express toll lanes were assumed to be located in the median of the existing roadway and separated from the general purpose lanes by a concrete barrier.

Traffic and revenue estimates for Scenarios 1 and 2 of the C-470 project were developed using the base trip tables from the DRCOG model, after developing new trip distributions to reflect the hypothetical additional capacity on C-470. However, even with the additional capacity, the model showed very low levels of growth in traffic demand, averaging only between 1 and 2 percent per year through 2010 and less than 1 percent per year after 2010.

A detailed independent economic review of this or other corridors was beyond the scope of this feasibility study. Indeed, the extremely low growth rates and travel demand for the C-470 corridor may well be appropriate. However, given the preliminary nature of this feasibility assessment, an alternative growth scenario was tested, which doubled the rate of projected traffic growth between 2010 and 2025 only. Even with this hypothetical increased level of growth, total growth in corridor demand along the C-470 corridor still would average less than 2 percent per year, subsequent to 2010.

Again, the purpose of this alternative growth scenario was to assess the potential impact on traffic and revenue for the C-470 express toll lanes given a level of future growth which was more consistent with that being seen on other freeways throughout the region. This was a hypothetical alternative, and is not intended to suggest that the base line traffic growth forecasts within the DRCOG model are necessarily inappropriate. These are simply two alternative growth conditions evaluated as part of this preliminary study.

Current Traffic Conditions

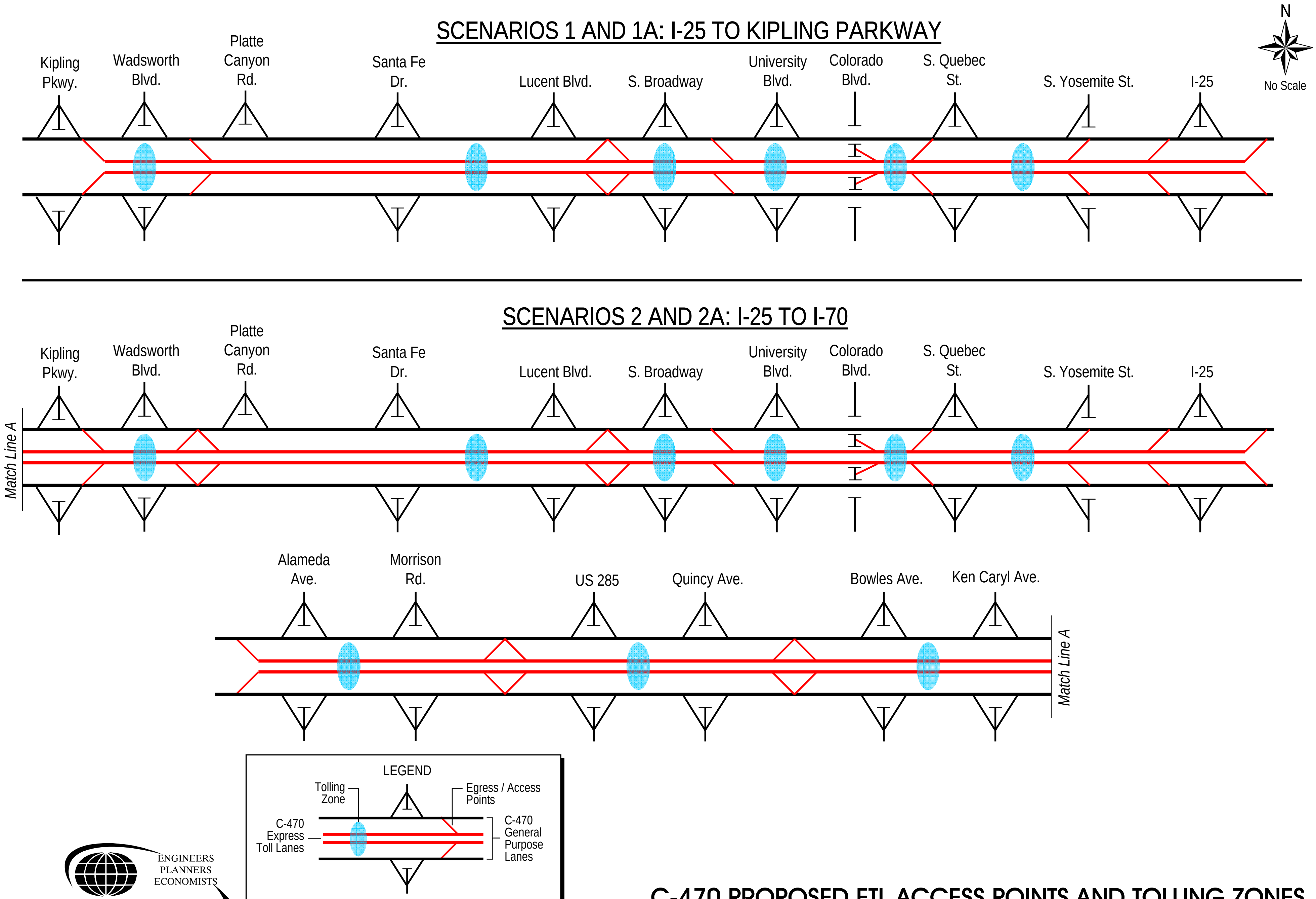
For the analysis of these scenarios the latest regional traffic model was obtained for the DRCOG. A collection of hourly traffic counts on all C-470 ramps within the study corridor and at three mainline locations along C-470 were used to create an hourly traffic demand profile for 2003.

The highest traffic volume along the corridor is found between Quebec Street and Yosemite Street, where there are approximately 102,000 vehicles on an average weekday. Traffic levels continue to be near 100,000 vehicles until west of S. Broadway. Between S. Broadway and Wadsworth Boulevard average weekday traffic ranges from 68,000 to 79,000 vehicles. The lowest volumes along the corridor are found between Wadsworth Boulevard and W. Bowles Avenue where average weekday volumes are approximately 55,000 vehicles. Average weekday volumes increase, approaching I-70 to a maximum of 82,500 vehicles north of U.S. 285.

Hourly variation patterns along the mainline sections of C-470 showed that the west section of C-470 has significant directional peaking patterns. There, traffic is heaviest in the morning northbound and southbound during the afternoon peak. The eastern section of the C-470 has significant peaking patterns in both directions during the a.m. and p.m. peak periods with the highest peaks in traffic occurring eastbound during a.m. and westbound during the p.m.

Project Access Points And Tolling Concept

The assumed points of express toll lane access and tolling for Scenarios 1, 1A, 2 and 2A are shown in Figure 3-22. Entry to and exit from the



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C-470 PROPOSED ETL ACCESS POINTS AND TOLLING ZONES

FIGURE 3-22

express toll lanes were assumed to be provided via 9 locations in Scenarios 1 and 1A, and 12 locations in Scenarios 2 and 2A.

In Scenarios 1 and 1A access is provided at the following locations:

- To/from the east, east of Kipling Parkway;
- To/from the east, east of Wadsworth Boulevard;
- To/from the east and west, west of Broadway;
- From the east and west, west of University Boulevard;
- Direct connections to/from the east at Colorado Boulevard;
- Direct connections to/from the west at Quebec Street;
- To/from the west at Yosemite Street;
- To/from the west with I-25; and
- To/from the west, east of I-25.

Except for several additional express toll lane access points which will be described below, eight of the nine access points identified above for Scenarios 1 and 1A are identical to those assumed for Scenarios 2 and 2A.

In Scenarios 2 and 2A, the access which was to/from the east, only, east of Wadsworth Boulevard becomes full directional access. New access points are assumed to be provided at the following locations:

- To/from the north and south, north of Bowles Avenue;
- To/from the north and south, north of U.S. 285; and
- To/from the south, south of I-70.

Figure 3-22 also identifies the general location of tolling zones for each scenario. There are six tolling zones identified in Scenarios 1 and 1A and nine in Scenario 2 and 2A. Under Scenarios 1 and 1A, the far west tolling zone would cover the distance traveled from Wadsworth Boulevard to the Santa Fe Drive access, the middle tolling zone would cover the distance traveled from the Santa Fe Drive access to University Boulevard and the last tolling zone would cover the distance from the University Boulevard access to I-25.

In addition to the three tolling zones described above, Scenarios 2 and 2A, include three additional tolling zones. The first additional tolling zone covers the distance traveled between Kendall Boulevard and Quincy Avenue, the second, the distance traveled between Bowles Avenue and Morrison Road, and the third covering the distance between U.S. 285 and the end of project's north end.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average weekday traffic for years 2010 and 2025. Volumes shown are by time period and total weekday on the express toll lanes and total weekday on the general purpose lanes. Finally, estimates of the annual number of trips and gross toll revenue for each scenario are provided.

Toll Rates – A toll sensitivity analysis was conducted for each analysis period in years 2010 and 2025 for the four scenarios. A per-mile rate structure was assumed for all scenarios. Per-mile toll rates tested ranged from $0.050 to $0.450. Shown in Tables 3-18 through 3-21 are the optimum passenger car-based per-mile toll rates by time period and travel direction for Scenarios 1, 1A, 2 and 2A, respectively. Also presented is the toll for a full-length trip by time period and direction.

The full-length tolls in Scenarios 1 and 1A range from $1.00 to $4.75 in 2010. By 2025, the full-length tolls in Scenario 1 increase during the peak periods, ranging from $1.00 to $6.00. Due to the increased traffic growth assumption for year 2025 in Scenario 1A, toll rates increase over Scenario 1 due primarily to increases in congestion in the general purpose lanes. Year 2025 tolls in Scenario 1A range from $1.60 to $6.75.

The tolls in Scenarios 2 and 2A for a 26 mile full-length trip range from $1.25 to $7.75 in year 2010. By 2025, the full-length tolls in Scenario 2 increase during the peak periods, ranging from $1.25 to $11.00. Due to the increased traffic growth assumption for year 2025 in Scenario 2A, some toll rates increase over Scenario 2 due primarily to increases in congestion in the general purpose lanes. In practice, due to the length and orientation of C-470 from I-70 to I-25, it is likely that there would be very few “through trips” on the full, express toll lane project.

Estimated Traffic – Average toll weekday traffic along C-470 on the general purpose and express toll lanes was summarized for each scenario at the optimum toll rates. Additionally, weekday volumes on the express toll lanes by time period are also provided. These volumes at 2010 and 2025 levels are displayed in Figure 3-23 for Scenario 1, and Figure 3-24 for Scenario 1A.

Table 3-18
Toll Rates By Time Period
C-470 Express Toll Lanes
Scenario 1: I-25 to Kipling Parkway
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip
AM Shoulder	6 - 7 a.m.	$ 0.150	$ 2.00	$ 0.100	$ 1.25	$ 0.175	$ 2.50	$ 0.125	$ 1.75
AM Peak	7 - 8 a.m.	0.350	4.75	0.175	2.50	0.450	6.00	0.250	3.50
AM Shoulder	8 - 9 a.m.	0.200	2.75	0.100	1.25	0.275	3.75	0.150	2.00
Midday	9 a.m. - 3 p.m.	0.050	0.75	0.075	1.00	0.075	1.00	0.100	1.25
PM Shoulder	3 - 4 p.m.	0.100	1.25	0.200	2.75	0.150	2.00	0.250	3.50
PM Peak	4 - 6 p.m.	0.175	2.50	0.300	4.00	0.250	3.50	0.425	5.75
PM Shoulder	6 - 7 p.m.	0.100	1.25	0.175	2.50	0.150	2.00	0.225	3.00

Table 3-19
Toll Rates By Time Period
C-470 Express Toll Lanes
Scenario 1A: I-25 to Kipling Parkway
(2004 dollars)

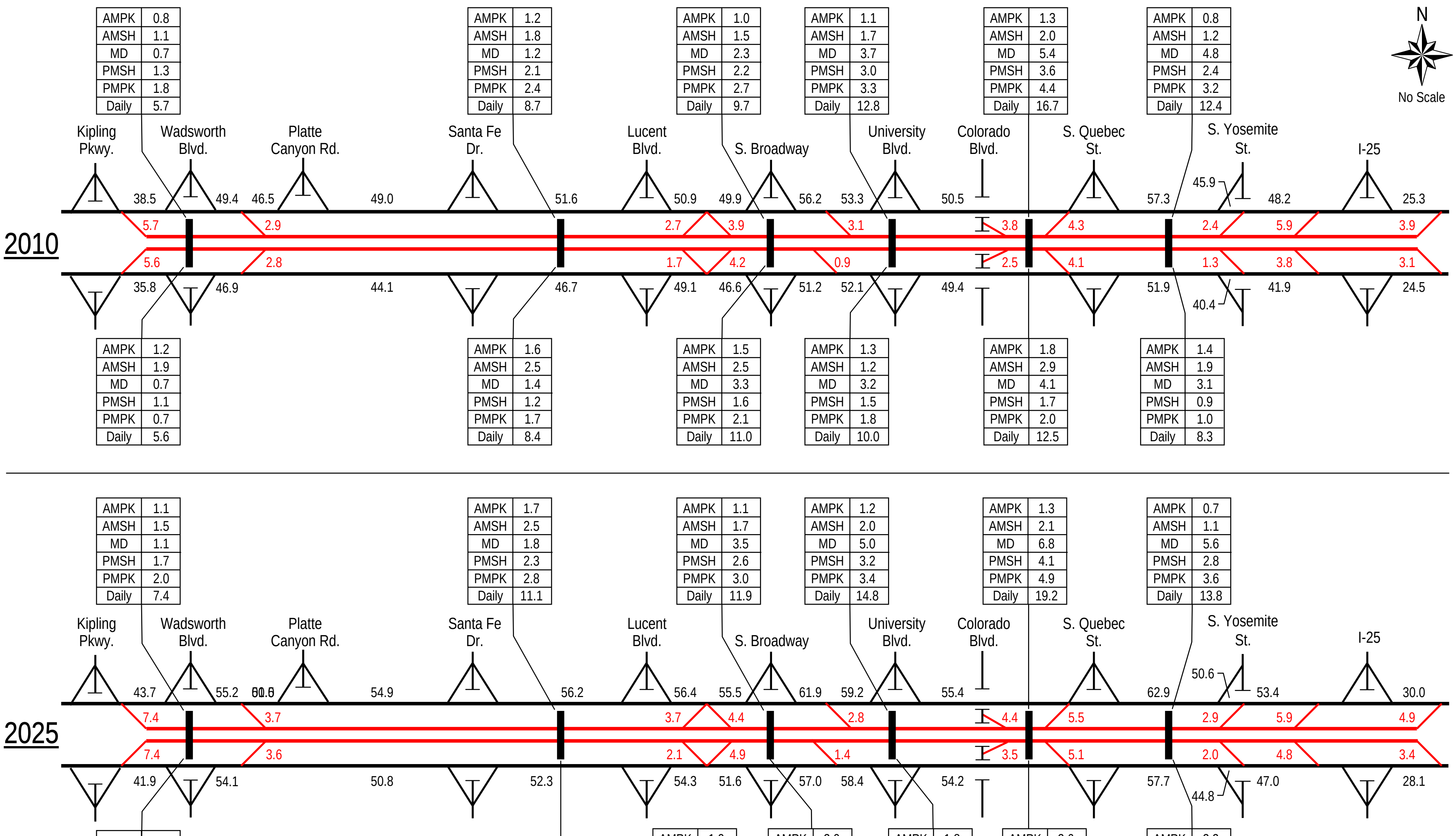
		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip
AM Shoulder	6 - 7 a.m.	$ 0.150	$ 2.00	$ 0.100	$ 1.25	$ 0.200	$ 2.75	$ 0.150	$ 2.00
AM Peak	7 - 8 a.m.	0.350	4.75	0.175	2.50	0.500	6.75	0.250	3.50
AM Shoulder	8 - 9 a.m.	0.200	2.75	0.100	1.25	0.300	4.00	0.175	2.50
Midday	9 a.m. - 3 p.m.	0.050	0.75	0.075	1.00	0.100	1.25	1.000	1.25
PM Shoulder	3 - 4 p.m.	0.100	1.25	0.200	2.75	0.200	2.75	0.250	3.50
PM Peak	4 - 6 p.m.	0.175	2.50	0.300	4.00	0.450	6.00	0.500	6.75
PM Shoulder	6 - 7 p.m.	0.100	1.25	0.175	2.50	0.200	2.75	0.225	3.00

Table 3-20
Toll Rates By Time Period
C-470 Express Toll Lanes
Scenario 2: I-25 to I-70
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip
AM Shoulder	6 - 7 a.m.	$ 0.125	$ 3.25	$ 0.125	$ 3.25	$ 0.150	$ 3.75	$ 0.175	$ 4.50
AM Peak	7 - 8 a.m.	0.300	7.75	0.250	6.50	0.425	11.00	0.350	9.00
AM Shoulder	8 - 9 a.m.	0.175	4.50	0.150	3.75	0.200	5.00	0.175	4.50
Midday	9 a.m. - 3 p.m.	0.050	1.25	0.075	2.00	0.050	1.25	0.075	2.00
PM Shoulder	3 - 4 p.m.	0.125	3.25	0.175	4.50	0.175	4.50	0.200	5.00
PM Peak	4 - 6 p.m.	0.250	6.50	0.300	7.75	0.425	11.00	0.375	9.50
PM Shoulder	6 - 7 p.m.	0.100	2.50	0.150	3.75	0.150	3.75	0.175	4.50

Table 3-21
Toll Rates By Time Period
C-470 Express Toll Lanes
Scenario 2A: I-25 to I-70
(2004 dollars)

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	**Hours**	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip	Per-Mile	Through Trip
AM Shoulder	6 - 7 a.m.	$ 0.125	$ 3.25	$ 0.125	$ 3.25	$ 0.200	$ 5.00	$ 0.200	$ 5.00
AM Peak	7 - 8 a.m.	0.300	7.75	0.250	6.50	0.450	11.50	0.450	11.50
AM Shoulder	8 - 9 a.m.	0.175	4.50	0.150	3.75	0.275	7.00	0.225	5.75
Midday	9 a.m. - 3 p.m.	0.050	1.25	0.075	2.00	0.075	2.00	0.100	2.50
PM Shoulder	3 - 4 p.m.	0.125	3.25	0.175	4.50	0.275	7.00	0.250	6.50
PM Peak	4 - 6 p.m.	0.250	6.50	0.300	7.75	0.450	11.50	0.450	11.50
PM Shoulder	6 - 7 p.m.	0.100	2.50	0.100	2.50	0.225	5.75	0.225	5.75



LEGEND

- 0.0 Existing General Purpose Lanes
- 0.0 Express Lanes
- Access To / From Express Lanes
- Tolling Zones

AMPK	A.M. Peak (7-8 A.M.)
AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
MD	Midday (9 A.M. - 3 P.M.)
PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
PMPK	P.M. Peak (4-6 P.M.)
Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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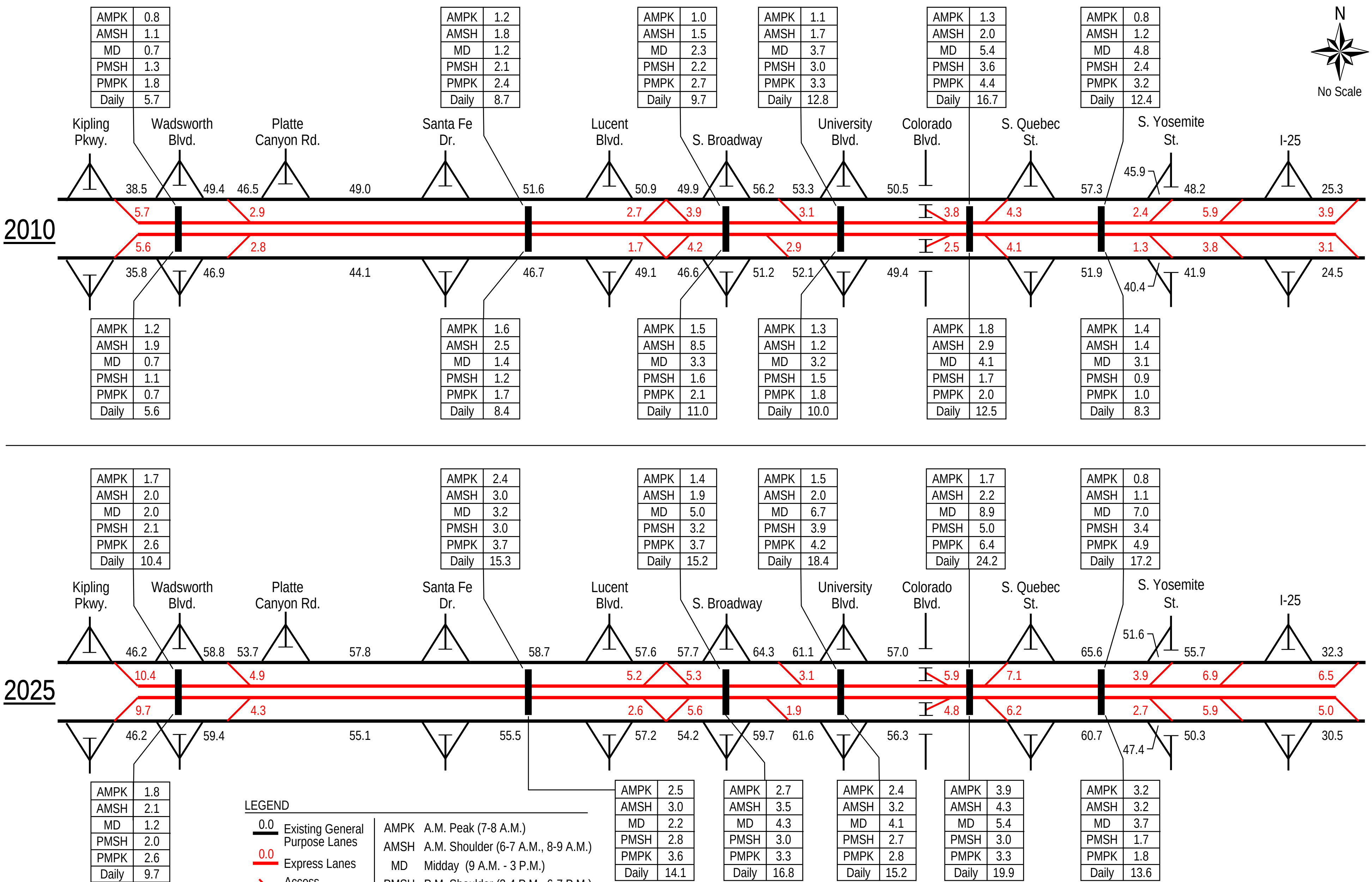
2010 AND 2025 ESTIMATED WEEKDAY TRAFFIC - C-470
SCENARIO 1: I-25 TO KIPLING PARKWAY

FIGURE 3-23



LEGEND

- 0.0 Existing General Purpose Lanes
- 0.0 Express Lanes
- Access To / From Express Lanes
- Tolling Zones

AMPK	A.M. Peak (7-8 A.M.)
AMSH	A.M. Shoulder (6-7 A.M., 8-9 A.M.)
MD	Midday (9 A.M. - 3 P.M.)
PMSH	P.M. Shoulder (3-4 P.M., 6-7 P.M.)
PMPK	P.M. Peak (4-6 P.M.)
Daily	Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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2010 AND 2025 ESTIMATED WEEKDAY TRAFFIC - C-470
SCENARIO 1A: I-25 TO KIPLING PARKWAY

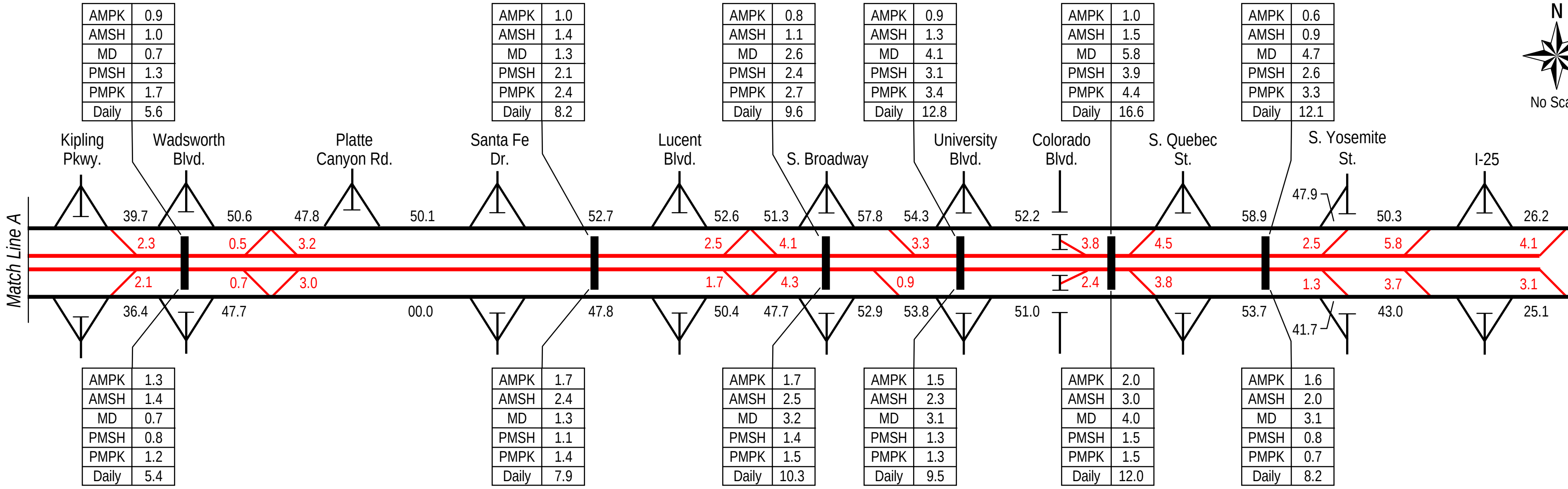
FIGURE 3-24

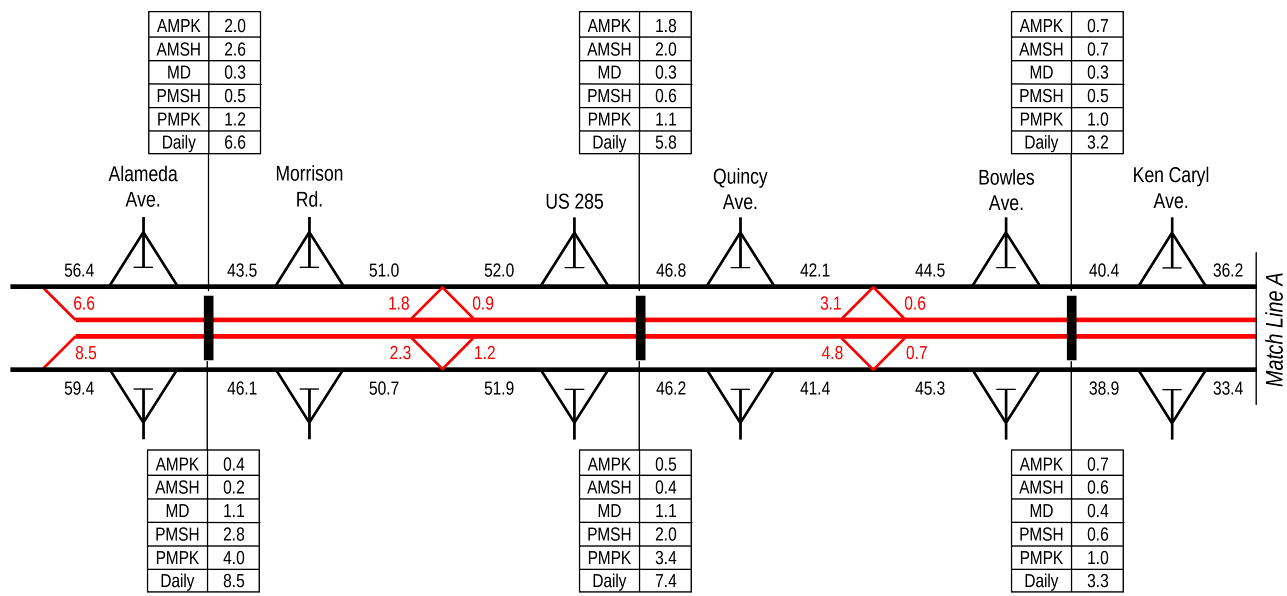
In Scenario 1, the peak load point on the express toll lanes in year 2010 is 29,200 vehicles at the tolling zone west of Quebec Street. This volume represents about 23 percent of the total C-470 demand at this location. By 2025 at this same location, the weekday express toll lane volume is estimated to increase to over 35,000 vehicles or 24 percent of the total demand.

The only differences in estimated traffic volumes between Scenarios 1 and 1A occur in the year 2025. This was the result of growth adjustments made to the micro-model time period trip tables. Existing trip tables produced traffic growth of less than one percent per year. Based on historical growth trends, this level of annual average growth was considered extremely conservative. Therefore, the growth between years 2010 and 2025 within the micro-model trip tables were adjusted, reflecting an average annual growth rate of 1.5 percent per year. Based on this revised growth, year 2025 express lane traffic at the tolling zone west of Quebec Street increased to over 41,000, while total demand in both the general purpose and express toll lanes increased from 144,800 in Scenario 1 to 157,400 in Scenario 1A.

Figures 3-25 and 3-26 show traffic estimates for Scenario 2. In Scenario 2, the peak load point on the express toll lanes in year 2010 is 28,600 vehicles at the tolling zone west of Quebec Street. This volume represents about 22 percent of the total C-470 demand at this location. At the other tolling zones between I-25 and Wadsworth Boulevard, express lane demand ranges between 11,000 and 22,000 vehicles. Lower volumes are experienced at the three tolling zones west of Wadsworth Boulevard, where estimated daily volumes range from approximately 6,500 to 15,000 vehicles. By 2025, daily express lane volumes are expected to increase to over 37,000 vehicles at the location west of Quebec Street or 25 percent of the total traffic demand of 146,500 vehicles in both general purpose and express toll lanes. This volume is almost 15,000 vehicles per day higher than in 2010.

As with Scenarios 1 and 1A, the only differences in estimated traffic volumes between Scenarios 2 and 2A occur in the year 2025. As shown in Figure 3-27, based on this revised growth, year 2025 express lane traffic at the tolling zone west of Quebec Street increased to 43,600 vehicles, while total demand in both the general purpose and express toll lanes increased from 146,500 vehicles in Scenario 2 to 156,500 vehicles in Scenario 2A. The Scenario 2A 2025 total demand at this tolling zone is 1.15 percent per year higher than volumes estimated for year 2010.





LEGEND

0.0 Existing General Purpose Lanes
0.0 Express Lanes
Access To / From Express Lanes
Tolling Zones

AMPK A.M. Peak (7-8 A.M.)
AMSH A.M. Shoulder (6-7 A.M., 8-9 A.M.)
MD Midday (9 A.M. - 3 P.M.)
PMSH P.M. Shoulder (3-4 P.M., 6-7 P.M.)
PMPK P.M. Peak (4-6 P.M.)
Daily Daily (6 A.M. - 7 P.M.)

Note: All volumes shown represent thousands of vehicles.

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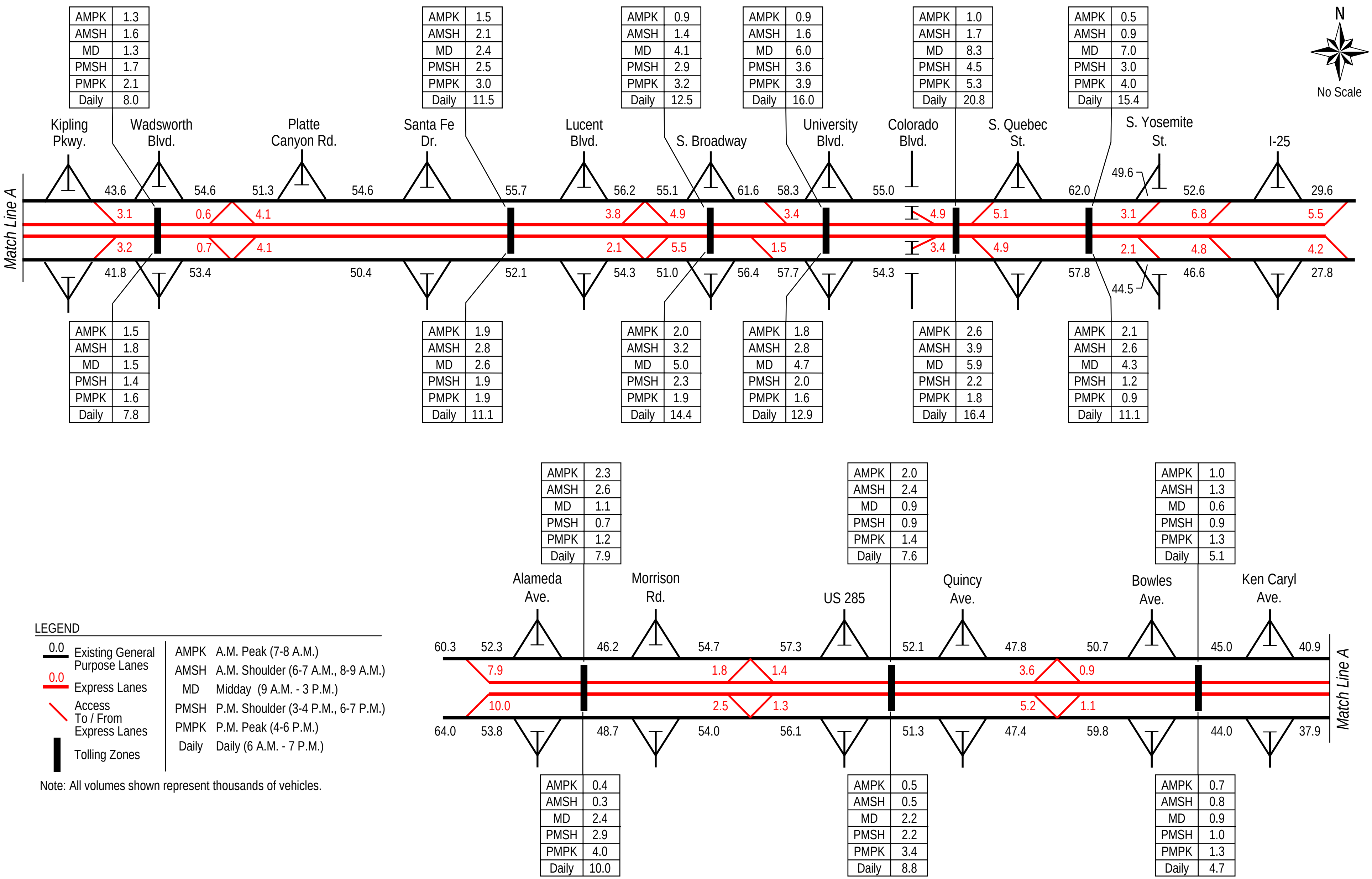
2010 ESTIMATED WEEKDAY TRAFFIC - C-470
SCENARIOS 2 AND 2A: I-25 TO I-70

FIGURE 3-25



Note: All volumes shown represent thousands of vehicles.

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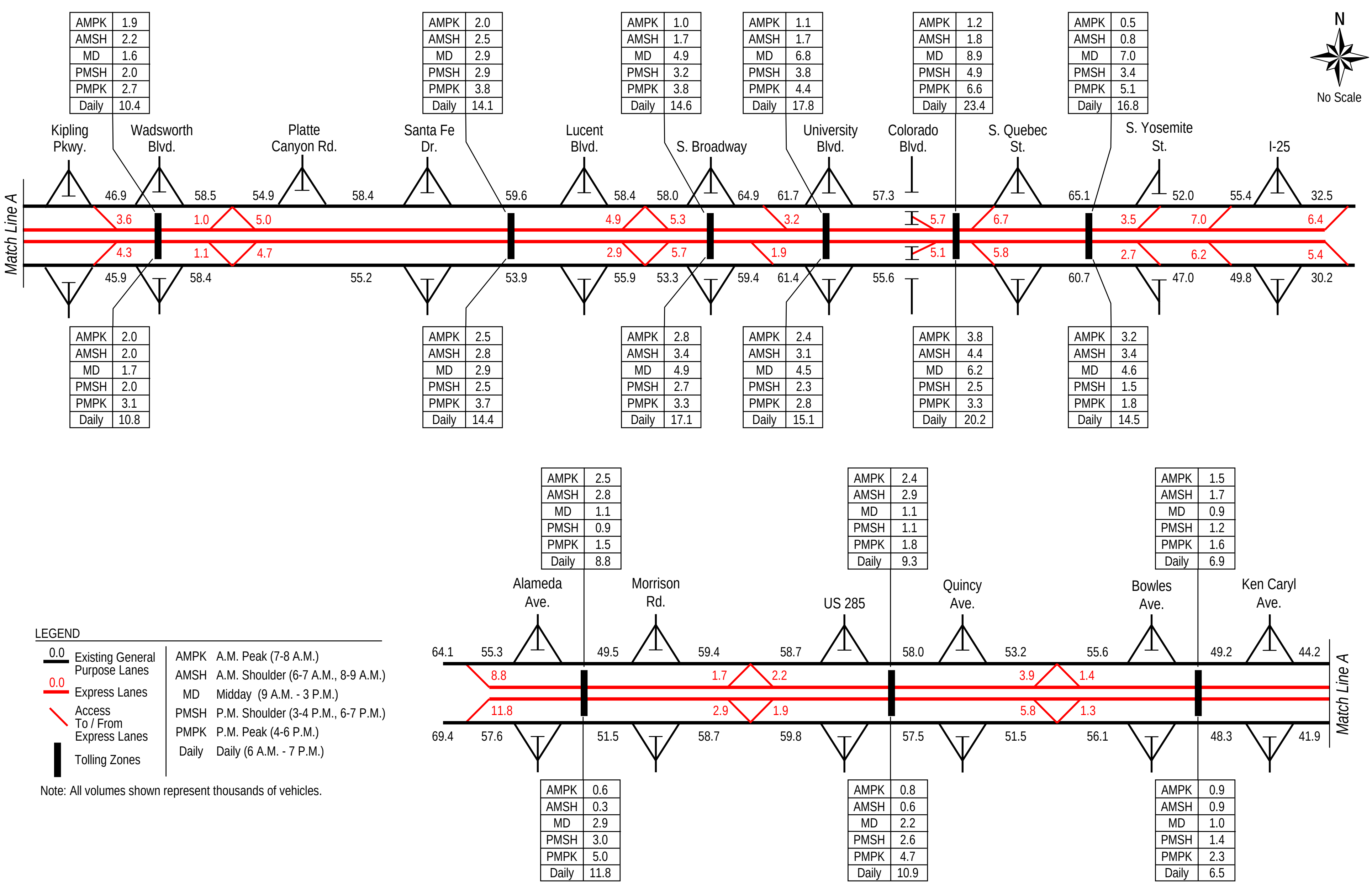
2025 ESTIMATED WEEKDAY TRAFFIC - C-470
SCENARIO 2: I-25 TO I-70

FIGURE 3-26



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2025 ESTIMATED WEEKDAY TRAFFIC - C-470
SCENARIO 2A: I-25 TO I-70

FIGURE 3-27

Estimated Annual Trips And Gross Toll Revenue – Annual trips and gross toll revenue for Scenarios 1, 1A 2, and 2A are provided in Tables 3-22 through 3-25, respectively. Scenario 1 produces an estimated \$14.5 million in gross toll revenue in year 2010 and grows to an estimated \$24.1 million by year 2025. The annual number of trips is estimated at 10.6 million in year 2010, growing to 13.0 million by year 2025.

Scenario 1A produces an estimated \$14.5 million in gross toll revenue in year 2010 and grows to an estimated \$37.1 million by year 2025. The annual number of trips is estimated at 10.6 million in year 2010, growing to 16.6 million by year 2025.

Gross toll revenue produced by Scenario 2 is estimated at \$22.3 million in year 2010 and \$36.6 million in year 2025. The annul number of trips in the express toll lanes rises from 14.5 million in year 2010 to 16.5 million in year 2025.

Scenario 2A is estimated to produce \$22.3 million in gross toll revenue in 2010, growing to \$56.9 million by 2025. The annual number of trips for 2010 is estimated at 14.5 million and is estimated to increase to 21.5 million by year 2025

NORTHWEST CORRIDOR TOLL ROAD – SCENARIOS 1 AND 2

Two scenarios were considered for this corridor. Scenario 1 consisted of a new toll road between U.S. 36 and C-470. The project of approximately 24 miles in length was assumed to be a four-lane roadway on new alignment. Scenario 2 was assumed to follow the same alignment as Scenario 1, but the tolled section would only extend approximately 14 miles from S.H. 128 to S.H. 58. The detailed assumptions for these scenarios, along with the analytical findings, are presented below.

The Northwest Corridor Scenario 1 project was assumed to consist of developing a new roadway corridor between U.S. 36 and C-470, connecting it to the existing Northwest Parkway Tollway and completing the outer beltway around Denver. The new corridor was assumed to be approximately 24 miles long and include a four-lane roadway on new alignment. New interchanges were assumed at nine locations along the corridor at major interstate, highway and arterial crossings.

Table 3-22

Annual Traffic And Revenue Estimates

C-470 Express Toll Lanes

Scenario 1 : I-25 to Kipling Parkway

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	10,551	$14,491
2011	10,699	14,992
2012	10,850	15,511
2013	11,003	16,047
2014	11,157	16,602
2015	11,314	17,177
2016	11,474	17,771
2017	11,635	18,385
2018	11,799	19,021
2019	11,965	19,679
2020	12,133	20,360
2021	12,304	21,064
2022	12,477	21,793
2023	12,652	22,546
2024	12,830	23,326
2025	13,011	24,133
2026	13,141	24,857
2027	13,273	25,603
2028	13,405	26,371
2029	13,539	27,162
2030	13,675	27,977
2031	13,811	28,676
2032	13,950	29,393
2033	14,089	30,128
2034	14,230	30,881
2035	14,372	31,653
2036	14,516	32,286
2037	14,661	32,932
2038	14,808	33,591
2039	14,956	34,262
2040	15,105	34,948

(1) Not adjusted for ramp-up.

Table 3-23
Annual Traffic And Revenue Estimates
C-470 Express Toll Lanes
Scenario 1A : I-25 to Kipling Parkway

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	10,551	$14,491
2011	10,875	15,428
2012	11,209	16,427
2013	11,553	17,489
2014	11,908	18,621
2015	12,274	19,825
2016	12,651	21,108
2017	13,040	22,473
2018	13,440	23,927
2019	13,853	25,475
2020	14,278	27,123
2021	14,717	28,878
2022	15,169	30,746
2023	15,635	32,735
2024	16,115	34,853
2025	16,610	37,108
2026	17,025	39,149
2027	17,451	41,302
2028	17,887	43,574
2029	18,334	45,970
2030	18,793	48,499
2031	19,169	50,681
2032	19,552	52,962
2033	19,943	55,345
2034	20,342	57,836
2035	20,749	60,438
2036	21,060	62,554
2037	21,376	64,743
2038	21,696	67,009
2039	22,022	69,354
2040	22,352	71,782

(1) Not adjusted for ramp-up.

Table 3-24
Annual Traffic And Revenue Estimates
C-470 Express Toll Lanes
Scenario 2 : I-25 to I-70

Year	Annual Trips (1)	Annual Revenue (1)
	(000)	(000)
2010	14,457	$22,284
2011	14,582	23,035
2012	14,709	23,811
2013	14,837	24,614
2014	14,965	25,443
2015	15,095	26,300
2016	15,226	27,187
2017	15,358	28,103
2018	15,491	29,050
2019	15,626	30,029
2020	15,761	31,040
2021	15,898	32,086
2022	16,036	33,168
2023	16,175	34,285
2024	16,315	35,441
2025	16,457	36,635
2026	16,704	37,734
2027	16,954	38,866
2028	17,209	40,032
2029	17,467	41,233
2030	17,729	42,470
2031	17,906	43,532
2032	18,085	44,620
2033	18,266	45,736
2034	18,449	46,879
2035	18,633	48,051
2036	18,726	49,012
2037	18,820	49,992
2038	18,914	50,992
2039	19,009	52,012
2040	19,104	53,052

(1) Not adjusted for ramp-up.

Table 3-25
Annual Traffic And Revenue Estimates
C-470 Express Toll Lanes
Scenario 2A : I-25 to I-70

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	14,457	$22,284
2011	14,845	23,722
2012	15,243	25,252
2013	15,651	26,881
2014	16,071	28,615
2015	16,502	30,461
2016	16,945	32,426
2017	17,399	34,518
2018	17,865	36,745
2019	18,345	39,115
2020	18,836	41,638
2021	19,342	44,324
2022	19,860	47,184
2023	20,393	50,228
2024	20,940	53,468
2025	21,501	56,917
2026	22,039	60,332
2027	22,589	63,952
2028	23,154	67,789
2029	23,733	71,856
2030	24,326	76,168
2031	24,813	79,976
2032	25,309	83,975
2033	25,815	88,174
2034	26,332	92,582
2035	26,858	97,212
2036	27,261	101,100
2037	27,670	105,144
2038	28,085	109,350
2039	28,506	113,724
2040	28,934	118,273

(1) Not adjusted for ramp-up.

The Northwest Corridor Scenario 2 project was assumed to follow the same alignment as Scenario 1, however, the tolled section of the corridor was assumed to extend from S.H. 128 to S.H 58. This new corridor was assumed to be approximately 14 miles long and include a four-lane roadway on new alignment. New interchanges were assumed at five locations along the corridor at major highway and arterial crossings. Since tolls were assumed to be levied along the S.H. 128 to S.H. 58 segment only, tolling of existing Highway 93 capacity would not occur.

Current Traffic Conditions

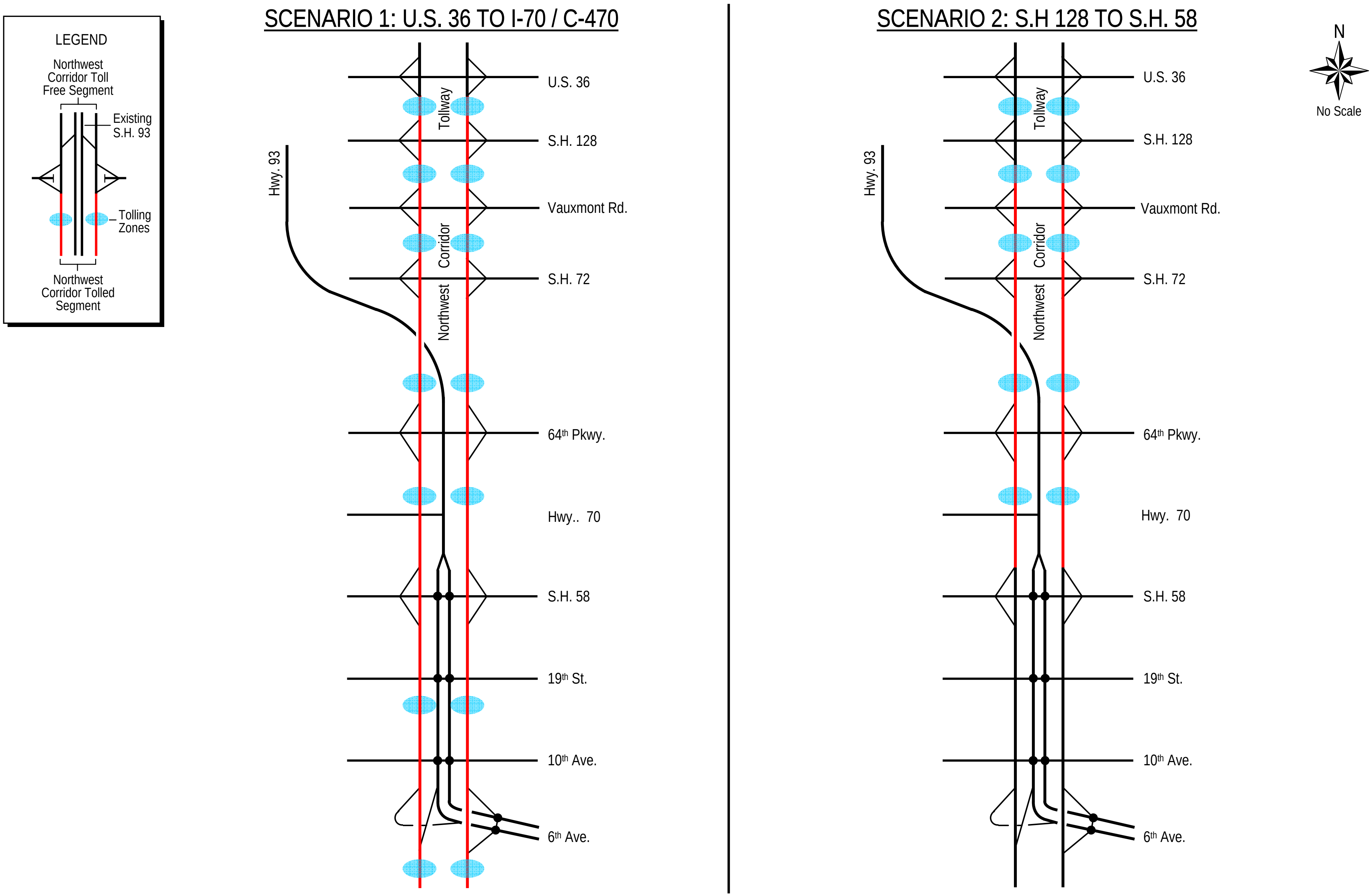
A major north-south facility in the immediate project corridor is S.H. 93. This highway carries year 2004 average weekday traffic (AWDT) volumes in the range of 20,000 to 25,000 vehicles on segments from S.H. 128 in the north to S.H. 58 in the south. South of S.H. 58, the road carries the U.S. 6 designation through the heart of Golden, where the (AWDT) falls in the range of 30,000 to 50,000 vehicles.

Other north-south roads in the project corridor which have sizeable average weekday traffic volumes include McIntyre Street, Indiana Street and Wadsworth Boulevard. McIntyre Street, closer to the corridor's south end, carries AWDT volumes in the range of 10,000 to 15,000 vehicles. Indiana Street, generally in the north-central portion of the corridor, carries AWDT volumes in the range of 12,000 between S.H. 128 and S.H. 72. South of S.H. 72 volumes increase to approximately 19,000 vehicles. Along Wadsworth Boulevard at the far east end of the project corridor, AWDT falls in the 30,000 to 35,000 vehicles range between U.S. 36 and 88th Avenue. Between 88th Avenue and I-70 through Arvada, AWDT volumes are over 50,000 vehicles.

Project Access Points And Tolling Concept

Figure 3-28, presents the assumed interchange access locations for the project. Access to the Scenario 1 project was assumed to be provided from all major highway and arterial crossings between the Northwest Parkway to the north and I-70 to the south. Apart from interchanges at the project termini, the interchanges include U.S. 36, S.H. 128, Vauxmont Road, S.H. 72, 64th Parkway, S.H. 58 and 6th Avenue. The electronic toll collection concept is comprised of a toll zone between each interchange as illustrated in Figure 3-29.

Access to the Scenario 2 project was also assumed to be provided from all major highway and arterial crossings. However, for this shorter toll project, access to the tolled facility was assumed to be provided at S.H. 128, Vauxmont Road, S.H. 72, 64th Parkway and S.H. 58. The electronic toll collection concept for Scenario 2 is also illustrated in Figure 3-29.



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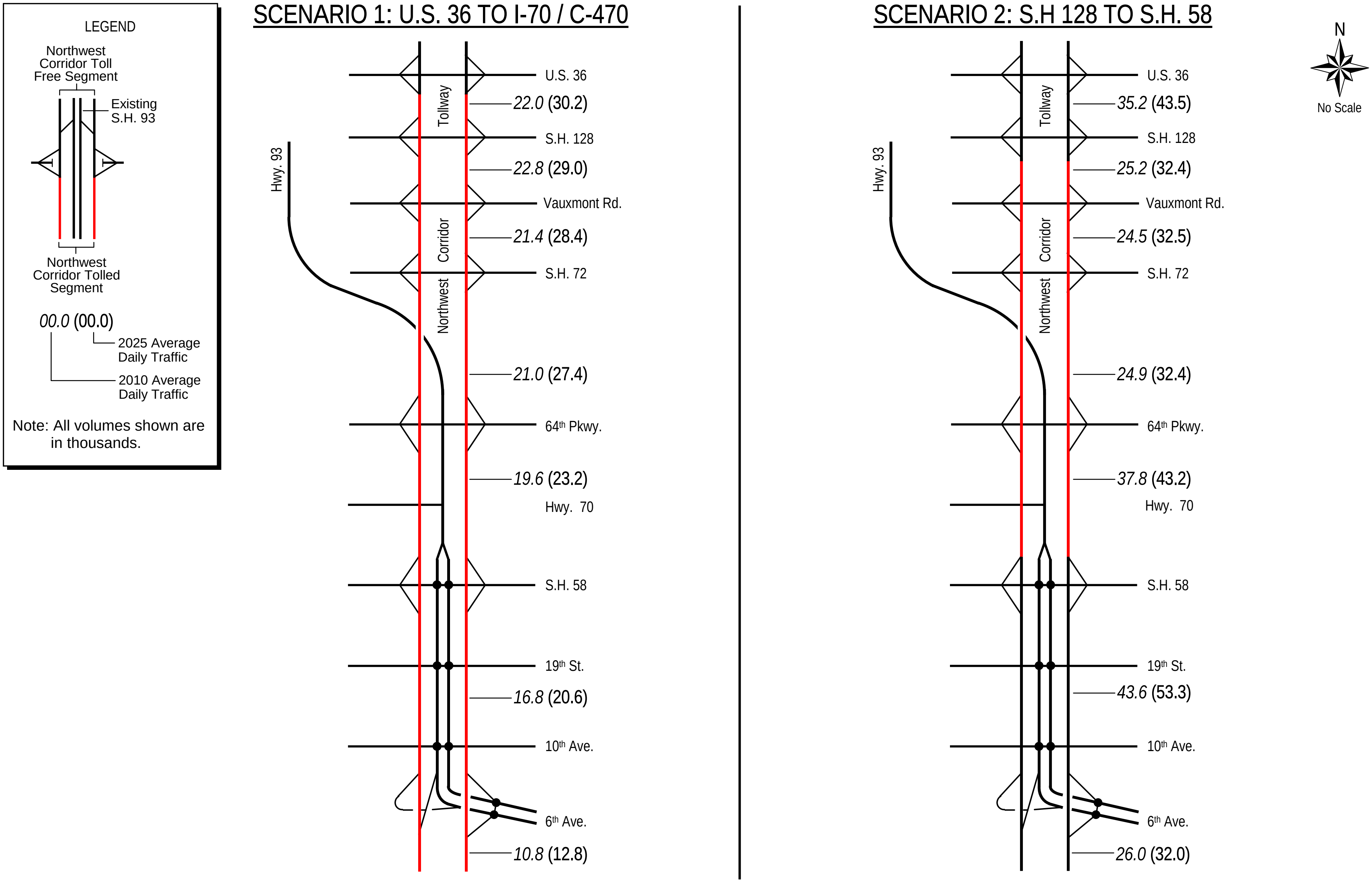
NORTHWEST CORRIDOR PROPOSED
ACCESS POINTS AND TOLLING ZONES - SCENARIOS 1 AND 2

FIGURE 3-28



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2010 AND 2025 ESTIMATED AVERAGE DAILY TRAFFIC NORTHWEST CORRIDOR - SCENARIOS 1 AND 2

FIGURE 3-29

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Presented below are the estimated optimum toll rates by time period which were the outcome of toll sensitivity analyses performed for the assumed opening year (2010) and future year (2025). Also presented below are estimates of average daily traffic for years 2010 and 2025. Finally, estimates of the annual number of trips and gross toll revenue for each scenario are provided.

Toll Rates - The toll rates tested for both Scenarios 1 and 2 ranged from approximately $0.05 to $0.25 per mile, at increments of $0.05. For every toll rate tested a unique revenue yield was produced, from which a toll sensitivity curve was developed. Based on review of toll sensitivity curves for years 2010, a toll rate of $0.15 per mile was selected for both scenarios. For the year 2025, the optimum toll equated to a rate of approximately $0.20 per mile.

Estimated Traffic - Figure 3-29 presents estimates of average daily traffic for the years 2010 and 2025 for both Scenarios 1 and 2. For the 24 mile Scenario 1 project, opening year average daily traffic ranges from an estimated 10,800 vehicles between the I-70 and 6th Avenue Interchanges to almost 23,000 vehicles between the S.H. 128 and Vauxmont Road Interchanges. By 2025, volumes at these same locations increase to 12,800 and 29,000, respectively.

For the 14 mile Scenario 2 project, opening year average daily traffic ranges from an estimated 24,500 between the Vauxmont Road and S.H. 72 Interchanges to almost 37,800 between the 64th Parkway and S.H. 58 Interchanges. By 2025, volumes at these same locations increase to 32,500 and 43,200, respectively.

Estimated Annual Trips and Gross Toll Revenue - Table 3-26 presents the traffic and revenue summary for Scenario 1. For opening year 2010, the number of annual trips is estimated to be 17.0 million, producing annual toll revenue of $34.7 million. By 2025, the annual trips on the proposed facility increase to 20.6 million, generating annual revenue of $51.3 million.

Future year trips and revenue for Scenario 2 are shown in Table 3-27. In the opening year, the annual number of trips is estimated to be 20.3 million, producing approximately $24.5 million in revenue. By 2025, the number of annual trips is estimated to increase to 24.1 million, while toll revenues are estimated to rise to $30.2 million.

Table 3-26
Annual Traffic And Revenue Estimates
Northwest Corridor
Scenario 1 : U.S. 36 to S.H. 6

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	16,971	$34,663
2011	17,192	35,579
2012	17,416	36,519
2013	17,643	37,484
2014	17,873	38,474
2015	18,106	39,491
2016	18,342	40,534
2017	18,581	41,605
2018	18,823	42,704
2019	19,068	43,832
2020	19,316	44,990
2021	19,568	46,179
2022	19,823	47,399
2023	20,081	48,651
2024	20,343	49,936
2025	20,608	51,256
2026	20,814	52,537
2027	21,022	53,850
2028	21,232	55,197
2029	21,445	56,577
2030	21,659	57,991
2031	21,876	59,151
2032	22,095	60,334
2033	22,316	61,541
2034	22,539	62,771
2035	22,764	64,027
2036	22,878	64,667
2037	22,992	65,314
2038	23,107	65,967
2039	23,223	66,627
2040	23,339	67,293

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

Table 3-27
Annual Traffic And Revenue Estimates
Northwest Corridor
Scenario 2 : S.H. 128 to S.H. 58

Year	Annual Trips (1) (000)	Annual Revenue (1, 2) (000)
2010	20,320	$24,459
2011	20,553	24,806
2012	20,789	25,158
2013	21,028	25,516
2014	21,270	25,878
2015	21,514	26,245
2016	21,761	26,618
2017	22,011	26,996
2018	22,264	27,379
2019	22,519	27,768
2020	22,778	28,162
2021	23,039	28,562
2022	23,304	28,968
2023	23,572	29,379
2024	23,842	29,796
2025	24,116	30,219
2026	24,357	30,642
2027	24,601	31,071
2028	24,847	31,506
2029	25,095	31,947
2030	25,346	32,394
2031	25,600	32,394
2032	25,856	32,718
2033	26,114	33,046
2034	26,375	33,376
2035	26,639	33,710
2036	26,772	34,047
2037	26,906	34,387
2038	27,041	34,731
2039	27,176	35,078
2040	27,312	35,429

(1) Not adjusted for ramp-up.
(2) Uninflated, in constant 2004 dollars.

* * *

DISCLAIMER

Current professional practices and procedures were used in the development of these findings. However, there is considerable uncertainty inherent in future traffic and revenue forecasts for any toll facility. There may sometimes be differences between forecasted and actual results caused by events and circumstances beyond the control of the forecasters. These differences could be material. Also, it should be recognized that traffic and revenue forecasts in this document are intended to reflect the overall estimated long-term trend. Actual experience in any given year may vary due to economic conditions and other factors.

CHAPTER 4

PRELIMINARY ESTIMATES OF TRAFFIC AND TOLL REVENUE STATEWIDE CANDIDATE – OUTSIDE DENVER AREA TOLL PROJECTS

This chapter describes the traffic and revenue study of projects generally outside of the Denver metropolitan area. These were located in various areas including Fort Collins, Colorado Springs, the I-70 Mountain Corridor, and the eastern Front Range. In general, most of the projects were studied as new toll roads limited to electronic toll collection only. The one exception was a study of the I-70 Mountain Corridor, in which one of the alternatives included a study of reversible express toll lanes limited to electronic tolling only.

In addition to the development traffic and revenue estimates, existing daily traffic volume data is presented, along with the proposed project interchange locations and tolling concepts.

PROJECT DESCRIPTIONS

The study consisted of analyzing five corridors: U.S. 287-I-25 Connector; Front Range Toll Road; Powers Boulevard; Banning Lewis Parkway; and the I-70 Mountain Corridor. Table 4-1 presents the list of project corridors and the 14 alternative project scenarios that were studied.

ANALYSIS METHODOLOGY

Presented below is a brief discussion of the general methodology used to develop the traffic and revenue forecasts, along with an overview of the toll collection system for each project.

Table 4-1
Second-Tier Candidate Toll Projects
Colorado Springs, I-70 Mountain Corridor and Others Statewide

No.	Location	Limits	Project Description
1	U.S. 287 Corridor	U.S. 287 to I-25	Build two new toll lanes/direction on new alignment from U.S. 287 (Livermore) to I-25.
2	Front Range Toll Road Scenario 1	I-25N (at Fort Collins) to I-25S (south of Pueblo)	New four lane toll road with southern connection s/o Pueblo.
3	Front Range Toll Road Scenario 2	I-25N (at Fort Collins) to I-25S (north of Pueblo)	New four lane toll road with southern connection n/o Pueblo.
4	Powers Boulevard Scenario 1	I-25N (Northgate Rd.) to Woodmen Rd.	New four lane toll road from I-25N (Northgate) to Woodmen Road.
5	Powers Boulevard Scenario 2	I-25N (Northgate Rd.) to Drennan	New four lane toll road from I-25N (Northgate) to Drennan Road.
6	Powers Boulevard Scenario 3	I-25N (Northgate Rd.) to New Arterial	New four lane toll road from I-25N (Northgate) to new arterial s/o Fontaine Blvd.
7	Powers Boulevard Scenario 4	I-25N (Northgate Rd.) to Woodmen Rd. and I-25S to Powers Blvd.	New four lane toll road from I-25N (Northgate) to Woodmen Road and from I-25S to Powers Blvd. along new alignmment near Drennan Rd. Powers from Woodmen to Drennan upgraded.
8	I-70 Mountain Corridor ETL Scenario 1	West of Eisenhower Tunnel to Floyd Hill	Add two reversible ETL from west of the Eisenhower Tunnel to Floyd Hill.
9	I-70 Mountain Corridor Scenario 2	Eisenhower Tunnel to Floyd Hill	Add one general purpose lane per direction from Eisenhower Tunnel to Floyd Hill. Add new bores at both tunnels and toll all lanes in WB direction. $5 toll pays for entire roadway and tunnel improvement.
10	I-70 Mountain Corridor Scenario 3	Eisenhower Tunnel to Floyd Hill	Add one general purpose lane per direction from Eisenhower Tunnel to Floyd Hill. Add new bores at both tunnels and toll all lanes in WB direction. $5 toll pays for costs of new tunnels, only.
11	I-70 Mountain Corridor Scenario 3A	Eisenhower Tunnel to Floyd Hill	Add one general purpose lane per direction from Eisenhower Tunnel to Floyd Hill. Add new bores at both tunnels and toll all lanes in WB direction. $3 toll pays for costs of new tunnels, only.
12	I-70 Mountain Corridor Scenario 3B	Eisenhower Tunnel to Floyd Hill	Add one general purpose lane per direction from Eisenhower Tunnel to Floyd Hill. Add new bores at both tunnels and toll all lanes in WB direction. $2 toll pays for costs of new tunnels, only.
13	Banning-Lewis Parkway Scenario 1	I-25N to I-25S at Fountain (unimproved Powers Blvd.)	New four lane toll road from I-25N (Northgate) to I-25S at Fountain, including an unimproved Powers Blvd.
14	Banning-Lewis Parkway Scenario 2	I-25N to I-25S at Fountain (improved Powers Blvd.)	New four lane toll road from I-25N (Northgate) to I-25S at Fountain, including an improved Powers Blvd.

TRAFFIC MODELING

WSA utilized its proprietary toll diversion traffic model to analyze the potential traffic and revenue impacts to the proposed toll facilities. The toll diversion model estimates the market share of toll facilities versus alternative routes. The model considers toll costs, values of time, vehicle operating costs, highway capacity, travel time and distance parameters, etc.

Traffic model data sets were obtained from the relevant planning jurisdictions or study teams for each of the identified project corridors. These included highway networks, socioeconomic data files and trip tables from the North Front Range Council of Governments (NFRCOG), from the Denver Regional Council of Governments (DRCOG), from the Pikes Peak Area Council of Governments (PPACOG), the Pueblo Metropolitan Planning Organization (PMPO) and the I-70 PEIS Travel Demand Model.

The networks and trip tables were modified to a Tranplan traffic model format. For each of the models, WSA attempted to calibrate model traffic assignments to actual traffic counts. During this process, travel speeds were adjusted and zone centroid connectors were positioned to best represent traffic loading into the network. As part of this process, traffic screenlines were developed to capture major east-west or north-south movements including the project and major alternative routes. Once, satisfactory calibration was reached, future year traffic assignments were conducted with the proposed improvements and tolling concepts. In general, traffic models were prepared for the opening year 2010 and other future years. For each of the scenarios, a series of increasing toll rates were tested to establish toll sensitivity curves.

For certain corridors and scenarios additional work was performed or methodologies adopted, these are described below:

- The U.S. 287-I-25 Connector Toll Road was covered in the northern periphery of the NFRCOG model. It was observed that U.S. 287 and I-25 links in the immediate study area were represented as external links into the model. While it would be possible to assess the impact of the new connector to existing east-west routes, such as S.H. 14; it would not be possible to model the potential route switching between U.S. 287 and I-25 for traffic orientated to and from Laramie, Wyoming. As such, a manual toll diversion technique was employed that attempted to estimate total demand on I-25 to and from Laramie and the travel demand to the new toll road connector. This was based on travel time costs, operating costs and toll charges comparisons for the toll and non-toll route and a resulting market share between both routes.

- The Front Range Toll Road extends a distance of approximately 194-miles. In order to fully model the entire road, several models were combined. This included the NFRCOG, DRCOG, PPACOG and the PMPO traffic models. The process involved combining each of the highway networks into a common system, and recoding of the individual traffic analysis zones. Where necessary, highway network links were extended to provide connectivity to each of the MPO networks. An external trip table was developed that was merged with the internal trip tables of the four MPO's. The internal and external components of these trip tables were separated. The internal trips were retained and the external trips were used a basis for the development of interregional trips.

- The Powers Boulevard and Banning Lewis projects were studied using the PPACOG 2025 model. New 2030 socioeconomic information was also provided by PPACOG. This new dataset incorporated a portion of the proposed Banning Lewis Development. Prior socioeconomic forecasts were compared with the new socioeconomic forecasts for select zones in the Banning Lewis influence area. Based on these comparisons, some adjustments were made to the trip tables, via a fratar process. It was noted that the 2020 PPACOG model was very coarse in the Banning Lewis area and would require considerable refinement to better reflect the proposed land uses in more detailed studies in the future.

- For the I-70 Mountain Corridor, Scenario 1 was studied as reversible express toll lanes using a similar methodology described in Chapter 3. Existing traffic profiles were developed for a typical summer weekday, Saturday and Sunday. For each of these days, detailed hourly traffic profiles were prepared by four time periods representing the AM, PM, midday and nightime conditions. These were consistent with the trip tables time periods received from the I-70 PEIS Mountain Corridor Study. Once these profiles were developed, the base year 2000 trip tables were adjusted to better represent the actual observed profiles. Future year trip tables were prepared by applying the difference in the synthesized base year and future year trips to the calibrated/adjusted base year trip table.

TOLL COLLECTION SYSTEM CONSIDERATIONS

With the exception of one scenario for the I-70 Mountain Corridor, all of the potential toll facility projects evaluated outside of the Denver area would generally involve construction of new toll facilities, in which all vehicles using the facilities would be subjected to a toll. With the exception of another scenario on I-70, all of these new toll facilities were assumed to feature open road tolling, i.e., fully electronic tolling without the option to pay cash.

A detailed description of toll collection concepts applicable to the various potential types of projects was included in Chapter 3. The one exception to the fully electronic toll assumptions was an option for I-70 in which tolls would be imposed on all travelers on I-70, possibly at each of the tunnels undergoing major expansion. In this case, toll collection was assumed to be limited to one travel direction only at each of the tunnels. Given the unique nature of travel in the I-70 Mountain Corridor, however, under a scenario where all traffic would be subject to tolls, it was assumed that both electronic and cash collection facilities would be made available.

PROPOSED U.S. 287-I-25 CONNECTOR

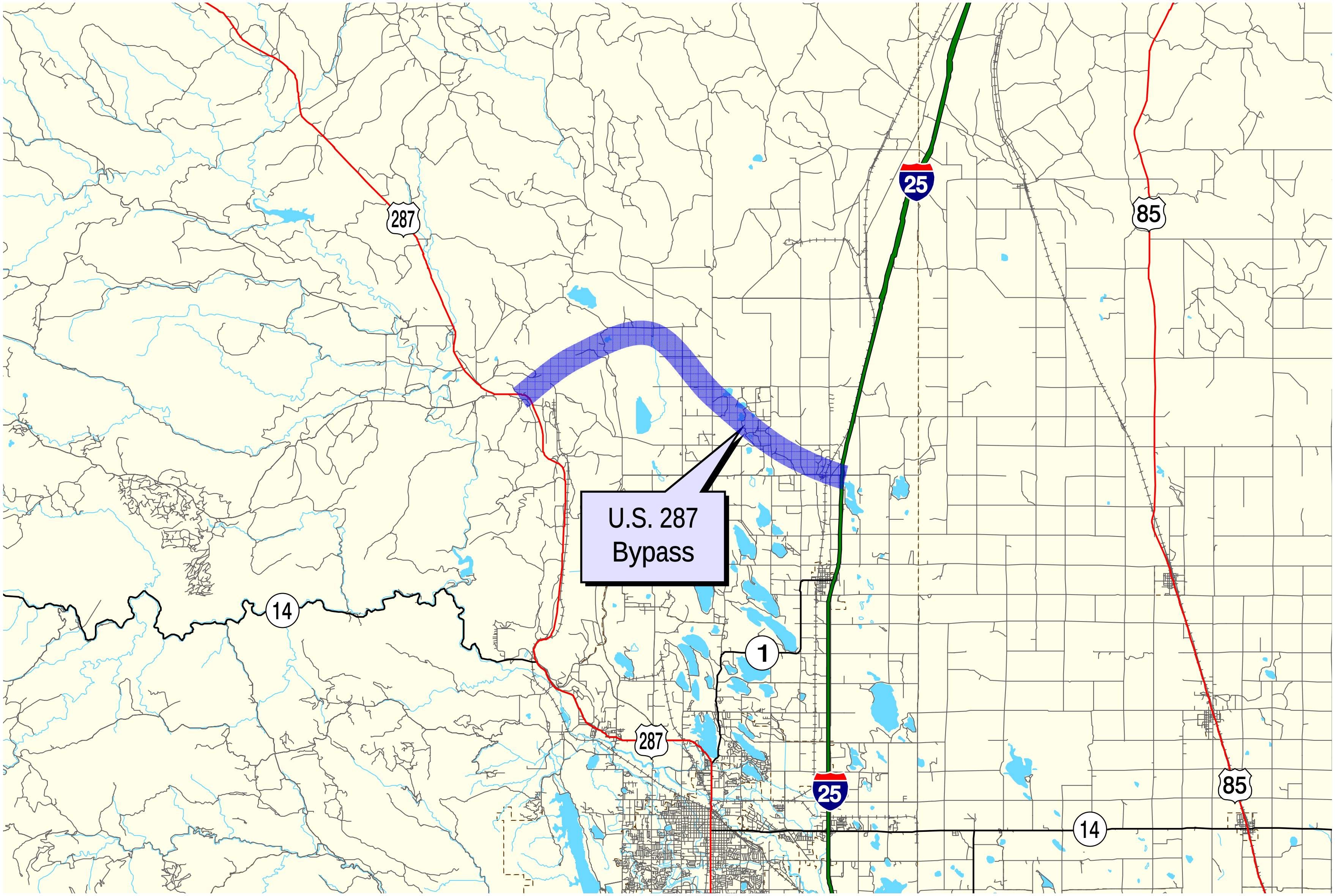
One scenario was considered for the corridor. The proposed scenario would build a new four lane toll road connecting U.S 287 (Livermore) to I-25.

The project corridor is located just north of the City of Fort Collins, as shown in Figure 4-1. It would provide a new high-speed east-west connector route between I-25 and U.S. 287, a distance of approximately 12 miles. The proposed route would provide for two lanes in both directions with assumed direct full connections at I-25 and U.S. 287. One full directional interchange was assumed to be provided in the vicinity of County Road 15/17. The project would serve as an alternative route for through traffic (without a Fort Collins destination), particularly trucks, which are presently exiting I-25 at S.H. 14 and traveling within the City limits to connect to U.S. 287, traveling north and vice-versa. The U.S. 287 provides a shorter route in terms of distance, when traveling from Fort Collins to Laramie, Wyoming. The alternative route is to travel north on I-25 and then west on I-80.

CURRENT TRAFFIC CONDITIONS

Daily traffic volumes approaching 33,000 vehicles per day (vpd) are observed on I-25, south of the S.H. 14 Mulberry Interchange. North of the S.H. 14 Interchange, traffic volumes decline to around 20,000 vpd. Outside of the Fort Collins area, traffic volumes along I-25 continue to fall off, with traffic levels in the range of 13,000 to 16,500 vpd.

Along U.S. 287, traffic volumes ranging from 8,000 to 13,500 are seen between S.H. 14 (North) and S.H. 14 (South Fort Collins). North of



FORT COLLINS SECOND TIER CANDIDATE PROJECT

FIGURE 4-1

S.H.14, traffic volumes decline, and range between 4,200 and 5,700 vpd, with trucks representing approximately 30.0 percent of the total.

S.H. 14, Mulberry, the primary east-west route, traffic is currently using to travel between I-25 and U.S. 287 shows traffic volumes in the range of 25,000 to 30,000, with trucks representing 15.0 percent of the total.

Other east-west routes, north of Fort Collins, which connect I-25 to U.S. 287 carry minor traffic generally less than 3,000 vpd. In general, the routes located furthest north show the lowest traffic volumes.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

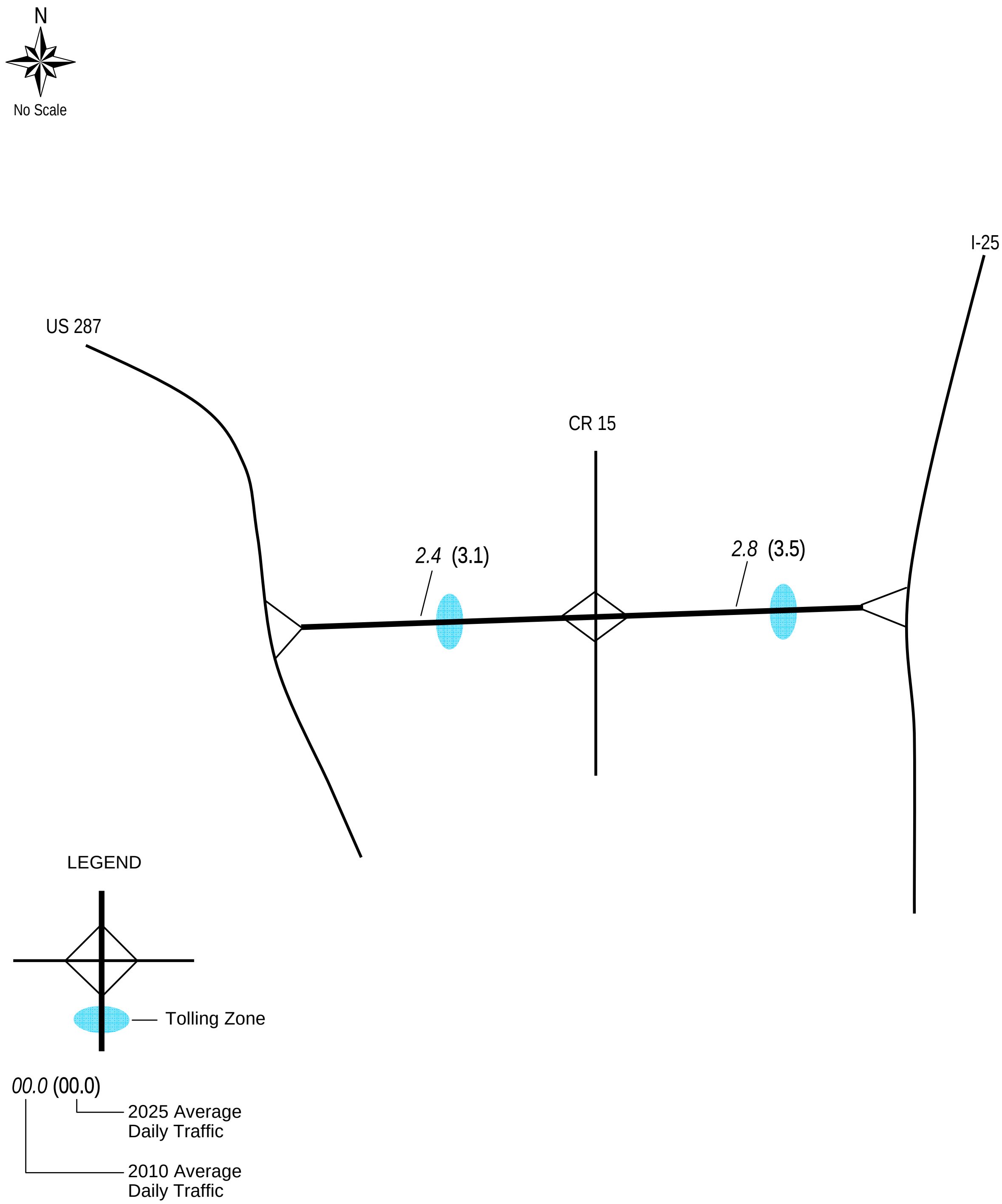
The new toll road was assumed to provide full directional access at U.S. 287, CR 15/17, and I-25. Tolls were assumed to be collected electronically based on a total of two toll zones located on the mainline segments. These are shown in Figure 4-2.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Toll Rates **–** A series of incremental toll rates were assumed and tested for the Project ranging from $0.05 to $0.25 per-mile for passenger car tolls, with higher rates for commercial vehicles. Each of the toll rates tested produced a unique revenue yield which formed the basis for establishing a toll elasticity curve. Based on review of the toll sensitivity curve, $0.15 per-mile passenger car toll rate was selected. The through rate for a passenger car and heavy truck would be approximately $1.80 and $5.40, respectively.

Estimated Traffic - The estimated traffic for 2010 and 2020 is also presented in Figure 4-2. This shows opening year traffic in the range of 2,000 to 3,000 vpd. By year 2025, traffic increases to 3,000 to 3,500 vpd. Trucks would represent approximately 30.0 percent of the total traffic.

Estimated Annual Trips and Gross Toll Revenue **–** Review of Table 4-2 shows that for opening year, 2010, the estimated annual trips would be 733,000 with gross toll revenues of approximately $1.9 million. By 2025, estimated annual trips would increase to 922,000 representing an increase of approximately 25.0 percent. For the same year, gross toll revenues are estimated to increase to $2.9 million. By 2040, the number of annual trips is shown to be 1.1 million, producing approximately $3.4 million in revenues.



Note: All volumes shown are in thousands

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ESTIMATED YEAR 2010 AND 2025 AVERAGE DAILY TRAFFIC
U.S. 287

FIGURE 4-2

Table 4-2
Annual Traffic And Revenue Estimates
US 287-I-25 Connector
Scenario 1

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	734	$ 1,995
2011	746	2,054
2012	759	2,113
2013	771	2,172
2014	784	2,230
2015	797	2,289
2016	809	2,348
2017	822	2,407
2018	834	2,466
2019	847	2,524
2020	859	2,583
2021	872	2,642
2022	884	2,701
2023	897	2,759
2024	909	2,818
2025	922	2,877
2026	940	2,932
2027	957	2,986
2028	974	3,038
2029	990	3,087
2030	1,005	3,135
2031	1,019	3,180
2032	1,033	3,222
2033	1,045	3,262
2034	1,057	3,299
2035	1,068	3,333
2036	1,078	3,364
2037	1,087	3,392
2038	1,095	3,417
2039	1,102	3,438
2040	1,108	3,457

(1) Not adjusted for ramp-up.

PROPOSED FRONT RANGE TOLL ROAD

Two scenarios were considered for this corridor. These included:

- Scenario 1 assumes a new four lane toll road from I-25 N (at Fort Collins) to I-25S (south of Pueblo); and
- Scenario 2 assumes a new four lane toll road from I-25 N (at Fort Collins) to I-25S (north of Pueblo).

The proposed Front Range Toll Road corridor extends 194 miles along the Front Range of the Rocky Mountains. As shown in Figure 4-3, it traverses seven counties with East Central Colorado, including Larimer, Weld, Adams, Arapahoe, Elbert, El Paso, and Pueblo Counties. Two alternative alignments were studied for the Front Range Toll Road. Each of the two scenarios had a northern terminus at I-25, north of Fort Collins at the Wellington Interchange. For the southern terminus, Scenario 1 had an interchange with I-25 south of the St. Charles River, south of Pueblo; whereas Scenario 2 would have an interchange with I-25 north of Pueblo.

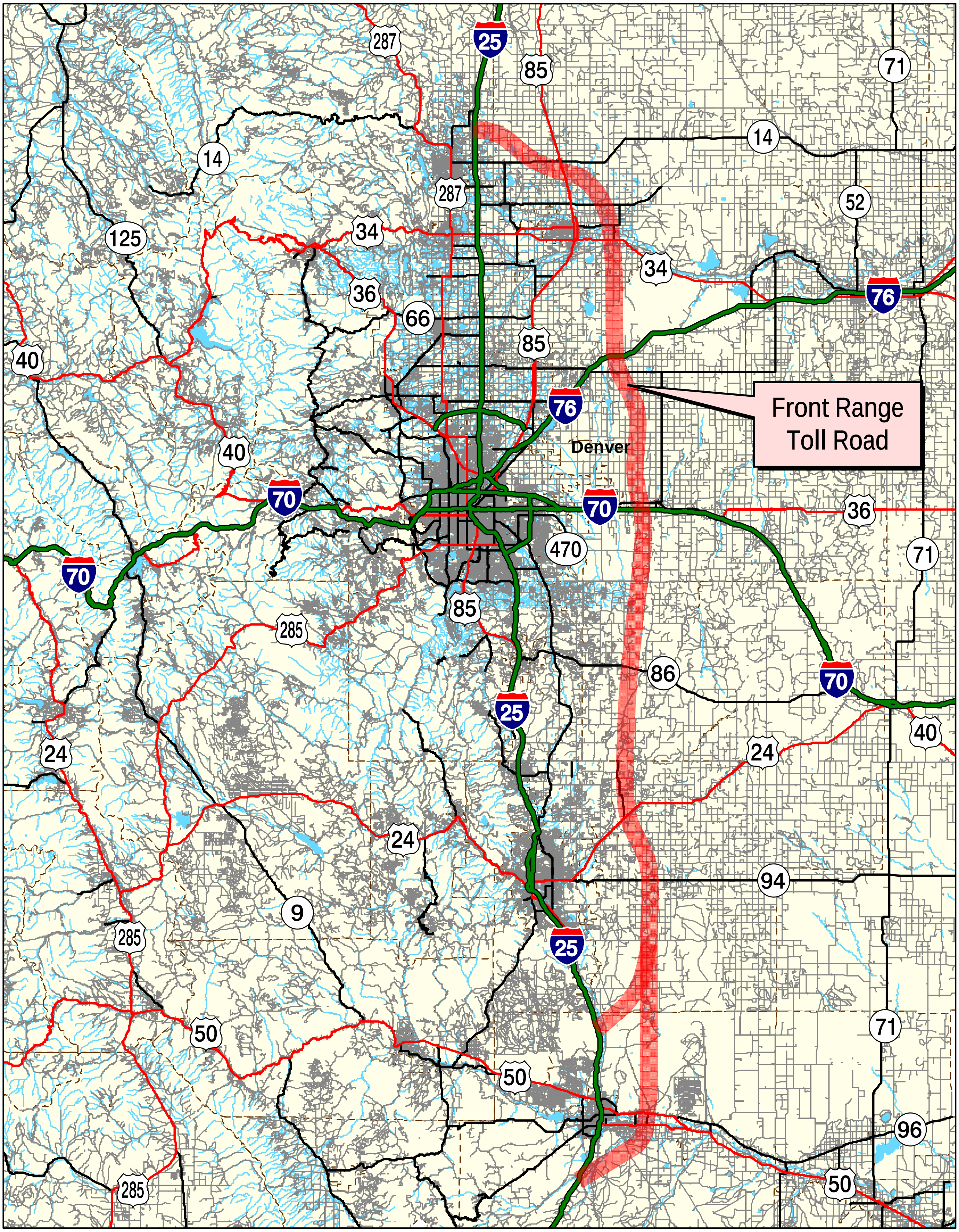
The proposed Front Range Toll Road was studied as a four-lane controlled access, tolled highway. Scenarios 1 and 2 were assumed to have 12 and 11 interchanges intersecting with the major routes across the corridor. The total length for Alternative 1 was approximately 194 miles. For Scenario 2, the southerly termini would be located north of Pueblo, eliminating an interchange at U.S. 50, with a total length of approximately 169-miles.

CURRENT TRAFFIC CONDITIONS

The main routes the proposed North Front Range Toll Road would be competing against would be I-25. Starting from the north end, I-25 in the Fort Collins area currently services daily traffic in the range of 20,000 to 50,000 vpd. In the Denver metro area, I-25 approaches an ADT of approximately 200,000 in the vicinity of the I-70 Interchange. South of the Denver metro area traffic volumes decline to the range of 50,000 to 60,000 vpd. In the Colorado Springs area, I-25 traffic volumes range from 30,000 to 75,000 vpd. In the southern most metro area, Pueblo, I-25 traffic volumes range from 40,000 to 70,000 vpd.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

For Scenario 1, the new toll road was assumed to provide full directional access at 12 interchanges. These included interchanges at I-25; U.S. 85; U.S. 34; I-76; DIA; I-70; S.R. 86; U.S. 24; U.S. 94; U.S. 50; and I-25. For Scenario 2, the Project was assumed to terminate short of Pueblo, thus



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FRONT RANGE TOLL ROAD SECOND TIER CANDIDATE PROJECTS

FIGURE 4-3

eliminating the U.S. 50 Interchange from the prior list of interchanges. The new toll road was assumed to be limited to ETC users only, providing a toll zone for every mainline segment between each of the interchanges. Figure 4-4 presents the assumed location of interchanges and toll zones for Scenarios 1 and 2.

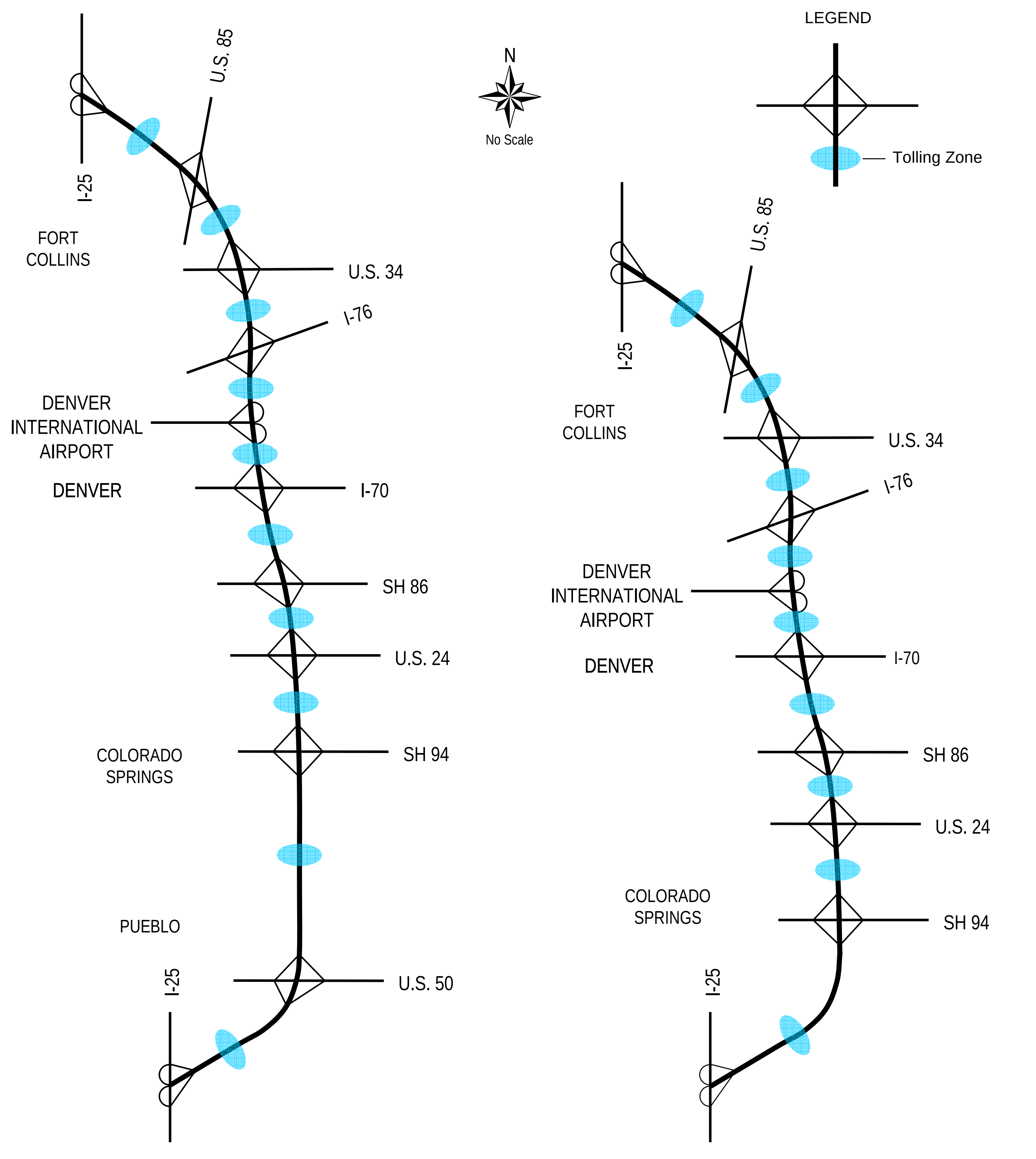
PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Toll Rates – A series of incremental toll rates were tested for the Project ranging from $0.05 to $0.20 per-mile for passenger car tolls, with higher rates for commercial vehicles. Each of the toll rates tested produced a unique revenue yield which formed the basis for establishing a toll elasticity curve. Based on review of the toll sensitivity curves, $0.10 per-mile passenger car toll rate was assumed. This would be equivalent to a through trip toll of about $20.00 for Scenario 1 and about $17.00 for Scenario 2.

Estimated Traffic - The estimated traffic for 2010 and 2025 is presented in Figures 4-5 and 4-6 for Scenarios 1 and 2. For Scenario 1, opening year traffic shows traffic volumes in the range of 2,400 to 14,200 vpd. The highest volumes are seen in the Denver metro area, in particular the mainline segment from I-70 to S.H. 86. By 2025, there is modest growth with traffic volumes ranging from 2,600 to 22,000 vpd. Scenario 2 shows similar traffic volumes to that observed in Scenario 1.

Estimated Annual Trips and Gross Toll Revenue – Annual trips and toll revenue are presented in Tables 4-3 and 4-4 for Scenarios 1 and 2, respectively. For Scenario 1, the number in annual trips in estimated be 10.0 million for the opening year. Annual toll revenue is estimated to be $81.0 million for the same year. By 2025, the annual number of trips is estimated to increase to 15.3 million, with annual toll revenues reaching approximately $123.0 million. The last year shown, 2040, shows the annual number of trips increasing to 19.2 million, producing an estimated $155.1 million in toll revenue.

For Scenario 2, the traffic and revenues produced are slightly less than shown for Scenario 1 due to the shorter project distance. For opening year, the project is estimated to serve approximately 9.9 million annual trips, which produce approximately $76.3 million in toll revenue. In 2025, the number of annual trips is estimated to increase to 15.2 million, representing an increase of 50.0 percent with toll revenues reaching $117.8 million. By 2040, the annual number of trips is shown to be 19.2 million with toll revenues rising to $149.1 million.



SCENARIO 1
I-25N (FORT COLLINS) TO I-25S (SOUTH OF PUEBLO)

SCENARIO 2
I-25N (FORT COLLINS) TO I-25S (NORTH OF PUEBLO)

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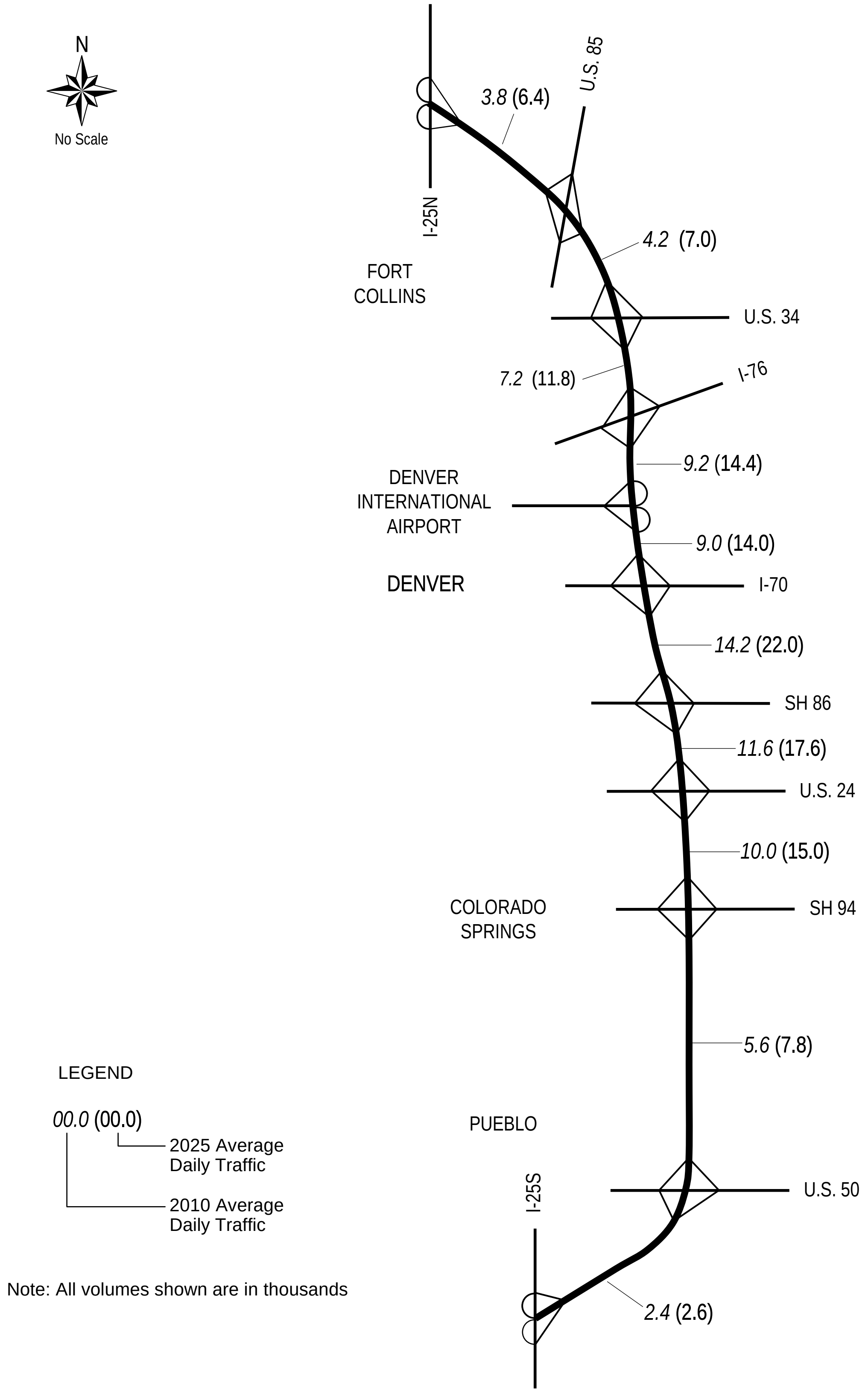
FRONT RANGE PROPOSED ACCESS POINTS AND TOLLING ZONES

FIGURE 4-4



Note: All volumes shown are in thousands

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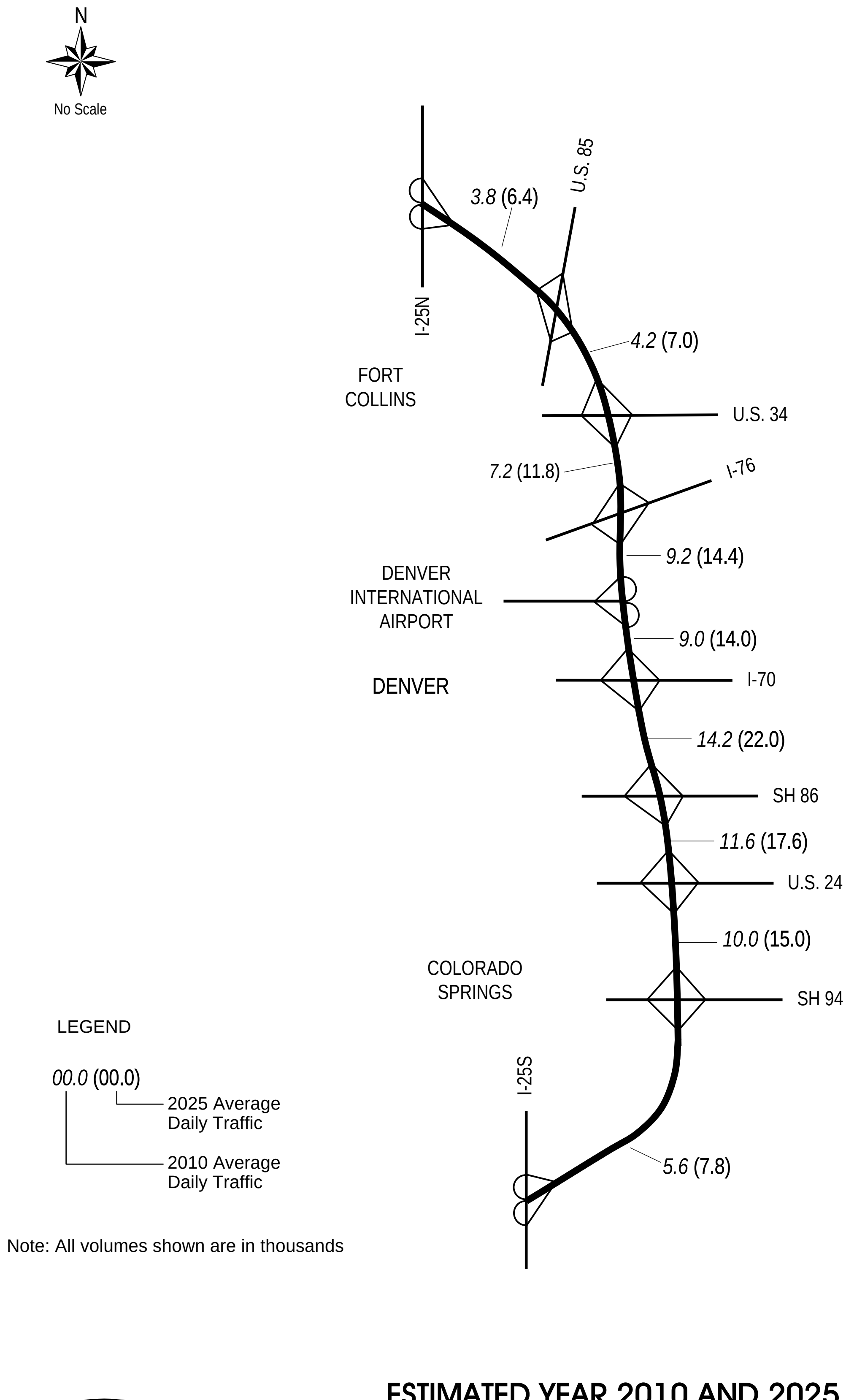
ESTIMATED YEAR 2010 AND 2025 AVERAGE DAILY TRAFFIC
FRONT RANGE
SCENARIO 1: I-25N (FORT COLLINS) TO I-25S (SOUTH OF PUEBLO)

FIGURE 4-5



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ESTIMATED YEAR 2010 AND 2025 AVERAGE DAILY TRAFFIC
FRONT RANGE
SCENARIO 2: I-25N (FORT COLLINS) TO I-25S (NORTH OF PUEBLO)

FIGURE 4-6

Table 4-3
Annual Traffic And Revenue Estimates
Scenario 1: I-25N (at Fort Collins) to I-25S (south of Pueblo)
Front Range Toll Road

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	10,001	$ 81,044
2011	10,366	83,834
2012	10,731	86,727
2013	11,060	89,516
2014	11,425	92,306
2015	11,790	95,199
2016	12,118	97,988
2017	12,483	100,778
2018	12,848	103,671
2019	13,213	106,461
2020	13,542	109,250
2021	13,907	112,143
2022	14,272	114,933
2023	14,600	117,723
2024	14,965	120,616
2025	15,330	123,405
2026	15,659	126,167
2027	15,987	128,864
2028	16,316	131,490
2029	16,644	134,037
2030	16,936	136,501
2031	17,228	138,873
2032	17,520	141,147
2033	17,776	143,317
2034	18,031	145,378
2035	18,287	147,322
2036	18,506	149,146
2037	18,725	150,843
2038	18,907	152,408
2039	19,090	153,837
2040	19,236	155,125

(1) Not adjusted for ramp-up.

Table 4-4
Annual Traffic And Revenue Estimates
Scenario 2: I-25N (at Fort Collins) to I-25S (north of Pueblo)
Front Range Toll Road

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	9,928	$ 76,323
2011	10,257	79,041
2012	10,622	81,860
2013	10,987	84,578
2014	11,315	87,397
2015	11,680	90,116
2016	12,045	92,935
2017	12,374	95,653
2018	12,739	98,472
2019	13,067	101,190
2020	13,432	104,009
2021	13,797	106,727
2022	14,126	109,546
2023	14,491	112,265
2024	14,856	115,084
2025	15,184	117,802
2026	15,513	120,491
2027	15,841	123,122
2028	16,170	125,687
2029	16,498	128,179
2030	16,827	130,593
2031	17,119	132,921
2032	17,411	135,158
2033	17,703	137,298
2034	17,958	139,334
2035	18,214	141,261
2036	18,433	143,074
2037	18,652	144,766
2038	18,871	146,334
2039	19,053	147,773
2040	19,236	149,078

(1) Not adjusted for ramp-up.

COLORADO SPRINGS AREA PROJECTS

Figure 4-7 shows the two core projects are potential toll facility candidate projects evaluated in the Greater Colorado Springs area. These include Powers Boulevard and the proposed Banning-Lewis Parkway. Several scenarios were evaluated for the different corridors, one of which would combine portions of the two projects.

The Powers Boulevard Corridor would include both potentially completing connections along existing Powers Boulevard to and from I-25 on the north and south and the possibility of upgrading the existing Powers Boulevard from a major arterial to a fully limited access facility.

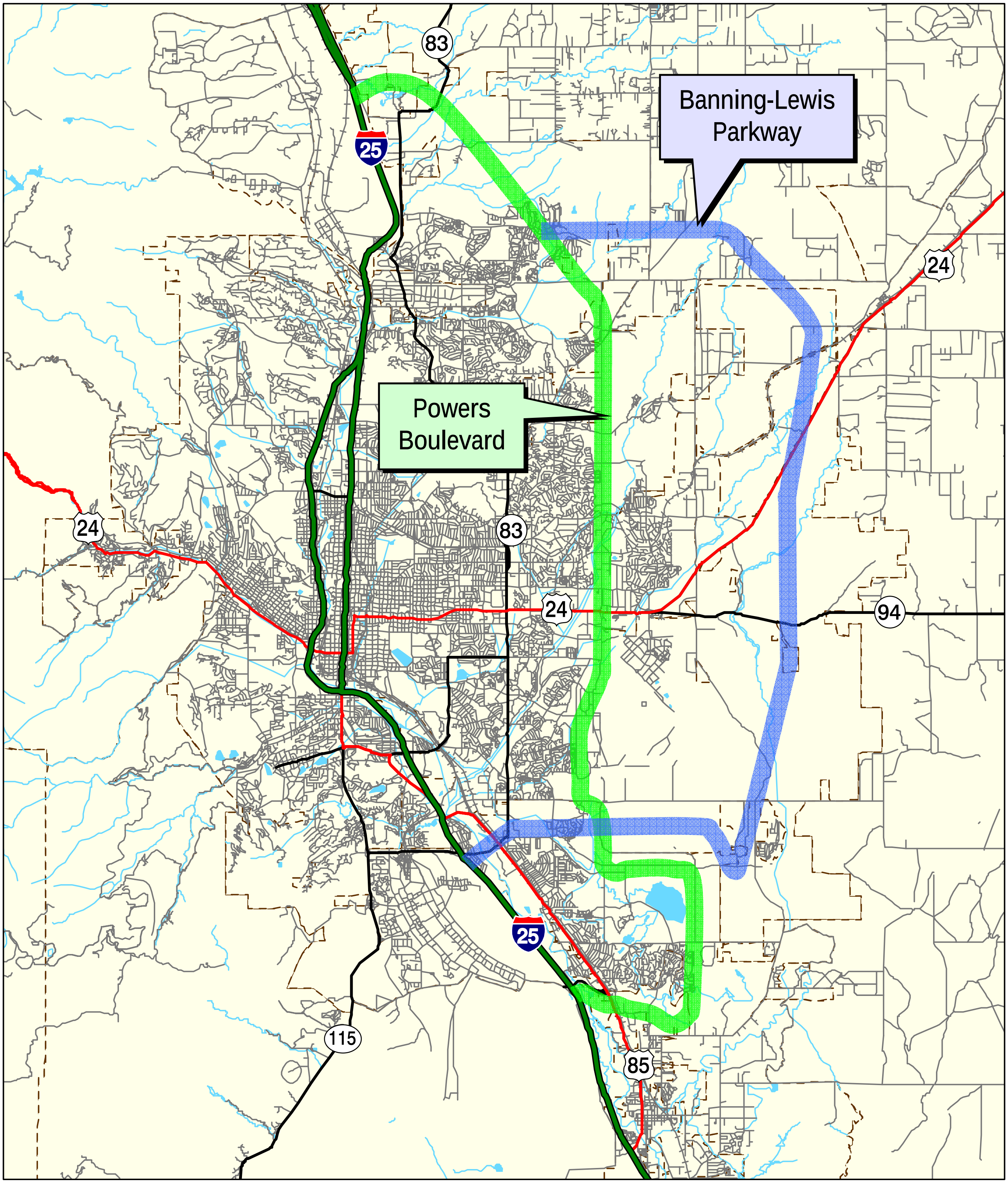
The proposed Banning-Lewis Parkway would be constructed in a major plan development along the eastern edge of Colorado Springs generally referred to as Banning-Lewis Ranch. That project, if fully built out, would substantially increase the size of the Colorado Springs region. However, most of that planned development is scheduled for subsequent to the year 2020, which results in relatively low early demand for Banning-Lewis Parkway in the early years of the traffic and revenue analysis.

PROPOSED POWERS BOULEVARD CORRIDOR

Four scenarios were considered for this corridor. These included:

- Scenario 1 – a new four lane toll road from I-25N (Northgate) to Woodmen Road;
- Scenario 2 – a new four lane toll road from I-25N (Northgate) to Drennan Road;
- Scenario 3 – a new four lane toll road from I-25N (Northgate) to south of Fountaine Boulevard;
- Scenario 4 – a new four lane toll road from I-25N (Northgate) to Woodmen Road plus a new four lane east-west toll road in the Drennan Road corridor connecting I-25 to the Colorado Springs Airport,

The Powers Road project is located in El Paso County and the City Colorado Springs. Powers Boulevard is currently an existing arterial, with at-grade signalized intersections that extend from Research Parkway to Fountain Boulevard, a length of approximately 18.0 miles. A grade-separated interchange is provided at Platte Avenue (U.S. 24). From Woodmen Road to Platte Avenue, Powers Boulevard is a 6-lane arterial,



COLORADO SPRINGS SECOND -TIER CANDIDATE PROJECTS

FIGURE 4-7

with posted speed limits of 45 MPH; south of Platte Avenue, Powers Boulevard is reduced to 4-lane section with posted speed limits ranging from 45 to 55 MPH.

The proposed project was studied as a series of phased implementations, represented by four scenarios. In Scenario 1, a new 4-lane toll road would be constructed from I-25 (Northgate) on the north near the Air Force Academy to Woodmen Road; Powers Boulevard, south of Woodmen Road, was assumed to be a freeway. In Scenario 2, the toll road would be extended from Woodmen to Drennan Road, a distance of approximately 11-miles. For Scenario 3, the toll road would be extended south of Drennan Road to a point just south of Fontaine Boulevard, where it would tie into a new east-west arterial providing access to I-25. For all scenarios, it was assumed that a four or six lane frontage road would be provided to replace any existing 'free' capacity, as well as to provide access to local businesses and residences.

Scenario 4, assumed that the north end of the project would be completed as a toll road from Northgate to Woodmen Road. In addition a new east-west toll road would be built connecting I-25 to the Colorado Springs Airport, running parallel to Drennan Road.

CURRENT TRAFFIC CONDITIONS

The 2003 ADT on Powers Boulevard just north of Woodmen Road is about 17,000. The volume on Powers, south of Woodmen Road increases to about 35,000. Woodmen Road itself has an ADT of 27,000 west of Powers and 17,000 on the east side. Woodmen Road also serves as a major east-west facility in this region as indicated by the traffic volumes on Woodmen Road between I-25 and Powers Boulevard, which are in the range of 30,000-35,000. Moving southward, the ADT on Powers Boulevard changes to about 39,000, just south of Barnes Road. In the central part of Powers Boulevard, traffic volume increases further to over 42,000 south of US-24 (Platte Avenue). Further south, the traffic volumes tend to be relatively lower. On most parts of South Powers Boulevard, daily traffic volumes remain in the range of 10,000 vehicles.

A major north-south facility west of Powers Boulevard is Academy Boulevard, which carries higher traffic volumes. For the most part, the ADT on Academy Boulevard is in the range of 45,000. It increases in some areas, particularly near Woodmen, to 54,000, and declines to near 30,000 south of Fountain Boulevard. The traffic volumes again increase at its south terminus, near I-25 to 45,000 vehicles per day.

Another north-south facility, east of Powers Boulevard, is Marksheffel Road, which passes through rapidly growing areas. However, the current volume on this facility is approximately 7,000 in the northern part, south of Woodmen Road. In the central portion north of the airport, the ADT reduces to 4,000, which reduces further to 3,000 and less in the southern part of Marksheffel Road east of the Colorado Springs Airport.

PROJECT ACCESS POINTS AND TOLLING CONCEPT

Figure 4-8 presents the assumed project limits and interchange locations for Scenario 1. Major interchanges were assumed at: I-25, Voyager Parkway, Academy Boulevard (S.H.-83), Old Ranch Road, Union Boulevard, Briargate Boulevard, and Research Parkway and Woodman Road.

Scenario 2 extends the toll road further south along Powers Boulevard, to Drennan Road. In addition to the access points in Scenario 1, access to the Project was assumed to be provided at interchanges between Woodmen Road and Drennan Road. These included, Dublin Street, Stetson Hills Boulevard, Barnes Road, Constitution Avenue, Palmer Park Boulevard, Platte Avenue (U.S. 24), Airport Road and Fountain Boulevard, as shown in Figure 4-9.

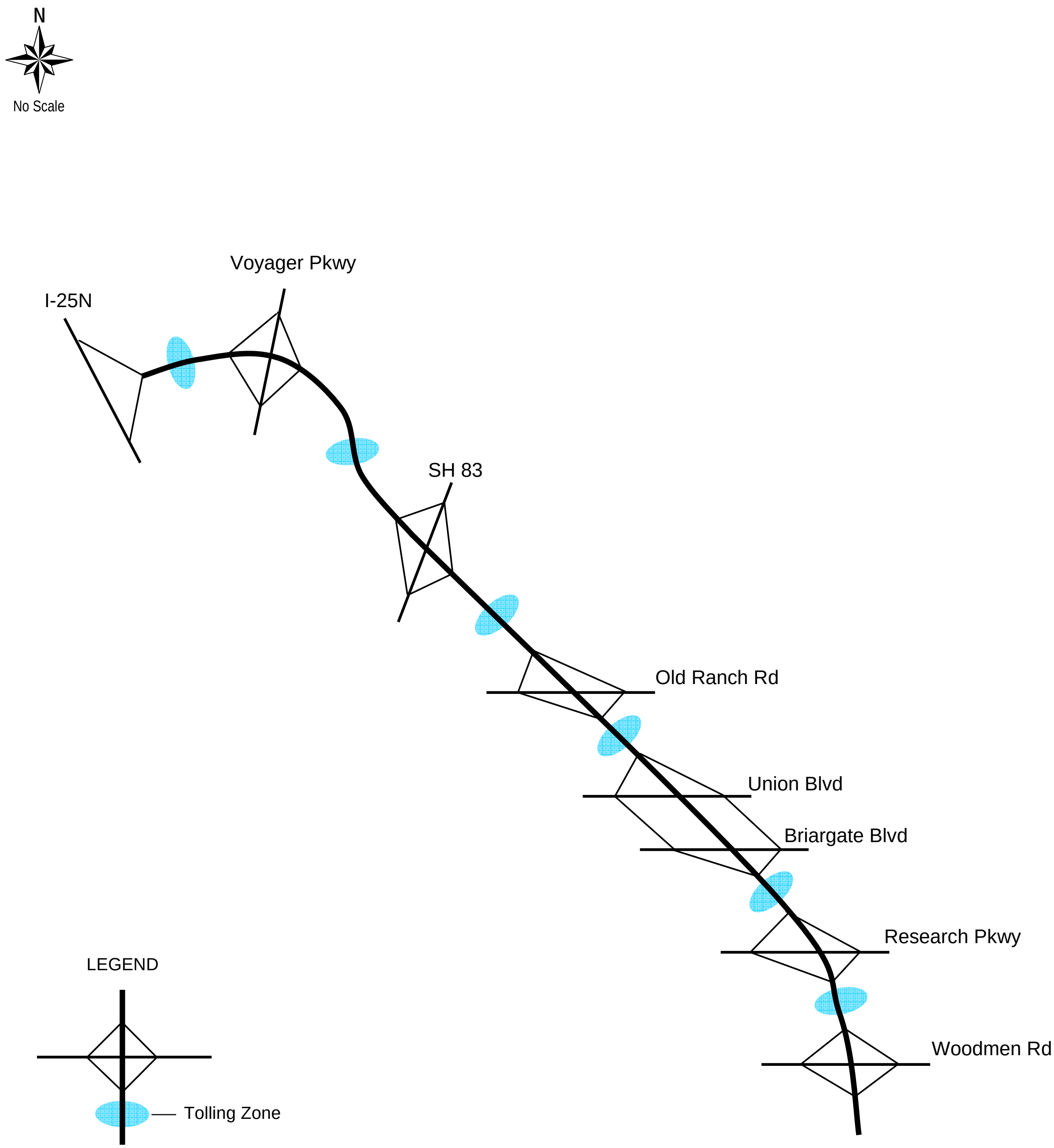
Scenario 3 is presented in Figure 4-10. Additional access points were assumed to be provided at Grinnel Street, Bradley Road, Fontaine Boulevard and Mesa Ridge Parkway. The tolling concept remains similar to other scenarios.

Scenario 4 combines the north piece described by Scenario 1 and adds a new east-west toll road in the south. The south portion includes an east-west toll road connecting the Colorado Springs Municipal Airport, to I-25, near Drennan Road. Access point in the south portion is assumed to be provided at South Powers Boulevard. Figure 4-11 presents the assumed access points for both toll roads.

For all four scenarios, electronic tolling was assumed to be implemented by providing toll zones on each mainline segment between each interchange.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Toll Rates - Each of the four scenarios was analyzed under varying sets of toll rates for both 2010 and 2030 conditions. The toll rates tested ranged from $0.05 to $0.25 per mile, at increments of $0.05. The results of the analysis produced a toll sensitivity curve for the Project. Based on review of the toll sensitivity curve, the toll rate of $0.20 per mile was assumed for



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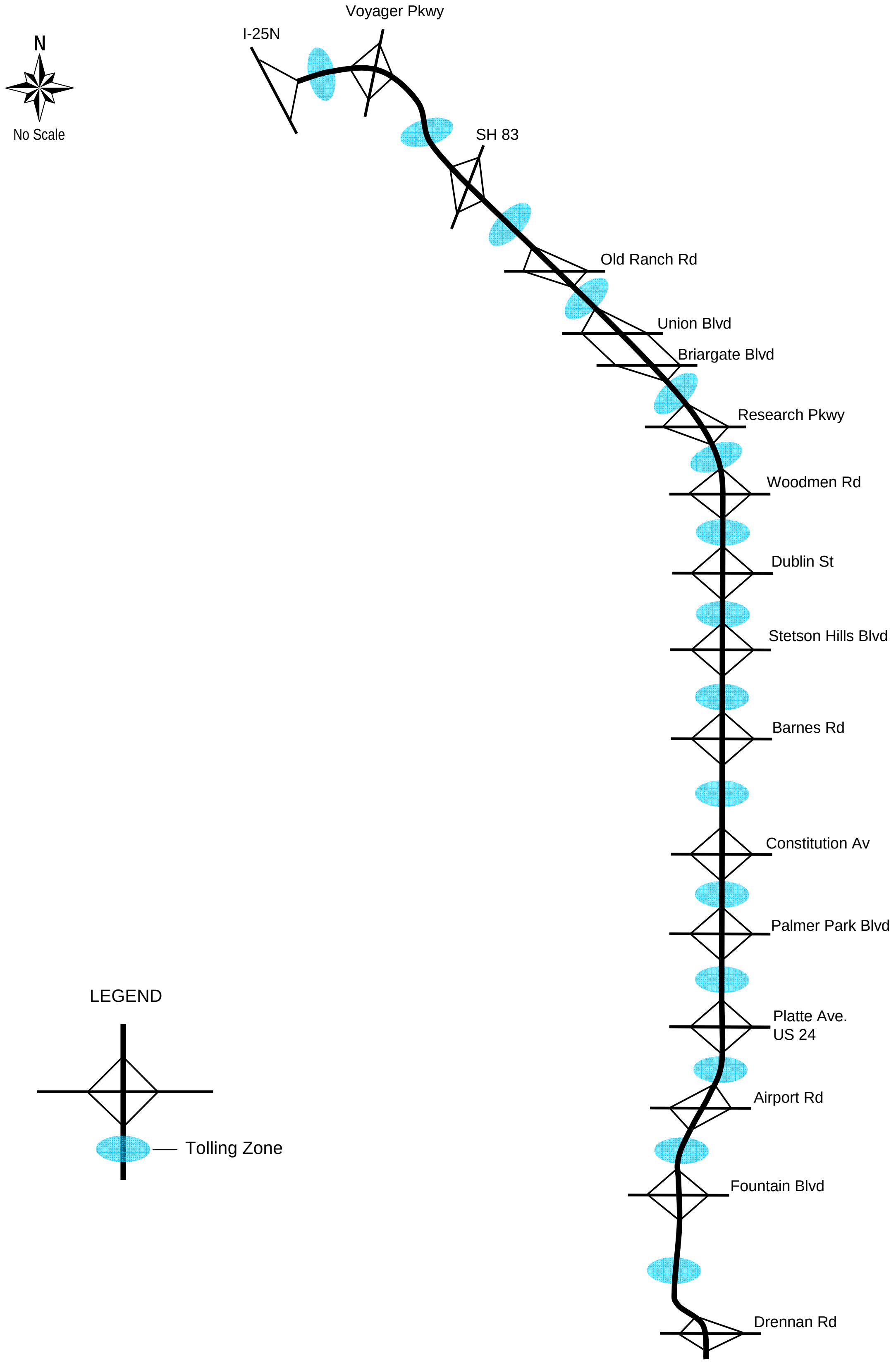
POWERS BOULEVARD
PROPOSED ACCESS POINTS AND TOLLING ZONES
SCENARIO 1: I-25N TO WOODMEN ROAD

FIGURE 4-8



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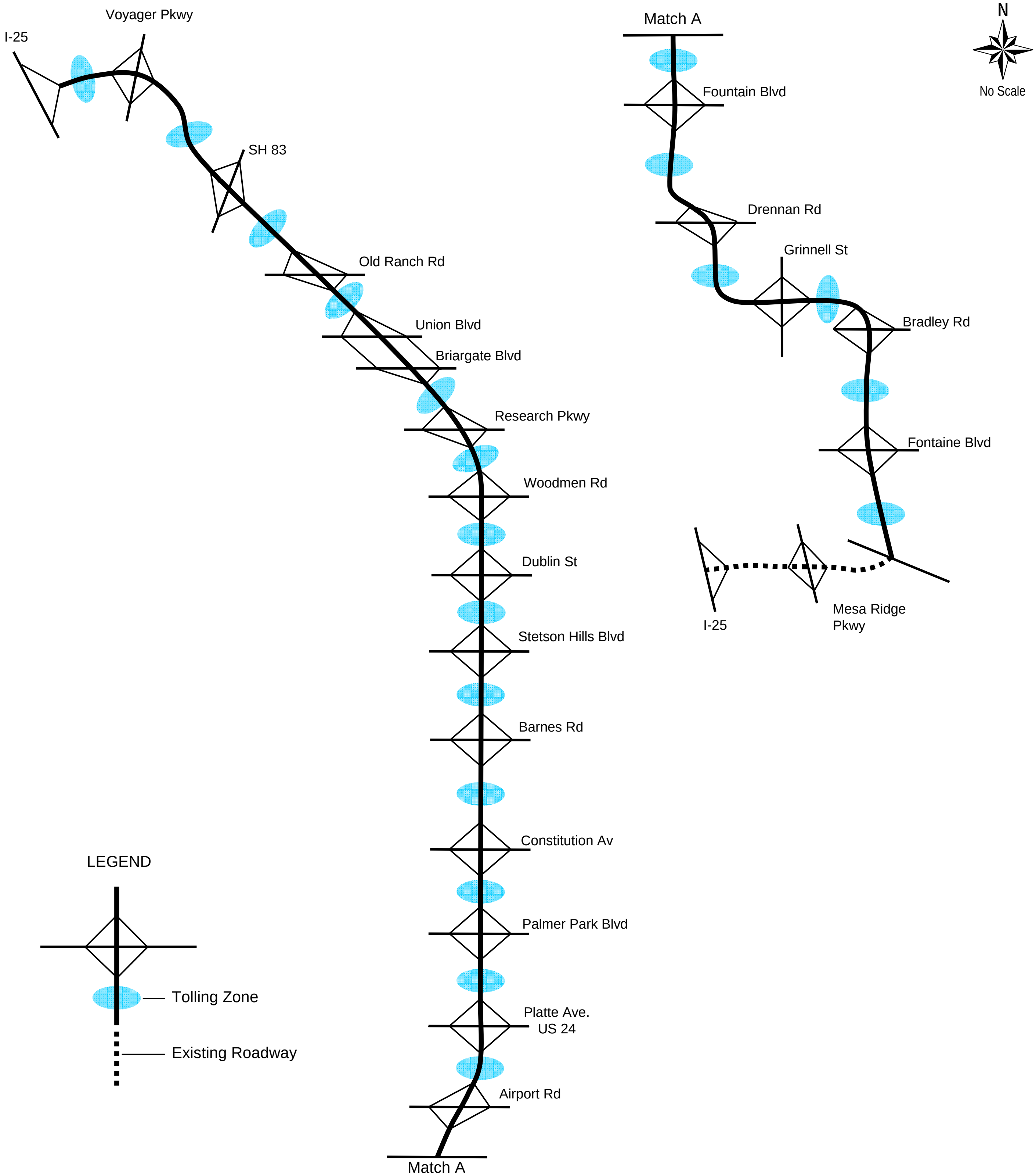
PROPOSED ACCESS POINTS AND TOLLING ZONES
SCENARIO 2: I-25N TO DRENNAN ROAD

FIGURE 4-9



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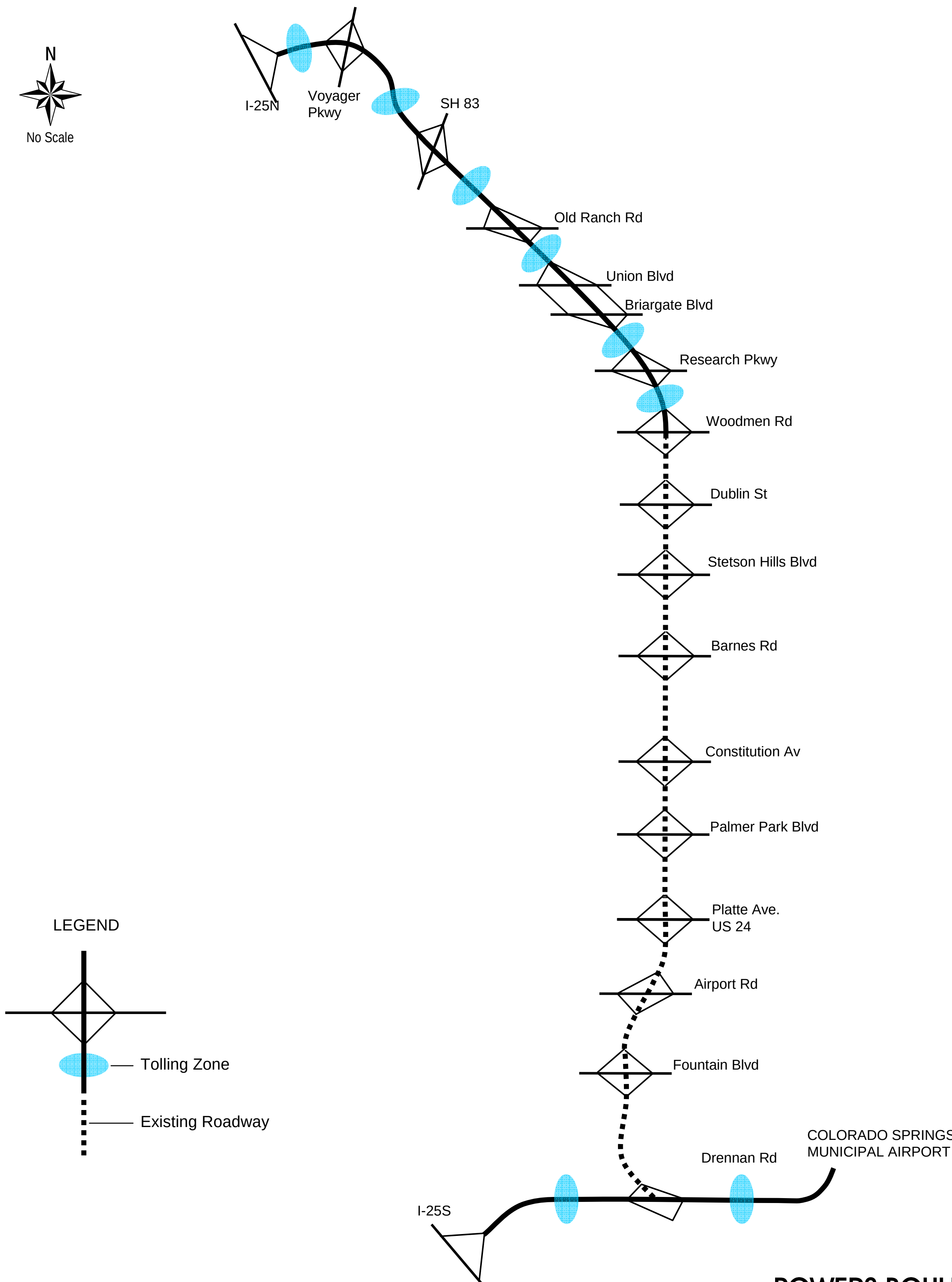
POWERS BOULEVARD
PROPOSED ACCESS POINTS AND TOLLING ZONES
SCENARIO 3: I-25N TO I-25S

FIGURE 4-10



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POWERS BOULEVARD
PROPOSED ACCESS POINTS AND TOLLING ZONES
SCENARIO 4: I-25N TO I-25S

FIGURE 4-11

further analysis including computation of revenue. An estimated proportion of 8 percent was assumed for commercial vehicles. The toll rate for commercial vehicles was considered as three times that of passenger cars.

Estimated Traffic **-** Figure 4-12 presents future year traffic for Scenario 1. Under 2010 conditions, the expected average daily traffic ranges from 15,000 near I-25 to 27,600 near Woodmen Road. The 2030 counterparts of these volumes are 28,700 and 49,000, respectively.

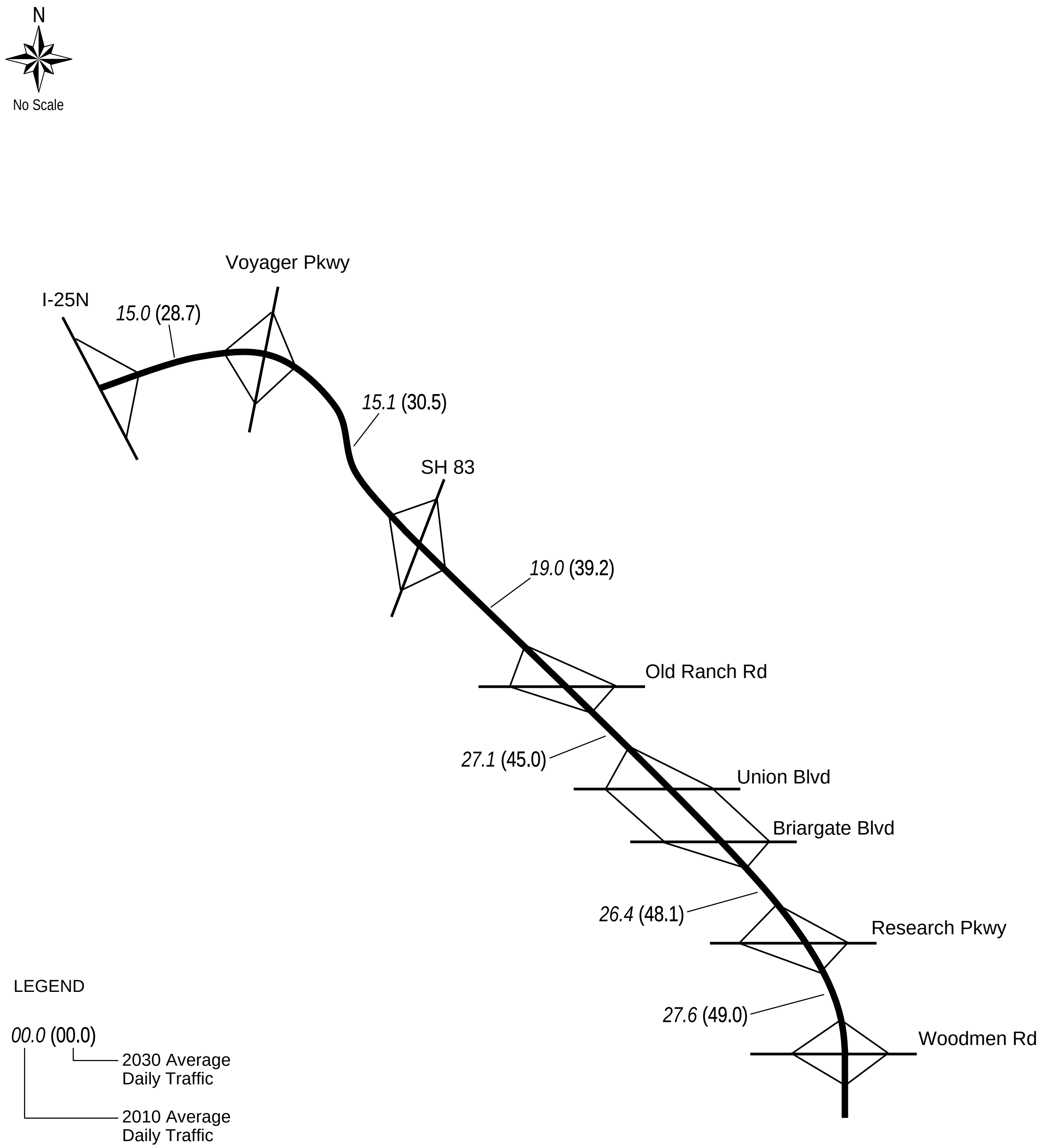
Figure 4-13 presents 2010 and 2030 traffic estimates for Scenario 2. For opening year, the expected average daily traffic ranges from 13,800 near I-25 to 64,500 north of Palmer Park Boulevard. The 2030 counterparts of these volumes are 28,700 and 115,600, respectively. At the southern terminus, the estimated 2010 and 2030 daily traffic is 43,200 and 66,200, respectively.

Future year traffic estimates for Scenario 3 are shown in Figure 4-14. In 2010, average daily traffic is estimated to range from 13,200 near I-25 to 62,700 north of Palmer Park Boulevard. The 2030 counterparts of these volumes are 27,000 and 113,800, respectively. At the southern terminus, the estimated 2010 and 2030 daily traffic is 14,600 and 26,600, respectively, south of Fontaine Boulevard.

Figure 4-15 presents the 2010 and 2030 traffic estimates associated with Scenario 4. In opening year, the expected average daily traffic ranges from 14,100 near I-25 to 26,600, north of Woodmen Road. The 2030 counterparts of these volumes are 28,700 and 49,100, respectively. In the southern portion, the estimated 2010 and 2030 daily traffic is 17,700 and 31,100, respectively.

Estimated Annual Trips and Gross Toll Revenue - Table 4-5 presents estimated annual trips and annual gross toll revenues for Scenario 1. Opening year shows an estimated 9.8 million annual trips passing through the Project, generating annual toll revenue of $11.2 million. By 2030, the annual trips on the proposed facility increase to 17.6 million, with an annual revenue of $21.2 million. The trips and revenue rise to 21.5 and $26.2 million in the year 2040

For Scenario 2, an estimated 34.6 million annual trips are anticipated to use the Project in 2010, generating annual toll revenue of $45.1 million. By 2030, the number of annual trips on the proposed facility increases to 64.6 million, with an annual revenue of $82.7 million. The trips and



Note: All volumes shown are in thousands

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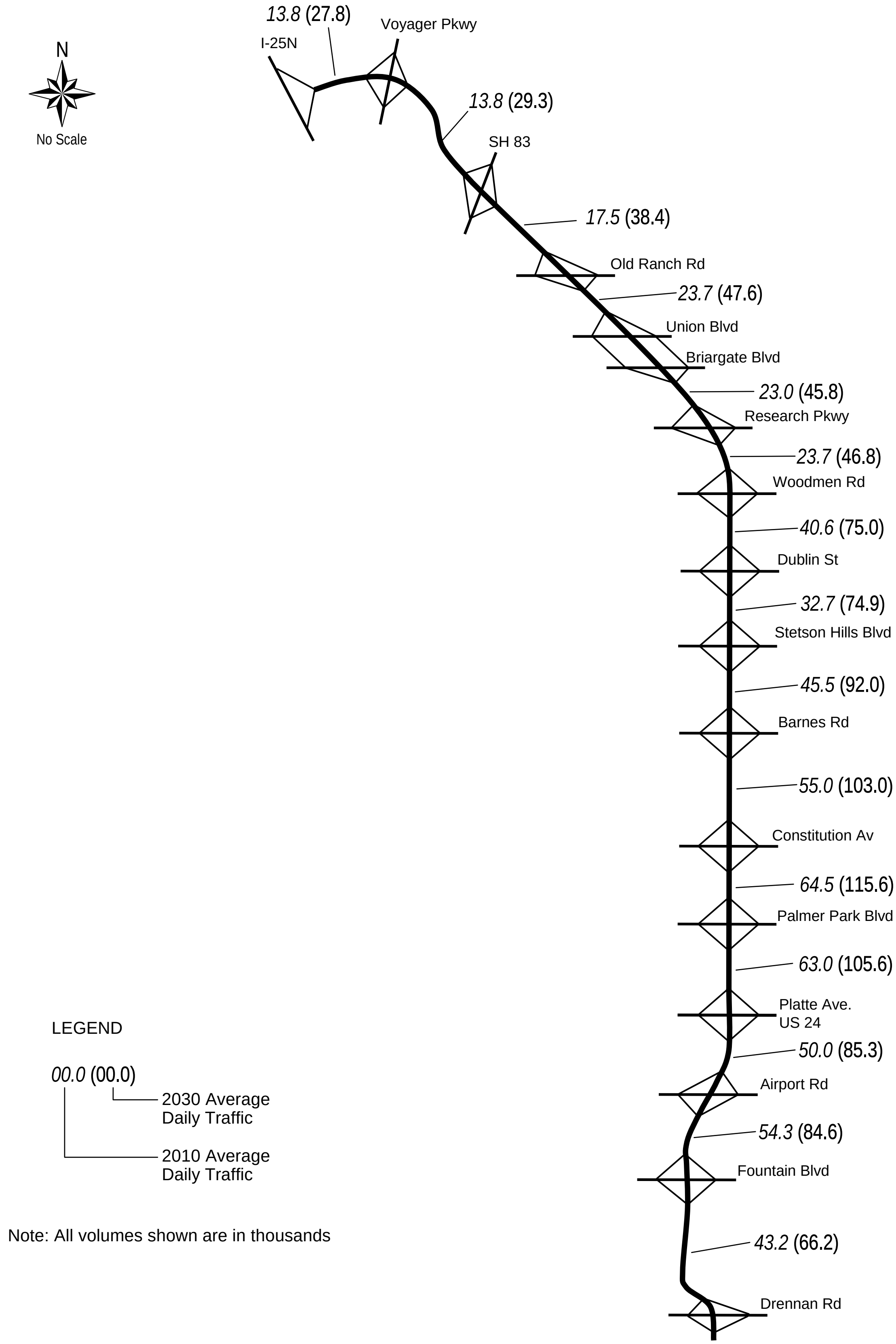
ESTIMATED YEAR 2010 AND 2030 AVERAGE DAILY TRAFFIC
POWERS BOULEVARD - SCENARIO 1
I-25N TO WOODMEN ROAD

FIGURE 4-12



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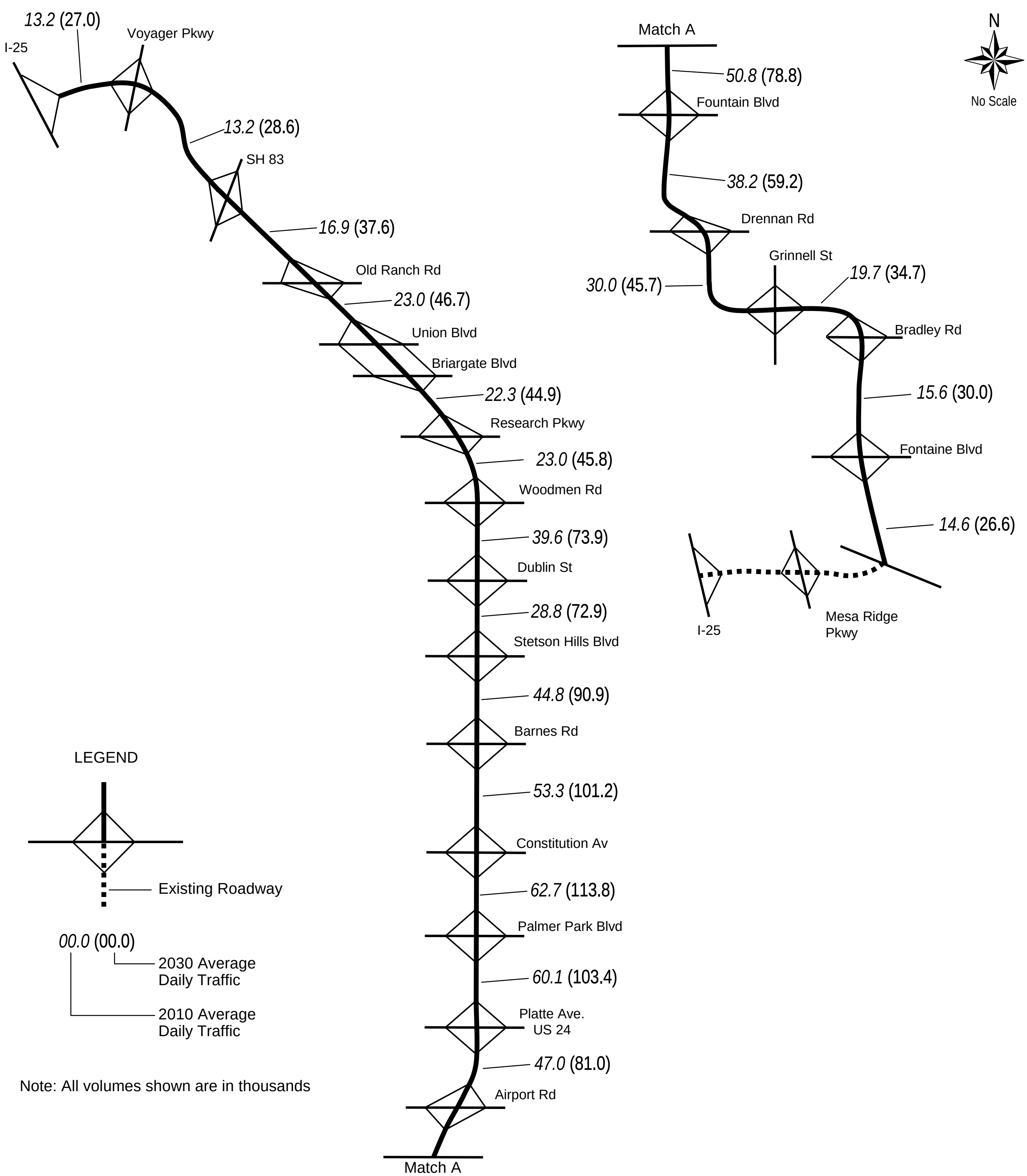
ESTIMATED YEAR 2010 AND 2030 AVERAGE DAILY TRAFFIC
POWERS BOULEVARD
SCENARIO 2: I-25N TO DRENNAN ROAD

FIGURE 4-13



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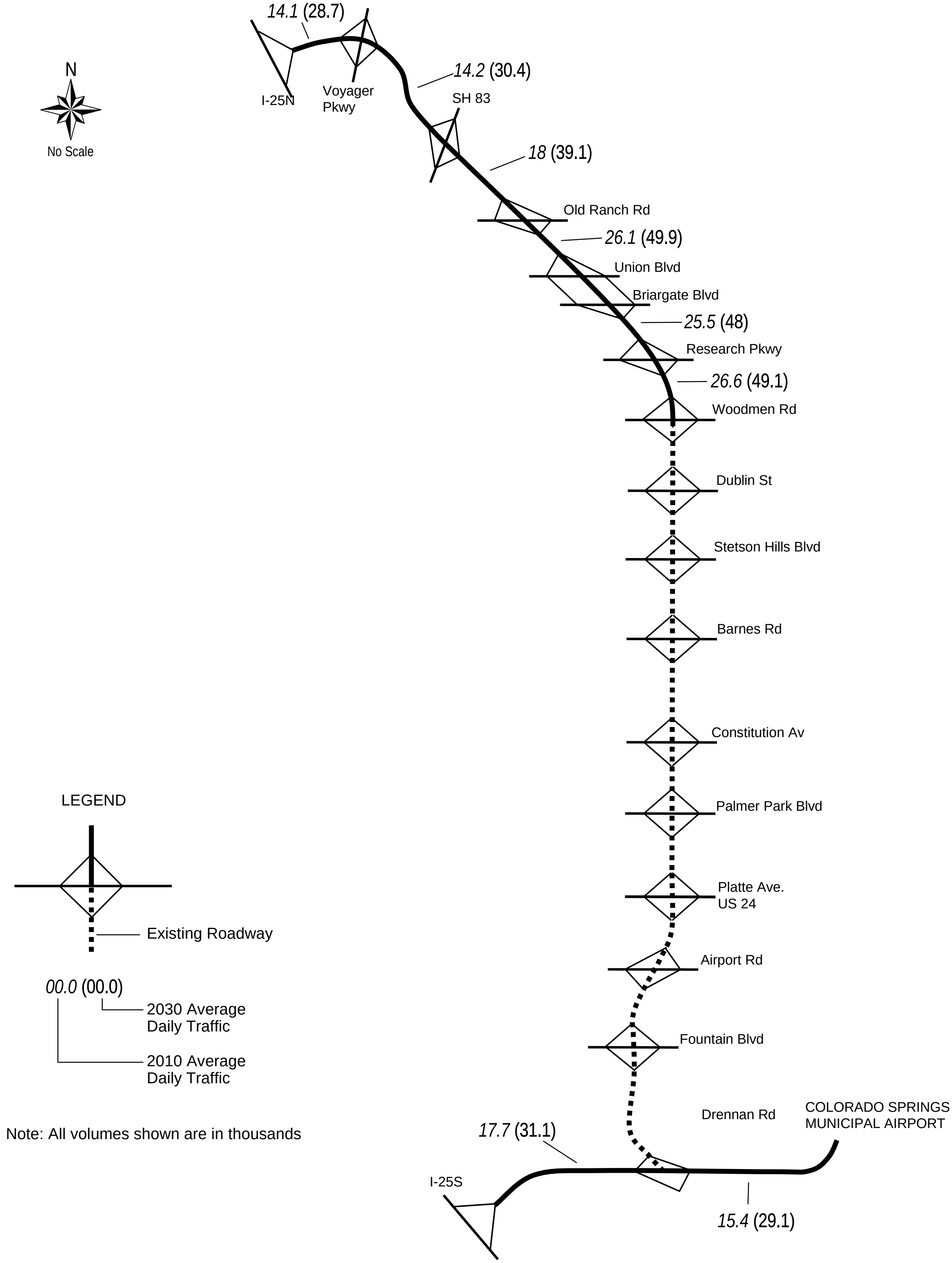
ESTIMATED YEAR 2010 AND 2030 AVERAGE DAILY TRAFFIC
POWERS BOULEVARD
SCENARIO 3: I-25N TO I-25S

FIGURE 4-14



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ESTIMATED YEAR 2010 AND 2030 AVERAGE DAILY TRAFFIC
POWERS BOULEVARD
SCENARIO 4: I-25N TO I-25S

FIGURE 4-15

Table 4-5
Annual Traffic And Revenue Estimates
Scenario 1 : I-25N to Woodmen Road
Powers Boulevard Toll Road

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	9,813	$ 11,231
2011	10,201	11,731
2012	10,589	12,230
2013	10,977	12,729
2014	11,366	13,229
2015	11,754	13,728
2016	12,142	14,227
2017	12,530	14,727
2018	12,918	15,226
2019	13,306	15,725
2020	13,694	16,225
2021	14,082	16,724
2022	14,471	17,223
2023	14,859	17,723
2024	15,247	18,222
2025	15,635	18,721
2026	16,023	19,220
2027	16,411	19,720
2028	16,799	20,219
2029	17,187	20,718
2030	17,576	21,218
2031	17,964	21,717
2032	18,352	22,216
2033	18,740	22,716
2034	19,128	23,215
2035	19,516	23,714
2036	19,904	24,214
2037	20,292	24,713
2038	20,681	25,212
2039	21,069	25,712
2040	21,457	26,211

(1) Not adjusted for ramp-up.

revenue rise to 79.6 and $101.5 million in the year 2040, as summarized in Table 4-6.

Table 4-7 presents the estimated traffic and revenue summary for Scenario 3. This shows that for the opening year, an estimated 42.3 million annual trips would use the Project, generating annual toll revenue of $52.5 million. By 2030, the number of annual trips on the proposed facility increases to 71.5 million, with an annual revenue of $96.8 million. The estimated number of trips and toll revenues are anticipated to rise to 86.1 and $118.9.5 million by 2040.

Table 4-8 presents the estimated traffic and revenue for Scenario 4. For opening year, the estimated number of annual trips using the Project is 14.2 million, producing annual toll revenue of $15.6 million. By 2030, the number of annual trips increases to 24.7 million, with an annual revenue of $29.9 million. In the last year of analysis, 2040, the number of annual trips is anticipated to rise to 30.0 million with annual toll revenues exceeding $37.0 million.

PROPOSED BANNING LEWIS CORRIDOR

Two scenarios were considered for the Banning Lewis Corridor. These included:

- Scenario 1 – a new four lane toll road from I-25N (Northgate) to I-25S at Fountaine Boulevard, assuming an unimproved Powers Boulevard; and

- Scenario 2 – a new four lane toll road from I-25N (Northgate) to I-25S at Fountaine Boulevard, assuming an improved Powers Boulevard.

The Banning Lewis project alignment would be located in the eastern portion of Colorado Springs. It would provide a new eastern bypass around the city, as well as providing access to the proposed Banning Lewis Ranch development. The Banning Lewis Ranch Development, if fully realized would cover approximately 21,000 acres, accommodating nearly 75,000 new dwelling units, and nearly 50.0 million square ft of new commercial/office/industrial space.

The Banning Lewis project was studied as new four lane toll road, covering distance of approximately 21.0 miles. At the north end, it was assumed to connect to I-25 at Northgate, and follow the same partial alignment described in Scenario 1 for Powers Boulevard. Just north of Research Parkway, the Banning Lewis alignment would swing east and run parallel to Woodmen Road. The road alignment would then move

Table 4-6
Annual Traffic And Revenue Estimates
Scenario 2 : I-25N to Drennan Road
Powers Boulevard Toll Road

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	34,582	$ 45,108
2011	36,084	46,986
2012	37,585	48,864
2013	39,087	50,742
2014	40,588	52,620
2015	42,090	54,498
2016	43,591	56,376
2017	45,093	58,254
2018	46,594	60,132
2019	48,096	62,010
2020	49,597	63,888
2021	51,099	65,766
2022	52,600	67,644
2023	54,102	69,523
2024	55,603	71,401
2025	57,105	73,279
2026	58,607	75,157
2027	60,108	77,035
2028	61,610	78,913
2029	63,111	80,791
2030	64,613	82,669
2031	66,114	84,547
2032	67,616	86,425
2033	69,117	88,303
2034	70,619	90,181
2035	72,120	92,059
2036	73,622	93,937
2037	75,123	95,815
2038	76,625	97,694
2039	78,126	99,572
2040	79,628	101,450

(1) Not adjusted for ramp-up.

Table 4-7
Annual Traffic And Revenue Estimates
Scenario 3 : I-25N to Mesa Ridge Parkway
Powers Boulevard Toll Road

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	42,329	$ 52,516
2011	43,788	54,729
2012	45,247	56,942
2013	46,705	59,156
2014	48,164	61,369
2015	49,623	63,582
2016	51,081	65,796
2017	52,540	68,009
2018	53,999	70,222
2019	55,457	72,436
2020	56,916	74,649
2021	58,375	76,862
2022	59,833	79,076
2023	61,292	81,289
2024	62,751	83,502
2025	64,209	85,716
2026	65,668	87,929
2027	67,127	90,142
2028	68,585	92,356
2029	70,044	94,569
2030	71,503	96,782
2031	72,961	98,996
2032	74,420	101,209
2033	75,879	103,422
2034	77,338	105,636
2035	78,796	107,849
2036	80,255	110,062
2037	81,714	112,275
2038	83,172	114,489
2039	84,631	116,702
2040	86,090	118,915

(1) Not adjusted for ramp-up.

Table 4-8
Annual Traffic And Revenue Estimates
Scenario 4 : I-25N to Woodmen & Airport to I-25S
Powers Boulevard Toll Road

Year	**Annual Trips (1)** (000)	**Annual Revenue (1)** (000)
2010	14,165	$ 15,605
2011	14,693	16,320
2012	15,221	17,036
2013	15,750	17,751
2014	16,278	18,466
2015	16,807	19,182
2016	17,335	19,897
2017	17,864	20,613
2018	18,392	21,328
2019	18,920	22,043
2020	19,449	22,759
2021	19,977	23,474
2022	20,506	24,189
2023	21,034	24,905
2024	21,563	25,620
2025	22,091	26,335
2026	22,619	27,051
2027	23,148	27,766
2028	23,676	28,482
2029	24,205	29,197
2030	24,733	29,912
2031	25,262	30,628
2032	25,790	31,343
2033	26,318	32,058
2034	26,847	32,774
2035	27,375	33,489
2036	27,904	34,204
2037	28,432	34,920
2038	28,961	35,635
2039	29,489	36,351
2040	30,018	37,066

(1) Not adjusted for ramp-up.

south running parallel to Marksheffel Road, extending to Drennan Road. From Drennan Road, the road alignment would move in a western direction, terminating at I-25. Two scenarios were studied based on this alignment. Scenario 1 assumed that Powers Boulevard would not be improved; while Scenario 2 assumed that Powers Boulevard would be upgraded to a freeway.

CURRENT TRAFFIC CONDITIONS

The primary north-south facility is Marksheffel Road, which carries traffic volumes ranging from 7,000 in its northern sections, to approximately 4,000 in its central portion, near the Colorado Springs airport. The daily traffic volumes drop to 3,000 south of the airport.

The primary east-west route is Woodmen Road, north of the study area, which presently services approximately 17,000 vpd. Other east-west routes include Barnes Road, which carries traffic in range of 16,000 vpd; and Constitution Avenue which carries traffic in the range of 10,000 to 30,000 vpd.

Areas east of Marksheffel Road, which constitute the Banning-Lewis corridor, are not currently developed to the extent that they would result in major traffic impacts on Marksheffel Road at this time.

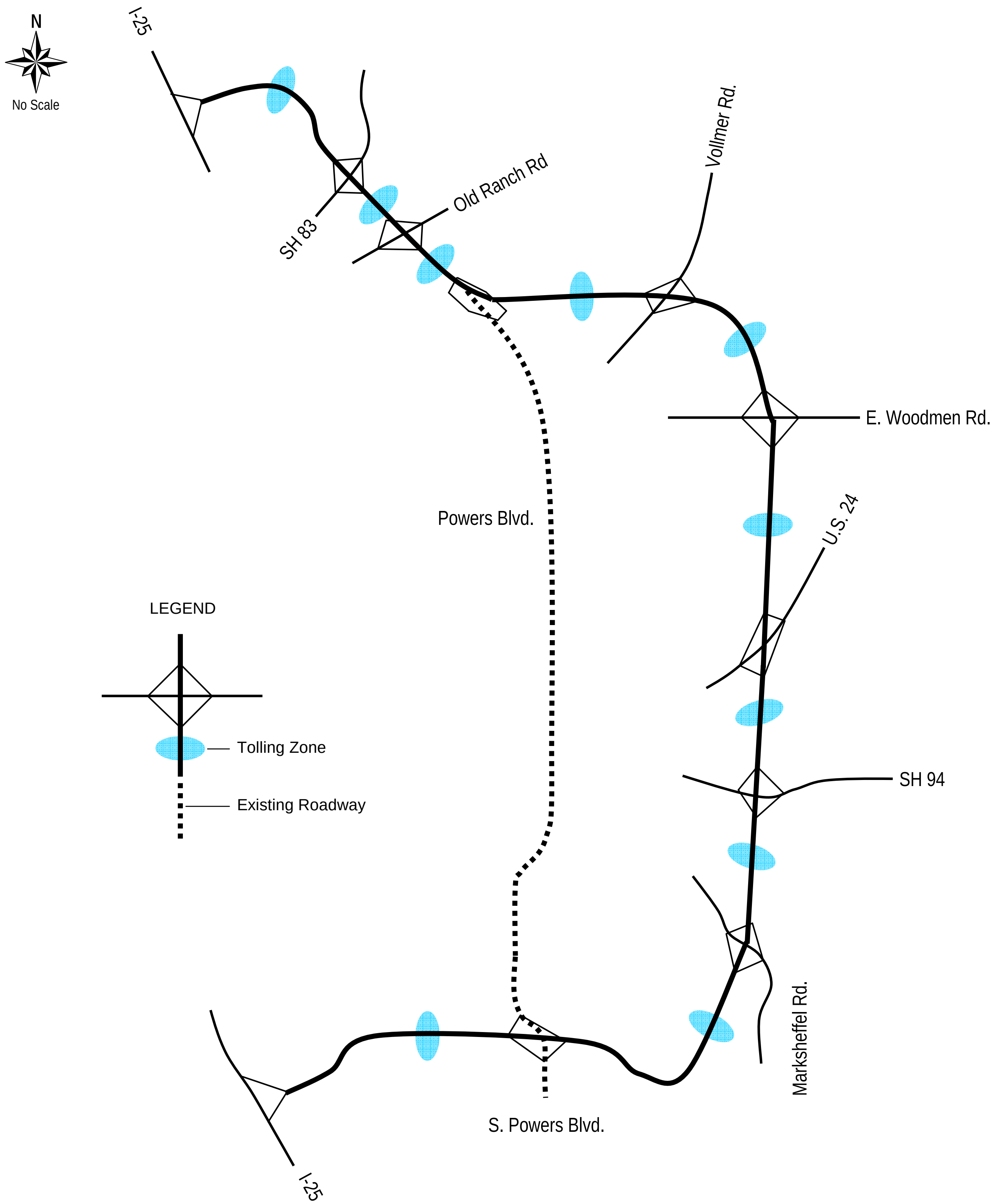
PROJECT ACCESS POINTS AND TOLLING CONCEPT

Figure 4-16, presents the assumed interchange access location points for the Project. Access to the Project is assumed to be provided from all major interchanges between I-25N, and the southern terminus of the Project where it connects back to I-25S. Starting from the north terminus, the interchanges assumed include, S.H. 83, Old Ranch Road, Union & Briargate Boulevard, Vollmer Road, East Woodmen Road, U.S.24, S.H. 94, Marksheffel Road and South Powers Boulevard. The electronic toll collection scheme assumed comprises a toll zone between each interchange as illustrated in the above referenced figure.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

Toll Rates - The toll rates tested ranged from $0.05 to $0.25 per mile, at increments of $0.05. For every toll rate tested a unique revenue yield was produced, from which a toll sensitivity curve was developed. Based on review of toll sensitivity curves for 2010 and 2030, a toll rate of $0.20 per mile was assumed for further analysis including computation of revenue.

Estimated Traffic - Figure 4-17 presents the estimated 2010 and 2030 traffic for Scenario 1. In the opening year, the expected average daily traffic ranges from 7,500 near I-25 to 3,800 near East Woodmen Road.



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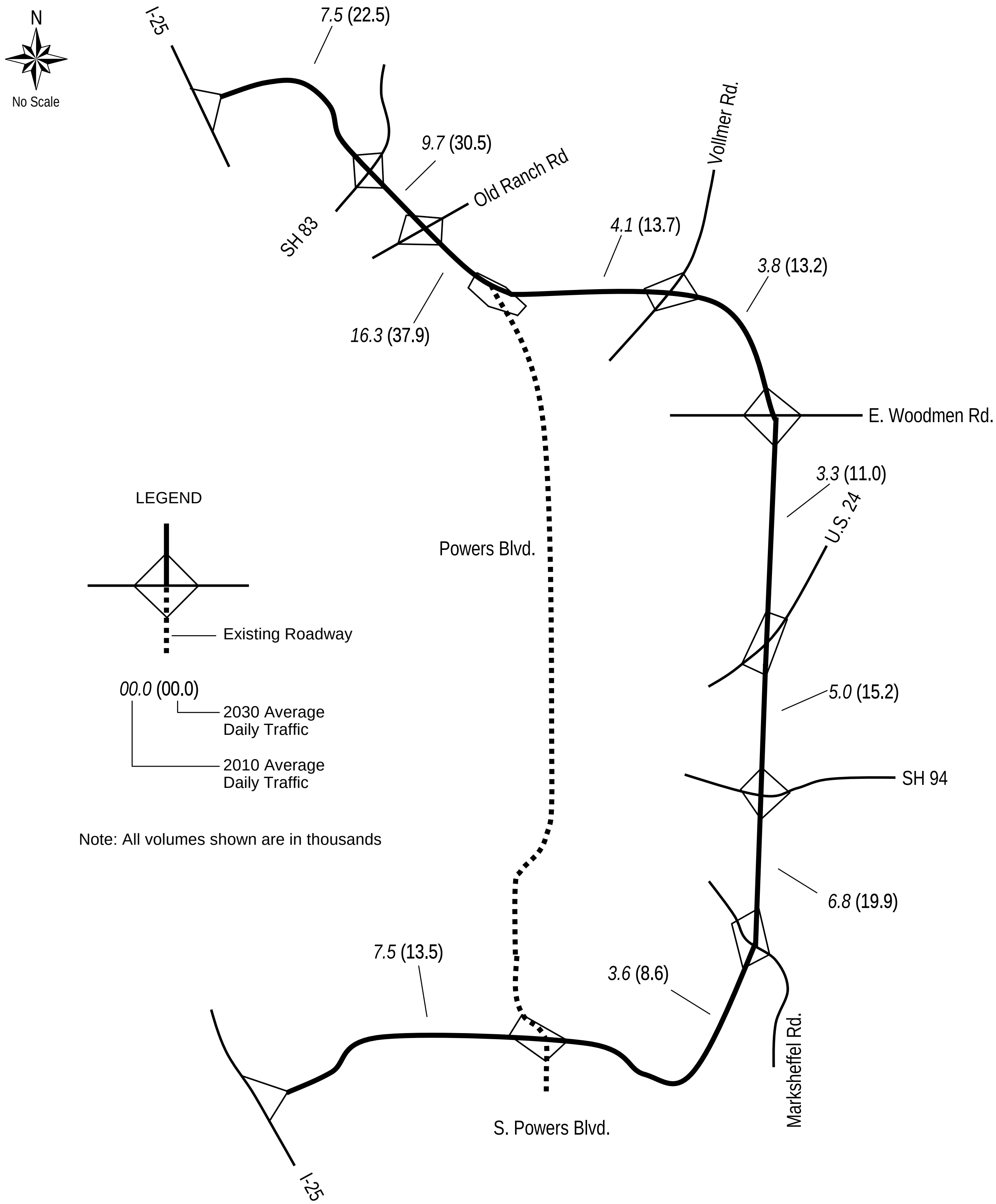
BANNING-LEWIS
PROPOSED ACCESS POINTS AND TOLLING ZONES
SCENARIOS 1 AND 2

FIGURE 4-16



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ESTIMATED YEAR 2010 AND 2030 AVERAGE DAILY TRAFFIC BANNING-LEWIS PARKWAY - SCENARIO 1: I-25 N TO I-25 S AT FOUNTAIN (UNIMPROVED POWERS BLVD.)

FIGURE 4-17

The 2030 counterparts of these volumes are 22,500 and 13,200, respectively. Higher volume is expected south of S.H. 94, which is 6,800 in 2010 and 19,900 in 2030. At the south terminus, near I-25S, the volumes are 7,500 and 13,500 for 2010 and 2030, respectively.

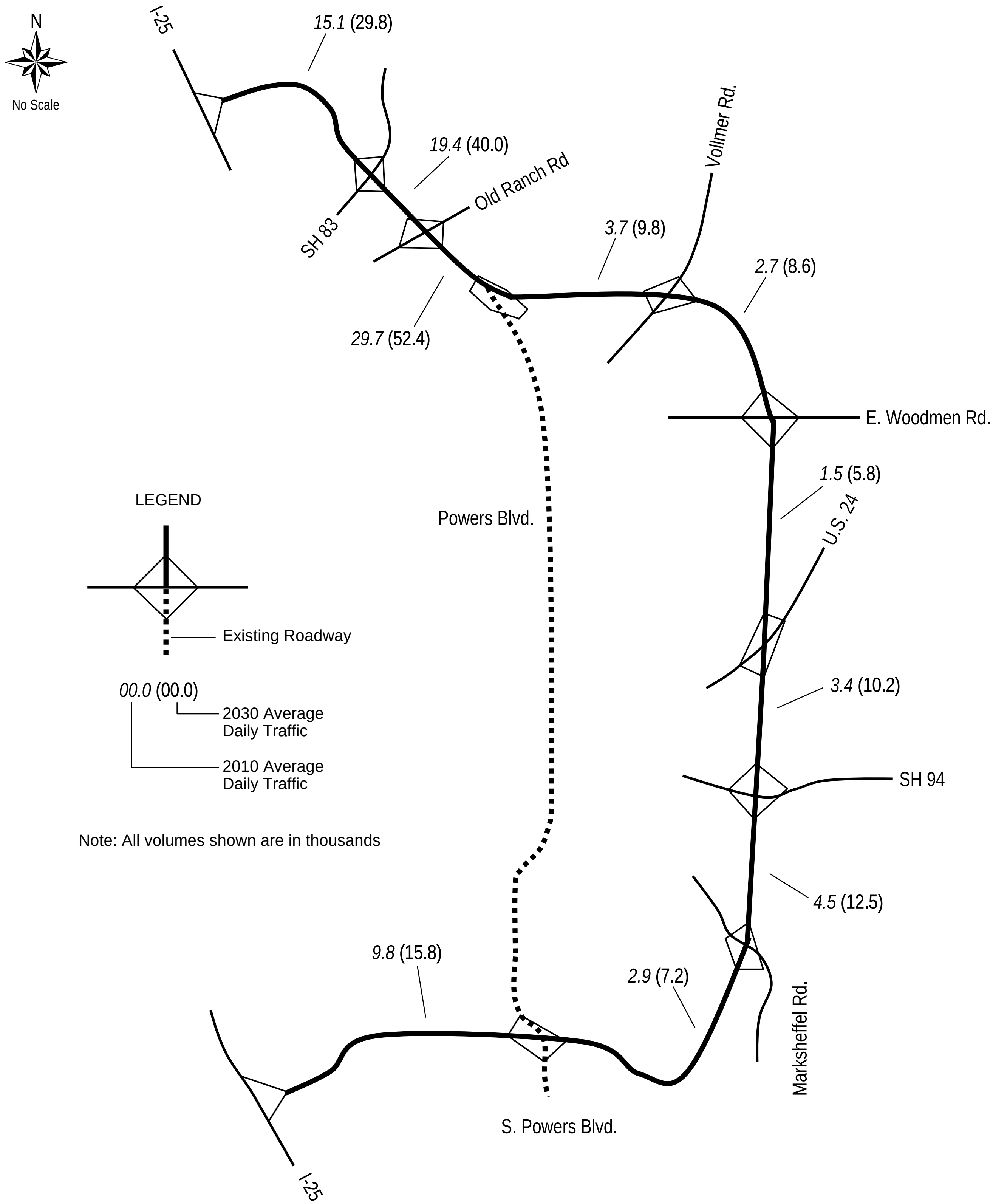
Figure 4-18 presents the future year traffic Scenario 2. This shows that in 2010, the expected average daily traffic ranges from 15,100 near I-25 to 2,700 near East Woodmen Road. The 2030 counterparts of these volumes are 29,800 and 8,600, respectively. Higher volume is expected south of S.H.-94, which is 4,500 in 2010 and 12,500 in 2030. At the south terminus, near I-25S, the volumes are 9,800 and 15,800 for 2010 and 2030, respectively.

It is important to recognize that the relatively low traffic volumes estimated for the Banning-Lewis toll road reflect the fact that the models used in the analysis assumed no more than 30.0 percent of the ultimate planned development for Banning-Lewis Ranch would be in place by 2030. This was the most distant modeling year available for use in the analysis. In addition, the level of model detail in the Banning-Lewis Ranch area was relatively low, hence this may have resulted in a slight underestimation of local trip demand within the Banning-Lewis Ranch, coupled with the assumed early stages of development, resulted in relatively low traffic and revenue potential on that facility.

In this particular case, the longer term traffic and revenue potential for the project may well be much higher, depending on the pace and ultimate level of development in the Banning-Lewis Ranch project. This should be carefully monitored; and study findings updated as more specific information about the planned development, including anticipated timing, becomes known.

Estimated Annual Trips and Gross Toll Revenue - Table 4-9 presents the traffic and revenue summary for Scenario 1. For opening year, the number of annual trips using the Banning Lewis project is estimated to be 10.1 million, producing annual toll revenue of $10.5 million. By 2030, the annual trips on the proposed facility increases to 23.9 million, generating annual revenue of $28.7 million. In 2040, the number of annual trips is expected to reach 30.9 million, generating annual toll revenue of $37.8 million.

Future year traffic and revenues for Scenario 2 are shown in Table 4-10. In the opening year, the annual number of trips is expected to be 13.7 million, producing approximately 12.8 million in revenue. By 2030, the number of annual trips is estimated to increase to 26.2 million, while toll



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ESTIMATED YEAR 2010 AND 2030 AVERAGE DAILY TRAFFIC BANNING-LEWIS PARKWAY - SCENARIO 2: I-25 N TO I-25 S AT FOUNTAIN (IMPROVED POWERS BLVD.)

FIGURE 4-18

Table 4-9
Annual Traffic And Revenue Estimates
Scenario 1 : Unimproved Powers Blvd.
Banning-Lewis Parkway

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	10,095	$ 10,486
2011	10,788	11,395
2012	11,481	12,305
2013	12,174	13,214
2014	12,867	14,124
2015	13,560	15,034
2016	14,253	15,943
2017	14,946	16,853
2018	15,639	17,762
2019	16,332	18,672
2020	17,025	19,582
2021	17,718	20,491
2022	18,411	21,401
2023	19,104	22,310
2024	19,797	23,220
2025	20,490	24,130
2026	21,183	25,039
2027	21,876	25,949
2028	22,569	26,858
2029	23,262	27,768
2030	23,955	28,678
2031	24,648	29,587
2032	25,341	30,497
2033	26,034	31,406
2034	26,727	32,316
2035	27,420	33,226
2036	28,113	34,135
2037	28,806	35,045
2038	29,499	35,954
2039	30,192	36,864
2040	30,885	37,774

(1) Not adjusted for ramp-up.

Table 4-10
Annual Traffic And Revenue Estimates
Scenario 2 : Powers Blvd. as Freeway
Banning-Lewis Parkway

Year	Annual Trips (1) (000)	Annual Revenue (1) (000)
2010	13,698	$ 12,790
2011	14,325	13,521
2012	14,953	14,251
2013	15,581	14,982
2014	16,208	15,712
2015	16,836	16,443
2016	17,464	17,173
2017	18,091	17,904
2018	18,719	18,634
2019	19,346	19,365
2020	19,974	20,095
2021	20,602	20,826
2022	21,229	21,556
2023	21,857	22,287
2024	22,485	23,017
2025	23,112	23,748
2026	23,740	24,478
2027	24,368	25,209
2028	24,995	25,939
2029	25,623	26,670
2030	26,251	27,400
2031	26,878	28,131
2032	27,506	28,861
2033	28,133	29,592
2034	28,761	30,322
2035	29,389	31,053
2036	30,016	31,783
2037	30,644	32,514
2038	31,272	33,244
2039	31,899	33,975
2040	32,527	34,705

(1) Not adjusted for ramp-up.

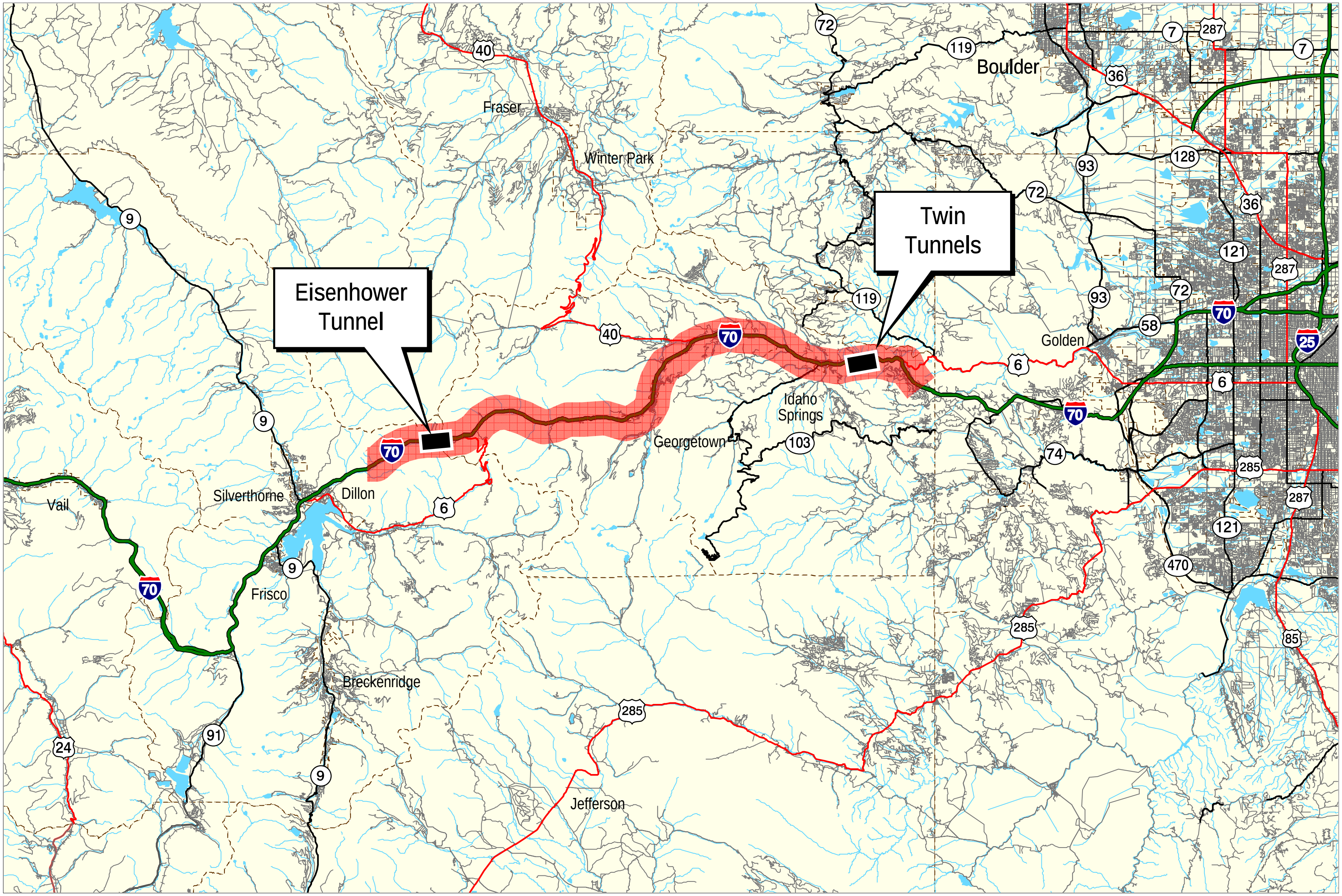
revenues are estimated to rise to $27.4 million. In the final year of analysis, the Project is estimated to service 32.5 million trips annually, and generate $34.7 million in annual toll revenue.

PROPOSED I-70 MOUNTAIN CORRIDOR

A total of five scenarios were studied for the I-70 Mountain Corridor. These included:

- Scenario 1 – Two lane reversible express toll project from west of the Eisenhower Tunnel to Floyd Hill. Add new bores at the Eisenhower and Twin Tunnels;
- Scenario 2 – Add one general purpose lane in both directions from Eisenhower Tunnel to Floyd Hill. Add new bores at Eisenhower and Twin Tunnels. Collect tolls in a one-way direction. $5.00 toll pays for cost of tunnels and roadways;
- Scenario 3 – Add one general purpose lane in both directions from Eisenhower Tunnel to Floyd Hill. Add new bores at Eisenhower and Twin Tunnels. Collect tolls in a one-way direction. $5.00 toll pays for cost of tunnels only;
- Scenario 3a – Add one general purpose lane in both directions from Eisenhower Tunnel to Floyd Hill. Add new bores at Eisenhower and Twin Tunnels. Collect tolls in a one-way direction. $3.00 toll pays for cost of tunnels only; and
- Scenario 3b – Add one general purpose lane in both directions from Eisenhower Tunnel to Floyd Hill. Add new bores at Eisenhower and Twin Tunnels. Collect tolls in a one-way direction. $2.00 toll pays for cost of tunnels only;

These projects covered improvements to I-70 generally between the Eisenhower Tunnel and Floyd Hill, representing a length of approximately 35-miles, as shown in Figure 4-19. It should be noted that these five scenarios were developed for analysis purposes only. The WSA study team recognizes that Colorado law precludes tolling of existing capacity, but Federal law allows tolling of existing bridges and tunnels for reconstruction or for providing additional capacity. Within this section of I-70, the current section of roadway is generally two lanes per direction with steep uphill and downhill grades. In addition, there are two tunnels:



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I-70 MOUNTAIN CORRIDOR SECOND-TIER CANDIDATE PROJECTS

FIGURE 4-19

the Eisenhower Tunnel, located just west of the Loveland Bypass (U.S. 6); and the Twin Tunnels near Idaho Springs.

CURRENT TRAFFIC CONDITIONS

I-70, between the Eisenhower Tunnel and Floyd Hill presently services AADT volumes in the range of 30,000 to 40,000. The highest traffic volumes are seen at Twin Tunnels location, between S.H. 70 Idaho Springs (Interchange 243) and Hidden Valley (Interchange 244). The peak monthly travel demand on this section of I-70 occur during the summer months of July and August, which may be 25.0 percent higher than average month in the year. The shoulder months of June and September are also higher than average. The winter months, January-March, are also relatively high due to the ski season recreational trends.

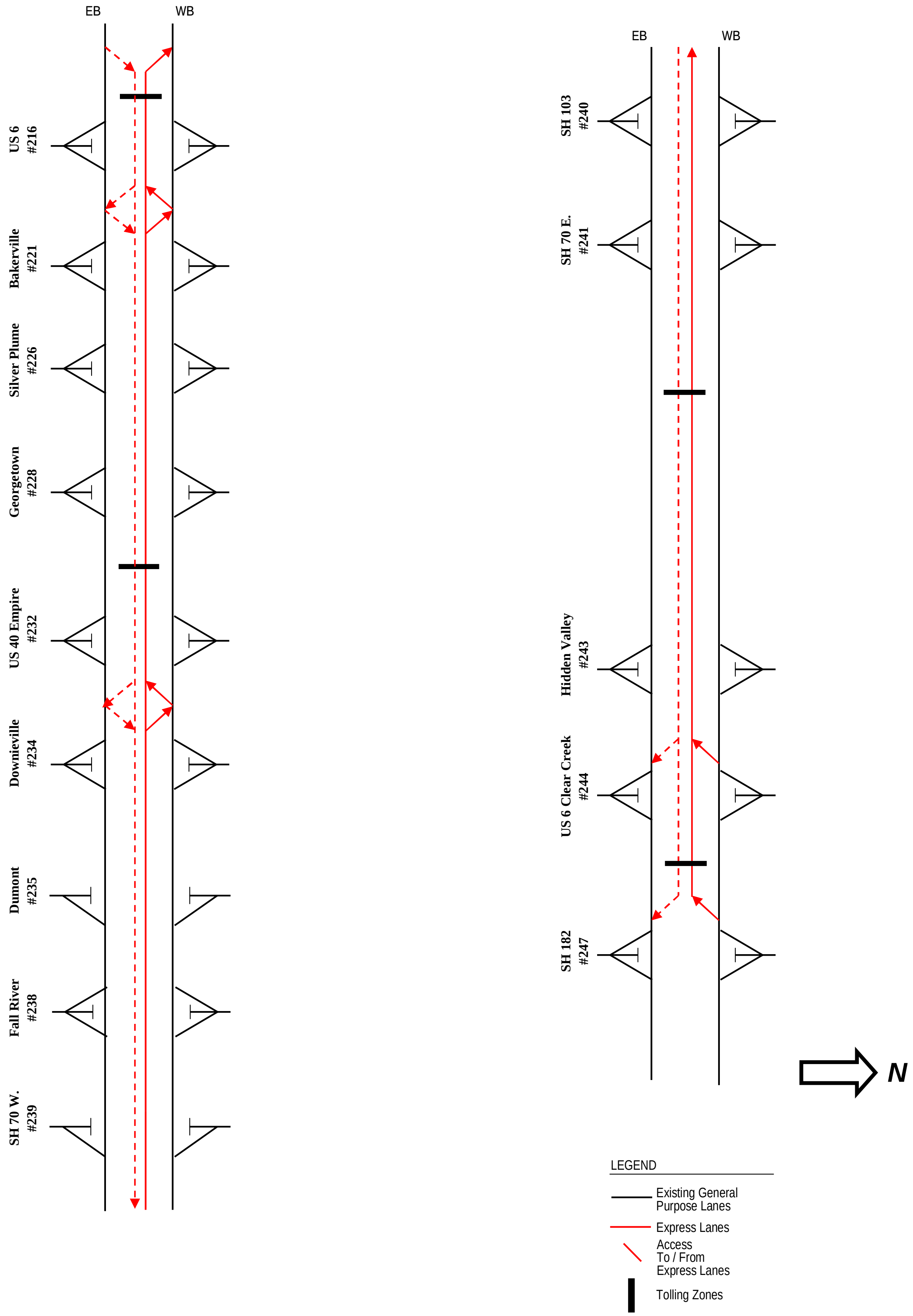
In the summer months, weekend travel is typically heavier than weekday travel. In summer, for example, Sunday traffic through the Twin Tunnels can reach almost 65,000 vpd, as compared to the annual average of 40,000. Saturday peaks are almost as high. The typical weekday traffic outside of the summer months is well below average daily traffic.

The highest hourly traffic volumes are typically experienced on Saturdays and Sundays, particularly during the midday time periods in the westbound and eastbound travel directions, respectively.

PROJECT ACCESS POINTS AND TOLLING CONCEPTS

For Scenario 1, the reversible express toll lanes, access was assumed to be provided at five points from the general purpose lanes. Traffic traveling westbound, motorists would initially be able to access the express toll lanes just east of the U.S. 6 Clear Creek Interchange. The second access point was assumed to be located west of the U.S. Clear Creek Interchange. The third fully directional access point was assumed to be provided east of the U.S. 40 Empire Interchange, approximately 10.0 miles west from the last access point. The next access point was assumed to be located approximately 15.0 miles west, between the Bakersville and U.S. 6 interchanges. The last access/egress point to the express toll lanes was assumed to be situated just west of the Eisenhower Tunnel. An ETC toll zone would be located in the express toll lanes for each of the mainline segments between the access/egress points. Figure 4-20 presents the access/egress points to the express toll lanes and the location for each of the toll zones.

For Scenarios 2, 3, 3a and 3b all current interchanges would be maintained. Tolling was assumed to occur in one direction only at each of the tunnels. The tolls were assumed to be collected in opposite directions.



Tolling Zones I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-20

For conceptual purposes, the toll plazas at the Eisenhower Tunnel and Twin Tunnels were shown in the eastbound direction and westbound directions, respectively. More detailed studies would be conducted to establish the most feasible location. Figure 4-21 presents the concept.

PRELIMINARY TRAFFIC AND REVENUE ESTIMATES

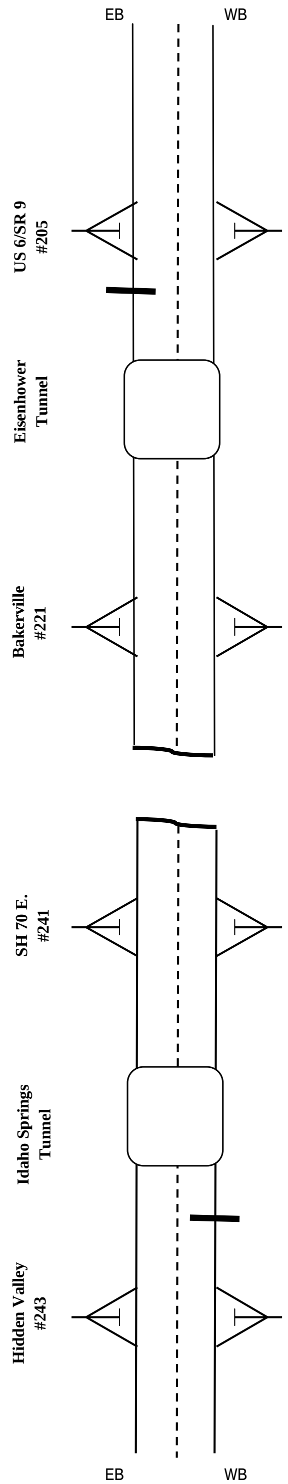
***Toll Rates* -** For Scenario 1, the reversible express toll lanes, a series of toll rates were tested for weekday, Saturday and Sunday by time period. Tolls were tested ranging from $0.05 to $0.50 per-mile. For each discrete time period, toll sensitivity curves were prepared, and an optimum toll rate selected.

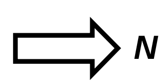
Table 4-11 presents the toll rates for Scenario 1, for each of the time periods by day and year. For 2010, weekday rates were no higher than $0.05 per-mile. On Saturdays, the same year, the highest toll rate would be in the westbound midday period at $0.15 per-mile; while on Sunday optimum toll rates of $0.10 and $0.15 per-mile would be charged in the eastbound direction for the midday and evening time periods. In 2025, toll rates would remain unchanged from 2010, for the weekday period, reflecting minimum demand. However both Saturday and Sunday would see toll rates as high as $0.50 per-mile in the busiest time periods.

For Scenarios 2, 3, 3a and 3b a flat toll charge was assumed to be levied at the Eisenhower and Twin Tunnels in a one-way direction to all traffic. The toll rates tested included a $2.00, $3.00 and $5.00 passenger car rate.

Estimated Traffic - Year 2010 traffic conditions for Scenario 1 are presented in Figures 4-22, 4-23 and 4-24 for weekday, Saturday and Sunday, respectively. Review of the weekday data shows minimal demand in the express toll lanes. The analysis for Saturday shows higher demand in the express toll lanes in the westbound direction for AM and Midday time periods. For Sunday, similar traffic volumes are seen in the eastbound direction occurring in the Midday and PM time periods.

Year 2025 traffic conditions for Scenario 1 are presented in Figures 4-25, 4-26 and 4-27 for weekday, Saturday and Sunday, respectively. Minimal demand in the express lane would be anticipated during the weekdays. For Saturday, the higher demand would occur in the AM and Midday time periods in the westbound direction. The analysis shows that the highest travel demand is likely to occur during Sunday for the Midday and PM time periods. While travel demand is likely to be high for both weekend days for specific periods, the relatively high toll rates would temper demand within the express toll lanes and allow them to operate in a free





Legend
- General Purpose Lanes
- Tunnels
- Mainline Toll Plazas. One Direction Only.

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Toll Locations I-70 Mountain Corridor
Scenarios 2,3,3-A,3-B : One Way Tolling at Eisenhower, Idaho Springs Tunnels

Figure 4-21

Table 4-11
Toll Rates By Time Period
I-70 Mountain Corridor -
Scenario 1: Reversible Express Toll Lanes; Eisenhower to Floyd Hill
(2004 dollars)

WEEKDAY

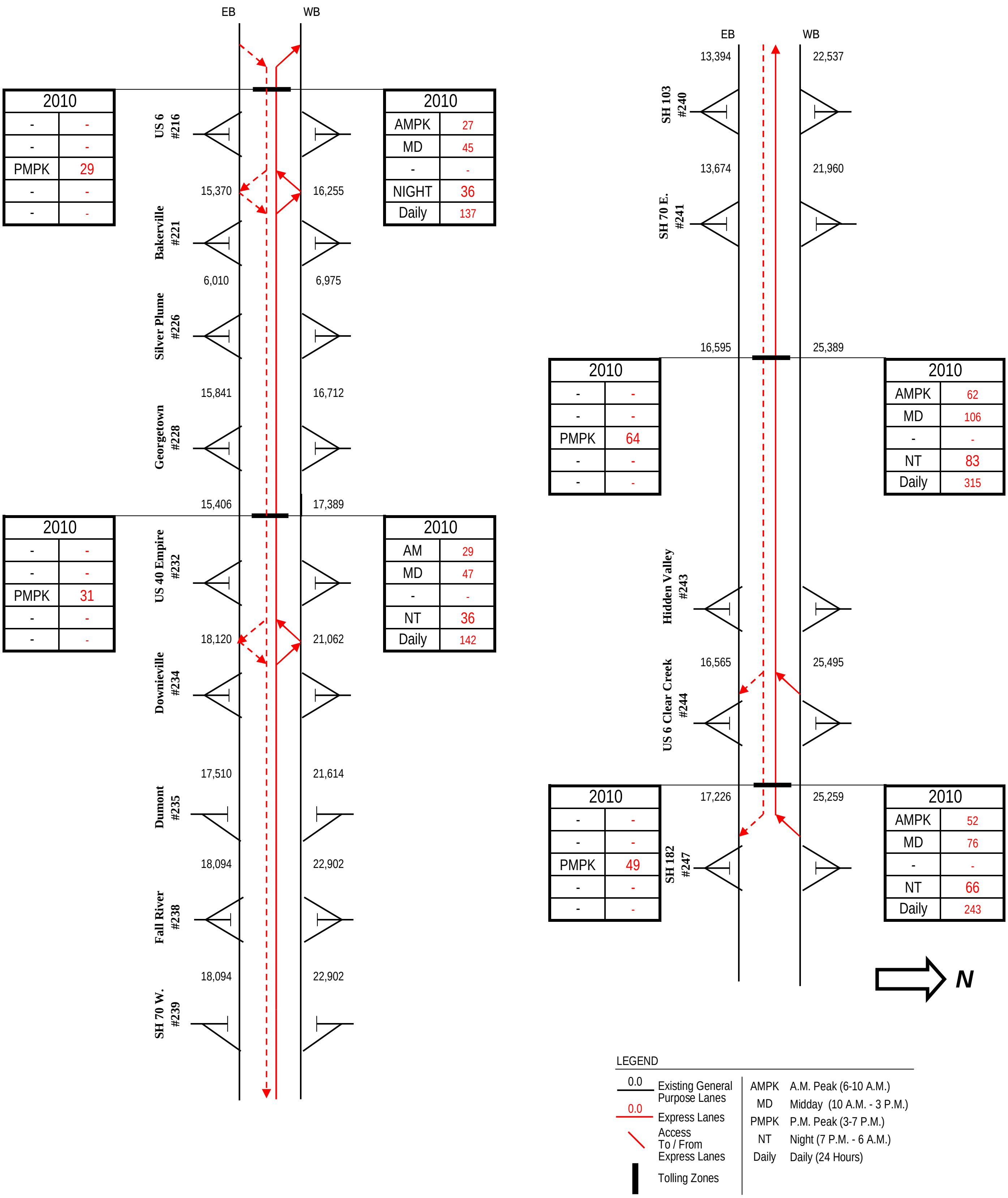
		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	Hours	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip
AM	6-10 AM	$ -	$ -	$ 0.05	$ 1.75	$ -	$ -	$ 0.05	$ 1.75
Midday	10.AM-3 PM	-	-	0.05	1.75	-	-	0.05	1.75
PM	3-7 PM	0.05	1.75	-	-	0.05	1.75	-	-
Night	7 PM-6 AM	-	-	0.05	1.75	-	-	0.05	1.75

SATURDAY

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	Hours	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip
AM	6-10 AM	$ -	$ -	$ 0.05	$ 1.75	$ -	$ -	$ 0.40	$ 14.00
Midday	10.AM-3 PM	-	-	0.15	5.25	-	-	0.50	17.50
PM	3-7 PM	0.05	1.75	-	-	0.05	1.75	-	-
Night	7 PM-6 AM	-	-	0.05	1.75	-	-	0.05	1.75

SUNDAY

		2010				2025			
		Eastbound		Westbound		Eastbound		Westbound	
Time Period	Hours	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip	Per-Mile (1)	Through Trip
AM	6-10 AM	$ -	$ -	$ 0.05	$ 1.75		$ -	$ 0.05	$ 1.75
Midday	10.AM-3 PM	0.10	3.50	-	-	0.50	17.50	-	-
PM	3-7 PM	0.15	5.25	-	-	0.50	17.50	-	-
Night	7 PM-6 AM	0.05	1.75	-	-	0.05	1.75	-	-



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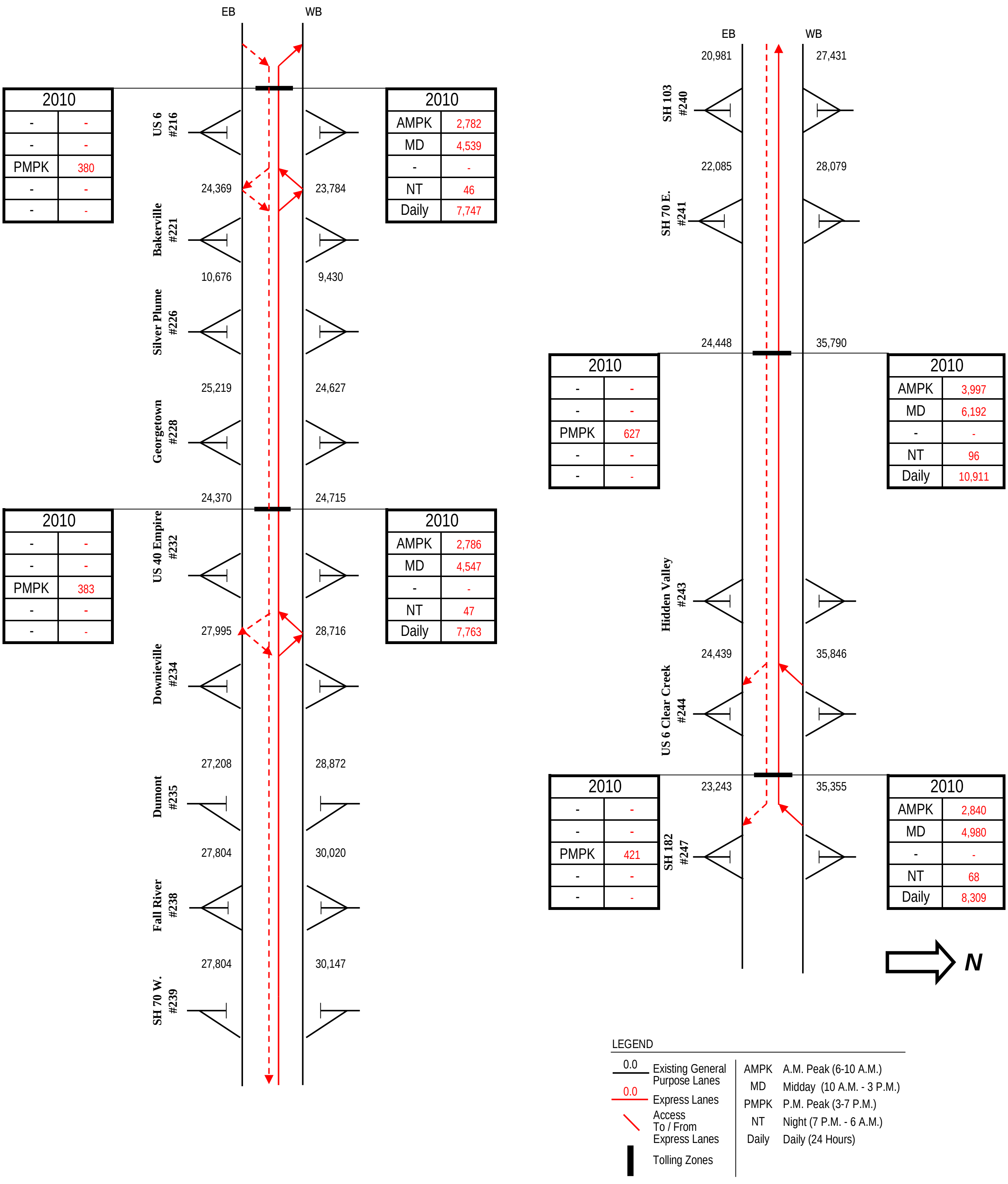
2010 Estimated Weekday ADT I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-22



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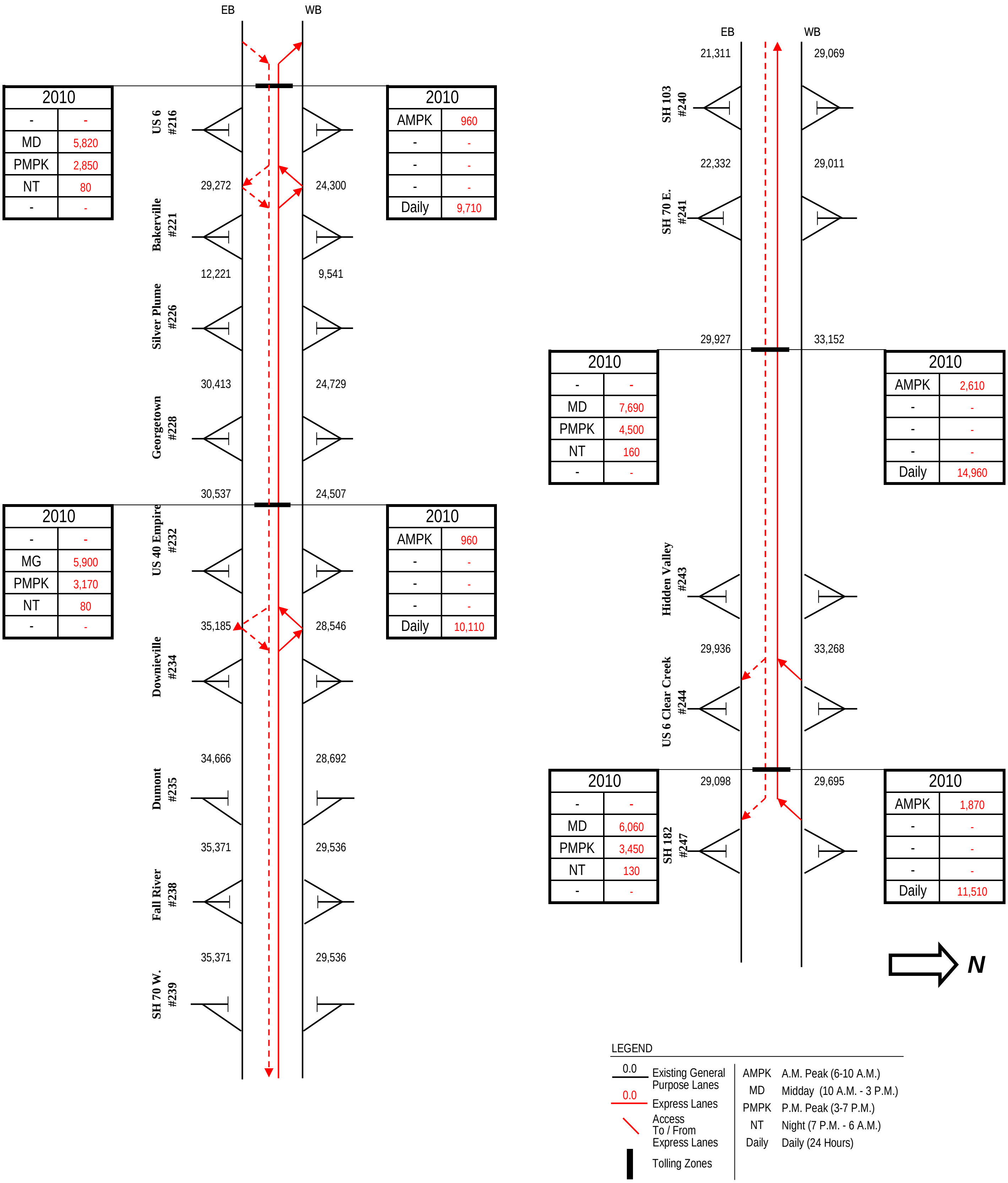
2010 Estimated Saturday ADT I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-23



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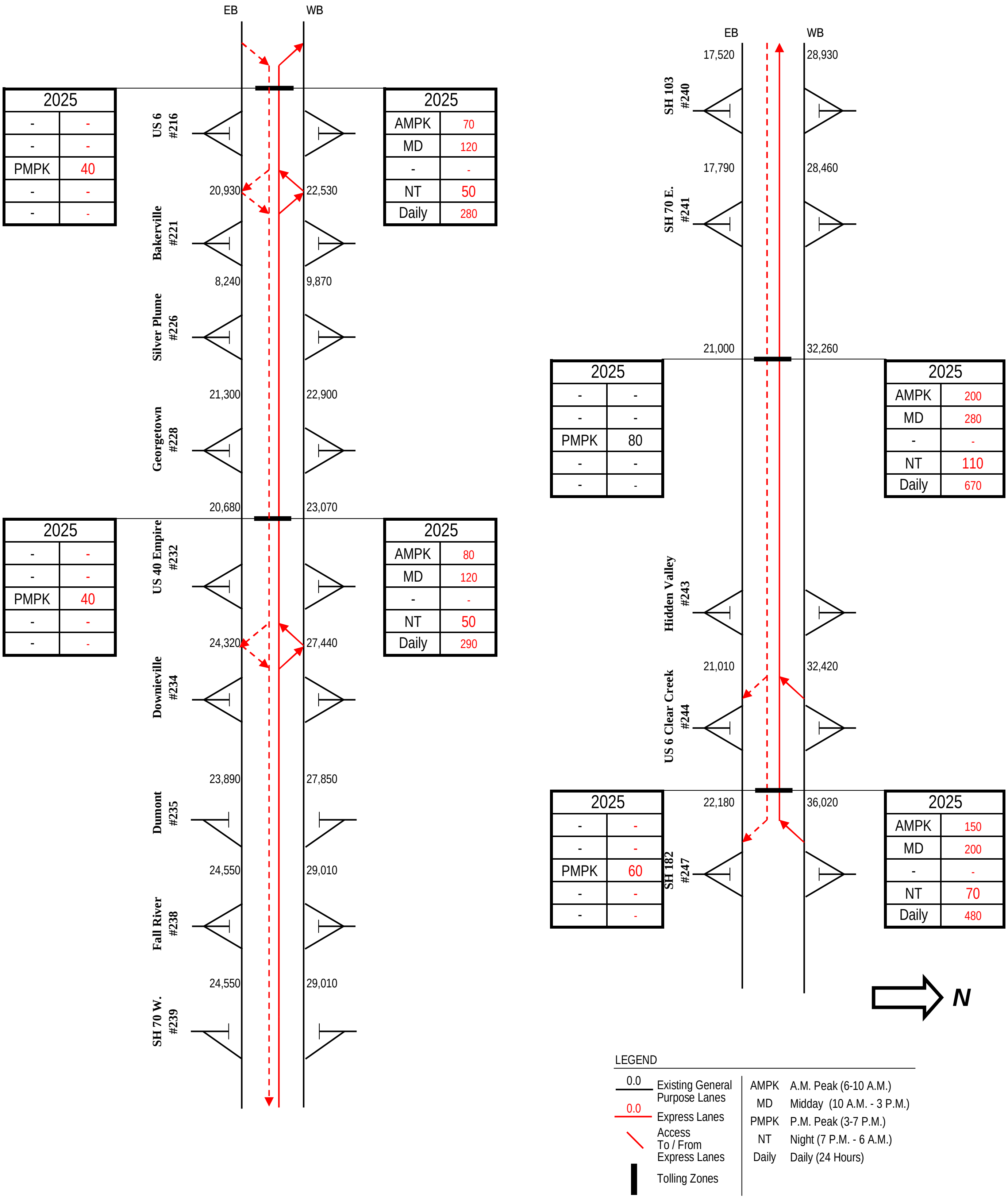
2010 Estimated Sunday ADT I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-24



2025	
-	-
-	-
PMPK	40
-	-
-	-

2025	
AMPK	70
MD	120
-	-
NT	50
Daily	280

2025	
-	-
-	-
PMPK	40
-	-
-	-

2025	
AMPK	80
MD	120
-	-
NT	50
Daily	290

2025	
-	-
-	-
PMPK	80
-	-
-	-

2025	
AMPK	200
MD	280
-	-
NT	110
Daily	670

2025	
-	-
-	-
PMPK	60
-	-
-	-

2025	
AMPK	150
MD	200
-	-
NT	70
Daily	480

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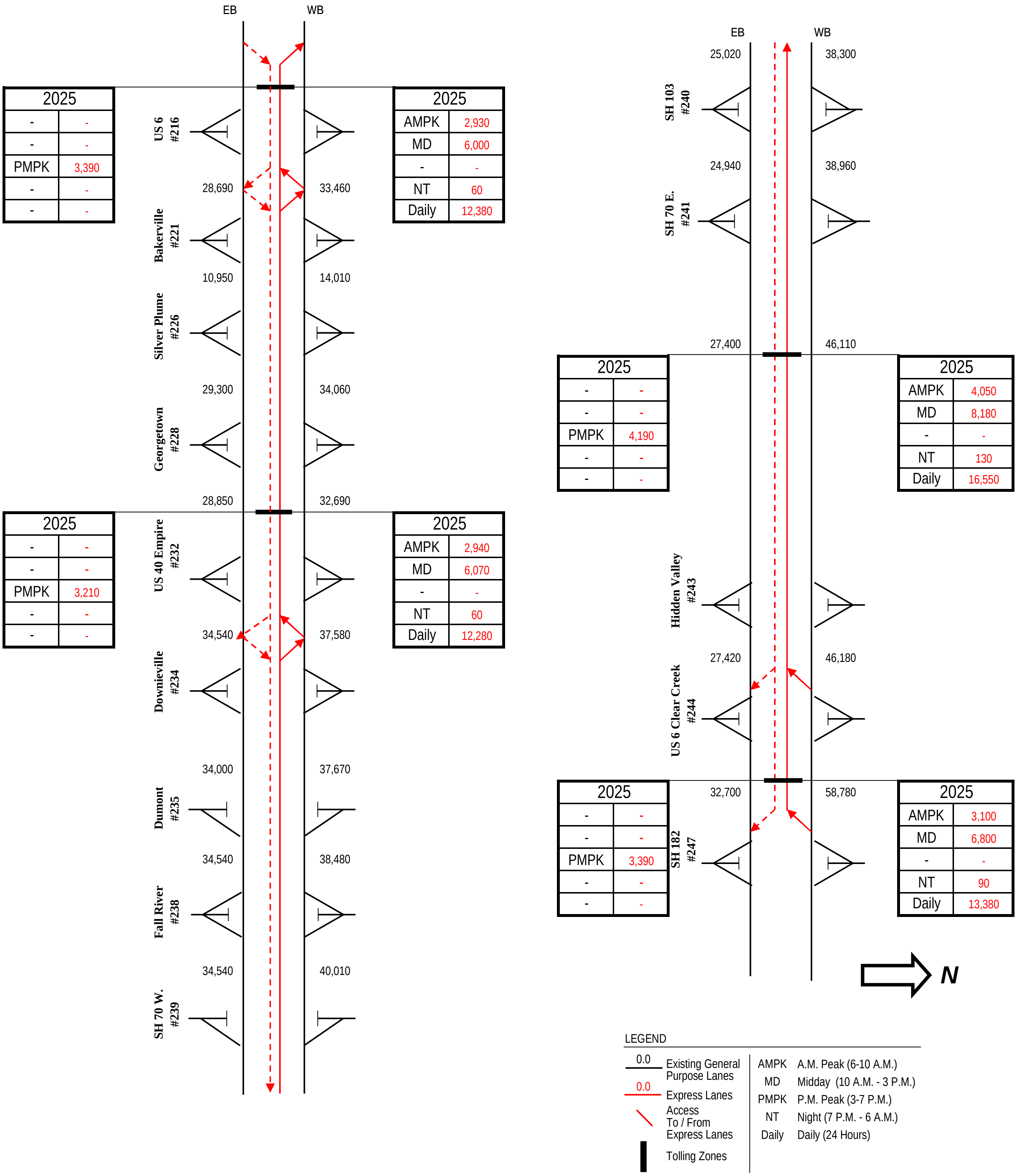
2025 Estimated Weekday ADT I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-25



2025	
-	-
-	-
PMPK	3,390
-	-
-	-

2025	
AMPK	2,930
MD	6,000
-	-
NT	60
Daily	12,380

2025	
-	-
-	-
PMPK	3,210
-	-
-	-

2025	
AMPK	2,940
MD	6,070
-	-
NT	60
Daily	12,280

2025	
-	-
-	-
PMPK	4,190
-	-
-	-

2025	
AMPK	4,050
MD	8,180
-	-
NT	130
Daily	16,550

2025	
-	-
-	-
PMPK	3,390
-	-
-	-

2025	
AMPK	3,100
MD	6,800
-	-
NT	90
Daily	13,380

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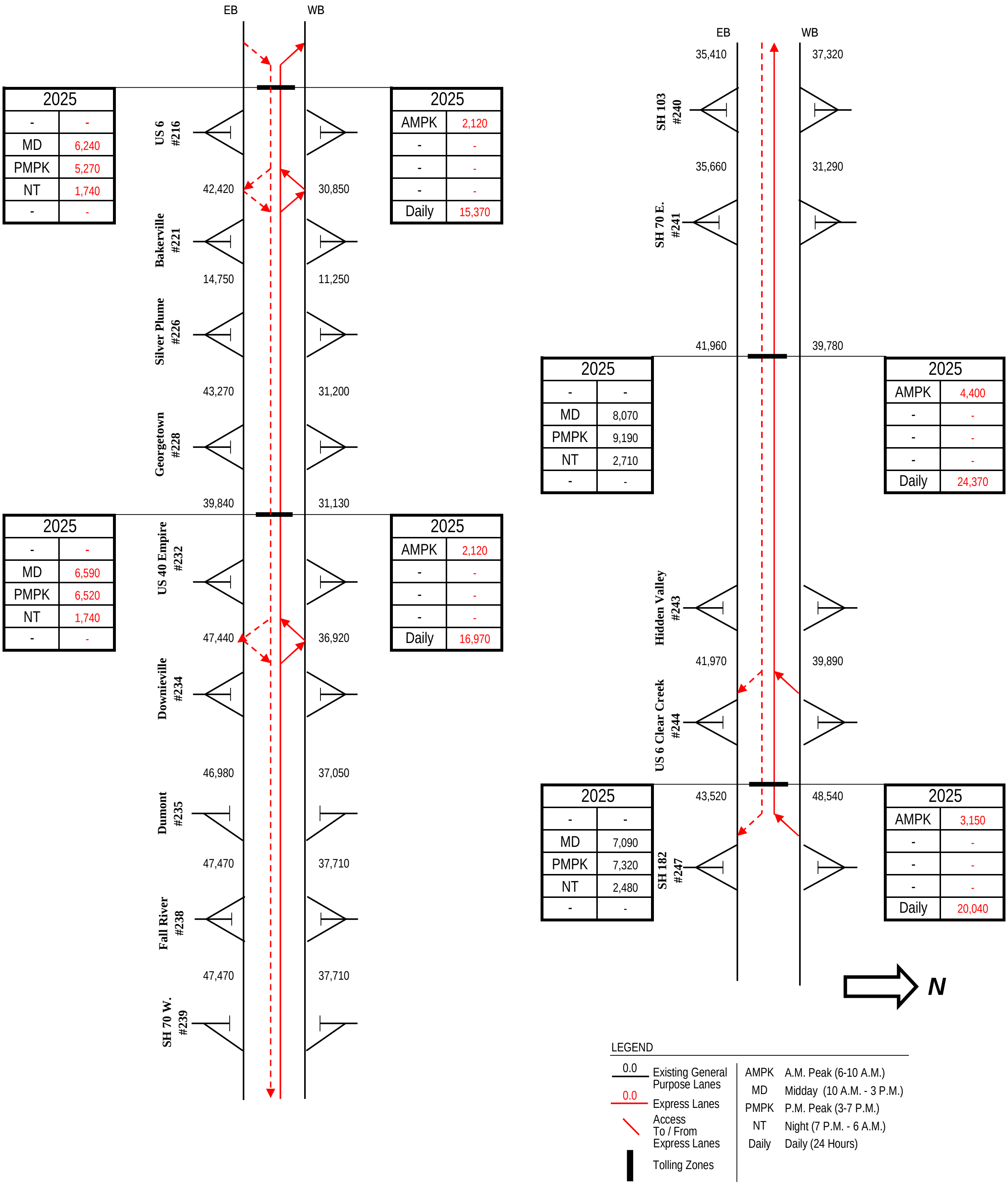
2025 Estimated Saturday ADT I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-26



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2025 Estimated Sunday ADT I-70 Mountain Corridor
Scenario 1: Reversible ETL West of Eisenhower Tunnel to Floyd Hill

Figure 4-27

flow manner at the expense of the general purpose lanes, which would be severely degraded.

The future year traffic estimates for Scenarios 2, 3, 3a, and 3b are shown in Figure 4-28 for 2010. At 2010, daily traffic estimates at the Twin Tunnels for the tolled direction are 27,800, 30,300 and 31,500 for the $5.00, $3.00 and $2.00 passenger car toll, respectively. Similarly at the Eisenhower Tunnel, traffic estimates in the tolled direction are 16,400, 19,400 and 21,200 for the same three toll rates.

Figure 4-29 presents 2025 average daily traffic estimates for Scenarios 2, 3, 3a, and 3b. At the Twin Tunnels, daily traffic estimates for the tolled direction are 32,600, 36,000 and 37,400, which correspond to the $5.00, $3.00 and $2.00 passenger car toll rates, respectively. At the Eisenhower Tunnel, the traffic estimates for the same three toll rates are 19,100, 23,000 and 24,800 vpd, respectively.

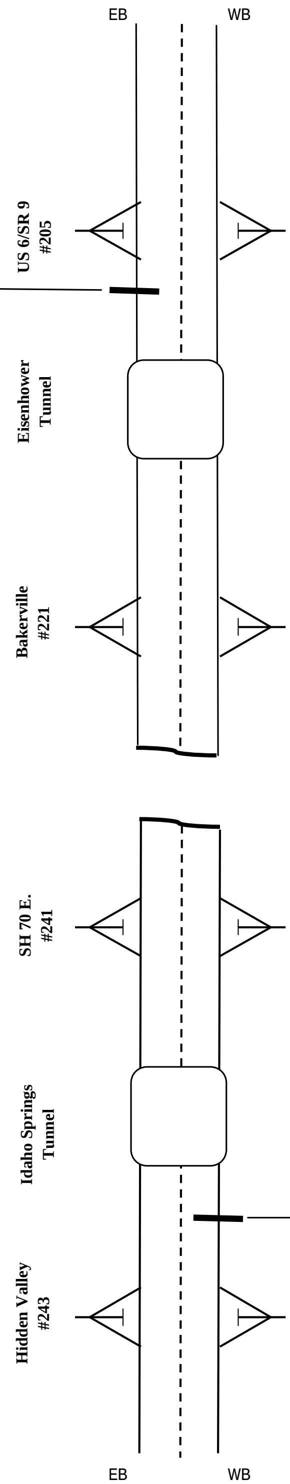
Estimated Annual Trips/Transactions and Gross Toll Revenue - Table 4-12 presents the annual trips and toll revenues for Scenario 1 from 2010 to 2040. In the opening year, the number of annual trips using the Project is estimated to be 1.9 million, generating approximately $5.8 million in toll revenue. By 2025, the number of annual trip increases to 2.8 million, producing approximately $29.5 million. The final year, 2040, shows the number of annual trips using the Project exceeding 8.2 million with corresponding toll revenue of approximately $87.1 million.

Table 4-13 presents the annual toll transactions and annual gross toll revenues for Scenario’s 2, 3, 3a and 3b. At the $5.00 passenger car toll rate, opening year revenues are estimated to reach $95.3 million. By 2025, annual toll revenues increase to $111.7 million. For the last year shown, 2040, annual revenues are anticipated to reach $130.8 million.

Opening year, annual gross toll revenue for Scenario 3-A, is estimated to be $64.4 million. By 2025, this is estimated to increase to $76.3 million. Year 2040 shows annual toll revenues reaching $90.3 million.

For Scenario 3b, the $2.00 passenger car toll, opening year toll revenue is estimate to be $45.6 million. In 2025, the tunnels are estimated to generate$53.7 million in toll revenue. In the last year shown, annual gross toll revenue is anticipated to reach $63.3 million.

Scenario	Toll	AADT
2 & 3	$5.00	16,393
3-A	$3.00	19,442
3-B	$2.00	21,242



Scenario	Toll	AADT
2 & 3	$5.00	27,771
3-A	$3.00	30,289
3-B	$2.00	31,457

N

Legend
General Purpose Lanes
Tunnels
Mainline Toll Plazas. One Direction Only.

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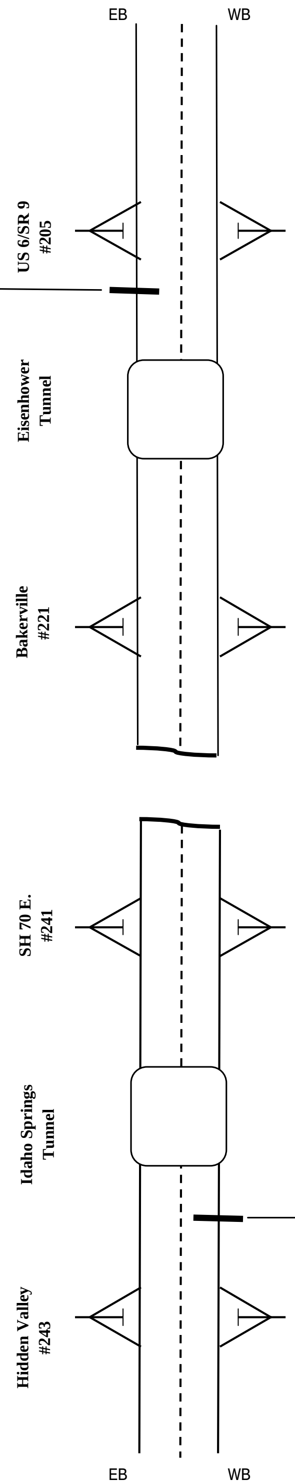
2010 ADT I-70 Mountain Corridor
Scenarios 2,3,3-A,3-B : One Way Tolling at Eisenhower, Idaho Springs Tunnels

Figure 4-28



Scenario	Toll	AADT
2 & 3	$5.00	19,148
3-A	$3.00	22,967
3-B	$2.00	24,813

Scenario	Toll	AADT
2 & 3	$5.00	32,608
3-A	$3.00	35,952
3-B	$2.00	37,402

N

Legend
General Purpose Lanes
Tunnels
Mainline Toll Plazas. One Direction Only.

2025 ADT I-70 Mountain Corridor
Scenarios 2,3,3-A,3-B : One Way Tolling at Eisenhower, Idaho Springs Tunnels
Figure 4-29

Table 4-12
Annual Traffic And Revenue Estimates

Scenario 1: Reversible ETL, from west of Eisenhower Tunnel to Floyd Hill
I-70 Mountain Corridor

Year	**Annual Trips (1)** (000)	**Annual Revenue (1)** (000)
2010	1,871	$ 5,752
2011	1,920	6,414
2012	1,972	7,152
2013	2,024	7,975
2014	2,079	8,893
2015	2,134	9,917
2016	2,191	11,058
2017	2,250	12,331
2018	2,310	13,750
2019	2,371	15,332
2020	2,435	17,097
2021	2,500	19,065
2022	2,567	21,259
2023	2,635	23,706
2024	2,706	26,435
2025	2,778	29,477
2026	3,084	32,722
2027	3,408	36,162
2028	3,749	39,781
2029	4,105	43,564
2030	4,475	47,489
2031	4,856	51,530
2032	5,245	55,658
2033	5,639	59,837
2034	6,034	64,032
2035	6,427	68,200
2036	6,813	72,299
2037	7,189	76,282
2038	7,549	80,103
2039	7,889	83,716
2040	8,205	87,072

(1) Not adjusted for ramp-up.

Table 4-13
Annual Revenue And Toll Transactions (For Both Mainline Toll Plazas)
I-70 Mountain Corridor
Scenario 2, 3, 3A and 3B
From Eisenhower Tunnel to Floyd Hill
One-Way Tolling At Eisenhower And Twin Tunnels

Year	Scenario 2 & 3		Scenario 3-A		Scenario 3-B	
	$5.00 Toll		$3.00 Toll		$2.00 Toll	
	Annual Toll Transactions (000)	Annual Revenue (000)	Annual Toll Transactions (000)	Annual Revenue (000)	Annual Toll Transactions (000)	Annual Revenue (000)
2010	16,120	$ 95,290	18,152	$ 64,385	19,235	$ 45,486
2011	16,291	96,304	18,358	65,117	19,449	45,992
2012	16,464	97,328	18,567	65,857	19,666	46,504
2013	16,639	98,363	18,778	66,605	19,884	47,021
2014	16,816	99,409	18,991	67,362	20,106	47,544
2015	16,995	100,466	19,207	68,128	20,329	48,073
2016	17,176	101,534	19,425	68,902	20,556	48,608
2017	17,358	102,613	19,646	69,685	20,784	49,149
2018	17,543	103,705	19,870	70,478	21,016	49,696
2019	17,730	104,807	20,095	71,279	21,250	50,249
2020	17,918	105,922	20,324	72,089	21,486	50,808
2021	18,109	107,048	20,555	72,908	21,725	51,374
2022	18,301	108,186	20,788	73,737	21,967	51,946
2023	18,496	109,337	21,025	74,575	22,211	52,524
2024	18,692	110,499	21,264	75,423	22,459	53,108
2025	18,891	111,674	21,505	76,280	22,709	53,699
2026	19,073	112,750	21,728	77,071	22,939	54,243
2027	19,276	113,950	21,976	77,948	23,194	54,847
2028	19,481	115,163	22,226	78,834	23,453	55,458
2029	19,689	116,389	22,479	79,731	23,714	56,076
2030	19,898	117,627	22,734	80,638	23,978	56,701
2031	20,110	118,879	22,993	81,556	24,245	57,332
2032	20,324	120,144	23,255	82,484	24,515	57,971
2033	20,540	121,423	23,519	83,422	24,788	58,617
2034	20,759	122,715	23,787	84,371	25,064	59,269
2035	20,980	124,021	24,057	85,331	25,343	59,930
2036	21,203	125,341	24,331	86,302	25,626	60,597
2037	21,429	126,675	24,608	87,284	25,911	61,272
2038	21,657	128,023	24,888	88,277	26,200	61,955
2039	21,887	129,386	25,171	89,281	26,492	62,645
2040	22,120	130,763	25,457	90,296	26,787	63,342

CHAPTER 5

PRELIMINARY PROJECT COST ESTIMATES

GENERAL METHODOLOGY

This section describes the approach used to estimate roadway capital costs and annual operations and maintenance (O&M) costs for the candidate toll projects for the second-tier study. In the first-tier study, the necessary roadway improvements were identified at a sketch-planning level to meet each individual corridor development plan. Program-planning level cost estimates were developed by using unit cost per lane-mile factors and all costs were expressed as ranges. For each improvement type, the unit-costs per lane-mile were developed to represent typical applications and were adjusted appropriately for special considerations such as major bridge crossings and interchanges. The construction costs for each project were then compared with a relative measure of the project's projected toll revenue to determine its Relative Feasibility Index.

Within the second-tier study, more detailed cost estimates were developed for a smaller, refined list of selected projects found to warrant further study in the first-tier study, using recent bid tabulations and other construction cost-related data to create unit cost build up tables based on similar CDOT roadway projects. The second-tier study was still considered a preliminary feasibility analysis. The analyses were not conducted to a sufficient level of detail to be used in support of actual project financing, but were of sufficient precision to identify those projects or elements of project corridors that were potentially feasible as toll facilities and could warrant further study at an investment grade study level as part of the project implementation process. All cost analyses were estimated in current 2004 dollars and cost inflationary factors and the additional costs associated with toll collection facilities were applied if cost estimates from previous studies or reports were used.

As part of the second-tier study, the toll collection system capital, operations and maintenance costs were estimated. Although the toll collection system capital costs are always a small percentage of the toll facility construction (i.e., capital) costs, the toll system always provides some schedule completion risk, potentially delaying the start of revenue operations. A significant component of this risk is the complexity of the System. Since there is considerable variation on toll systems capital costs, component identification and unit pricing accomplishes both a more complete understanding of the system design and a price that is within a reasonable realm of possibilities, given a number of unknowns.

System capital costs are subdivided into multiple distinct categories, each with multiple unit items deemed to have a high probability of being implemented. Item quantities are derived from the number of tolling points, length of the facility, and location of the facility. The same process was used for developing operations and maintenance costs, but with only two categories. However, operations costs are dominated by the electronic toll collection (ETC) costs derived from modeled traffic and trip data and converted to an annual cost using an industry supported per trip unit price. Conversely, violation transactions, the single alternative to ETC trip transactions, are assumed to derive revenue from issued citations that exactly equals all costs incurred to processing the violation. Except for the first year of operations, this has proved to be a valid assumption since the Agency can adjust operations as needed. All cost analyses were estimated in current 2004 dollars.

ESTIMATED ROADWAY CAPITAL COSTS

For the roadway capital costs, a review of existing and planned roadway infrastructure was performed to determine the extent and nature of the existing roadway infrastructure. The necessary roadway improvements were then determined to meet each corridor's proposed development plan. These typical roadway characteristics were developed based on current CDOT standards and AASHTO guidelines. For those projects where an environmental study has been recently completed or is currently ongoing, adjustments were made to these characteristics/parameters based on the assumptions made in the corridor/EIS studies or recently completed construction. The Colorado Department of Transportation's geographic information systems (GIS) database was used to characterize the existing conditions of each candidate toll project, as well as windshield-surveys.

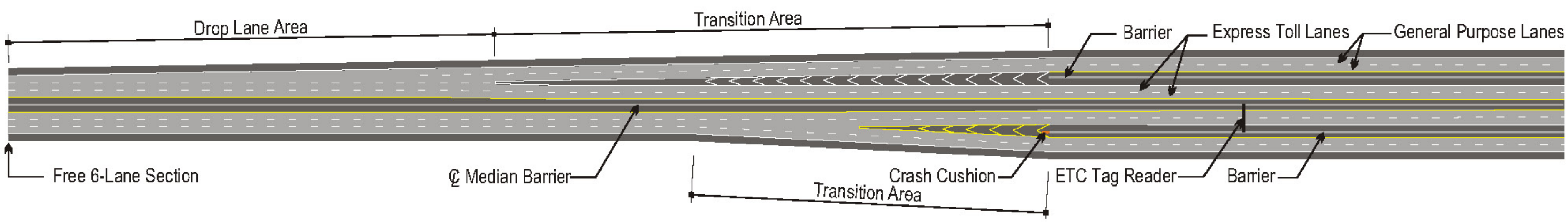
Utilizing available project cost information from Colorado for similar facilities, cost estimates from earlier studies, and previous cost estimation experience, unit cost factors were developed for each improvement type to represent the corridor improvement costs. Capital cost estimates included grading, drainage, surfacing and paving for an interstate-type facility. In addition, unit costs were developed for interchanges, bridges and other structures such as elevated ramps and retaining walls. Terrain conditions were identified based on available information from the Colorado Department of Transportation GIS database. Other incidental costs included consideration of erosion control, signing and pavement marking, maintenance of traffic during construction, traffic control and mobilization, construction staking and inspection and utility relocations.

Appropriate add-ons for "soft" costs associated with engineering design, right-of-way acquisition, and program management and administration were considered to develop a total capital cost. A contingency of 20 percent was added to each project to account for design unknowns. All cost analyses were estimated in current 2004 dollars and cost inflationary factors and the additional costs associated with toll collection facilities were applied if cost estimates from previous studies or reports were used in the study. A table showing the assumption and description for each unit cost factor is shown in Appendix A.

For each project, the type and location of access points for the toll system was taken into account as a part of the capital cost estimates. The beginning and ending of each toll system was assumed to have a transition area between the general purpose lanes and the express toll lanes, in order to provide time and distance to add or drop the express toll lanes. Figure 5-1 shows an example application for a transition area.

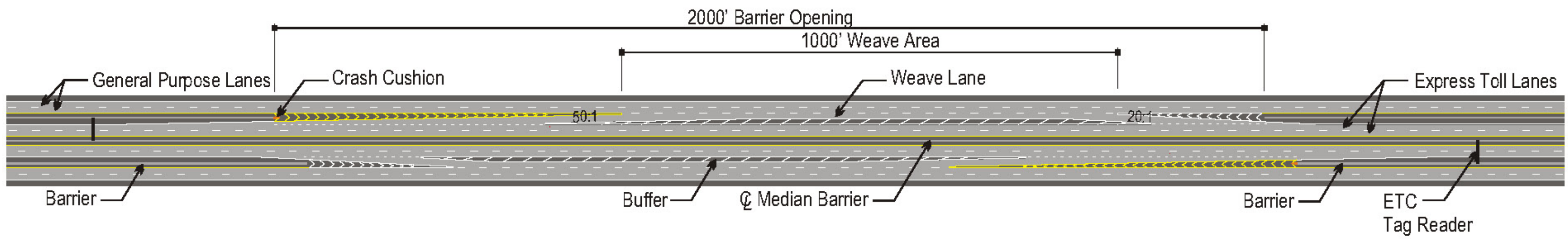
The majority of the access to the express toll lanes was assumed to occur through the use of slip toll access points located between existing interchanges. Figure 5-2 shows a typical application of slip toll access for barrier-separated express toll lanes located in the median of an existing roadway. For direct system connections, such as between the toll system of I-70 East and I-225, direct ramp toll access through flyover ramps was assumed. Figure 5-3 shows an example of direct ramp toll access. For each project, the location of transition areas, slip and direct toll access can be seen on each project's individual information sheet, shown in several Figures throughout the remainder of this chapter. For those projects on new alignment, such as the Front Range project, all capacity would be tolled through electronic toll collection so no exclusive toll access is required.

To provide flexibility in the evaluation of a corridor's financial feasibility, a range of construction improvements or "scenarios" were provided as



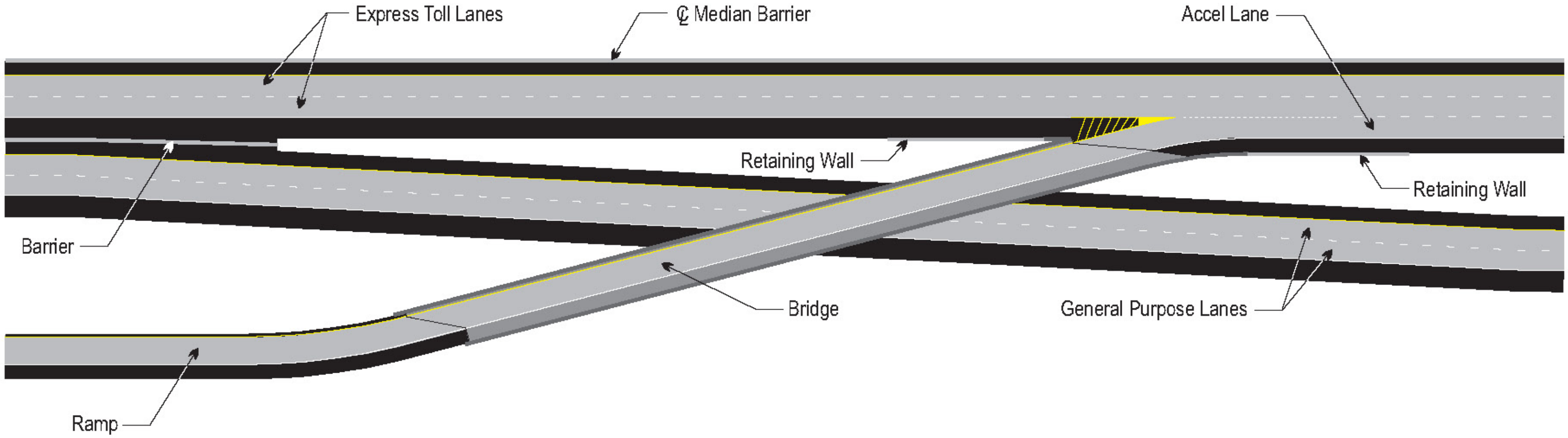
TRANSITION AREA DETAILS

FIGURE 5-1



SLIP TOLL ACCESS DETAILS

FIGURE 5-2



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DIRECT RAMP TOLL ACCESS DETAIL

FIGURE 5-3

necessary on a corridor-by-corridor basis. This provision allowed for adjustments to the facility type, improvements or limits to maximize the potential financial viability of a corridor or corridors, depending on corridor packaging. By providing a range of scenarios for a particular corridor, appropriate considerations can then be given to the sensitivity of a corridor's financial feasibility to the cost side of the feasibility equation. The following section describes the cost methodology and assumptions for each candidate toll project.

I-25 NORTH SCENARIO 1

As shown in Figure 5-4, the I-25 North Scenario 1 project spans approximately 26 miles between S.H. 66 and U.S. 36. The project is subdivided into two sections with different improvement types. From S.H. 66 to 120th Avenue, I-25 would have three general purpose lanes and two express toll lanes in each direction. From 120th to U.S. 36, I-25 would have three general purpose lanes in each direction and two reversible express toll lanes. A separate ongoing study is looking at the feasibility of converting the existing two-lane reversible high-occupancy vehicle (HOV) facility from US 36 to downtown Denver to a two-lane reversible high-occupancy toll (HOT) facility. The WSA study team also recognizes that segments of I-25 have recently been widened, resulting in the tolling of existing capacity. However, the project configuration assumptions were prepared for analysis purposes only.

In both sections the express toll lanes would be located in the median of the existing roadway. From 120th Avenue to US 36, the reversible express toll lanes would be separated from the general purpose lanes by a concrete barrier. However, from SH 66 to 120th Avenue, the express toll lanes would be separated by a four-foot buffer in order to fit the proposed section within the existing median width. In addition, the buffer allows flexibility for traffic to merge back into the general purpose lanes in the case of an incident.

For the section of I-25 from US 36 to S.H.7, it was assumed that the existing general purpose lanes would need to be reconstructed because the current median width is insufficient to add express toll lanes in the median without impacting the general purpose lanes. The section of I-25 from S.H. 7 to SH 66 has sufficient median width that will allow express toll lanes to be added in the median without significant impacts to the general purpose lanes. The existing right-of-way along the majority of the corridor was within a range of 200 to 300 feet. In order to construct the express toll lanes in the section from US 36 to 120th Avenue, it was assumed that right-of-way would need to be purchased at several locations along the corridor. The proposed section shown in Figure 5-4 provides the widths

Project Limits: US 36 (begin log 217) to SH 66 (end log 243)

Project Length: 26 Miles

Project Type: Express Toll Lanes/Reversible Express Toll Lanes/HOT Lanes

Description: Tolling new capacity and Conversion of HOV to HOT

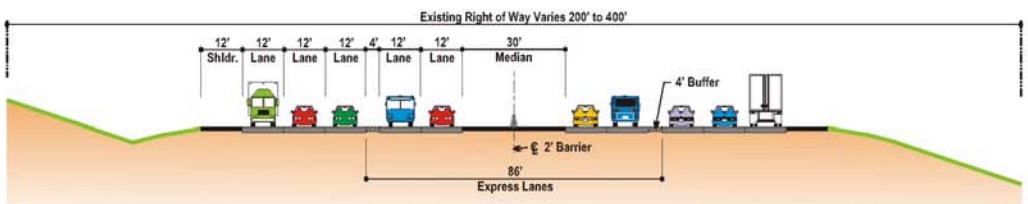
Improvement Scenario: Add 2 express toll lanes each direction from SH 66 to just N of 120th; add 2 reversible express toll lanes from just N of 120th to 84th; convert existing HOV to HOT from 84th to US 36.

Existing Corridor Attributes: Number of Lanes:
- 2 each direction (SH 66 to SH 7)
- 3 each direction (SH 7 to US 36)

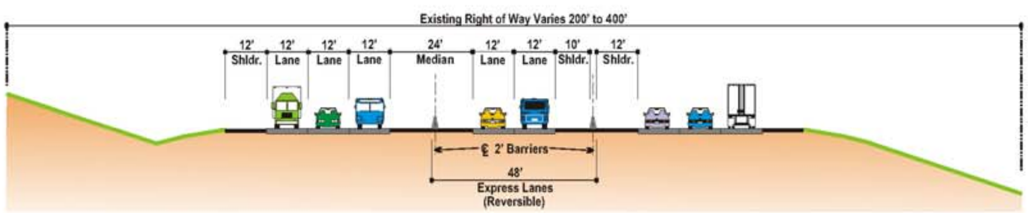
Outside Shoulder Width: Varies 8' to 10'
Inside Shoulder Width: Varies 2' to 10'
Median Width:
- 52' (SH 66 to SH 7)
- 4' (SH 7 to US 36)

Terrain: Rolling

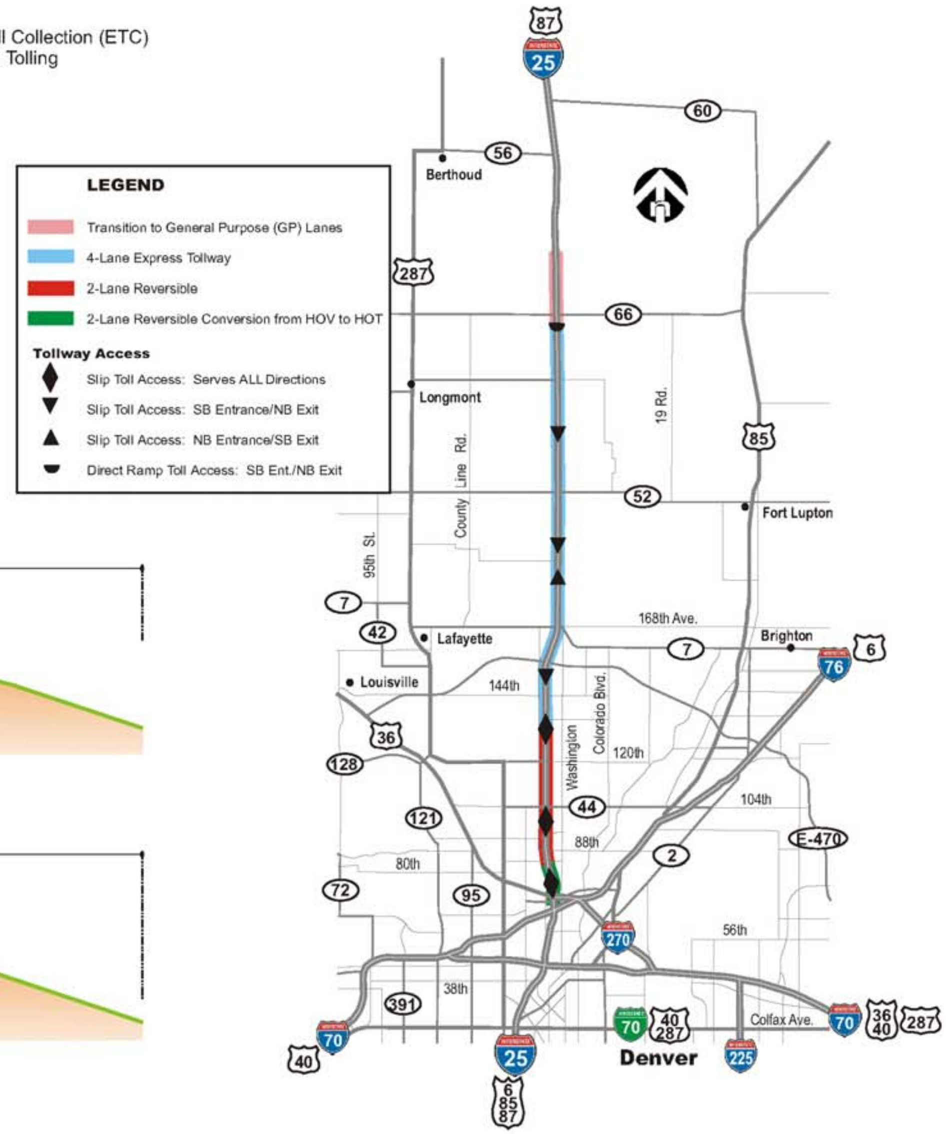
Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



I-25 Corridor
(4-Lane Express Tollway – SH 66 to Just N of 120th)



I-25 Corridor
(2-Lane Reversible – Just N of 120th to 84th)



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I-25 NORTH CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-4

for lanes, median treatments and shoulders assumed for the improved roadway.

No new interchanges were assumed for the corridor, but most existing interchanges required ramp or bridge reconstruction in order to construct the express toll lanes. As shown on Figure 5-4, the majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges. The proposed reversible HOT facility was assumed to connect to the existing I-25 HOV facility at US 36. In addition, the beginning and ending sections of the express toll facility at S.H. 66 would have direct access and a transition area similar to the example shown in Figure 5-1. This would be true for the beginning and ending sections of all the projects which add express toll lanes in the median of an existing roadway.

I-25 NORTH SCENARIO 2

The I-25 North Scenario 2 project limits extend from S.H. 7 to U.S. 36 for a distance of approximately 12 miles. From S.H. 7 to U.S. 36, I-25 would have three general purpose lanes in each direction and two reversible express toll lanes. As mention above, a separate ongoing study is looking at the feasibility of converting the existing two-lane reversible high-occupancy vehicle (HOV) facility from US 36 to downtown Denver to a two-lane reversible high-occupancy toll (HOT) facility.

Similar to Scenario 1 the reversible express toll lanes would be located in the median of the existing roadway and would be separated from the general purpose lanes by concrete barrier. It was assumed that the existing general purpose lanes would need to be reconstructed because the current median width is insufficient to add express toll lanes in the median without impacting the general purpose lanes. The existing right-of-way along the majority of the corridor was within a range of 200 to 300 feet. In order to construct the express toll lanes, it was assumed that right-of-way would need to be purchased at several locations along the corridor.

The proposed section shown in Figure 5-5 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway. No new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. As shown on Figure 5-5, the majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges. The proposed reversible HOT facility was assumed to connect to the existing I-25 HOV facility at U.S. 36.

Project Limits: US 36 (begin log 217) to SH 7 (end log 229)

Project Length: 12 Miles

Project Type: Reversible Express Toll Lanes/HOT Lanes

Description: Tolling new capacity and Conversion of HOV to HOT

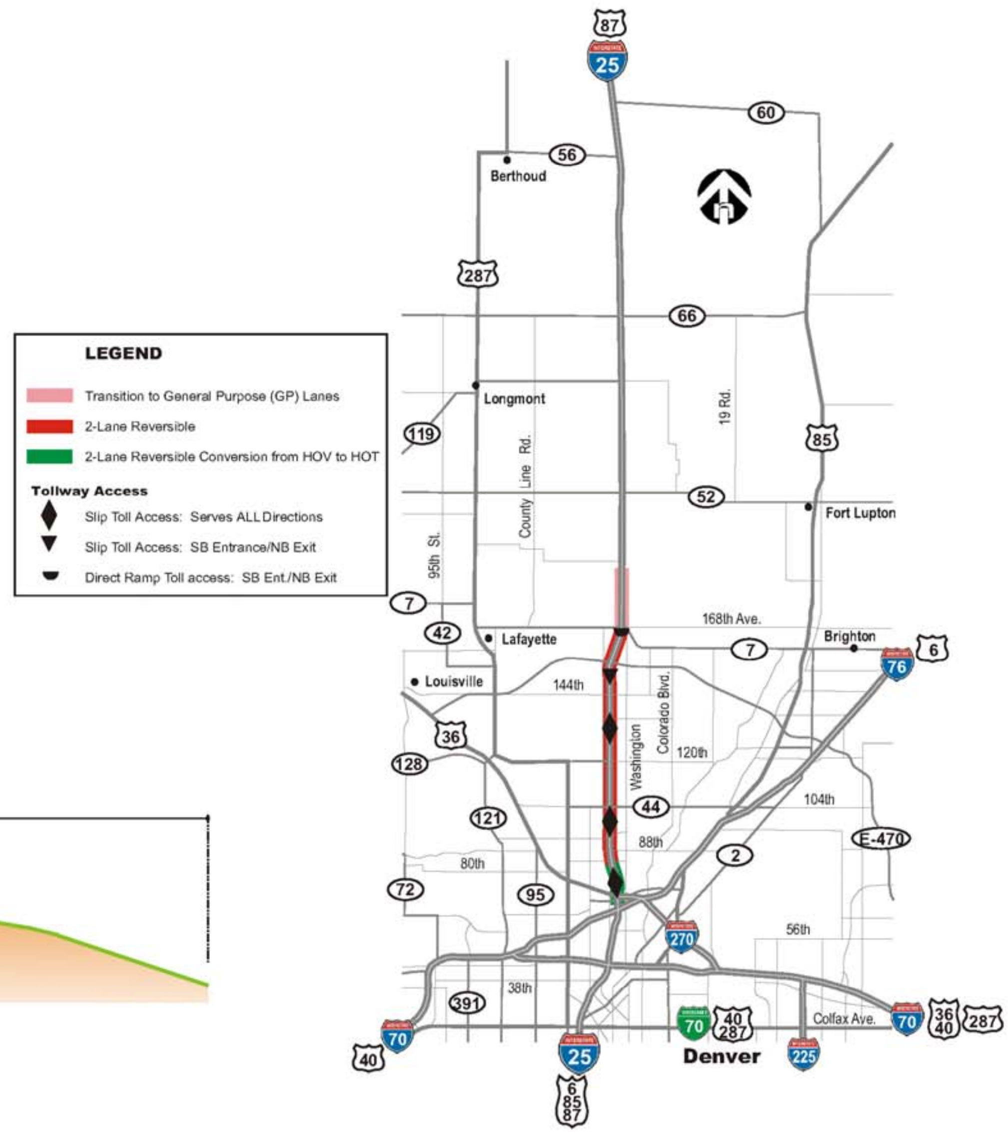
Improvement Scenario: Add 2 reversible express toll lanes from SH 7 to 84th;convert existing HOV to HOT from 84th to US 36.

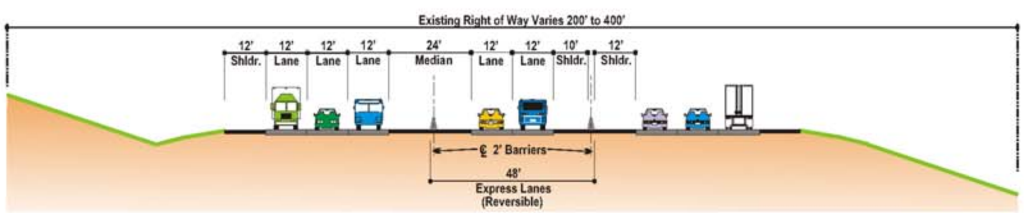
Existing Corridor Attributes: Number of Lanes:
- 3 each direction (SH 7 to US 36)

Outside Shoulder Width: Varies 8' to 10'
Inside Shoulder Width: Varies 4' to 12'
Median Width:
- 10' to 26' (SH 7 to US 36)

Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling





I-25 Corridor
(2-Lane Reversible –SH 7 to 84th)

I-25 NORTH CORRIDOR IMPROVEMENTS - SCENARIO 2

FIGURE 5-5

I-70 EAST SCENARIO 1

The I-70 East Scenario 1 project is located between I-25 and E-470. The project is approximately 12 miles and is subdivided into two sections with different improvement types. From I-25 to just east of I-270, the section would have three general purpose lanes in each direction, the majority of which is on elevated structure, and two express toll lanes each direction on elevated structure, located adjacent to the existing I-70 alignment on the north side. From just east of I-270 to just west of E-470, I-70 would vary between two (east of Chambers to E-470) and three (east of I-270 to east of Chambers) general purpose lanes and two express toll lanes in each direction located at-grade. Within this section the express toll lanes would be located in the median of existing I-70 and would be separated from the general purpose lanes by a concrete barrier. It was assumed that the existing general purpose lanes would need to be reconstructed between I-270 and E-470 because the current median width is not sufficient to add express toll lanes in the median without impacting the general purpose lanes.

The existing right-of-way along the eastern portion of the project from I-270 to E-470 was assumed to be adequate and no new right-of-way was assumed to be purchased. However, right-of-way from I-25 to I-270 was assumed to be acquired since the section was located on elevated structure to the north of the existing I-70 alignment. The proposed section shown in Figure 5-6 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway.

For the elevated roadway structure, access points were assumed to be needed at Colorado Boulevard, Quebec and I-270 through direct drop down ramps. For the section at-grade, no new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. Most of the mainline bridges in this section were assumed to be widened to accommodate the express toll lanes. As shown on Figure 5-6, access along the eastern portion of the corridor would be provided through slip toll access between existing interchanges. Direct connections via dedicated flyover ramps were assumed at I-225 and I-270 to and from the express toll lanes on I-70 to the general purpose lanes on I-225 and I-270.

Information from the ongoing I-70 Environmental Impact Statement was used to develop the cost estimate for the project.

I-70 EAST SCENARIO 2

The I-70 East Scenario 2 project is located between I-25 and Chambers. The project is approximately 8 miles and is subdivided into two sections

Project Limits: I-25 (begin Log 274) to E-470 (end Log 289)

Project Length: 13 Miles

Project Type: Express Toll Lanes

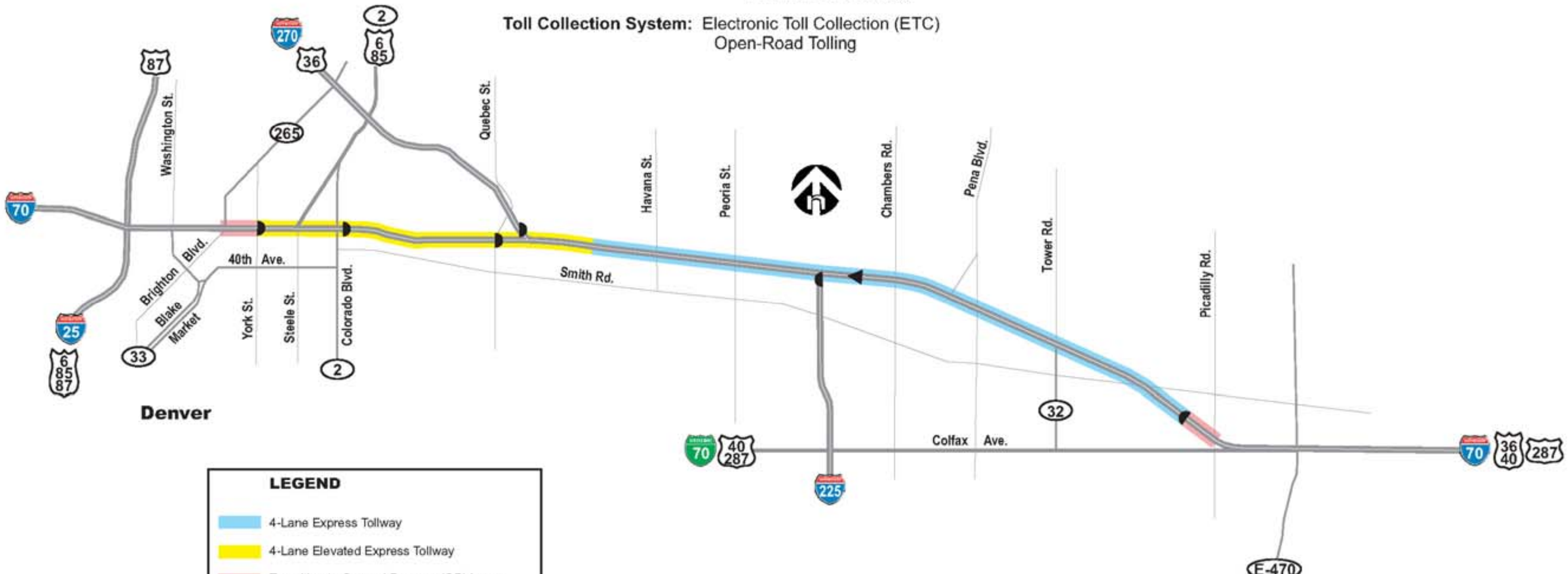
Description: Tolling new capacity

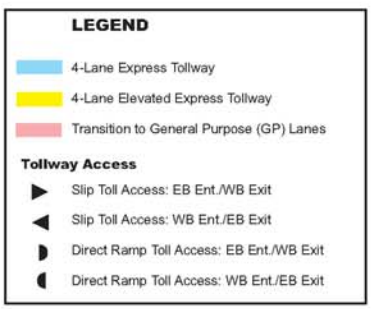
Improvement Scenario: Add 2 express toll lanes each direction.

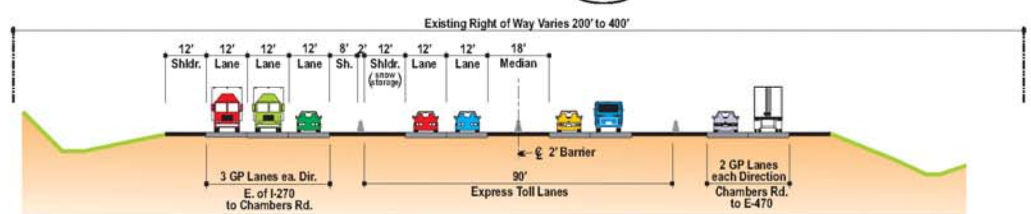
Existing Corridor Attributes: Number of Lanes:
- 4 each direction Washington to Brighton
- 3 each direction Brighton to Chambers
- 2 each direction Chambers to E-470

Outside Shoulder Width: 10'
Inside Shoulder Width: 2'
Median Width: Varies 0' to 60'
Terrain: Level-Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling







I-70 East Corridor
(4-Lane Express Tollway - E. of I-270 to E-470)

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I-70 EAST CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-6

with different improvement types. From I-25 to just east of I-270, the section would have three general purpose lanes in each direction, the majority of which is on elevated structure, and two express toll lanes each direction on elevated structure, located adjacent to the existing I-70 alignment on the north side. From just east of I-270 to Chambers, I-70 would have three general purpose lanes and two express toll lanes in each direction located at-grade. Within this section the express toll lanes would be located in the median of existing I-70 and would be separated from the general purpose lanes by a concrete barrier. It was assumed that the existing general purpose lanes would need to be reconstructed between I-270 and Chambers because the current median width is not sufficient to add express toll lanes in the median without impacting the general purpose lanes.

The existing right-of-way along the eastern portion of the project from I-270 to Chambers was assumed to be adequate and no new right-of-way was assumed to be purchased. However, right-of-way from I-25 to I-270 was assumed to be acquired since the section was located on elevated structure to the north of the existing I-70 alignment. The proposed section shown in Figure 5-7 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway.

For the elevated roadway structure, access points were assumed to be needed at Colorado Boulevard, Quebec and I-270 through direct drop down ramps. For the section at-grade, no new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. Most of the mainline bridges in this section were assumed to be widened to accommodate the express toll lanes. As shown on Figure 5-7, access would be provided through direct connections either as direct drop down ramps on the elevated structure or via dedicated flyover ramps at I-225 and I-270 to and from the express toll lanes on I-70 to the general purpose lanes on I-225 and I-270.

Information from the ongoing I-70 Environmental Impact Statement was used to develop the cost estimate for the project.

I-70 East Scenario 3

The I-70 East Scenario 3 project is located between Colorado and Chambers. The project is approximately 6 miles and would not have an elevated structure as was assumed in Scenarios 1 and 2. From just east of Colorado to Chambers, I-70 would have three general purpose lanes and two express toll lanes in each direction located at-grade. Within this section the express toll lanes would be located in the median of existing I-

Project Limits: I-25 (begin Log 274) to Chambers (end log 282)

Project Length: 8 Miles

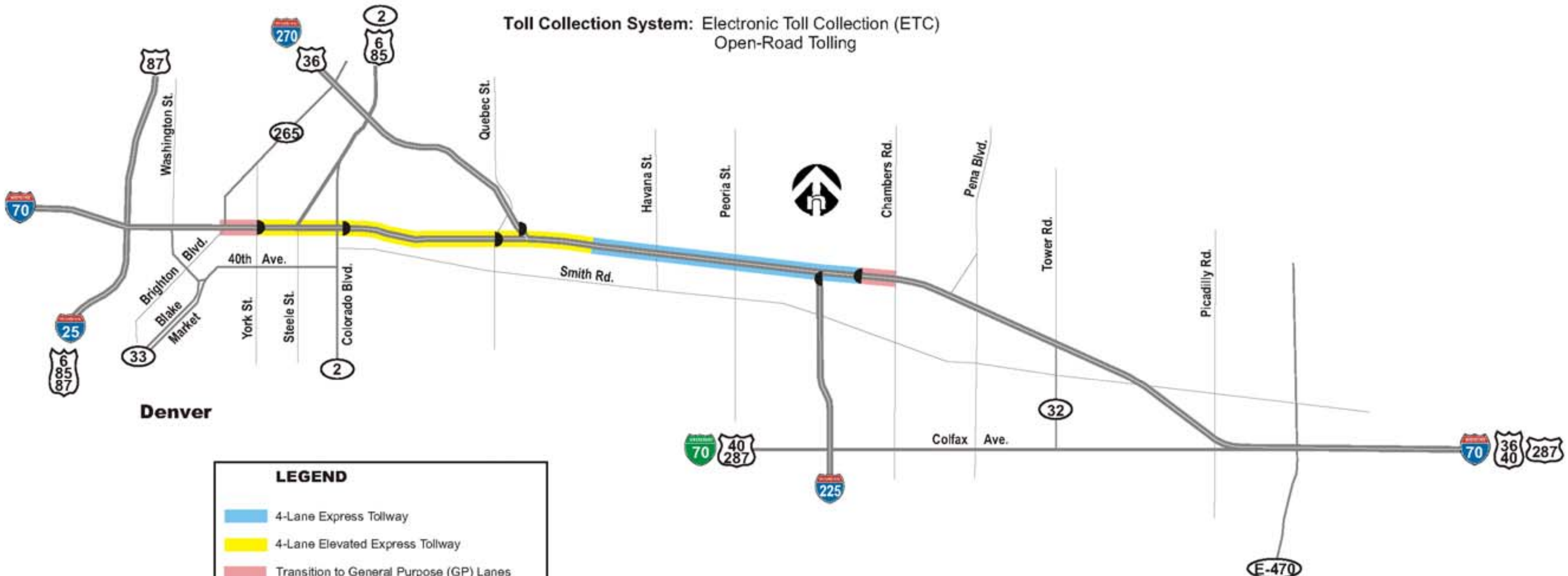
Project Type: Express Toll Lanes

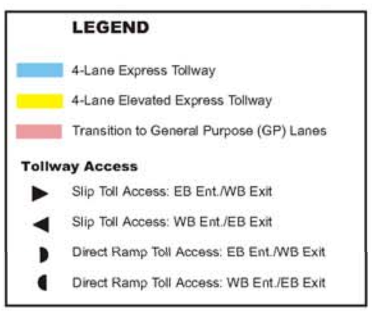
Description: Tolling new capacity

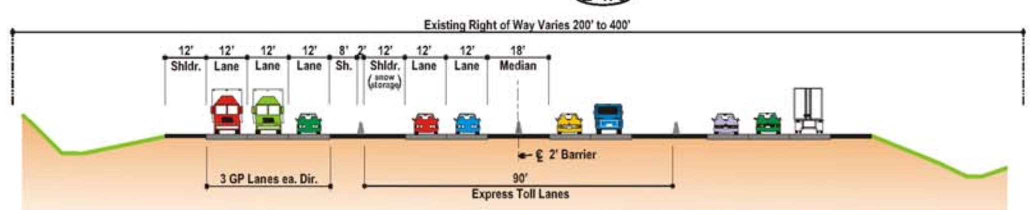
Improvement Scenario: Add 2 express toll lanes each direction.

Existing Corridor Attributes: Number of Lanes:
4 each direction Washington to Brighton
3 each direction Brighton to Chambers
Outside Shoulder Width: 10'
Inside Shoulder Width: 2'
Median Width: Varies 0' to 60'
Terrain: Level-Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling







I-70 East Corridor
(4-Lane Express Tollway - E. of I-270 to Chambers)

70 and would be separated from the general purpose lanes by a concrete barrier. It was assumed that the existing general purpose lanes would need to be reconstructed between Colorado and Chambers because the current median width is not sufficient to add express toll lanes in the median without impacting the general purpose lanes.

The existing right-of-way was assumed to be adequate and no new right-of-way was assumed to be purchased. The proposed section shown in Figure 5-8 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway. No new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. Most of the mainline bridges in this section were assumed to be widened to accommodate the express toll lanes. As shown on Figure 5-8, access would be provided at the beginning and ending of the toll facility and through direct connections via dedicated flyover ramps at I-225 and I-270 to and from the express toll lanes on I-70 to the general purpose lanes on I-225 and I-270.

Information from the ongoing I-70 Environmental Impact Statement was used to develop the cost estimate for the project.

U.S. 36 Scenario 1

As shown in Figure 5-9, the US 36 project extends from Foothills Parkway near the city limits of Boulder to the eastern terminus at I-25. The project is approximately 18 miles long and is subdivided into three sections with different improvement types. From Foothills Parkway to McCaslin Boulevard, the section would have two general purpose lanes and one express toll lane each direction. From McCaslin Boulevard to Pecos, US 36 would have two general purpose lanes and two express toll lanes in each direction and from Pecos to I-25, the project includes converting the existing one-lane reversible high-occupancy vehicle (HOV) facility to a two-lane reversible high-occupancy toll (HOT) facility. The section would then have two general purpose lanes in each direction.

In all three sections the express toll lanes would be located in the median of the existing roadway. From Foothills Parkway to I-25, the express toll lanes would be separated from the general purpose lanes by a concrete barrier. It was assumed that the majority of the existing general purpose lanes would need to be reconstructed because the current median width is not sufficient to add express toll lanes in the median without impacting the general purpose lanes. The existing right-of-way along the eastern portion of the project was approximately 300 feet, but the right-of-way for the majority of the corridor was within a range of 150 to 200 feet. In order to

Project Limits: Colorado (begin 276) to Chambers (end 282)

Project Length: 6 Miles

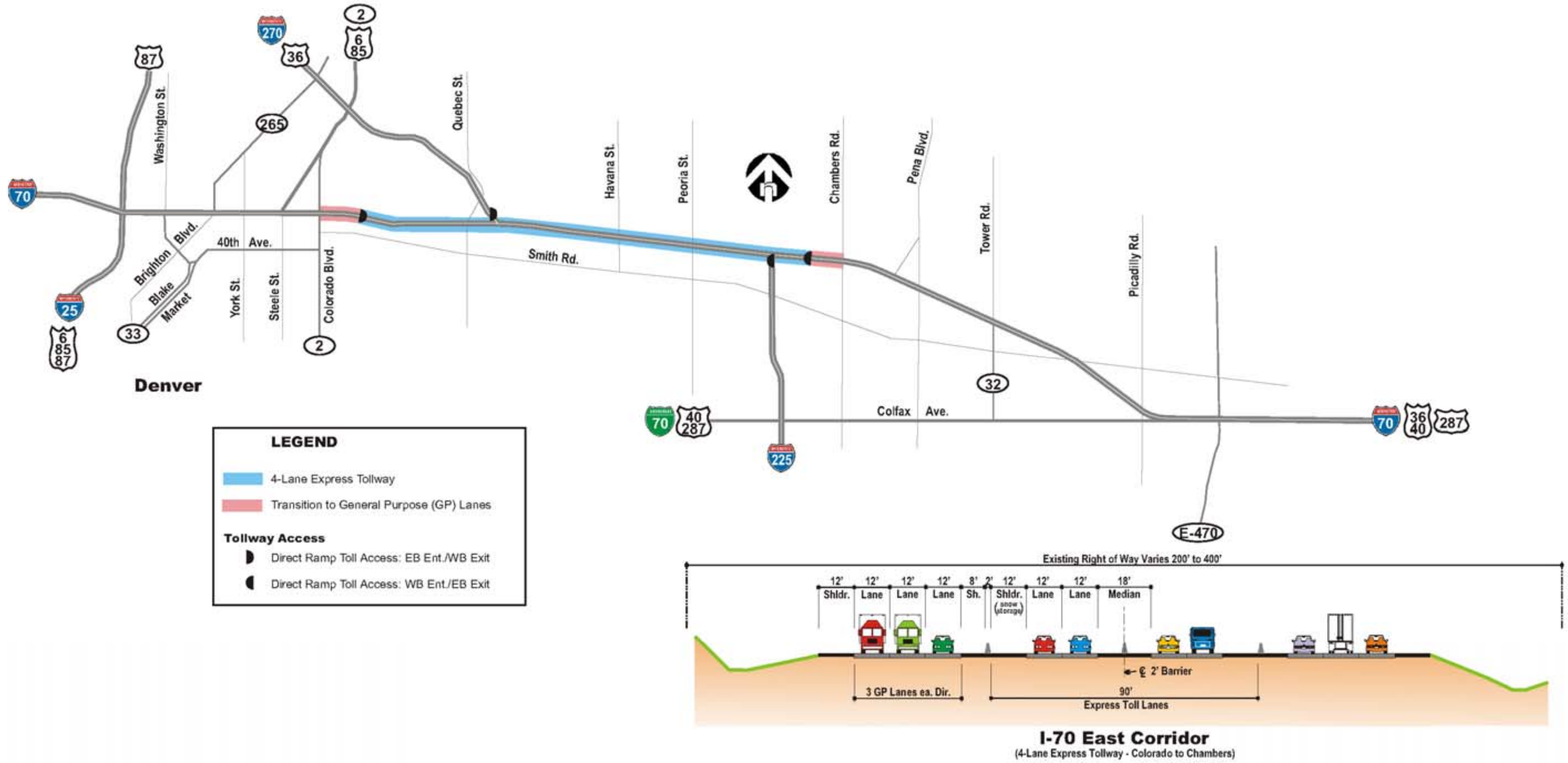
Project Type: Express Toll Lanes

Description: Tolling new capacity

Improvement Scenario: Add 2 express toll lanes each direction.

Existing Corridor Attributes: Number of Lanes: 3 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 2'
Median Width: Varies 0' to 60'
Terrain: Level-Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



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I-70 EAST CORRIDOR IMPROVEMENTS - SCENARIO 3

FIGURE 5-8

Project Limits: I-25 (begin Log 57) to Boulder, Foothills Parkway (end Log 39)

Project Length: 18 Miles

Project Type: Managed Lanes and HOT Lanes

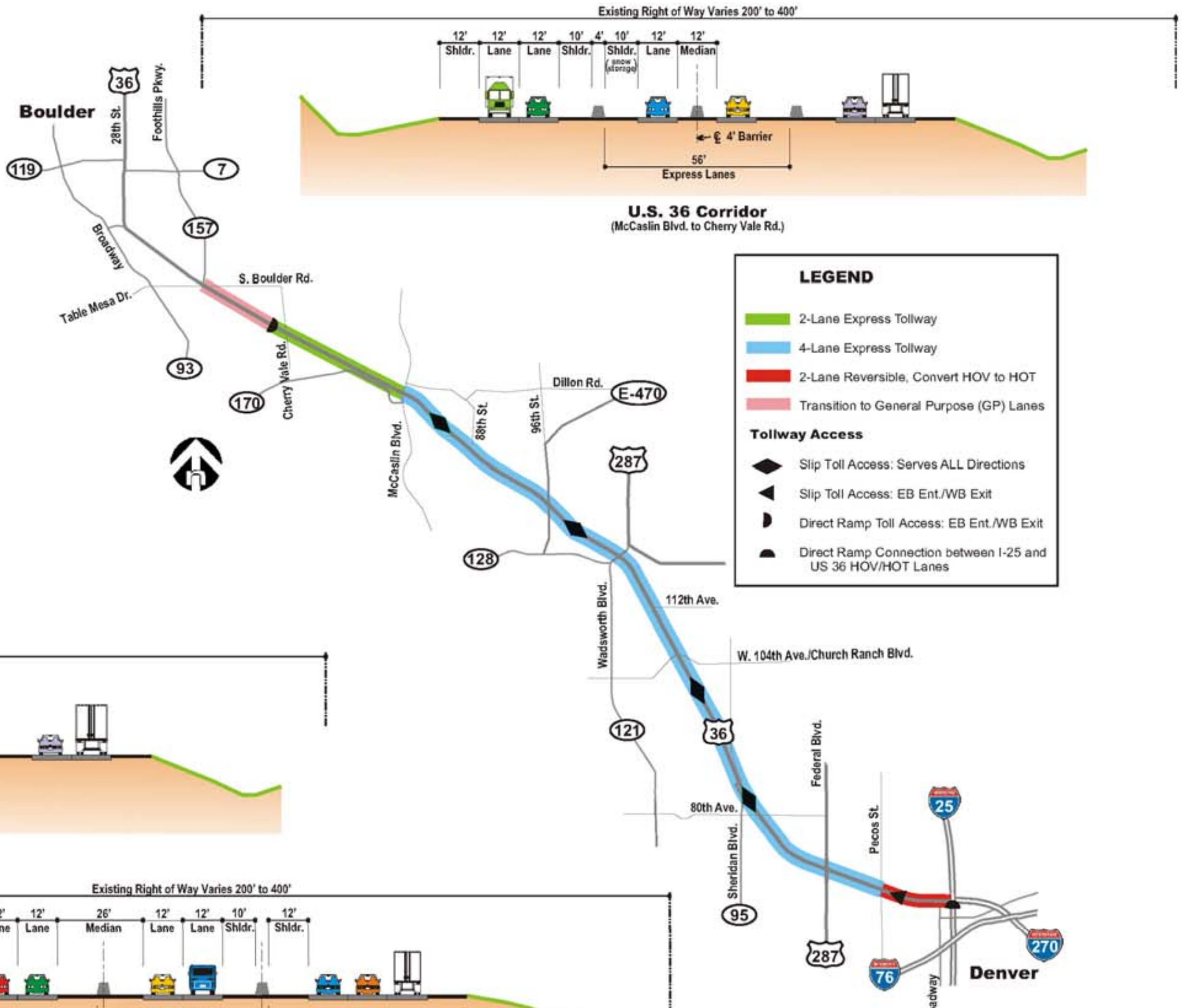
Description: Tolling new capacity, convert HOV to HOT lanes

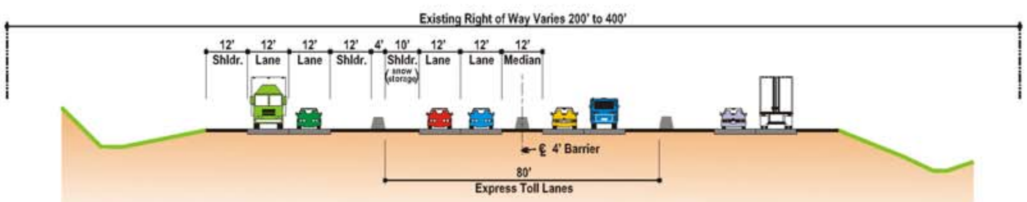
Improvement Scenarios:
- Add 1 express toll lane each direction Cherry Vale Rd. to McCaslin Blvd.
- Add 2 express toll lanes each direction McCaslin Blvd. to Pecos St.
- Convert existing 1-lane reversible HOV to 2-lane Reversible HOT Pecos St. to I-25.

Existing Corridor Attributes: Number of Lanes:
- 2 each direction (Cherry Vale to Pecos)
- 3 each direction (Pecos to I-25)

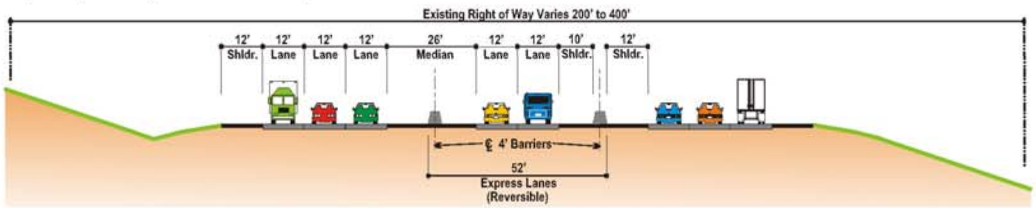
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 8'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC) / Open-Road Tolling





US 36 Corridor
(4-Lane Express Tollway – McCaslin Blvd. to Pecos St.)



US 36 Corridor
(2-Lane Reversible – Pecos to I-25)

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U.S. 36 CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-9

construct the express toll lanes, it was assumed that right-of-way would need to be purchased at several locations along the corridor. The majority of the right-of-way would occur in the section from Broomfield to I-25.
The proposed section shown in Figure 5-9 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway. Most of the existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. The Broomfield Interchange was estimated to be the most costly interchange improvement for the corridor at approximately $173 million.

As shown on Figure 5-9, the majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges. Direct connections to and from the HOT facility on US 36 to the I-25 HOV facility and the I-25 general purpose lanes via dedicated flyover ramps were assumed at the I-25 interchange.

Information from the ongoing US 36 Environmental Impact Statement was used to develop the cost estimate for the project. In order to be consistent with the ongoing study, the contingency was adjusted from 20 percent to 30 percent and a CDOT Force Account Miscellaneous was added to the overall capital cost estimate.

I-225 Scenario 1

The I-225 project spans approximately 8 miles from I-70 to S.H. 83. I-225 would have two express toll lanes in each direction and two general purpose lanes in each direction. The express toll lanes would be located in the median of the existing roadway and would be separated from the general purpose lanes by a concrete barrier. The section of the corridor from Parker Road to 6th Avenue has received environmental clearance for constructing six general purpose lanes and is included in the current TIP program; however the project has not been implemented due to a lack of funding. For the purposes of this study it was assumed that the improvements identified in the 2000 Environmental Assessment would be implemented in conjunction with the express toll lanes with the exception that only four general purpose lanes would be reconstructed instead of six as originally planned.

For the section of I-225 from 6th Avenue to I-70, it was assumed that widening could occur on the outside to provide the additional width required for express toll lanes. The existing right-of-way width is approximately 300 feet and was determined to be adequate; therefore no new right-of-way was assumed to be purchased.

Project Limits: S.H. 83 (begin Log 4) to I-70 (end Log 12)

Project Length: 8 Miles

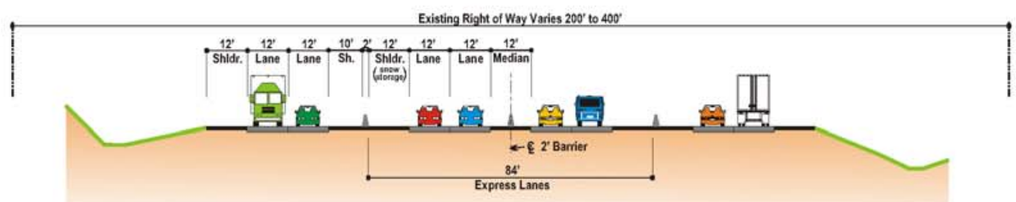
Project Type: Express Toll Lanes

Description: Tolling new capacity

Improvement Scenario: Add 2 express toll lanes each direction.

Existing Corridor Attributes: Number of Lanes: 3 each direction (I-70 to 6th Ave.)
2 each direction (6th Ave. to SH 83)
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 60'
Terrain: Level

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



I-225 Corridor
(4-Lane Express Tollway)

I-225 CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-10

The proposed section shown in Figure 5-10 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway. No new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes.

As shown on Figure 5-10, the majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges, except for at the beginning and ending sections of the express toll facility, which would have direct access and a transition area, similar to the example shown in Figure 5-1.

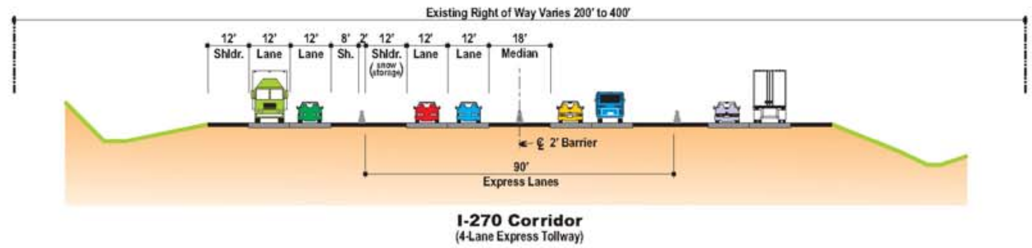
I-270 Scenario 1

The I-270 Scenario 1 is shown in Figure 5-11. The project spans approximately 5 miles between I-25 and I-70. I-270 would have two general purpose lanes and two express toll lanes in each direction. The express toll lanes would be located in the median of the existing roadway and would be separated from the general purpose lanes by a concrete barrier. It was assumed that the existing general purpose lanes would need to be reconstructed because the current median width is not sufficient to add two express toll lanes each direction. The existing right-of-way width was determined to be adequate in most locations; however, new right-of-way was included in the overall roadway construction cost at spot locations along the corridor. The proposed section provides the widths for lanes, median treatments and shoulders assumed for the improved roadway.

No new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. Most of the mainline bridges were assumed to be widened to accommodate the express toll lanes.

The majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges, except for at the beginning and ending sections of the express toll facility, which would have direct access and a transition area, similar to the example shown in Figure 5-1.

In order to be consistent with internal CDOT preliminary cost estimates for I-270 the contingency was adjusted from 20 percent to 30 percent and a CDOT Force Account Miscellaneous was added to the overall capital cost estimate.



Project Limits: I-25 (begin Log 0) to I-70 (end Log 5)

Project Length: 6 Miles

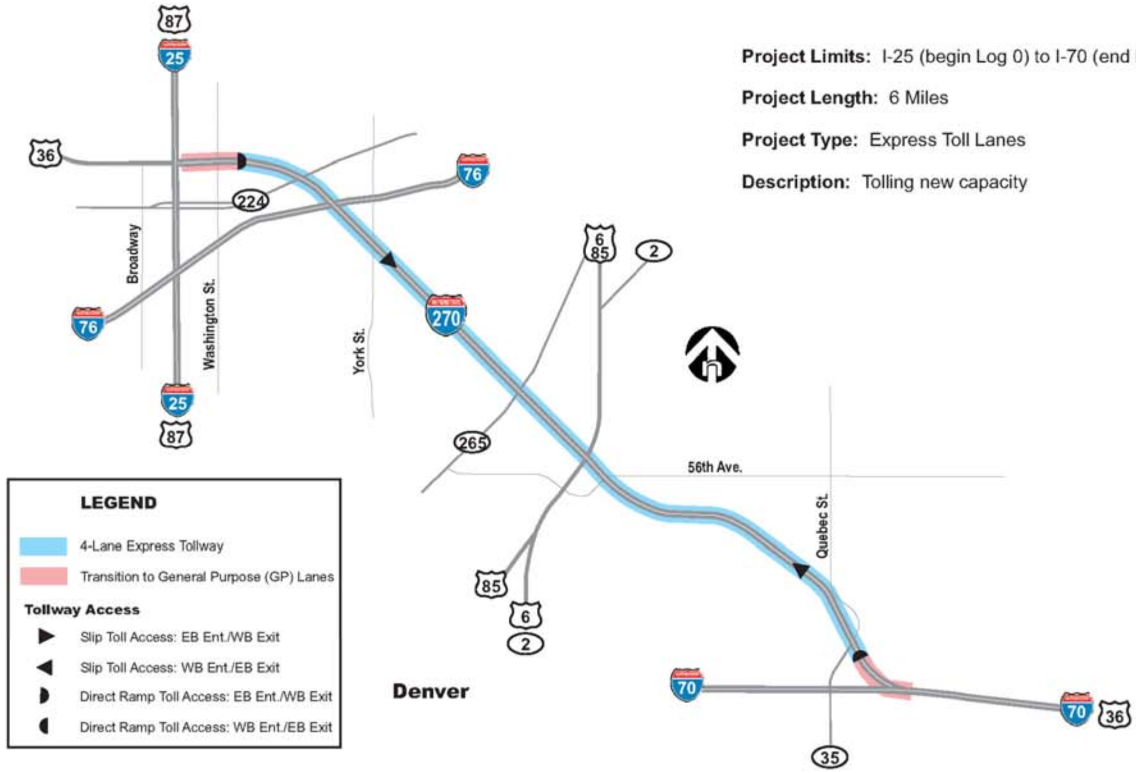
Project Type: Express Toll Lanes

Description: Tolling new capacity

Improvement Scenario: Add 2 express toll lanes each direction.

Existing Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 8'
Median Width: Varies 50' to 52'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



I-270 CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-11

C-470 SCENARIOS 1 AND 1A

The C-470 project spans approximately 14 miles from just east of I-25, connecting to the terminus of the existing E-470 Tollway, to Kipling Parkway. From just east of I-25 to east of Wadsworth Boulevard, C-470 would have two general purpose lanes and two express toll lanes in each direction. The express toll lanes would be located in the median of the existing roadway and would be separated from the general purpose lanes by a concrete barrier. From east of Wadsworth Boulevard to Kipling, C-470 would have two general purpose lanes and one express toll lane in each direction. The express toll lanes would be located in the median of the existing roadway and would be separated from the general purpose lanes by a four-foot buffer. It was assumed that the existing general purpose lanes would not be reconstructed. The existing right-of-way width was determined to be adequate in most locations (ranging between 250 to 300 feet); however, new right-of-way was included in the overall roadway construction cost at spot locations along the corridor. The proposed section shown in Figure 5-12 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway.

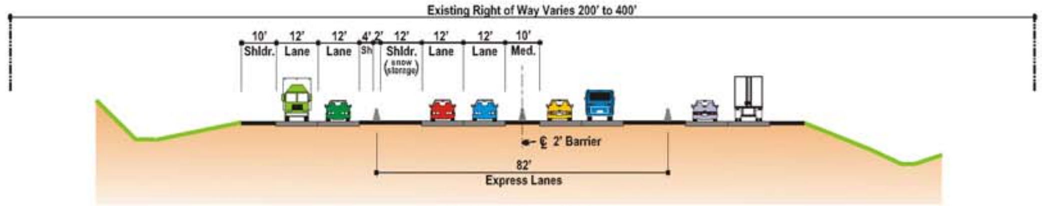
Some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. Most of the mainline bridges were assumed to be widened to accommodate the express toll lanes. In addition, a new t-ramp connection exclusively for the express toll lanes was assumed to be constructed at Colorado Boulevard.

As shown on Figure 5-12, the majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges. Direct connections to the express toll lanes via dedicated flyover ramps were assumed at I-25, as well as direct connections at Colorado Boulevard and Quebec Street.

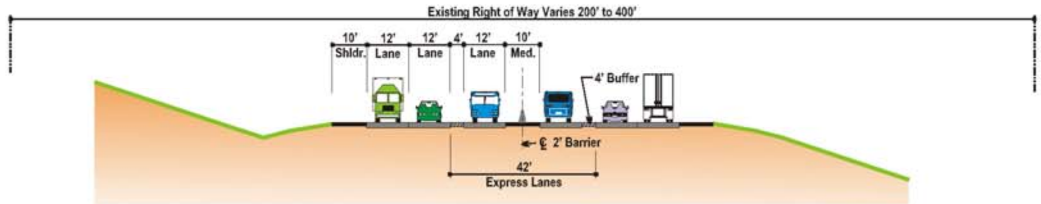
Information from the ongoing C-470 Corridor Environmental Assessment was used to develop the cost estimates and express toll lane access locations for the project.

C-470 SCENARIOS 2 AND 2A

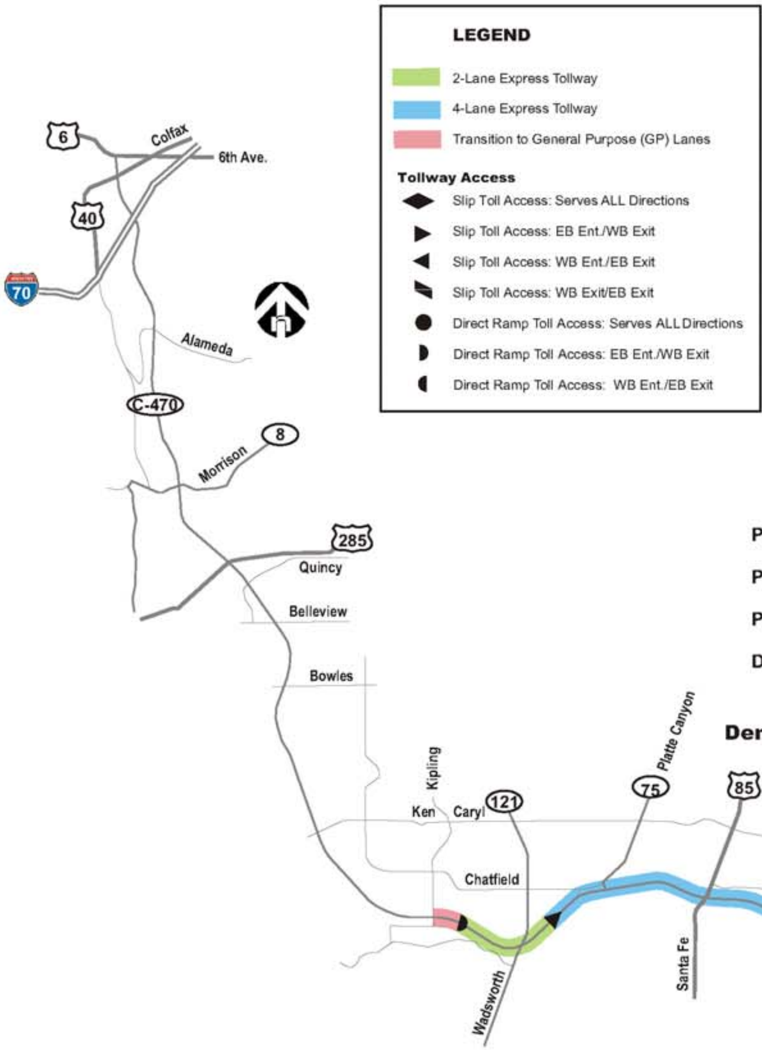
The C-470 Scenario 2 project limits are from just east of I-25, connecting to the terminus of the existing E-470 Tollway, to I-70. The project is approximately 26 miles long. Scenario 2 would have two general purpose lanes and two express toll lanes in each direction, including the section from Platte Canyon Road to Kipling Parkway. The express toll lanes would be located in the median of the existing roadway and would be separated from the general purpose lanes by a concrete barrier. It was assumed that the existing general purpose lanes would not be



C-470 Corridor
(4-Lane Express Tollway – West of Platte Canyon Rd. to I-25)



C-470 Corridor
(2-Lane Express Tollway – Kipling to West of Platte Canyon Rd.)



Project Limits: Kipling (begin log 12) to I-25 (end Log 26)

Project Length: 14 Miles

Project Type: Express Toll Lanes

Description: Tolling new capacity

Improvement Scenarios: Add 2 express toll lanes each direction just west of Platte Canyon to I-25. Add 1 express toll lane each direction Kipling to just west of Platte Canyon.

Existing Corridor Attributes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: Varies 20' to 40'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling

*T-Ramp at Colorado
**Note: I-25 SB Exit to C-470 WB Entrance
C-470 EB Exit to I-25 NB Entrance

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C-470 CORRIDOR IMPROVEMENTS - SCENARIOS 1 AND 1A

FIGURE 5-12

reconstructed. The existing right-of-way width was determined to be adequate in most locations (ranging between 250 to 400 feet); however, new right-of-way was included in the overall roadway construction cost at spot locations along the corridor.

The section from Morrison Road to I-70 was assumed to only need one express toll lane constructed each direction, with modifications to the existing general purpose lanes and shoulders to accommodate the express toll lanes in the median. This section had been recently widened to six general purpose lanes and while it is recognized that existing capacity cannot be tolled under Colorado law, this was assumed for analysis purposes. The proposed section shown in Figure 5-13 provides the widths for lanes, median treatments and shoulders assumed for the improved roadway.

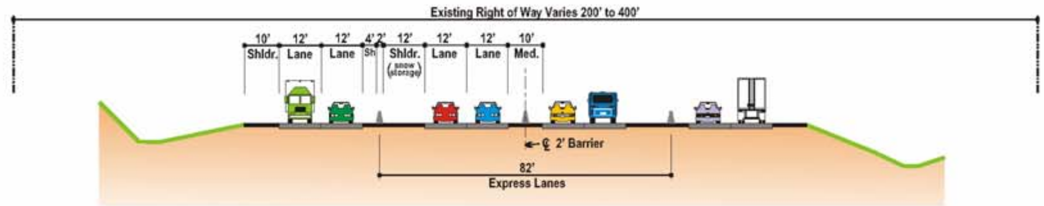
Some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. Most of the mainline bridges were assumed to be widened to accommodate the express toll lanes. In addition, a new t-ramp connection exclusively for the express toll lanes was assumed to be constructed at Colorado Boulevard.

As shown on Figure 5-13, the majority of the express toll lane access along the corridor would be provided through slip toll access between existing interchanges. Direct connections to the express toll lanes via dedicated flyover ramps were assumed at the I-25, as well as direct connections at Colorado Boulevard and Quebec Street.

Information from the ongoing C-470 Corridor Environmental Assessment was used to develop the cost estimates and express toll lane access locations for the project.

NORTHWEST CORRIDOR SCENARIO 1

The Northwest Corridor Scenario 1 project consists of developing a new roadway corridor between U.S. 36 and C-470, connecting it to the existing Northwest Parkway Tollway and completing the outer beltway around Denver. The new corridor would be approximately 24 miles long and includes a four-lane roadway on new alignment. Most of the project was assumed to be on new right-of-way; however, the section from the interchange at S.H. 93 south to C-470 follows the existing S.H. 93/U.S. 6 alignment and will require additional right-of-way at various points along the corridor. The proposed section shown in Figure 5-14 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.



C-470 Corridor
(4-Lane Express Tollway - I-70 to I-25)

Project Limits: I-70 (begin Log 0) to I-25 (end Log 26)

Project Length: 26 Miles

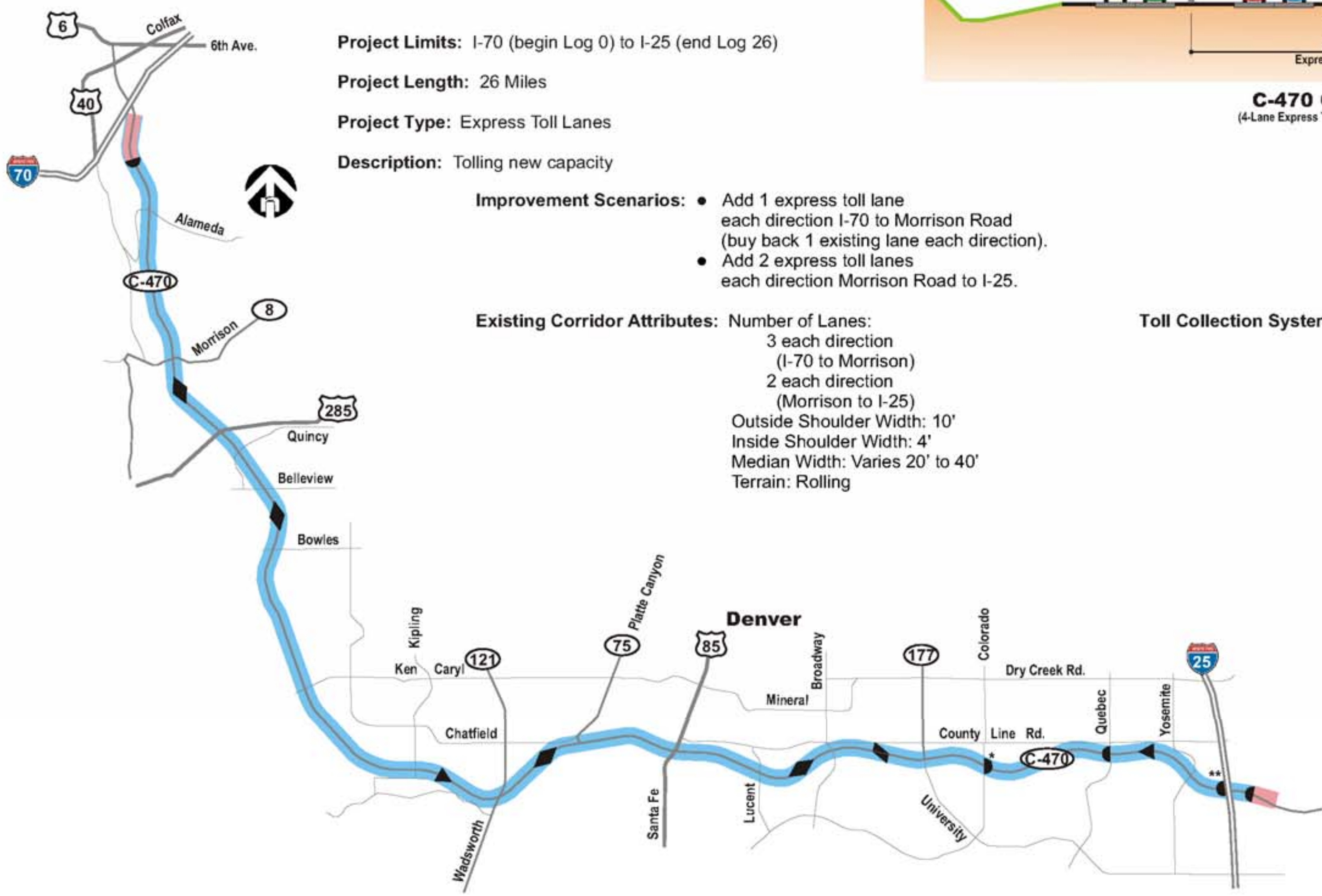
Project Type: Express Toll Lanes

Description: Tolling new capacity

Improvement Scenarios:
- Add 1 express toll lane each direction I-70 to Morrison Road (buy back 1 existing lane each direction).
- Add 2 express toll lanes each direction Morrison Road to I-25.

Existing Corridor Attributes: Number of Lanes:
3 each direction
(I-70 to Morrison)
2 each direction
(Morrison to I-25)
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: Varies 20' to 40'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



LEGEND

- 4-Lane Express Tollway
- Transition to General Purpose (GP) Lanes

Tollway Access
- Slip Toll Access: Serves ALL Directions
- Slip Toll Access: EB Ent./WB Exit
- Slip Toll Access: WB Ent./EB Exit
- Slip Toll Access: WB Exit/EB Exit
- Direct Ramp Toll Access: Serves ALL Directions
- Direct Ramp Toll Access: EB Ent./WB Exit
- Direct Ramp Toll Access: WB Ent./EB Exit

*T-Ramp at Colorado
**Note: I-25 SB Exit to C-470 WB Entrance
C-470 EB Exit to I-25 NB Entrance

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C-470 CORRIDOR IMPROVEMENTS - SCENARIOS 2 AND 2A

FIGURE 5-13

Project Limits: C-470 to NW Parkway/US 36

Project Length: 24 Miles

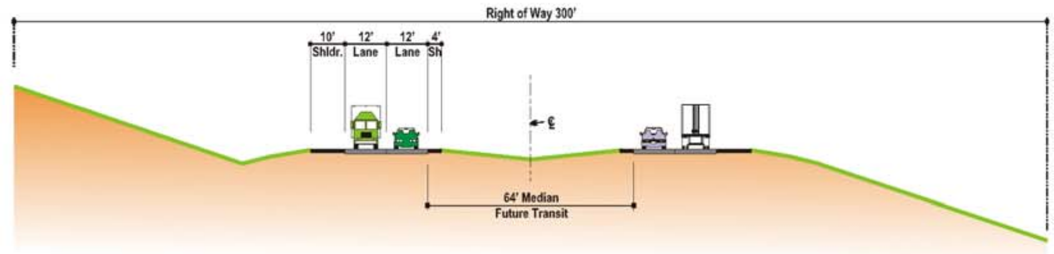
Project Type: New Toll Road

Description: Tolling new capacity

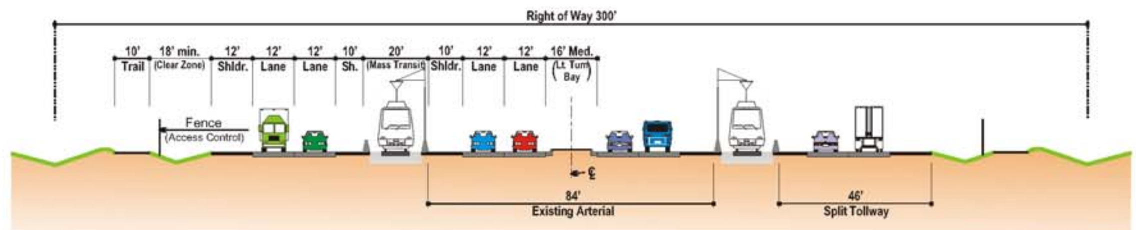
Improvement Scenario: Build two new toll lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 64'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Northwest Corridor
(4-Lane Express Tollway)



Northwest Corridor
(Split Tollway with Transit)

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NORTHWEST CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-14

New interchanges were assumed at nine locations along the corridor at major interstate, highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.
Information from the ongoing Northwest Corridor EIS was used to develop the cost estimates.

NORTHWEST CORRIDOR SCENARIO 2

The Northwest Corridor Scenario 2 project follows the same alignment as Scenario 1, however, the tolled section of the corridor would extend from S.H. 128 to S.H 58. The new corridor would be approximately 14 miles long and includes a four-lane roadway on new alignment. Most of the project was assumed to be on new right-of-way, however, the section from the interchange at S.H. 93 south to S.H. 58 follows the existing S.H. 93/U.S. 6 alignment and will require additional right-of-way at various points along the corridor. The proposed section shown in Figure 5-15 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.

New interchanges were assumed at five locations along the corridor at major highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road was not required. Information from the ongoing Northwest Corridor EIS was used to develop the cost estimates.

Information from the ongoing Northwest Corridor EIS was used to develop the cost estimates.

U.S. 287 BYPASS SCENARIO 1

The U.S. 287 Bypass project consists of developing a new corridor, bypassing Fort Collins near S.H. 14 and U.S. 287. The new bypass would be approximately 12 miles long, located between existing U.S. 287, near Livermore, and I-25. The new bypass would be a four-lane roadway on new alignment. The entire project was assumed to be on new right-of-way. The proposed section shown in Figure 5-16 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.

New interchanges were assumed at the intersection of U.S. 287 and the new bypass and at a median point along the corridor. The existing interchange with I-25 and CR 70 would be utilized by the new bypass, but was assumed to require ramp modifications in order to construct the new toll road.

Project Limits: SH 128 to SH 58

Project Length: 14 Miles

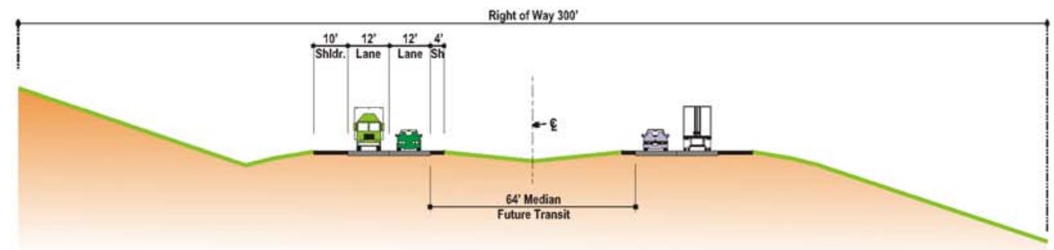
Project Type: New Toll Road

Description: Tolling new capacity

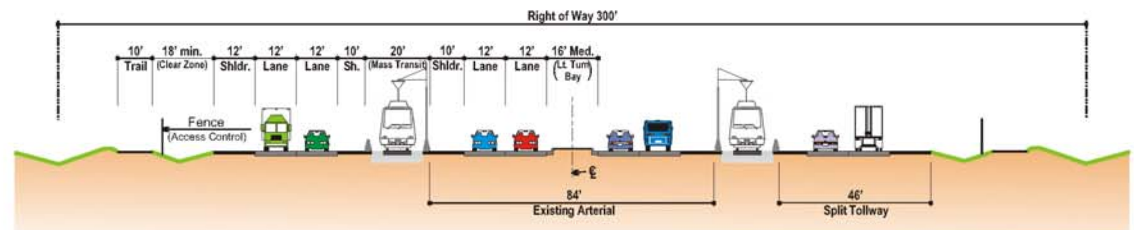
Improvement Scenario: Build two new toll lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 64'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Northwest Corridor
(4-Lane Express Tollway)



Northwest Corridor
(Split Tollway with Transit)

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

NORTHWEST CORRIDOR IMPROVEMENTS - SCENARIO 2

FIGURE 5-15

Project Limits: US 287 to I-25 Connector

Project Length: 12 Miles

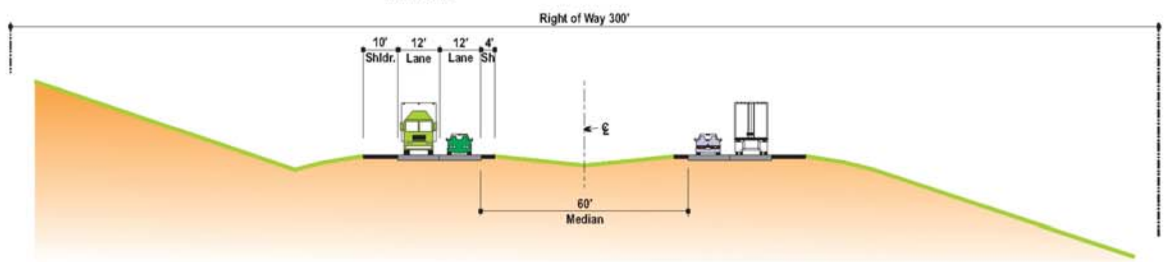
Project Type: New Toll Road

Description: Tolling new capacity

Improvement Scenario: Build 2 toll lanes each direction on new alignment.

Planned Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 60'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



U.S. 287 Corridor
(4-Lane Express Tollway)

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PLANNERS
ECONOMISTS

U.S. 287 BYPASS CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-16

All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

FRONT RANGE SCENARIO 1

The Front Range Scenario 1 project consists of developing a new roadway corridor between I-25 north of Fort Collins to I-25 south of Pueblo. The new corridor would be approximately 194 miles long. The new toll road would be a four-lane roadway on new alignment. The entire project was assumed to be on new right-of-way. The proposed section shown in Figure 5-17 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.

New interchanges were assumed at 11 locations along the corridor at major interstate and highway crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

FRONT RANGE SCENARIO 2

The Front Range Scenario 2 project is similar to Scenario 1, except that it consists of developing a new roadway corridor between I-25 north of Fort Collins to I-25 north of Pueblo. The new corridor would be approximately 169 miles long. The new toll road would be a four-lane roadway on new alignment. The entire project was assumed to be on new right-of-way. The proposed section shown in Figure 5-18 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.

New interchanges were assumed at 10 locations along the corridor at major interstate and highway crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

POWERS BOULEVARD SCENARIO 1

The Powers Boulevard Scenario 1 project consists of developing a new roadway corridor between I-25 north of Colorado Springs (Northgate Rd.) and Woodmen Road. The new corridor would be constructed as a four-lane roadway and the majority of the project would be located on new alignment. The corridor is approximately nine miles long. Most of the project required new right-of-way; however, a portion of the corridor followed the existing Powers Boulevard alignment. The project would relocate existing general purpose lanes to one-way, two-lane frontage roads located on both sides of the proposed toll road. These frontage roads would include signalized intersections. The proposed section shown in

Project Limits: I-25N (at Fort Collins) to I-25S (South of Pueblo)

Project Length: 194 Miles

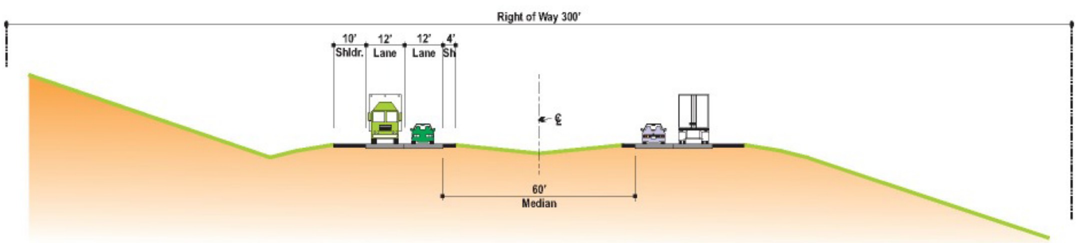
Project Type: New 4-Lane Toll Road

Description: Tolling new capacity

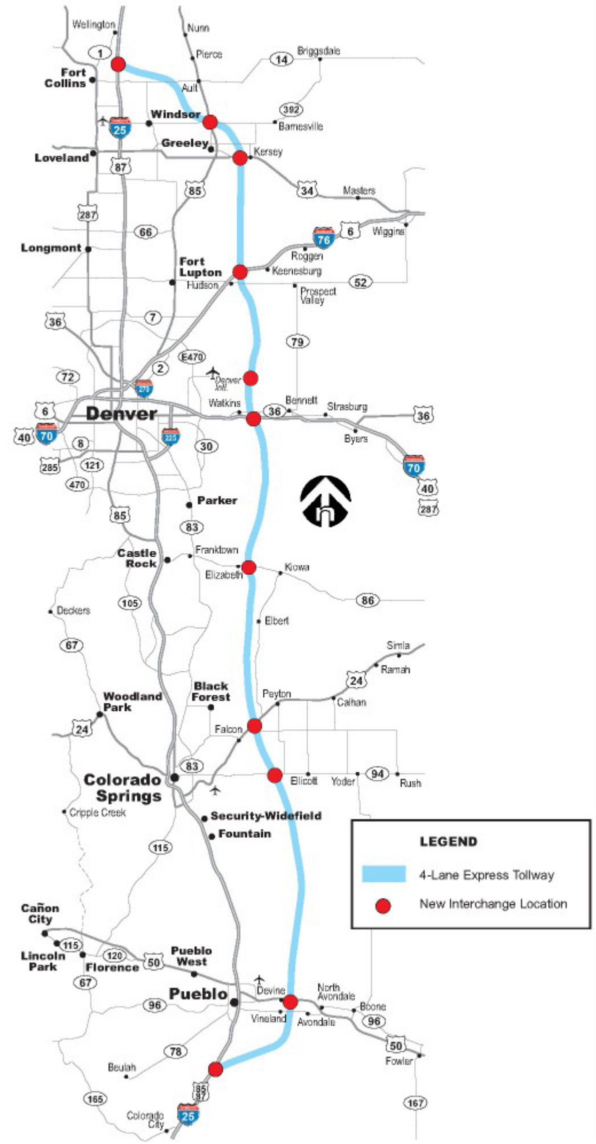
Improvement Scenario: Build two toll lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 60'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Front Range
(4-Lane Express Tollway)



FRONT RANGE CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-17

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Project Limits: I-25N (at Fort Collins) to I-25S (North of Pueblo)

Project Length: 169 Miles

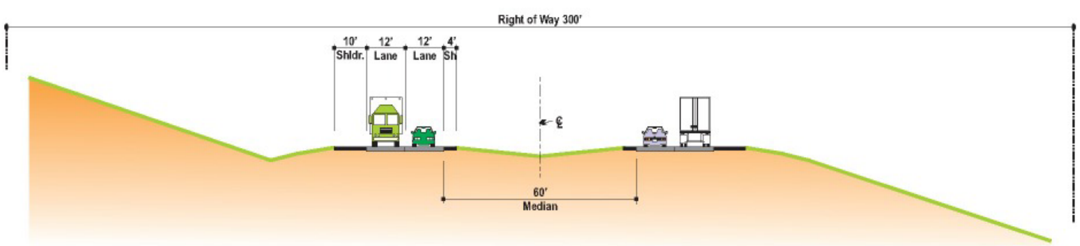
Project Type: New 4-Lane Toll Road

Description: Tolling new capacity

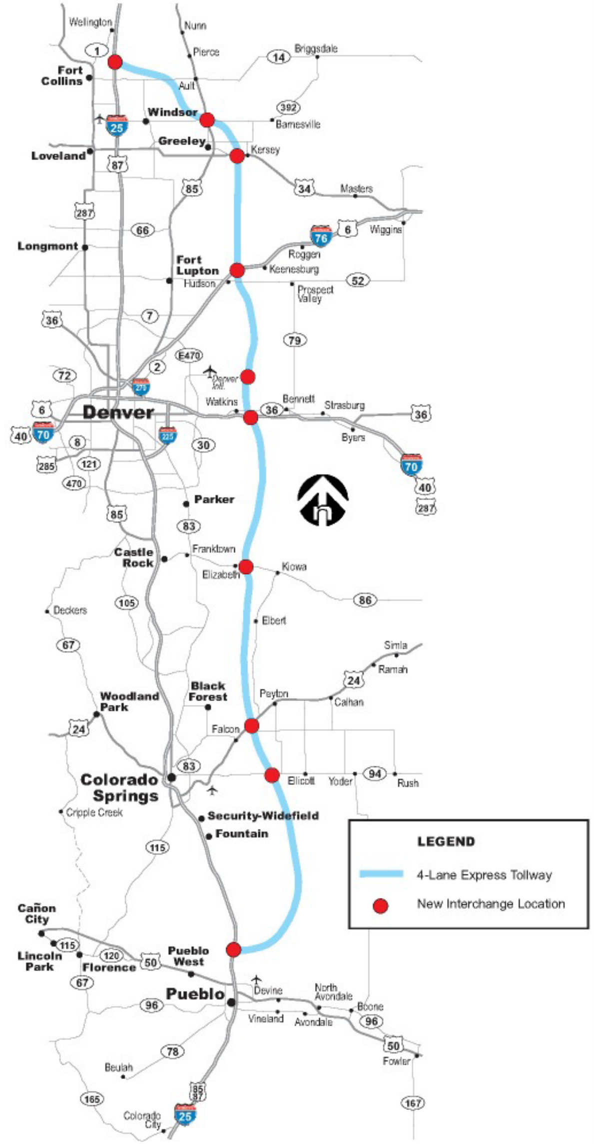
Improvement Scenario: Build two toll lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 60'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Front Range
(4-Lane Express Tollway)



FRONT RANGE CORRIDOR IMPROVEMENTS - SCENARIO 2

FIGURE 5-18

Figure 5-19 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.

New interchanges were assumed at eight locations along the corridor at major interstate highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

Information from the ongoing Powers Corridor Improvement Project was used to develop the cost estimate for the project.

POWERS BOULEVARD SCENARIO 2

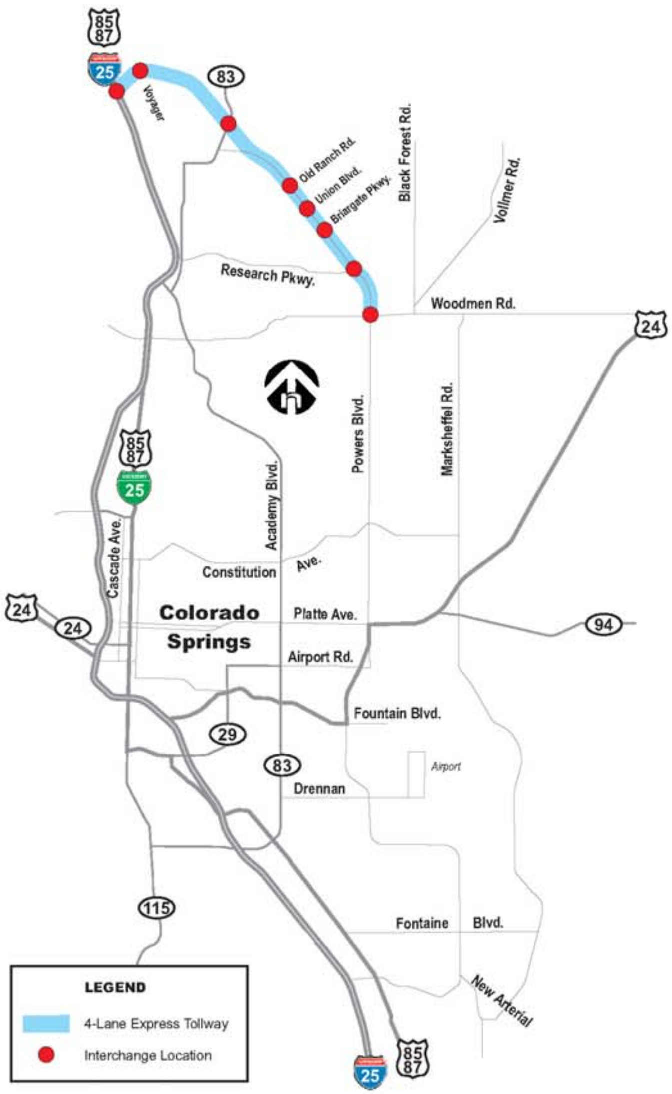
The Powers Boulevard Scenario 2 project consists of developing a new roadway corridor from I-25 north of Colorado Springs (Northgate Rd.) to Drennan Road. The corridor is approximately 21 miles long. The new corridor would be constructed as a four-lane toll road and some portions of the project would be located on new alignment. New right-of-way is required for the north segment of the project (I-25N to Woodmen); however, the majority of the corridor followed the existing Powers Boulevard alignment and will require additional right-of-way at various points along the corridor. The project would relocate the existing general purpose lanes to one-way, two-lane or three-lane frontage roads located on both sides of the proposed toll road. These frontage roads would include signalized intersections. The proposed section shown in Figure 5-20 provides the widths for lanes, median treatments and shoulders assumed for the new roadway. It also shows the limits of the frontage roads.

New interchanges were assumed at 19 locations along the corridor at major interstate, highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

Information from the ongoing Powers Corridor Improvement Project was used to develop the cost estimate for the project.

POWERS BOULEVARD SCENARIO 3

The Powers Boulevard Scenario 3 project consists of developing a new roadway corridor from I-25 north of Colorado Springs (Northgate Rd.) to south of Fontaine Boulevard. The corridor is approximately 27 miles long. The new corridor would be constructed as a four-lane toll road and some portions of the project would be located on new alignment. New right-of-way is required for the north segment of the project (I-25N to Woodmen); however, the majority of the corridor followed the existing Powers Boulevard alignment and will require additional right-of-way at



Project Limits: I-25N (Northgate Rd.) to Woodmen Rd.

Project Length: 9 Miles

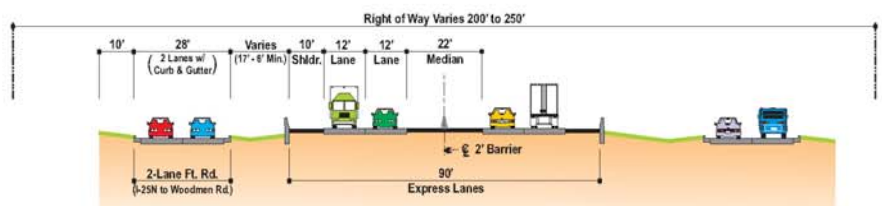
Project Type: New 4-Lane Toll Road

Description: Tolling new capacity

Improvement Scenario: Build two express lanes in each direction on new alignment.

Planned Corridor Attributes:
Number of Lanes (Mainline): 2 each direction
Number of Lanes (Frontage Roads): Varies 2 to 3 lanes each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 10'
Median Width: 22'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling

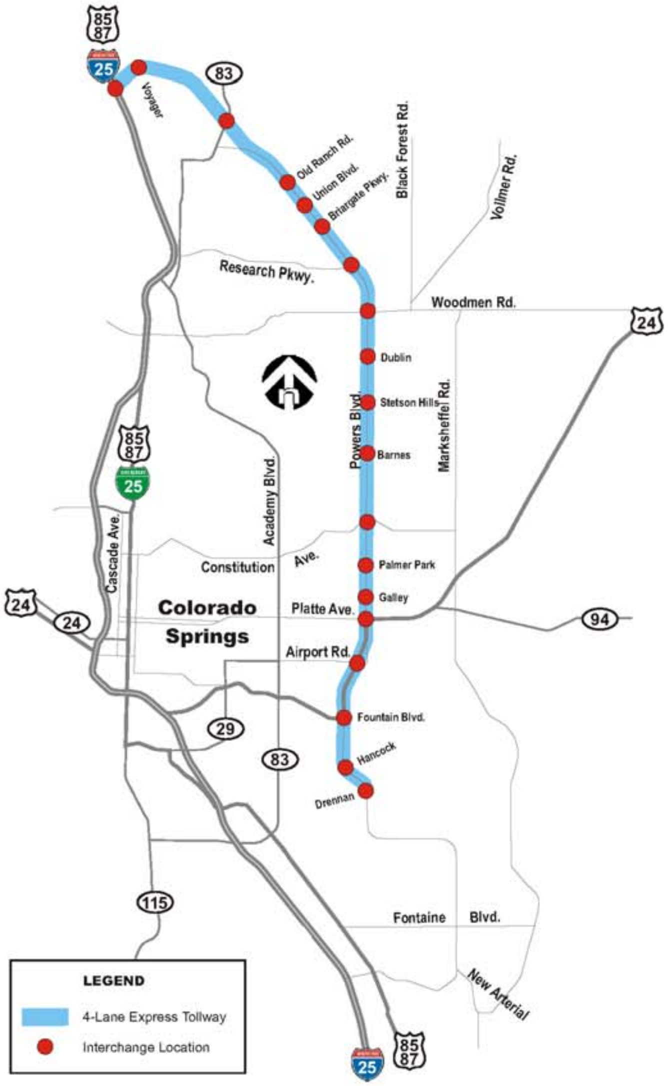


Powers Blvd. Corridor

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

POWERS BOULEVARD CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-19



Project Limits: I-25N (Northgate Rd.) to Drennan

Project Length: 21 Miles

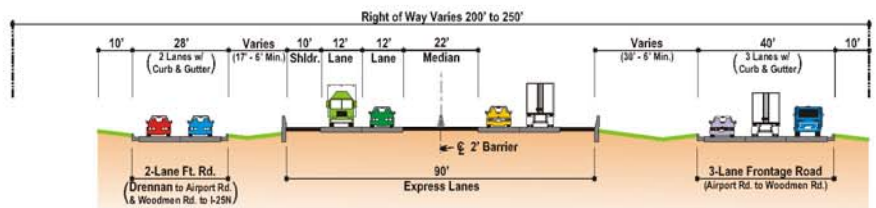
Project Type: New 4-Lane Toll Road

Description: Tolling new capacity

Improvement Scenario: Build two express lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes (Mainline): 2 each direction
Number of Lanes (Frontage Roads): Varies 2 to 3 lanes each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 10'
Median Width: 22'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Powers Blvd. Corridor

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ECONOMISTS

POWERS BOULEVARD CORRIDOR IMPROVEMENTS - SCENARIO 2

FIGURE 5-20

various points along the corridor. The project would relocate the existing general purpose lanes to one-way, two-lane or three-lane frontage roads located on both sides of the proposed toll road. These frontage roads would include signalized intersections. The proposed section shown in Figure 5-21 provides the widths for lanes, median treatments and shoulders assumed for the new roadway. It also shows the limits of the frontage roads.

New interchanges were assumed at 24 locations along the corridor at major interstate, highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

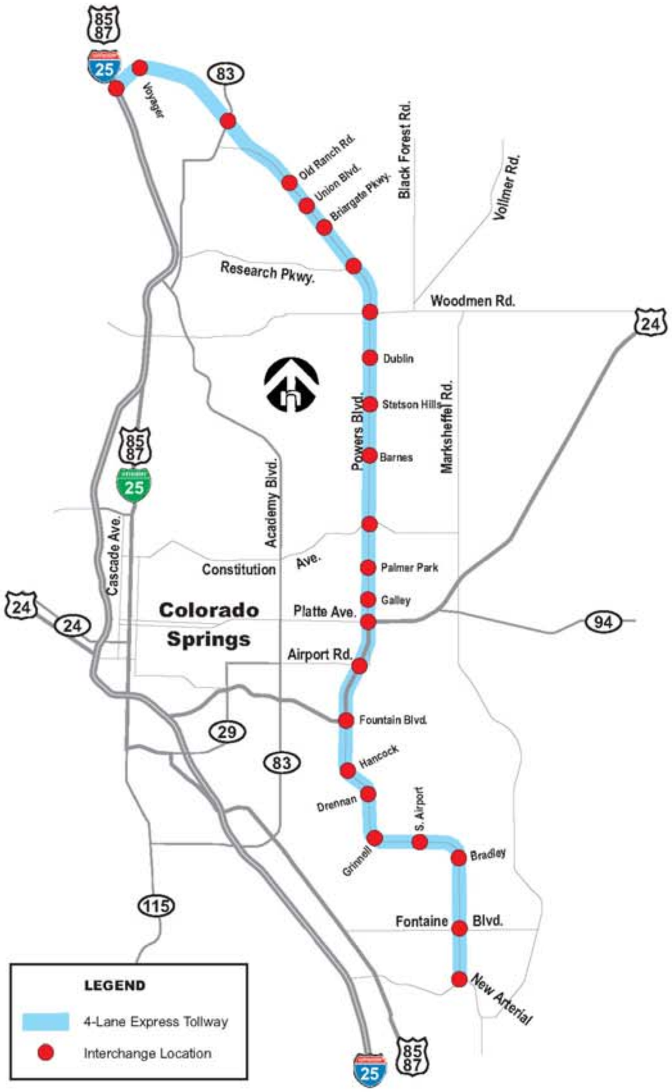
Information from the ongoing Powers Corridor Improvement Project was used to develop the cost estimate for the project.

POWERS BOULEVARD SCENARIO 4

The Powers Boulevard Scenario 4 project consists of developing a new toll road from I-25 north of Colorado Springs (Northgate Rd.) to Woodmen Road (Scenario 1), reconstructing Powers Boulevard from Woodmen Road to Drennan Road as a six lane freeway as currently proposed in the ongoing Powers Corridor Improvement Project, and constructing a new toll road that generally follows the existing Drennan Road alignment from the Powers Boulevard/Drennan Road Interchange to I-25 just north of Academy Boulevard. The section from I-25 (Northgate) to Woodmen Road would be the same as that described in Scenario 1. The new corridor west of Powers/Drennan Interchange would be constructed as a four-lane toll road and some portions of the project would be located on new alignment. The corridor is approximately 12 miles long. New right-of-way is required at the north and south ends of the project; however, the majority of the corridor followed the existing Powers Boulevard alignment. The proposed section shown in Figure 5-22 provides the widths for lanes, median treatments and shoulders assumed for the new roadway. It also shows the limits of the frontage roads.

New interchanges were assumed at 10 locations along the corridor at major interstate, highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

Information from the ongoing Powers Corridor Improvement Project was used to develop the cost estimate for the project.



Project Limits: I-25N (Northgate Rd.) to
New Arterial East of I-25S

Project Length: 27 Miles

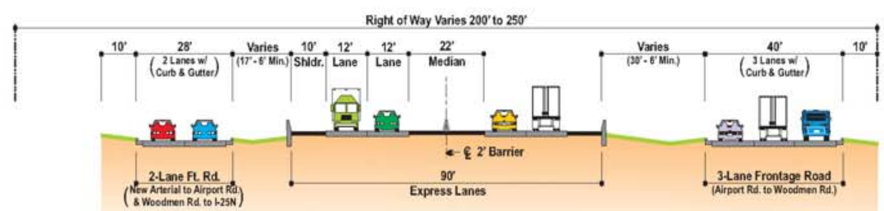
Project Type: New 4-Lane Toll Road

Description: Tolling new capacity

Improvement Scenario: Build two express lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes (Mainline): 2 each direction
Number of Lanes (Frontage Roads): Varies 2 to 3 lanes each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 10'
Median Width: 22'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling

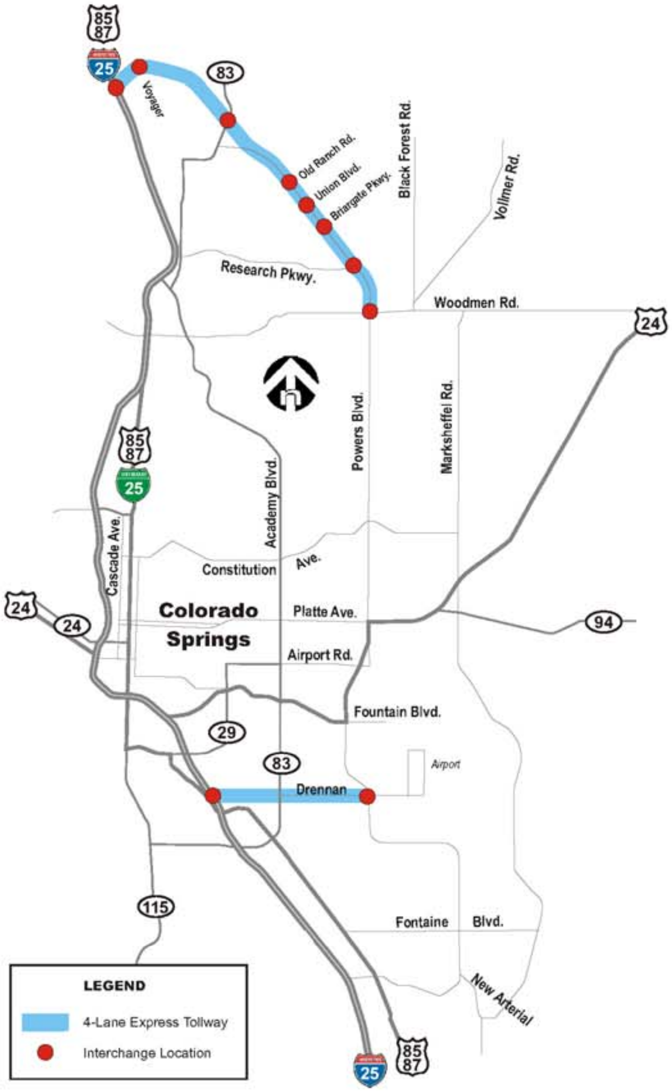


Powers Blvd. Corridor

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

POWERS BOULEVARD CORRIDOR IMPROVEMENTS - SCENARIO 3

FIGURE 5-21



Project Limits: I-25N (Northgate Rd.) to Woodmen Road and I-25S to Powers/Drennan interchange.

Project Length: 12 Miles

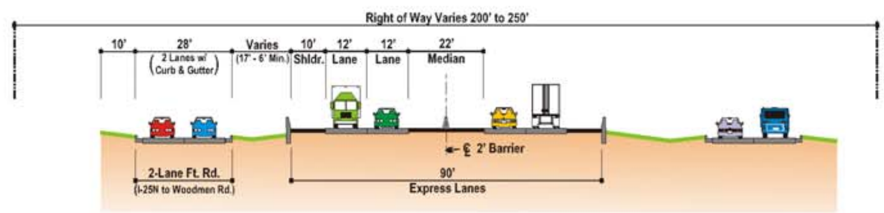
Project Type: New 4-Lane Toll Road

Description: Tolling new capacity

Improvement Scenario: Build two express lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes (Mainline): 2 each direction
Number of Lanes (Frontage Roads): Varies 2 to 3 lanes each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 10'
Median Width: 22'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Powers Blvd. Corridor
(I-25N to Woodmen and Powers/Drennan to I-25S)*
*Note: Woodmen to Powers/Drennan – ongoing CDOT 6-Lane Freeway Project (not included in toll Scenario)

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POWERS BOULEVARD CORRIDOR IMPROVEMENTS - SCENARIO 4

FIGURE 5-22

BANNING-LEWIS PARKWAY SCENARIOS 1 AND 2

The Banning-Lewis Parkway project consists of developing a new roadway corridor between I-25 north of Colorado Springs (Northgate Road) to I-25 south (Academy Boulevard). The new corridor would be approximately 31 miles long and includes a four-lane roadway on new alignment. The entire project was assumed to be on new right-of-way, however, right-of-way within the Banning Lewis Ranch property was assumed to be dedicated per the annexation agreement with the City of Colorado Springs. The proposed section shown in Figure 5-23 provides the widths for lanes, median treatments and shoulders assumed for the new roadway.

New interchanges were assumed at 11 locations along the corridor at major interstate, highway and arterial crossings. All capacity would be tolled through ETC/ Open Road Tolling so additional tollway access points and toll plazas to enter and exit the toll road were not required.

Information from the Banning Lewis Conceptual Design Report dated September 1998 and the ongoing Springs Toll Road Study were used to develop the cost estimates.

I-70 MOUNTAIN CORRIDOR SCENARIO 1

The I-70 Mountain Corridor Scenario 1 project spans approximately 34 miles from the Eisenhower Tunnels to Floyd Hill. Within this scenario, I-70 would have two general purpose lanes each direction and two reversible express toll lanes located in the median of the existing roadway, separated from the general purpose lanes by a concrete barrier. In addition, a new two-lane tunnel bore would be constructed at both the Eisenhower and Twin Tunnels. It was assumed that the majority of the existing general purpose lanes would need to be reconstructed because the current median width is not sufficient to add two reversible express toll lanes in the median. The existing right-of-way width was determined to be adequate in most locations (approximately 300 feet); however, new right-of-way was included in the overall roadway construction cost at spot locations near Idaho Springs, between Silverplume and Georgetown, and at the Eisenhower and Twin Tunnels for the new tunnel bores.

The proposed sections shown in Figure 5-24 provide the widths for lanes, median treatments, tunnel bores and shoulders assumed for the improved roadway.

No new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the reversible express toll lanes. As shown on Figure 5-24, access to the

Project Limits: I-25N (begin Log 155) to I-25S (end Log 136) at S. Academy Blvd.

Project Length: 31 Miles

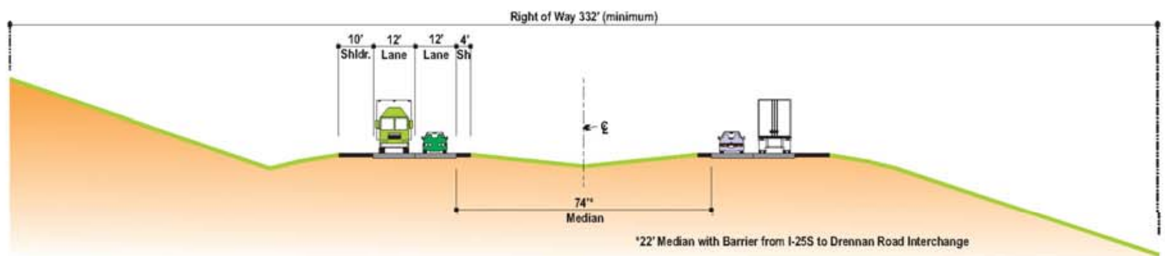
Project Type: New Toll Road

Description: Tolling new capacity

Improvement Scenario: Build two express lanes in each direction on new alignment.

Planned Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: 74'
Terrain: Rolling

Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



Banning-Lewis Parkway Corridor
(4-Lane Express Tollway)

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BANNING-LEWIS PARKWAY CORRIDOR IMPROVEMENTS - SCENARIOS 1 AND 2

FIGURE 5-23

Project Limits: West of Eisenhower Tunnel to Floyd Hill

Project Length: 34 Miles

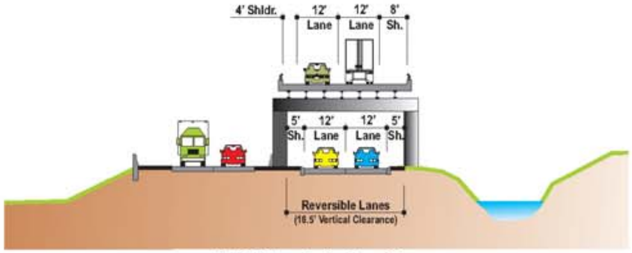
Project Type: Reversible Lanes

Description: Tolling new roadway capacity,
Tolling only reversible tunnel bore

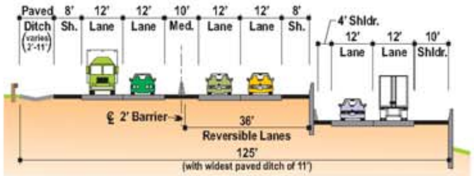
Improvement Scenario: Add 2 reversible express toll lanes.

Existing Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: Varies 4' to >60'
Terrain: Mountainous

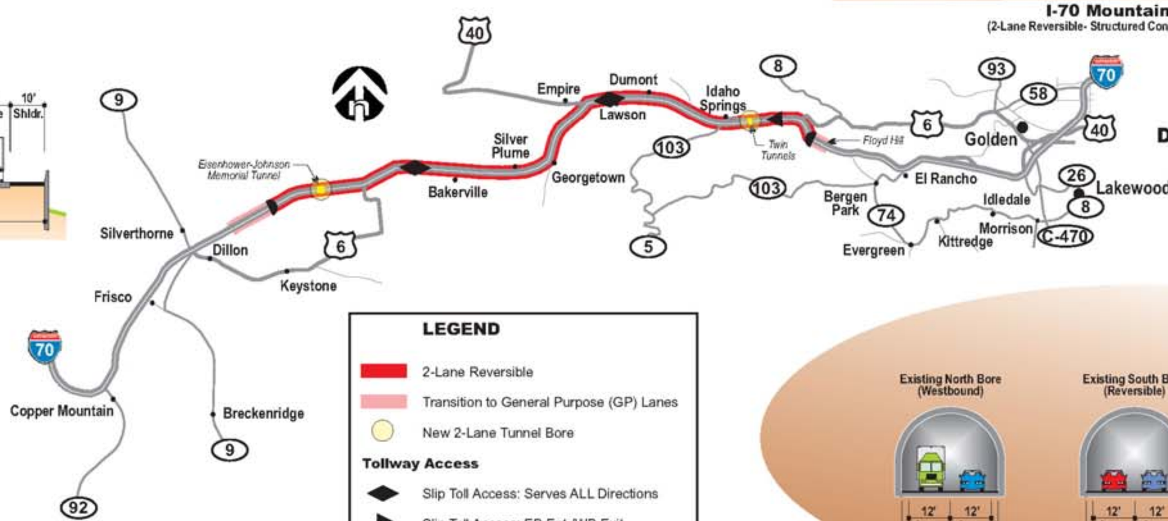
Toll Collection System: Electronic Toll Collection (ETC)
Open-Road Tolling



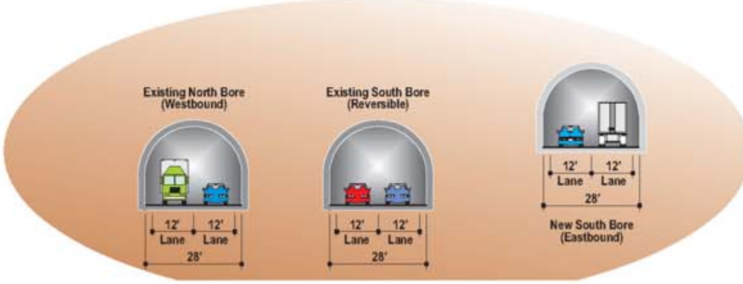
I-70 Mountain Corridor
(2-Lane Reversible- Structured Configuration in Idaho Springs)



I-70 Mountain Corridor
(2-Lane Reversible)



NOTE: Some access points are closed weekly or seasonally, depending on reversible lanes direction.



Twin Tunnels
(2-Lane Reversible)

Eisenhower/Johnson Memorial Tunnel
(2-Lane Reversible)

I-70 MOUNTAIN CORRIDOR IMPROVEMENTS - SCENARIO 1

FIGURE 5-24

reversible express toll lanes would be limited and would involve slip toll access, except for at the beginning and ending sections of the express toll facility, which would have direct access and a transition area, similar to the example shown in Figure 5-1.

Information from the ongoing I-70 Mountain Corridor Environmental Impact Statement was used to develop the cost estimate for the project.

I-70 MOUNTAIN CORRIDOR SCENARIO 2

The I-70 Mountain Corridor Scenario 2 project spans approximately 34 miles from the Eisenhower Tunnels to Floyd Hill. I-70 currently has two general purpose lanes each direction and one additional lane would be added each direction. In addition, a new two-lane tunnel bore would be constructed at the Eisenhower Tunnels and a new three-lane tunnel bore at the Twin Tunnels. The existing right-of-way width was determined to be adequate in most locations (approximately 300 feet); however, new right-of-way was included in the overall roadway construction cost at spot locations near Idaho Springs, between Silverplume and Georgetown, and at the Eisenhower and Twin Tunnels for the new tunnel bores.

The proposed sections shown in Figure 5-25 provide the widths for lanes, median treatments, tunnel bores and shoulders assumed for the improved roadway. No new interchanges were assumed for the corridor, but some existing interchanges required ramp or bridge modifications in order to construct the express toll lanes. As shown on Figure 5-25, all capacity would be tolled so new access points would need to be constructed for the facility.

Information from the ongoing I-70 Mountain Corridor Environmental Impact Statement was used to develop the cost estimate for the project.

I-70 MOUNTAIN CORRIDOR SCENARIOS 3, 3A, 3B

The I-70 Mountain Corridor Scenarios 3, 3A and 3B consist of constructing a new two-lane tunnel bore at the Eisenhower Tunnels and a new three-lane tunnel bore at the Twin Tunnels with one-half mile approach roadways on each side of the tunnels. The project length is approximately five miles with both tunnels combined. New right-of-way was assumed for construction of the new tunnel bores.

The proposed sections shown in Figure 5-26 provides the widths for lanes, median treatments, tunnel bores and shoulders assumed for the new tunnels and approach roadways. All capacity at all tunnel bores would be tolled.

Project Limits: Eisenhower Tunnel to Floyd Hill

Project Length: 34 Miles

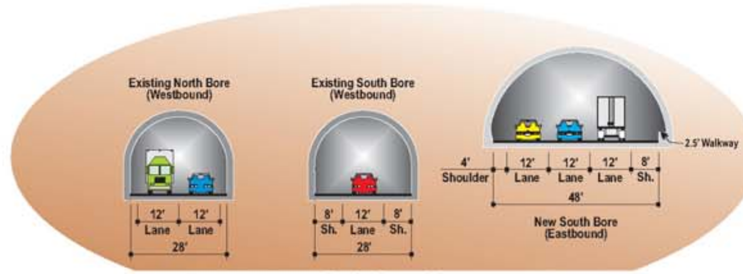
Project Type: New Toll Lanes

Description: Tolling all capacity

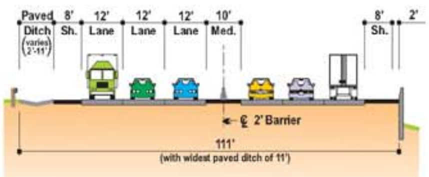
Improvement Scenario: Add 1 Lane each direction; toll all lanes

Existing Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: Varies 4' to >60'
Terrain: Mountainous

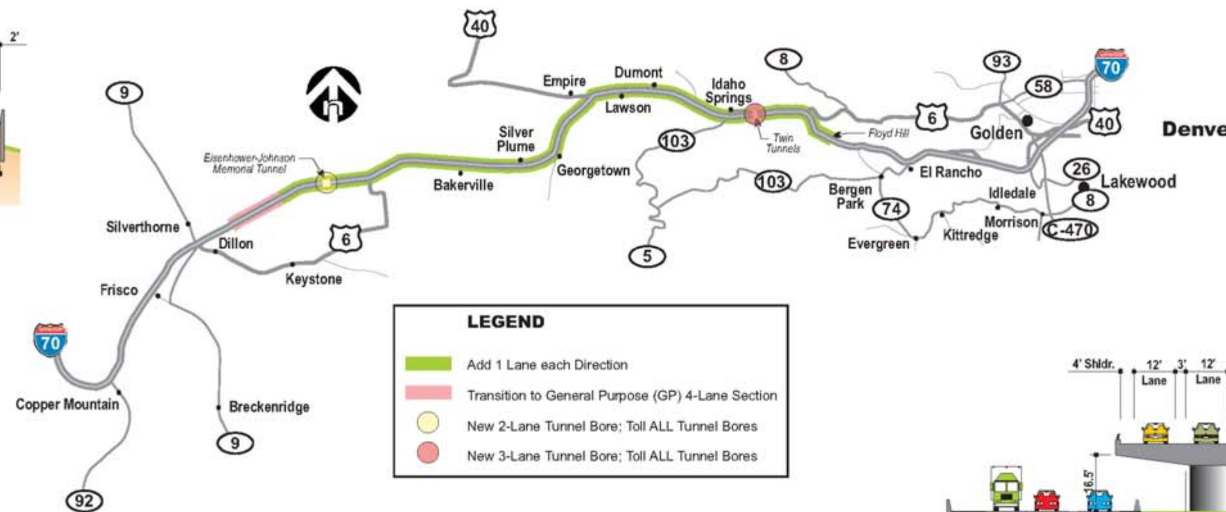
Toll Collection System: Closed Barrier Toll Collection with Manual and ETC

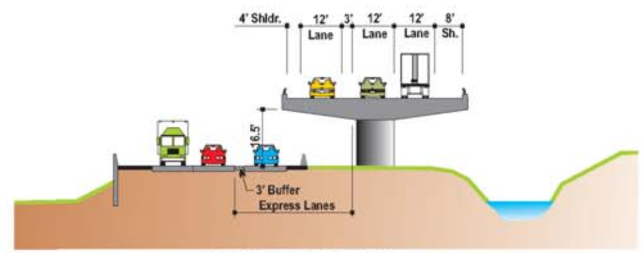


Twin Tunnels

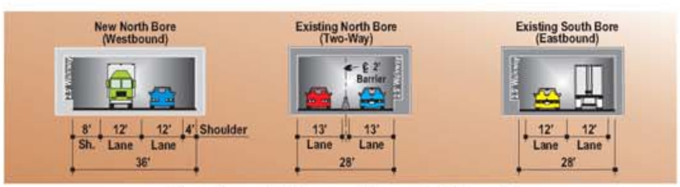


I-70 Mountain Corridor





I-70 Mountain Corridor
Structured Configuration in Idaho Springs



Eisenhower/Johnson Memorial Tunnel
(Two-Way)

I-70 MOUNTAIN CORRIDOR IMPROVEMENTS - SCENARIO 2

FIGURE 5-25

Project Limits: Eisenhower Tunnel and Twin Tunnel

Project Length: 5 Miles

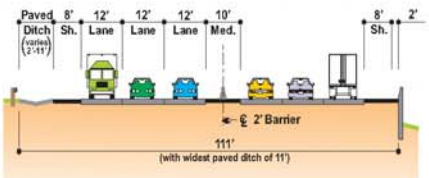
Project Type: New Tunnel Bores

Description: Tolling all capacity

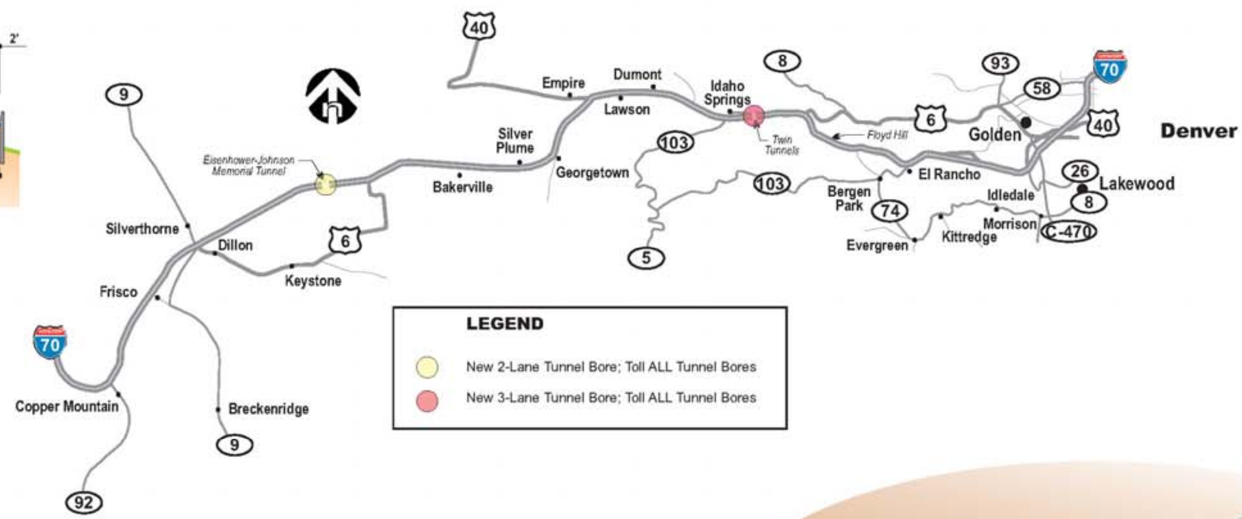
Improvement Scenario:
- Add new 2-lane tunnel bore Eisenhower Tunnels
- Add new 3-lane tunnel bore Twin Tunnels

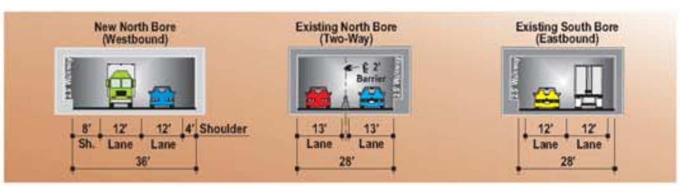
Existing Corridor Attributes: Number of Lanes: 2 each direction
Outside Shoulder Width: 10'
Inside Shoulder Width: 4'
Median Width: Varies 4' to >60'
Terrain: Mountainous

Toll Collection System: Closed Barrier Toll Collection with Manual and ETC

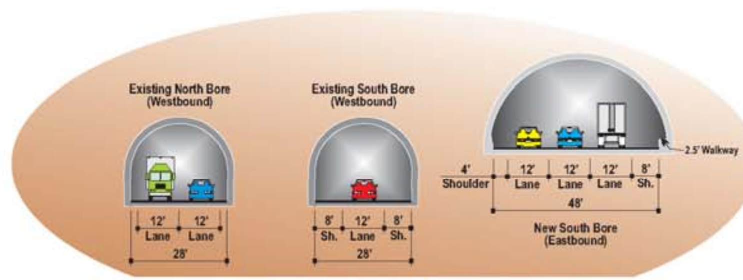


I-70 Mountain Corridor
(Approach Roadways to Tunnel)





Eisenhower/Johnson Memorial Tunnel
(Two-Way)



Twin Tunnels

I-70 MOUNTAIN CORRIDOR IMPROVEMENTS - SCENARIOS 3, 3A AND 3B

FIGURE 5-26

Information from the ongoing I-70 Mountain Corridor Environmental Impact Statement was used to develop the cost estimate for the project.

Table 5-1 shows the roadway capital costs for each project in 2004 dollars.

ESTIMATED TOLL COLLECTION CAPITAL COSTS

The estimated toll system capital costs are shown in Table 5-2. The capital costs are typically subdivided into the following categories for each project:

- Structures - The capital cost for overhead equipment mounting structures and roadside structures for housing equipment.
- Communications - The capital cost for installing a fiber optic communication backbone interconnecting dynamic and changeable signs and tolling points with the local carriers network interconnection.
- Power - The capital cost to install electrical and power backup to the roadside structure housing transaction processing and communication equipment.
- Electronic Toll Collection - The capital cost to furnish and install the components of the ETC subsystem to record transactions that are used to build trips and charge accounts for facility usage.
- Vehicle Detection and Violation Trigger - The capital cost to furnish and install the detection and triggering components of the violation enforcement system that is implemented to assure the integrity of the System by issuing citations to users who fail to obtain a valid transponder to use the facility.
- Violation Enforcement System - The capital cost to furnish and install the components of the of the violation enforcement system that is implemented to assure the integrity of the System by issuing citations to users who fail to obtain a valid transponder to use the facility.
- Lane Processing - The capital cost to furnish and install the lane processing equipment used to identify valid transactions based on the transponder ID read from the vehicle, coordinate updates to the list of transponder ID, and build transaction records that are subsequently used to build trips by the customer service center server.
- Vehicle Access Control - The capital cost to furnish and install overhead dynamic message and combined fixed, static and changeable message signs for informing users regarding the approaching express lane facility and the trip charges to various destinations.
- Host Processing - The capital cost for the host computer system that in located at the Agency’s leased office space and used to process the

Table 5-1
Summary of Roadway Capital Cost Estimates
Second-Tier Candidate Toll Projects

Location	Limits	Length (miles)	Roadway Capital Costs (000)	Roadway Cost per Mile (000)
I-25 Express Toll Lanes Scenario 1	U.S. 36 to S.H. 66	26	$ 299,200	$ 11,508
I-25 Express Toll Lanes Scenario 2	U.S. 36 to S.H. 7	12	225,800	18,817
I-70 East Express Toll Lanes Scenario 1	I-25 to E-470	12	648,000	54,000
I-70 East Express Toll Lanes Scenario 2	I-25 to Chambers Road	8	555,200	69,400
I-70 East Express Toll Lanes Scenario 3	Colorado to Chambers Road	6	258,600	43,100
U.S. 36 Express Toll Lanes	I-25 to Foothills Parkway	18	1,206,100	67,006
I-225 Express Toll Lanes	I-70 to S.H. 83	8	171,600	21,450
I-270 Express Toll Lanes	I-25 to I-70	5	205,700	38,093
C-470 Express Toll Lanes Scenario 1, 1A	I-25 to Kipling	14	314,200	22,443
C-470 Express Toll Lanes Scenario 2, 2A	I-25 to I-70	26	514,000	19,769
Northwest Corridor Toll Road Scenario 1	C-470 to NW Parkway/US 36	24	852,600	35,525
Northwest Corridor Toll Road Scenario 2	SH 128 to SH 58	14	319,200	22,800
I-70 West Toll Road Scenario 1	West of Eisenhower Tunnel to Floyd Hill	34	2,603,500	76,574
I-70 West Toll Road Scenario 2	Eisenhower Tunnel to Floyd Hill	34	2,480,300	72,950
I-70 West Toll Road Scenario 3, 3A, 3B	Eisenhower Tunnel and Twin Tunnel	5	639,200	127,840
U.S. 287 Bypass Toll Road	U.S. 287 to I-25 Connector	12	142,200	11,850
Powers Boulevard Toll Road Scenario 1	I-25N (Northgate Rd.) to Woodmen Rd.	9	175,200	19,467
Powers Boulevard Toll Road Scenario 2	I-25N (Northgate Rd.) to Drennan	21	550,000	26,190
Powers Boulevard Toll Road Scenario 3	I-25N (Northgate Rd.) to New Arterial	27	722,100	26,744
Powers Boulevard Toll Road Scenario 4	Following Drennan Alignment	12	229,600	19,133
Banning-Lewis Parkway Toll Road Scenario 1	I-25N to I-25S at Fountain (unimproved Powers Blvd.)	31	573,600	18,503
Banning-Lewis Parkway Toll Road Scenario 2	I-25N to I-25S at Fountain (improved Powers Blvd.)	31	573,600	18,503
Front Range Toll Road Scenario 1	I-25N (at Fort Collins) to I-25S (south of Pueblo)	194	2,344,100	12,083
Front Range Toll Road Scenario 2	I-25N (at Fort Collins) to I-25S (north of Pueblo)	169	1,979,400	11,712
I-25 Sc 1/U.S. 36/I-270/I-70E Sc 3/I-225 Toll System	System	62	2,894,700	46,689

Table 5-2
Summary of Toll Collection Capital Cost Estimates
Second-Tier Candidate Toll Projects

Location	Limits	Length (miles)	Toll Collection Capital Costs (000)
I-25 Express Toll Lanes Scenario 1	U.S. 36 to S.H. 66	26	$ 7,820
I-25 Express Toll Lanes Scenario 2	U.S. 36 to S.H. 7	12	6,640
I-70 East Express Toll Lanes Scenario 1	I-25 to E-470	12	4,812
I-70 East Express Toll Lanes Scenario 2	I-25 to Chambers Road	8	4,577
I-70 East Express Toll Lanes Scenario 3	Colorado to Chambers Road	6	4,577
U.S. 36 Express Toll Lanes	I-25 to Foothills Parkway	18	7,500
I-225 Express Toll Lanes	I-70 to S.H. 83	8	3,241
I-270 Express Toll Lanes	I-25 to I-70	5	3,168
C-470 Express Toll Lanes Scenario 1, 1A	I-25 to Kipling	14	5,707
C-470 Express Toll Lanes Scenario 2, 2A	I-25 to I-70	26	7,706
Northwest Corridor Toll Road Scenario 1	C-470 to NW Parkway/US 36	24	6,240
Northwest Corridor Toll Road Scenario 2	SH 128 to SH 58	14	6,240
I-70 West Toll Road Scenario 1	West of Eisenhower Tunnel to Floyd Hill	34	7,305
I-70 West Toll Road Scenario 2	Eisenhower Tunnel to Floyd Hill	34	6,279
I-70 West Toll Road Scenario 3, 3A, 3B	Eisenhower Tunnel and Twin Tunnel	5	6,279
U.S. 287 Bypass Toll Road	U.S. 287 to I-25 Connector	12	2,840
Powers Boulevard Toll Road Scenario 1	I-25N (Northgate Rd.) to Woodmen Rd.	9	9,022
Powers Boulevard Toll Road Scenario 2	I-25N (Northgate Rd.) to Drennan	21	13,715
Powers Boulevard Toll Road Scenario 3	I-25N (Northgate Rd.) to New Arterial	27	16,375
Powers Boulevard Toll Road Scenario 4	Following Drennan Alignment	12	16,375
Banning-Lewis Parkway Toll Road Scenario 1	I-25N to I-25S at Fountain (unimproved Powers Blvd.)	31	10,408
Banning-Lewis Parkway Toll Road Scenario 2	I-25N to I-25S at Fountain (improved Powers Blvd.)	31	10,408
Front Range Toll Road Scenario 1	I-25N (at Fort Collins) to I-25S (south of Pueblo)	194	17,649
Front Range Toll Road Scenario 2	I-25N (at Fort Collins) to I-25S (north of Pueblo)	169	16,919
I-25 Sc 1/U.S. 36/I-270/I-70E Sc 3/I-225 Toll System	System	62	23,641

transactions sent from the lane processing equipment and then forward the ETC transactions to the remote customer service center server.

- Project Delivery - The capital costs for the System Integrator's project management, document preparation in accordance with the contract and successful system and acceptance testing as a condition of acceptance by the Agency.

The primary assumptions made in developing these tables was for single tolling point facilities, a roadside cabinet was used instead of a toll and communication building to reduce trade costs and communication transmission is arranged through the local carrier. Also, host software is licensed from a vendor with no customization and paid for as an operating cost. For multi-tolling point projects, a communication backbone is installed that is routed for the approximate length of the facility to interconnect tolling points and provide flexibility in locating dynamic and changeable signs. Toll and communication buildings are installed at each toll point to provide a more durable and secure structure with a trade cost that can be spread. Facilities that included the toll and communication building also included costs associated with a remotely monitored security access control system. Reversible lane facilities include costs for gate access control. Finally, the tunnel toll plaza project includes manual equipment costs. All capital cost estimates for each project are in 2004 dollars.

ESTIMATED ROADWAY ANNUAL OPERATIONS AND MAINTENANCE COST

Annual roadway operations and maintenance (O&M) costs were developed for each project. The derivation was, in part, based on the experiences of the other turnpike systems currently in operation in Colorado (E-470 and Northwest Parkway), other express toll systems in operation throughout the country, and team experience on other similar toll studies. O&M costs refer to the perpetual costs associated with the operations and upkeep of the turnpike system. These costs represent the annual revenue necessary to responsibly operate and maintain the toll road in a manner similar with customary practice. The annual roadway O&M costs for each project included cost estimates for the following cost categories:

- Insurance – The annual costs to insure the toll facility including property, liability and business interruption insurance.

- Colorado State Patrol (CSP) – The annual costs to employ CSP for the toll facility for enforcement and safety. For the smaller candidate toll projects, this assumed one patrol car operating at all times in three shifts – weekdays, weeknights and weekends. For the larger candidate toll projects, such as the Front Range or the system concepts, a dedicated troop was assumed, operating at all times in three shifts – weekdays, weeknights and weekends and includes the vehicle O & M costs.

- Roadway Maintenance – Roadway maintenance costs are those costs associated with the upkeep of the turnpike pavement and roadside, including snow removal, mowing, sign and guardrail repair, minor bridge repair, and pavement resurfacing. The annual costs to maintain the entire length of the toll facility were developed as an annual cost per lane-mile.

- Facility Maintenance – Facility maintenance is the annual operations and maintenance and utilities for a facility related to roadway and bridge maintenance and equipment, including signing and lighting for the toll facility. The cost is based on the square footage of the facility.

- Engineering/Traffic Consulting – The annual costs associated with retaining an independent engineering and traffic consultant for the toll system.

Table 5-3 shows the roadway annual O&M cost estimates for each project in 2004 dollars.

ESTIMATED TOLL COLLECTION ANNUAL OPERATIONS AND MAINTENANCE COST

Annual toll collection O & M costs are shown in Table 5-4 for each of the projects. These are the costs incurred annually to operate and maintain the toll system described in detail in Chapters 3 and 4. The two categories of costs that apply to all projects are administration and maintenance. Administration costs are the minimum expenses incurred by the Agency to manage operations and maintenance and perform the audit and reconciliation activities required by statute. This includes daily review of system, revenue and violation performance to identify anomalies and trends. It is assumed these activities will take place at a leased commercial space suited for this operation. The host computer system is assumed to reside in this space and communications to the remote express lane or toll road facility and the regional customer service and violation processing or

Table 5-3
Summary of Roadway Operation and Maintenance Cost Estimates
Second-Tier Candidate Toll Projects

Location	Limits	Length (miles)	Roadway O&M Costs
I-25 Express Toll Lanes Scenario 1	U.S. 36 to S.H. 66	26	$ 1,980,000
I-25 Express Toll Lanes Scenario 2	U.S. 36 to S.H. 7	12	1,110,000
I-70 East Express Toll Lanes Scenario 1	I-25 to E-470	12	1,370,000
I-70 East Express Toll Lanes Scenario 2	I-25 to Chambers Road	8	1,100,000
I-70 East Express Toll Lanes Scenario 3	Colorado to Chambers Road	6	1,000,000
U.S. 36 Express Toll Lanes	I-25 to Foothills Parkway	18	1,690,000
I-225 Express Toll Lanes	I-70 to S.H. 83	8	1,110,000
I-270 Express Toll Lanes	I-25 to I-70	5	960,000
C-470 Express Toll Lanes Scenario 1, 1A	I-25 to Kipling	14	1,460,000
C-470 Express Toll Lanes Scenario 2, 2A	I-25 to I-70	26	2,160,000
Northwest Corridor Toll Road Scenario 1	C-470 to NW Parkway/US 36	24	2,040,000
Northwest Corridor Toll Road Scenario 2	SH 128 to SH 58	14	1,460,000
I-70 West Toll Road Scenario 1	West of Eisenhower Tunnel to Floyd Hill	34	2,440,000
I-70 West Toll Road Scenario 2	Eisenhower Tunnel to Floyd Hill	34	2,440,000
I-70 West Toll Road Scenario 3, 3A, 3B	Eisenhower Tunnel and Twin Tunnel	5	1,360,000
U.S. 287 Bypass Toll Road	U.S. 287 to I-25 Connector	12	1,350,000
Powers Boulevard Toll Road Scenario 1	I-25N (Northgate Rd.) to Woodmen Rd.	9	1,170,000
Powers Boulevard Toll Road Scenario 2	I-25N (Northgate Rd.) to Drennan	21	1,870,000
Powers Boulevard Toll Road Scenario 3	I-25N (Northgate Rd.) to New Arterial	27	2,220,000
Powers Boulevard Toll Road Scenario 4	Following Drennan Alignment	12	1,370,000
Banning-Lewis Parkway Toll Road Scenario 1	I-25N to I-25S at Fountain (unimproved Powers Blvd.)	31	2,450,000
Banning-Lewis Parkway Toll Road Scenario 2	I-25N to I-25S at Fountain (improved Powers Blvd.)	31	2,450,000
Front Range Toll Road Scenario 1	I-25N (at Fort Collins) to I-25S (south of Pueblo)	194	14,500,000
Front Range Toll Road Scenario 2	I-25N (at Fort Collins) to I-25S (north of Pueblo)	169	13,050,000
I-25 Sc 1/U.S. 36/I-270/I-70E Sc 3/I-225 Toll System	System	62	6,640,000

Table 5-4
Summary of Toll Collection Operation and Maintenance Cost Estimates
Second-Tier Candidate Toll Projects

Location	Limits	Length (miles)	Toll Collection Operation and Maintenance Costs (Opening Year)
I-25 Express Toll Lanes Scenario 1	U.S. 36 to S.H. 66	26	$ 2,045,000
I-25 Express Toll Lanes Scenario 2	U.S. 36 to S.H. 7	12	1,358,000
I-70 East Express Toll Lanes Scenario 1	I-25 to E-470	12	2,471,000
I-70 East Express Toll Lanes Scenario 2	I-25 to Chambers Road	8	2,419,000
I-70 East Express Toll Lanes Scenario 3	Colorado to Chambers Road	6	2,437,000
U.S. 36 Express Toll Lanes	I-25 to Foothills Parkway	18	2,275,000
I-225 Express Toll Lanes	I-70 to S.H. 83	8	1,720,000
I-270 Express Toll Lanes	I-25 to I-70	5	1,513,000
C-470 Express Toll Lanes Scenario 1, 1A	I-25 to Kipling	14	2,017,000
C-470 Express Toll Lanes Scenario 2, 2A	I-25 to I-70	26	2,727,000
Northwest Corridor Toll Road Scenario 1	C-470 to NW Parkway/US 36	24	3,043,000
Northwest Corridor Toll Road Scenario 2	SH 128 to SH 58	14	3,412,000
I-70 West Toll Road Scenario 1	West of Eisenhower Tunnel to Floyd Hill	34	1,294,000
I-70 West Toll Road Scenario 2	Eisenhower Tunnel to Floyd Hill	34	3,171,000
I-70 West Toll Road Scenario 3, 3A, 3B	Eisenhower Tunnel and Twin Tunnel	5	3,171,000
U.S. 287 Bypass Toll Road	U.S. 287 to I-25 Connector	12	830,000
Powers Boulevard Toll Road Scenario 1	I-25N (Northgate Rd.) to Woodmen Rd.	9	2,026,000
Powers Boulevard Toll Road Scenario 2	I-25N (Northgate Rd.) to Drennan	21	4,908,000
Powers Boulevard Toll Road Scenario 3	I-25N (Northgate Rd.) to New Arterial	27	5,833,000
Powers Boulevard Toll Road Scenario 4	Following Drennan Alignment	12	2,578,000
Banning-Lewis Parkway Toll Road Scenario 1	I-25N to I-25S at Fountain (unimproved Powers Blvd.)	31	2,192,000
Banning-Lewis Parkway Toll Road Scenario 2	I-25N to I-25S at Fountain (improved Powers Blvd.)	31	2,588,000
Front Range Toll Road Scenario 1	I-25N (at Fort Collins) to I-25S (south of Pueblo)	194	2,968,000
Front Range Toll Road Scenario 2	I-25N (at Fort Collins) to I-25S (north of Pueblo)	169	2,960,000
I-25 Sc 1/U.S. 36/I-270/I-70E Sc 3/I-225 Toll System	System	62	8,843,000

remote service providers is assumed to be interconnected to the local carrier's network using a T1 service. For projects with a single toll point, the vendor field support item includes the cost to license the non-developmental, off the shelf host software in addition to maintaining the host hardware including all peripherals.

Projects with multiple toll points do not include host software with this item. For operations, the cost to process, store, transfer, reconcile and report ETC transactions dominates all other operations cost. This cost is derived by using the calculated trips and an industry supported unit price. The only alternative transaction for express lane operations, violation transactions, are assumed to be revenue neutral, meaning all costs incurred to gather and process annual violations is assumed to be equal to the revenue generated from the fees and fines paid by violators receiving a violation citation. Historical performance for a properly designed, implemented, operated and managed violation processing system demonstrating net revenue is generated.

The maintenance category includes the cost to maintain the field level toll system equipment. This work is performed by trained technicians, who must be provided with a vehicle, a cell phone, test equipment, and tools to perform preventative maintenance and restore failures. An inventory of spare parts is also included under this category to make the necessary replacements and repairs. The leased facility is assumed to have space allocated to storing spare parts in addition to what the technician carries in the vehicle. Annual O & M cost estimates for each project is in 2004 dollars.

ANNUAL REPLACEMENT FUND DEPOSIT

Included in the annual costs of a toll system are replacement reserve fund considerations. On an annual basis, the Replacement Fund Deposit needs to be deposited for the replacement of the system's infrastructure to replace or refurbish the system at the end of its service life, assumed to be 30 years. The depreciation of the system's value is a function of the system's use and the extent that annual maintenance activities are able to defer major system reconstruction. It is assumed that upon reaching maturity, the system's driving surface, including the pavement and bridge decks, will require reconstruction in its original configuration. The remaining value of these elements, consisting of the pavement base and the bridge substructure, would depend on the rate of the system's deterioration due to use and weathering. Upgrades of the system for increased capacity demands or new design standards would not be included. Assuming a typical construction value for these elements of the system's infrastructure of around 15 percent of the original construction costs, necessary deposits into a "sinking" fund are assumed to accrue during the typical life of the system to provide the necessary funds to reconstruct the system upon reaching its service life. Using a discount rate of 6 percent, an annual deposit approximately equaling 0.19 percent of the original construction cost would be necessary during the life of the project. The replacement fund deposits would likely have to be supplemented by potential bond refinancing or sale of additional debt if the costs to reconstruct exceed available monies in this fund. Other considerations such as toll increases and major maintenance bond issues are considerations for additional funds, of course, assuming the project toll revenues could support this process.

For each project, the annual replacement fund deposit value estimated includes only the portion of construction costs and right-of-way associated with the toll facility and was not based on costs associated with improvements/reconstruction of the general purpose lanes.

Table 5-5 shows the annual cost estimate for the Replacement Fund Deposit for each project. In addition, Appendix A shows a summary of the Replacement Fund Deposit for each project.

Table 5-5
Summary of Annual Reserve Maintenance Fund Deposit Cost Estimates
Second-Tier Candidate Toll Projects

Location	Limits	Length (miles)	Replacement Fund Deposit
I-25 Express Toll Lanes Scenario 1	U.S. 36 to S.H. 66	26	$ 380,000
I-25 Express Toll Lanes Scenario 2	U.S. 36 to S.H. 7	12	290,000
I-70 East Express Toll Lanes Scenario 1	I-25 to E-470	12	660,000
I-70 East Express Toll Lanes Scenario 2	I-25 to Chambers Road	8	570,000
I-70 East Express Toll Lanes Scenario 3	Colorado to Chambers Road	6	260,000
U.S. 36 Express Toll Lanes	I-25 to Foothills Parkway	18	1,150,000
I-225 Express Toll Lanes	I-70 to S.H. 83	8	200,000
I-270 Express Toll Lanes	I-25 to I-70	5	200,000
C-470 Express Toll Lanes Scenario 1, 1A	I-25 to Kipling	14	540,000
C-470 Express Toll Lanes Scenario 2, 2A	I-25 to I-70	26	880,000
Northwest Corridor Toll Road Scenario 1	C-470 to NW Parkway/US 36	24	1,390,000
Northwest Corridor Toll Road Scenario 2	SH 128 to SH 58	14	550,000
I-70 West Toll Road Scenario 1	West of Eisenhower Tunnel to Floyd Hill	34	3,310,000
I-70 West Toll Road Scenario 2	Eisenhower Tunnel to Floyd Hill	34	3,160,000
I-70 West Toll Road Scenario 3, 3A, 3B	Eisenhower Tunnel and Twin Tunnel	5	1,080,000
U.S. 287 Bypass Toll Road	U.S. 287 to I-25 Connector	12	240,000
Powers Boulevard Toll Road Scenario 1	I-25N (Northgate Rd.) to Woodmen Rd.	9	150,000
Powers Boulevard Toll Road Scenario 2	I-25N (Northgate Rd.) to Drennan	21	470,000
Powers Boulevard Toll Road Scenario 3	I-25N (Northgate Rd.) to New Arterial	27	620,000
Powers Boulevard Toll Road Scenario 4	Following Drennan Alignment	12	200,000
Banning-Lewis Parkway Toll Road Scenario 1	I-25N to I-25S at Fountain (unimproved Powers Blvd.)	31	980,000
Banning-Lewis Parkway Toll Road Scenario 2	I-25N to I-25S at Fountain (improved Powers Blvd.)	31	980,000
Front Range Toll Road Scenario 1	I-25N (at Fort Collins) to I-25S (south of Pueblo)	194	4,040,000
Front Range Toll Road Scenario 2	I-25N (at Fort Collins) to I-25S (north of Pueblo)	169	3,400,000
I-25 Sc 1/U.S. 36/I-270/I-70E Sc 3/I-225 Toll System	System	62	2,750,000

CHAPTER 6

FINANCIAL ANALYSIS

The study team, including participants from Citigroup, WSA and HNTB, evaluated the financial feasibility of the CDOT's second-tier candidate toll projects to assist CDOT in determining the priority and economic feasibility of the projects. This comprehensive evaluation encompassed 12 individual express toll and/or managed lane projects, including multiple construction/design approaches for certain projects. In all, the financial feasibility for 28 individual project scenarios was reviewed.

Three main themes resulted from this analysis:

1) Targeting for early completion programs that can fully fund construction costs through toll revenues (i.e., without requiring federal, state and/or local monies);

2) Combining certain toll roads into a "Regional System" allows the more economical toll roads to "leverage up" less economical toll roads, resulting in a more efficient use of toll revenues, reduced total dependence on governmental monies, and provides for a more cohesive financing; and

3) Supporting projects with some federal/state monies to enhance statewide project completion feasibility.

METHODOLOGY FOR PRO FORMAS

The study team evaluated the 28 second-tier toll projects based on a variety of assumptions provided by WSA and HNTB, and the financial feasibility analyses performed by Citigroup. The assumptions incorporated into the analyses include project capital costs, annual toll revenues, operations and maintenance costs (both roadway and toll collection), and renewal and replacement fund deposits. Each project assumed an opening date of January 1, 2010 and a three-year construction period.

The project cost factors share the following characteristics:

- Project Costs – provided in 2004 dollars, inflated at 5.0 percent annually to 2010;
- Annual Toll Revenues – provided in 2004 dollars, inflated at 2.5 percent from 2004 to year of revenue generation;
- Roadway and Toll Collection Operations and Maintenance – provided in 2004 dollars, inflated at 3.0 percent from 2004 to year of incurred expense; and
- Annual Renewal and Replacement Fund Deposit – provided in 2004 dollars, inflated at 3.0 percent from 2004 to year of incurred expense.

Each project was evaluated utilizing the same financial methodology:

First, the total costs for each scenario assumed the combination of project costs and bond costs. Bond costs for each scenario incorporated the following assumptions:

- Cost of Issuance – assumed at 2.0 percent of total senior lien bonds to fund estimated standard bond issuance expenses including legal fees, underwriting fees and rating agency fees, among others;
- Capitalized Interest – three years;
- Interest Earnings on Capitalized Interest and Construction Fund - 1.5 percent for three years;
- Construction Fund Adjustment – 4.5 percent loss on fund balance for three years (difference between borrowing cost and fund earnings);
- Debt Service Reserve Fund – 10.0 percent of senior lien principal; and
- Interest Rates – Current rates and, for the market sensitivity analysis, current rates plus 100 bps.

Second, each scenario was stressed to maximize the amount of senior lien bonds that could be issued, subject to certain constraints. These constraints, as listed below, are those likely to be imposed upon a start-up toll road bond program by rating agencies, bond insurers and/or investors.

- Principal Amortization Period – 30-years;
- Senior Lien Coverage Requirement – 1.75 times net revenues. Net revenues equal gross toll revenues less annual operation and maintenance expenses, plus annual debt service reserve fund interest earnings;
- Interest Rates on Senior Lien Current Interest Bonds – rates of August 9, 2004; and
- Interest Rates on Senior Lien Capital Appreciation Bonds – Current interest bond rates of August 9, 2004 plus 0.75 percent.

The financial methodology employed is based on industry practice and comparable startup toll road methodologies. Startup toll roads' senior lien financial structure must be rated at least "investment grade" ("BBB-" or greater) by one of the three major rating agencies to obtain efficient, broad market access. In general, ratings agencies assign BBB- credit ratings to start-up toll roads that meet a minimum senior lien coverage constraint of 1.75 times, have a reliable traffic and revenue study and have a strong management team. This credit assessment is especially true for toll facilities when not all lanes are tolled and when revenues must be generated in a concentrated time period. The coverage for a toll road is calculated by dividing total net revenues by total debt service (i.e., the road must project at least $1.75 in annual net revenues for each $1.00 of annual bond debt service).

Table 6-1 lists each scenario in order of financial feasibility. As later discussed in the section, "Evaluation of Denver Regional Area Projects," the rows titled "Denver Area Projects—Scenario 1" and "Denver Area Projects—Scenario 2" comprise toll systems of all Denver Regional Area Projects. These two Scenarios differ in their assumptions regarding the inclusion of federal and state/local transfers, also as later discussed.

REVIEW OF ALTERNATIVES EVALUATED

In Table 6-1, the alternatives are presented in order of "Percentage of Project Cost," representing the percentage of each project's costs paid from a maximum issuance of senior lien bonds (subject to the previously mentioned constraints) and equity contributions from federal, state and/or local sources (also subject to constraints, as described in the next paragraph). Projects above the blackline are those able to fund at least 70 percent of total project costs through these sources, and thus are deemed more probably financially feasible. Upon review of the projects and comparable industry standards, the study team concluded that such projects have a strong likelihood of financial feasibility as either additional senior bonds or subordinated bonds (with slightly lower coverage constraints of 1.30 times combined debt service coverage) could fund the remaining project costs.

Table 6-1
Summary of All Alternatives Evaluated

Project	Total 2010 Project Cost with COI	Senior Lien Proceeds Par Amount	Federal [1] Upfront Transfers %	Federal [1] Transfers $	Shortfall/ (Excess)	% of Project Cost	State & Local Annual Transfers %	State & Local Gross Transfers $ [2]	State & Local Net Transfers $ [3]
I-70E Express Toll Lanes Scenario 3	293,799,057	293,803,307	0.00%	-	(4,250)	100.00%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3	1,097,606,741	1,097,609,009	0.00%	-	(2,268)	100.00%	0.00%	-	-
I-25 Express Toll Lanes Scenario 1	522,092,110	522,092,920	0.00%	-	(809)	100.00%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3A	1,071,884,739	883,258,993	0.00%	-	188,625,746	82.40%	0.00%	-	-
I-225 Express Toll Lanes	290,149,773	237,603,245	0.00%	-	52,546,529	81.89%	0.00%	-	-
Powers Toll Road Scenario 2	933,255,559	747,768,444	0.00%	-	185,487,115	80.12%	0.00%	-	-
Powers Toll Road Scenario 3	1,210,713,055	879,441,589	0.00%	-	331,271,467	72.64%	0.00%	-	-
I-270 Express Toll Lanes	342,000,226	244,726,949	0.00%	-	97,273,277	71.56%	0.00%	-	-
C-470 Express Toll Lanes Scenario 1A	522,559,134	364,844,370	0.22%	943,015	156,771,749	70.00%	0.00%	-	-
C-470 Express Toll Lanes Scenario 2A	852,240,365	578,498,911	2.58%	18,036,151	255,705,303	70.00%	0.00%	-	-
Powers Toll Road Scenario 4	394,169,608	243,542,868	10.01%	32,365,222	118,261,518	70.00%	0.00%	-	-
I-25 Express Toll Lanes Scenario 2	379,744,624	219,101,717	15.00%	46,724,218	113,918,689	70.00%	0.00%	-	-
Northwest Corridor Scenario 2	526,511,749	297,186,533	16.52%	71,347,792	157,977,424	70.00%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3B	1,054,471,523	593,874,304	16.68%	144,274,552	316,322,667	70.00%	0.00%	-	-
Powers Toll Road Scenario 1	300,882,982	168,314,504	17.14%	42,302,735	90,265,743	70.00%	0.00%	-	-
Denver Area Projects Scenario 2	4,772,150,614	2,581,988,481	19.38%	758,623,843	1,431,538,290	70.00%	0.00%	-	-
I-70E Express Toll Lanes Scenario 2	822,058,672	431,498,113	20.00%	135,053,992	255,506,567	68.92%	10.00%	229,749,539	89,719,374
C-470 Express Toll Lanes Scenario 1	519,767,857	256,798,145	20.00%	85,728,598	177,241,113	65.90%	10.00%	137,088,844	56,055,554
I-70E Express Toll Lanes Scenario 1	942,486,280	465,372,174	20.00%	155,456,018	321,658,088	65.87%	10.00%	250,937,393	97,240,283
C-470 Express Toll Lanes Scenario 2	845,303,390	398,911,804	20.00%	139,815,126	306,576,459	63.73%	10.00%	208,463,594	85,359,182
Denver Area Projects Scenario 1	4,728,017,529	2,558,193,766	10.90%	414,642,845	1,755,180,917	62.88%	1.41%	223,153,273	85,521,879
Northwest Corridor Scenario 1	1,383,715,935	590,950,360	20.00%	230,175,248	562,590,327	59.34%	10.00%	286,314,081	120,009,645
Front Range Toll Road Express Toll Lanes Scenario 2	3,206,570,456	1,291,301,470	20.00%	535,043,465	1,380,224,485	56.96%	10.00%	645,201,105	271,532,386
I-70 Mountain Corridor - Scenario 2	3,973,487,116	1,436,659,073	20.00%	666,449,664	1,870,378,380	52.93%	10.00%	610,475,250	268,215,850
Front Range Toll Road Express Toll Lanes Scenario 1	3,768,725,282	1,321,022,578	20.00%	632,981,471	1,814,721,233	51.85%	10.00%	675,303,371	284,841,439
Banning-Lewis Parkway Toll Road - Scenario 2	918,411,929	214,320,663	20.00%	156,517,093	547,574,173	40.38%	10.00%	134,309,112	54,563,285
Banning-Lewis Parkway Tollroad - Scenario 1	917,972,752	210,660,853	20.00%	156,517,093	550,794,806	40.00%	10.00%	138,215,349	54,660,250
U.S. 36 Express Toll Lanes	1,901,224,249	384,281,903	20.00%	325,258,901	1,191,683,445	37.32%	10.00%	223,153,273	85,521,879
I-70 Mountain Corridor - Scenario 1	4,025,922,619	291,138,085	20.00%	699,744,728	3,035,039,805	24.61%	10.00%	225,471,439	76,317,237
U.S. 287 Corridor Express Toll Lanes	222,180,746	4,270,319	20.00%	38,865,390	179,045,037	19.41%	10.00%	15,587,417	6,651,248

= Denver Regional Area Projects Selected for Cashflow
[1] Upfront transfers include federal moneys available in the form of a one-time, upfront payment
[2] Gross transfers include the total annual state and local contributions over the life of the program
[3] Net transfers are the present value at 5.00% of the gross transfers to the year 2010

The additional federal, state and/or local equity contributions mentioned above were provided to the extent that senior lien bonds from leveraged toll revenues could not fund at least 70 percent of total project costs, subject to certain limitations. First, federal monies could be available in the form of a one-time, upfront payment. This upfront payment is limited to 20 percent of total 2010 project capital costs (exclusive of bond costs). Second, state and local contributions could be available as an annual transfer of up to 10 percent of total gross toll revenues generated for a specific project in a respective year. This annual transfer amount meets all TABOR restrictions. The need for transfers was determined in a four-step process:

1) Maximize senior lien bonds to meet at least 70 percent of total project costs;

2) If less than 70 percent of total project costs remain unfunded, utilize federal upfront contribution of up to 20 percent of 2010 project costs;

3) If less than 70 percent of total project costs remain unfunded after senior lien bond issuance and upfront federal contribution, utilize

annual state and local transfers up to 10 percent of gross toll revenues for a respective year; and

4) If less than 70 percent of total project costs remain unfunded after senior lien bond issuance, upfront federal contribution, and state/local annual transfers, project is deemed infeasible and falls below the blackline.

SELECTION OF ALTERNATIVES

Upon review of Table 6-1, for the individual projects containing multiple possible scenarios, the study team identified one scenario as the "Selected Alternative" for each project based on maximizing financial feasibility. However, the study team continues to present both Scenarios 1 and 2 for the Denver Area Projects as these two scenarios have different financing assumptions. Table 6-2, following, shows those projects selected by the study team, and with CDOT's review and concurrence, as the Selected Alternatives.

Table 6-2
Summary of Selected Alternatives

Project	Total 2010 Project Cost with COI	Senior Lien Proceeds Par Amount	Federal [1] Upfront Transfers %	Federal [1] Transfers $	Shortfall/ (Excess)	% of Project Cost	State & Local Annual Transfers %	State & Local Gross Transfers $ [2]	State & Local Net Transfers $ [3]
I-70E Express Toll Lanes Scenario 3	293,799,057	293,803,307	0.00%	-	(4,250)	100.00%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3	1,097,606,741	1,097,609,009	0.00%	-	(2,268)	100.00%	0.00%	-	-
I-25 Express Toll Lanes Scenario 1	522,092,110	522,092,920	0.00%	-	(809)	100.00%	0.00%	-	-
I-225 Express Toll Lanes	290,149,773	237,603,245	0.00%	-	52,546,529	81.89%	0.00%	-	-
I-270 Express Toll Lanes	342,000,226	244,726,949	0.00%	-	97,273,277	71.56%	0.00%	-	-
C-470 Express Toll Lanes Scenario 2A	852,240,365	578,498,911	2.58%	18,036,151	255,705,303	70.00%	0.00%	-	-
Powers Toll Road Scenario 4	394,169,608	243,542,868	10.01%	32,365,222	118,261,518	70.00%	0.00%	-	-
Northwest Corridor Scenario 2	526,511,749	297,186,533	16.52%	71,347,792	157,977,424	70.00%	0.00%	-	-
Denver Area Projects Scenario 2	4,772,150,614	2,581,988,481	19.38%	758,623,843	1,431,538,290	70.00%	0.00%	-	-
Denver Area Projects Scenario 1	4,728,017,529	2,558,193,766	10.90%	414,642,845	1,755,180,917	62.88%	1.41%	223,153,273	85,521,879
Front Range Toll Road Express Toll Lanes Scenario 1	3,768,725,282	1,321,022,578	20.00%	632,981,471	1,814,721,233	51.85%	10.00%	675,303,371	284,841,439
Banning-Lewis Parkway Toll Road - Scenario 2	918,411,929	214,320,663	20.00%	156,517,093	547,574,173	40.38%	10.00%	134,309,112	54,563,285
U.S. 36 Express Toll Lanes	1,901,224,249	384,281,903	20.00%	325,258,901	1,191,683,445	37.32%	10.00%	223,153,273	85,521,879
U.S. 287 Corridor Express Toll Lanes	222,180,746	4,270,319	20.00%	38,865,390	179,045,037	19.41%	10.00%	15,587,417	6,651,248

= Denver Regional Area Projects Selected for Cashflow
[1] Upfront transfers include federal moneys available in the form of a one-time, upfront payment
[2] Gross transfers include the total annual state and local contributions over the life of the program
[3] Net transfers are the present value at 5.00% of the gross transfers to the year 2010

As represented in Table 6-2, all projects in the Denver Regional Area, except for U.S. 36 Express Toll Lanes, are "financially feasible" on a stand-alone basis when using the 70 percent threshold (under the assumption that additional senior or subordinated debt would fund the remaining 30 percent of project costs).

EVALUATION OF DENVER REGIONAL AREA PROJECTS

Each Denver Area Project labeled Scenario 1 and Scenario 2 is a "System Credit," containing all projects in the Denver Area (with the individual projects shaded in grey). The system credit combines revenues and costs from each individual project, thus allowing surplus revenues from the most financially feasible toll roads to benefit other projects in the system credit. It should be noted that the Fast Tracks contribution for BRT has not been included in the financing assumptions.

Scenarios 1 and 2 differ in that in Scenario 1 calculates the maximum federal and state/local subsidy on a project-by-project basis, whereas Scenario 2 calculates the maximum federal and state/local subsidy on an aggregate project basis (combining all costs and forecasted revenues as one project).

Although the Denver Regional Area Projects Scenario 2 is financially feasible with the maximum amount of federal monies allocated, and some state/local annual transfers, the bulk of all Denver Regional Area Projects' surplus revenue and federal and state/local subsidies are paying for the U.S. 36 project. It is important to note that this "system credit" approach (Scenario 2) will only be feasible to the extent a strong prioritization of projects exists and the overall system credit has a strong financial history before the U.S. 36 project is financed. Since the U.S. 36 project requires a higher allocation of federal and state/local subsidies, and because it draws upon other projects' surplus revenue, it is only feasible to complete this project after those projects that stand on their own.

FEASIBILITY SUMMARY

Based on the results for the Denver Regional Area Projects, approximately $4.7 billion of project costs can be financed (including costs of issuance) with $414 million in equity contributions from CDOT under Scenario 1 and with $759 million in equity contributions under Scenario 2. This means with at least a 13 or 20 percent upfront contribution to projects for Scenarios 1 and 2, respectively, CDOT may complete major corridor improvements. Supplementing the benefits of CDOT's equity contributions is the option that as a system credit, monies transferred to projects can be paid back to CDOT over time. The study team expects that annual transfers can be paid back first, then any monies in excess after all payments will be available to repay CDOT for any upfront federal contributions to the system costs. Tables 6-3 and 6-4, represent the potential repayment to CDOT from CTE for contributions.

The column labeled "Total Excess Revenues to Repay Transfers" in each table reflects the monies available annually to repay CDOT for any state and local transfers made. The following column, "Total Transfers Estimate" represents the amount of state and local monies transferred from CDOT, and the last column, "Excess after State and Local Transfer Repaid," reflects the amount of monies in the CTE excess fund after debt service, operations and maintenance are paid and CDOT state and local transfers are repaid. This excess monies column is shown on a cumulative basis and may be used to repay CDOT for any upfront Federal monies provided to a project or, at guidance by CDOT, to other capital construction projects.

It should be noted that in Table 6-3, while Denver Regional Area Projects Scenario 1 appears to provide greater surplus, it does not fully fund U.S. 36 to the 70 percent threshold.

Table 6-3
Denver Regional Area Projects—Scenario 1
Cashflow of Funds to Repay Transfers

Date	Total Non-System Revenue	Total Non-System O&M	Estimated DSRF Earnings	Total Senior Lien DS	Estimated Sub DS *	Total Excess Revenues to Repay Transfers	Total Transfers Estimate	Excess After S&L Transfer Repaid
6/1/10	131,745,811	36,564,269	12,790,969	60,956,788	23,444,918	23,570,805	1,608,611	21,962,194
6/1/11	142,740,689	37,909,885	12,790,969	68,217,365	26,237,448	23,166,960	1,769,715	43,359,439
6/1/12	154,741,819	39,307,236	12,790,969	74,386,365	28,610,140	25,229,046	1,946,954	66,641,530
6/1/13	167,846,768	40,758,401	12,790,969	81,160,877	31,215,722	27,502,736	2,141,945	92,002,322
6/1/14	182,162,948	42,265,546	12,790,969	88,593,960	34,074,600	30,019,812	2,356,463	119,665,671
6/1/15	197,808,640	43,830,926	12,790,969	96,782,718	37,224,122	32,761,843	2,592,466	149,835,048
6/1/16	214,914,125	45,456,894	12,790,969	105,771,496	40,681,345	35,795,360	2,852,105	182,778,303
6/1/17	233,622,942	47,145,897	12,790,969	115,664,817	44,486,468	39,116,729	3,137,747	218,757,285
6/1/18	254,093,280	48,900,491	12,790,969	126,532,787	48,666,457	42,784,514	3,451,996	258,089,803
6/1/19	276,499,513	50,723,334	12,790,969	138,490,770	53,265,681	46,810,697	3,797,718	301,102,782
6/1/20	301,033,914	52,617,202	12,790,969	151,648,922	58,326,508	51,232,251	4,178,065	348,156,969
6/1/21	327,908,540	54,584,983	12,790,969	166,124,691	63,894,112	56,095,723	4,596,503	399,656,189
6/1/22	357,357,329	56,629,691	12,790,969	182,043,787	70,016,841	61,457,980	5,056,849	456,057,320
6/1/23	389,638,429	58,754,467	12,790,969	199,572,857	76,758,791	67,343,283	5,563,299	517,837,304
6/1/24	425,036,768	60,962,584	12,790,969	218,851,303	84,173,578	73,840,271	6,120,471	585,557,104
6/1/25	463,866,916	63,257,457	12,790,969	240,074,737	92,336,437	80,989,254	6,733,444	659,812,914
6/1/26	495,089,237	65,642,643	12,790,969	256,810,865	98,773,410	86,653,289	7,177,851	739,288,352
6/1/27	528,488,523	68,121,854	12,790,969	274,744,281	105,670,877	92,742,481	7,651,589	824,379,244
6/1/28	564,221,022	70,698,958	12,790,969	293,988,307	113,072,426	99,252,301	8,156,594	915,474,951
6/1/29	602,454,480	73,377,991	12,790,969	314,604,072	121,001,566	106,261,819	8,694,929	1,013,041,841
6/1/30	643,369,008	76,163,160	12,790,969	336,716,595	129,506,383	113,773,839	9,268,794	1,117,546,886
6/1/31	680,311,089	79,058,854	12,790,969	356,475,750	137,106,058	120,461,396	9,785,530	1,228,222,752
6/1/32	720,138,367	82,069,648	12,790,969	377,825,040	145,317,323	127,717,326	10,331,073	1,345,609,005
6/1/33	762,383,921	85,200,317	12,790,969	384,942,402	148,054,770	156,977,400	10,907,030	1,491,679,375
6/1/34	807,199,528	88,455,840	12,790,969	380,630,492	146,396,343	204,507,821	11,515,097	1,684,672,099
6/1/35	854,746,786	91,841,411	12,790,969	403,038,282	155,014,724	217,643,339	12,157,064	1,890,158,374
6/1/36	897,179,496	95,362,447	12,790,969	422,896,932	162,652,666	229,058,420	12,710,210	2,106,506,583
6/1/37	941,799,493	99,024,603	12,790,969	443,802,162	170,693,139	241,070,558	13,288,525	2,334,288,616
6/1/38	988,724,038	102,833,775	12,790,969	465,838,822	179,168,778	253,673,632	13,893,153	2,574,069,095
6/1/39	1,038,076,928	106,796,117	12,790,969	489,041,182	188,092,762	266,937,836	14,525,291	2,826,481,639
6/1/40	1,089,988,872	110,918,049	12,790,969	489,335,007	188,205,772	314,321,013	15,186,192	3,125,616,460
Total	15,835,189,220	2,075,234,932	396,520,034	7,805,564,426	3,002,140,164	3,348,769,733	223,153,273	

* Subdebt estimated at 1.30x coverage constraint. Senior Lien at 1.75x coverage constraint, per model sheet shown

Table 6-4
Denver Area Projects—Scenario 2
Cashflow of Funds to Repay Transfers

Date	Total Non-System Revenue	Total Non-System O&M	Estimated DSRF Earnings	Total Senior Lien DS	Estimated Sub DS *	Total Excess Revenues to Repay Transfers	Total Transfers Estimate	Excess After S&L Transfer Repaid
6/1/10	131,745,811	36,564,269	12,909,942	61,767,052	23,756,558	22,567,874	-	22,567,874
6/1/11	142,740,689	37,909,885	12,909,942	67,278,720	25,876,431	24,585,597	-	47,153,470
6/1/12	154,741,819	39,307,236	12,909,942	73,337,870	28,206,873	26,799,783	-	73,953,253
6/1/13	167,846,768	40,758,401	12,909,942	80,000,462	30,769,408	29,228,439	-	103,181,692
6/1/14	182,162,948	42,265,546	12,909,942	87,316,032	33,583,089	31,908,224	-	135,089,916
6/1/15	197,808,640	43,830,926	12,909,942	95,364,160	36,678,523	34,844,973	-	169,934,889
6/1/16	214,914,125	45,456,894	12,909,942	104,210,182	40,080,839	38,076,153	-	208,011,041
6/1/17	233,622,942	47,145,897	12,909,942	113,937,902	43,822,270	41,626,815	-	249,637,857
6/1/18	254,093,280	48,900,491	12,909,942	124,631,931	47,935,358	45,535,442	-	295,173,299
6/1/19	276,499,513	50,723,334	12,909,942	136,389,696	52,457,575	49,838,850	-	345,012,150
6/1/20	301,033,914	52,617,202	12,909,942	149,329,498	57,434,422	54,562,734	-	399,574,884
6/1/21	327,908,540	54,584,983	12,909,942	163,560,887	62,908,033	59,764,578	-	459,339,463
6/1/22	357,357,329	56,629,691	12,909,942	179,219,515	68,930,583	65,487,483	-	524,826,945
6/1/23	389,638,429	58,754,467	12,909,942	196,453,076	75,558,875	71,781,953	-	596,608,899
6/1/24	425,036,768	60,962,584	12,909,942	215,417,800	82,853,000	78,713,326	-	675,322,225
6/1/25	463,866,916	63,257,457	12,909,942	236,297,332	90,883,589	86,338,480	-	761,660,705
6/1/26	495,089,237	65,642,643	12,909,942	252,776,678	97,221,799	92,358,060	-	854,018,764
6/1/27	528,488,523	68,121,854	12,909,942	270,443,249	104,016,634	98,816,729	-	952,835,493
6/1/28	564,221,022	70,698,958	12,909,942	289,387,961	111,303,062	105,740,984	-	1,058,576,477
6/1/29	602,454,480	73,377,991	12,909,942	309,704,477	119,117,106	113,164,848	-	1,171,741,326
6/1/30	643,369,008	76,163,160	12,909,942	331,495,704	127,498,348	121,121,738	-	1,292,863,064
6/1/31	680,311,089	79,058,854	12,909,942	350,950,854	134,981,098	128,230,225	-	1,421,093,289
6/1/32	720,138,367	82,069,648	12,909,942	371,990,124	143,073,125	135,915,413	-	1,557,008,702
6/1/33	762,383,921	85,200,317	12,909,942	394,338,712	151,668,735	144,086,099	-	1,701,094,802
6/1/34	807,199,528	88,455,840	12,909,942	418,086,249	160,802,403	152,764,977	-	1,853,859,779
6/1/35	854,746,786	91,841,411	12,909,942	443,322,379	170,508,607	161,984,332	-	2,015,844,111
6/1/36	897,179,496	95,362,447	12,909,942	465,560,699	179,061,807	170,104,485	-	2,185,948,596
6/1/37	941,799,493	99,024,603	12,909,942	488,964,829	188,063,396	178,656,608	-	2,364,605,204
6/1/38	988,724,038	102,833,775	12,909,942	513,597,809	197,537,619	187,664,777	-	2,552,269,981
6/1/39	1,038,076,928	106,796,117	12,909,942	539,537,099	207,514,269	197,139,386	-	2,749,409,367
6/1/40	1,089,988,872	110,918,049	12,909,942	566,846,273	218,017,797	207,116,695	-	2,956,526,062
Total	15,835,189,220	2,075,234,932	400,208,215	8,091,515,208	3,112,121,234	2,956,526,062	-	

* Subdebt estimated at 1.30x coverage constraint. Senior Lien at 1.75x coverage constraint, per model sheet shown

MARKET SENSITIVITY ANALYSIS

As interest rates fall, each project's ability to leverage debt increases thereby increasing its feasibility. Conversely, as interest rates rise, each project's ability to leverage debt decreases, which then lowers its feasibility. Clearly, the current interest rate environment affects the overall feasibility of each project. In order to represent the effect of market movements on these analyses, each project was evaluated reflecting an increase in market rates by an addition of 100 basis points (1.0 percent) to current market rates. The tables for "All Scenarios," Tables 6-5 and 6-6, are as follows.

Table 6-5
Costs Associated with Entire Construction – All Alternatives, Market +100 bps

Project	Total 2010 Project Cost with COI	Senior Lien Proceeds Par Amount	Federal [1] Upfront Transfers %	Transfers $	Shortfall/ (Excess)	% of Project Cost	State & Local Annual Transfers %	Gross Transfers $ [2]	Net Transfers $ [3]
I-70E Express Toll Lanes Scenario 3	293,798,477	293,798,481	0.00%	-	(4)	100.00%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3	1,097,605,975	1,097,602,625	0.00%	-	3,350	100.00%	0.00%	-	-
I-25 Express Toll Lanes Scenario 1	512,469,481	441,904,339	0.00%	-	70,565,141	86.23%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3A	1,058,504,240	771,754,834	0.00%	-	286,749,406	72.91%	0.00%	-	-
I-225 Express Toll Lanes	285,947,794	202,586,754	0.00%	-	83,361,040	70.85%	0.00%	-	-
Powers Toll Road Scenario 2	920,876,029	644,605,693	0.00%	-	276,270,336	70.00%	0.00%	-	-
Powers Toll Road Scenario 3	1,206,528,019	757,572,888	8.79%	86,993,397	361,961,733	70.00%	0.00%	-	-
I-270 Express Toll Lanes	341,301,223	208,666,022	10.80%	30,235,903	102,399,298	70.00%	0.00%	-	-
C-470 Express Toll Lanes Scenario 1A	522,562,852	308,251,615	13.43%	57,566,754	156,744,483	70.00%	0.00%	-	-
C-470 Express Toll Lanes Scenario 2A	852,245,201	490,245,955	15.21%	106,329,404	255,669,843	70.00%	0.00%	-	-
Powers Toll Road Scenario 4	394,171,598	211,258,891	20.00%	64,665,779	118,246,928	70.00%	0.88%	13,020,086	5,363,641
Northwest Corridor Scenario 2	526,511,457	282,154,424	20.00%	86,377,473	157,979,560	70.00%	7.00%	115,029,237	50,172,859
I-70 Mountain Corridor - Scenario 3B	1,054,474,843	565,185,459	20.00%	172,991,070	316,298,314	70.00%	7.78%	228,694,667	100,289,176
I-25 Express Toll Lanes Scenario 2	379,741,615	203,501,902	20.00%	62,298,957	113,940,756	70.00%	7.90%	104,363,248	40,789,729
Powers Toll Road Scenario 1	300,885,041	161,272,976	20.00%	49,361,418	90,250,647	70.00%	8.33%	87,532,702	36,128,017
Denver Area Projects Scenario 2	4,760,118,716	2,457,452,967	20.00%	782,893,543	1,519,772,207	68.07%	10.00%	1,583,518,922	612,348,278
I-70E Express Toll Lanes Scenario 2	814,199,593	366,005,788	20.00%	135,053,992	313,139,812	61.54%	10.00%	229,749,539	89,719,374
C-470 Express Toll Lanes Scenario 1	515,484,201	221,101,017	20.00%	85,728,598	208,654,586	59.52%	10.00%	137,088,844	56,055,554
Denver Area Projects Scenario 1	4,706,535,729	2,245,619,933	14.41%	548,201,680	1,912,714,116	59.36%	2.14%	338,182,510	135,694,739
I-70E Express Toll Lanes Scenario 1	934,026,910	394,877,422	20.00%	155,456,018	383,693,470	58.92%	10.00%	250,937,393	97,240,283
C-470 Express Toll Lanes Scenario 2	838,551,496	342,646,022	20.00%	139,815,126	356,090,347	57.54%	10.00%	208,463,594	85,359,182
Northwest Corridor Scenario 1	1,374,171,603	511,414,253	20.00%	230,175,248	632,582,101	53.97%	10.00%	286,314,081	120,009,645
Front Range Toll Road Express Toll Lanes Scenario 2	3,185,831,024	1,118,472,874	20.00%	535,043,465	1,532,314,685	51.90%	10.00%	645,201,105	271,532,386
I-70 Mountain Corridor - Scenario 2	3,951,864,686	1,256,472,156	20.00%	666,449,664	2,028,942,867	48.66%	10.00%	610,475,250	268,215,850
Front Range Toll Road Express Toll Lanes Scenario 1	3,747,385,656	1,143,192,365	20.00%	632,981,471	1,971,211,821	47.40%	10.00%	675,303,371	284,841,439
Banning-Lewis Parkway Toll Road - Scenario 2	914,705,360	183,432,589	20.00%	156,517,093	574,755,678	37.16%	10.00%	134,309,112	54,563,285
Banning-Lewis Parkway Tollroad - Scenario 1	914,157,162	178,864,270	20.00%	156,517,093	578,775,799	36.69%	10.00%	138,215,349	54,660,250
U.S. 36 Express Toll Lanes	1,894,262,095	326,263,957	20.00%	325,258,901	1,242,739,237	34.39%	10.00%	223,153,273	85,521,879
I-70 Mountain Corridor - Scenario 1	4,019,367,034	236,508,212	20.00%	699,744,728	3,083,114,094	23.29%	10.00%	225,471,439	76,317,237
U.S. 287 Corridor Express Toll Lanes	222,093,398	3,542,420	20.00%	38,865,390	179,685,588	19.09%	10.00%	15,587,417	6,651,248

= Denver Regional Area Projects Selected for Cashflow
[1] Upfront transfers include federal moneys available in the form of a one-time, upfront payment
[2] Gross transfers include the total annual state and local contributions over the life of the program
[3] Net transfers are the present value at 5.00% of the gross transfers to the year 2010

Table 6-6
Costs Associated with Entire Construction – Selected Alternatives, Market +100 bps

Project	Total 2010 Project Cost with COI	Senior Lien Proceeds Par Amount	Federal [1] Upfront Transfers %	Transfers $	Shortfall/ (Excess)	% of Project Cost	State & Local Annual Transfers %	Gross Transfers $ [2]	Net Transfers $ [3]
I-70E Express Toll Lanes Scenario 3	293,798,477	293,798,481	0.00%	-	(4)	100.00%	0.00%	-	-
I-70 Mountain Corridor - Scenario 3	1,097,605,975	1,097,602,625	0.00%	-	3,350	100.00%	0.00%	-	-
I-25 Express Toll Lanes Scenario 1	512,469,481	441,904,339	0.00%	-	70,565,141	86.23%	0.00%	-	-
I-225 Express Toll Lanes	285,947,794	202,586,754	0.00%	-	83,361,040	70.85%	0.00%	-	-
I-270 Express Toll Lanes	341,301,223	208,666,022	10.80%	30,235,903	102,399,298	70.00%	0.00%	-	-
C-470 Express Toll Lanes Scenario 2A	852,245,201	490,245,955	15.21%	106,329,404	255,669,843	70.00%	0.00%	-	-
Powers Toll Road Scenario 4	394,171,598	211,258,891	20.00%	64,665,779	118,246,928	70.00%	0.88%	13,020,086	5,363,641
Northwest Corridor Scenario 2	526,511,457	282,154,424	20.00%	86,377,473	157,979,560	70.00%	7.00%	115,029,237	50,172,859
Denver Area Projects Scenario 2	4,760,118,716	2,457,452,967	20.00%	782,893,543	1,519,772,207	68.07%	10.00%	1,583,518,922	612,348,278
Denver Area Projects Scenario 1	4,706,535,729	2,245,619,933	14.41%	548,201,680	1,912,714,116	59.36%	2.14%	338,182,510	135,694,739
Front Range Toll Road Express Toll Lanes Scenario 1	3,747,385,656	1,143,192,365	20.00%	632,981,471	1,971,211,821	47.40%	10.00%	675,303,371	284,841,439
Banning-Lewis Parkway Toll Road - Scenario 2	914,705,360	183,432,589	20.00%	156,517,093	574,755,678	37.16%	10.00%	134,309,112	54,563,285
U.S. 36 Express Toll Lanes	1,894,262,095	326,263,957	20.00%	325,258,901	1,242,739,237	34.39%	10.00%	223,153,273	85,521,879
U.S. 287 Corridor Express Toll Lanes	222,093,398	3,542,420	20.00%	38,865,390	179,685,588	19.09%	10.00%	15,587,417	6,651,248

= Denver Regional Area Projects Selected for Cashflow
[1] Upfront transfers include federal moneys available in the form of a one-time, upfront payment
[2] Gross transfers include the total annual state and local contributions over the life of the program
[3] Net transfers are the present value at 5.00% of the gross transfers to the year 2010

SUMMARY

Figures 6-1 through 6-3 present a summary of the financial feasibility analyses previously discussed. Figure 6-1 presents project feasibility based on current market rates. Under this scenario, five projects are considered financially feasible in that 70 percent or more of project costs can be covered solely with toll revenue. Another four projects could be feasible with some federal funding support; the percent of federal funds ranging from 10.0 to 20.0 percent of the 70 percent feasibility threshold.

Figure 6-2 presents a similar summary of project feasibility but assumes an increase of 100 basis points over current market interest rates. This assumption produces similar results, with the exception of the I-270 Express Toll Lane project. With the increase in market interest rates, this project could be feasible if supported with 10.8 percent federal funds. The C-470, Scenario 2A project could also be feasible if supported with 15.2 percent federal funds. The other projects in this category could be feasible with the maximum 20.0 percent federal fund support.

Figure 6-3 provides a side-by-side comparison of both scenarios described above.

Project	Type	Scenario	Feasible With Toll Revenue Only	Feasible With Some Federal Funds	Not Feasible
I-25 North	ETL	1	●		
I-70 East	ETL	3	●		
U.S. Route 36	ETL	1			●
I-225	ETL	1	●		
I-270	ETL	1	●		
C-470	ETL	2A		● (2.6%)*	
Northwest Corridor	Toll Road	2		● (16.5%)*	
Denver Area "System"	System	1			●
Denver Area "System"	System	2		● (19.4%)*	
I-70 Mountain Corridor	Tunnels	3A	●		
U.S. 287 Bypass	Toll Road	1			●
Powers Blvd.	Toll Road	4		● (10.0%)*	
Banning Lewis Pkwy	Toll Road	2			●
Front Range T.R.	Toll Road	1			●

* Percent federal funds needed.

FINANCIAL FEASIBILITY SUMMARY (With Full Project Cost)

FIGURE 6-1

Project	Type	Scenario	Feasible With Toll Revenue Only	Feasible With Some Federal Funds	Not Feasible
I-25 North	ETL	1	●		
I-70 East	ETL	3	●		
U.S. Route 36	ETL	1			●
I-225	ETL	1	●		
I-270	ETL	1		● (10.8%)*	
C-470	ETL	2A		● (15.2%)*	
Northwest Corridor	Toll Road	2		● (20.0%)*	
Denver Area “System”	System	1			●
Denver Area “System”	System	2			●
I-70 Mountain Corridor	Tunnels	3A	●		
U.S. 287 Bypass	Toll Road	1			●
Powers Blvd.	Toll Road	4		● (20.0%)*	
Banning Lewis Pkwy	Toll Road	2			●
Front Range T.R.	Toll Road	1			●

* Percent federal funds needed.

Wilbur Smith Associates
ENGINEERS
PLANNERS
ECONOMISTS

FINANCIAL FEASIBILITY SUMMARY (With Full Project Cost +100bps)

FIGURE 6-2

Project	Type	Scenario	Full Project Cost	Full Project Cost + 100 bps
I-25 North	ETL	1	🟢	🟢
I-70 East	ETL	3	🟢	🟢
U.S. Route 36	ETL	1	🔴	🔴
I-225	ETL	1	🟢	🟢
I-270	ETL	1	🟢	🟡 (10.8%)
C-470	ETL	2A	🟡 (2.6%)	🟡 (15.2%)
Northwest Corridor	Toll Road	2	🟡 (16.5%)	🟡 (20.0%)
Denver Area “System”	System	1	🔴	🔴
Denver Area “System”	System	2	🟡 (19.4%)	🔴
I-70 Mountain Corridor	Tunnels	3A	🟢	🟢
U.S. 287 Bypass	Toll Road	1	🔴	🔴
Powers Blvd.	Toll Road	4	🟡 (10.0%)	🟡 (20.0%)
Banning Lewis Pkwy	Toll Road	2	🔴	🔴
Front Range T.R.	Toll Road	1	🔴	🔴

🟢 Feasible with Toll Revenue Only 🟡 Feasible with Tolls and Some Federal Funds (Percent Federal Funds Needed) 🔴 Not Feasible

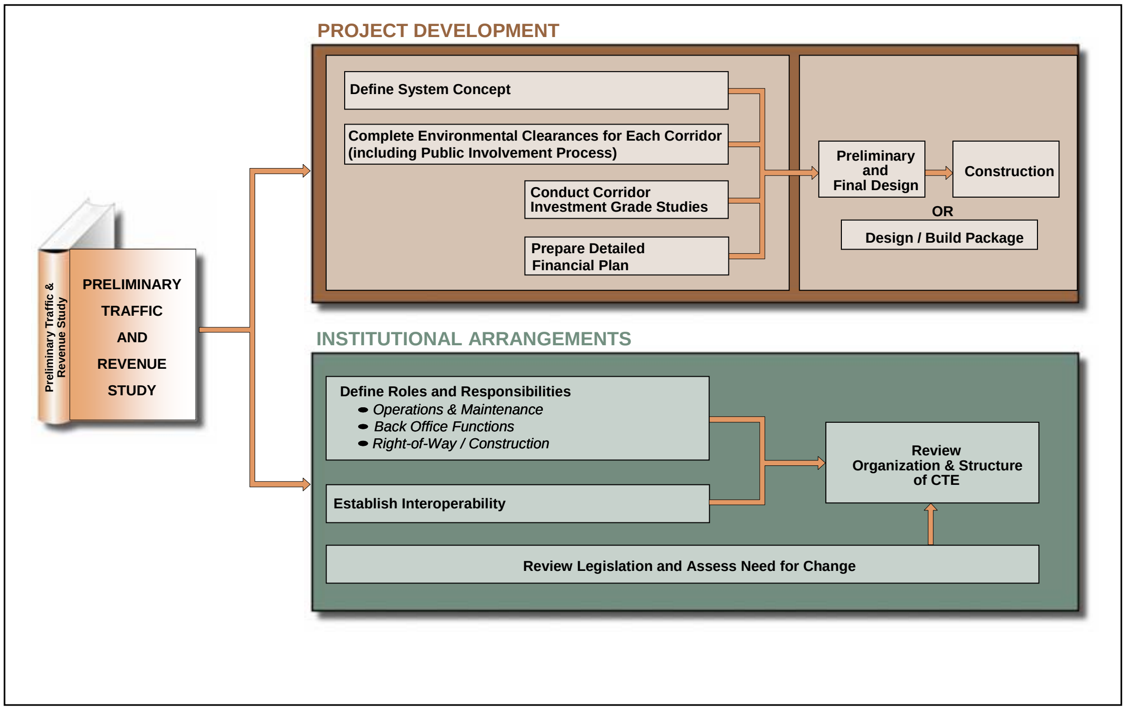
CHAPTER 7

NEXT STEPS TOWARD IMPLEMENTATION

This preliminary traffic and revenue study has tested the basic financial feasibility of utilizing tolls to finance the construction of transportation improvements in a wide range of corridors throughout Colorado. Although the results have indicated that a number of the corridors are potentially viable candidates for tolling, there is much work yet to be done before tolling could be implemented in any corridor. This chapter outlines those future tasks.

As illustrated by Figure 7-1, the next steps fall into two categories:

- Project Development; and
- Institutional Arrangements.



NEXT STEPS TO IMPLEMENTATION
FIGURE 7-1

In many cases, work on any number of these tasks could be on-going simultaneously; in some cases, certain tasks need to be completed before another task can even be initiated. These inter-relationships are also briefly described herein.

PROJECT DEVELOPMENT

This category of future efforts involves elements that lead to the definition, the approval, and the design and construction of a toll facility in any of the corridors. The following are brief synopsis of the key tasks in this category.

- This study has suggested that defining a “system” approach to implementing toll facilities would likely be the most viable approach. System continuity of toll corridors is important, but even more critical is the approach of a financing system. The proper balance of the physical and the finance systems must be carefully considered.

  It would likely be most strategic to first construct those projects or portions of projects that were found to have the highest financial feasibility or the ability to be self-supporting. Then, excess revenues generated by these early projects could help to fund those projects that are less viable, but that are still important components of the overall toll system from a system continuity and access standpoint.

  If the CTE Board determines that this system approach is appropriate, a strategic definition of the system should be developed before any individual corridor proceeds into implementation.

- Prior to implementation of tolls in any corridor, those improvements will need to obtain environmental clearances through the National Environmental Policy Act process. Most of the corridors either have, or are currently being studied under the NEPA process, and coordination with these efforts should be on-going. These studies are in various stages of completion; some of the on-going studies are programmed to be completed within the next year, while others are at least several years from completion.

  If this study indicates that a corridor is expected to be financially feasible for tolling, it is important that the NEPA study include a toll alternative and that it be carried forward as a reasonable alternative unless it has an environmental fatal flaw.

It should be noted, however, that financial feasibility in this study does not imply that tolling will be the chosen alternative through the NEPA process, merely that it is a viable alternative which should be considered. Within the NEPA process, the secondary and indirect impacts of tolling, such as the impacts to alternative routes due to some traffic diversion, should be considered. Environmental impacts should not be significantly different from non-tolled alternatives because open-road tolling with no manual toll collection is being proposed on all projects. Considering these impacts up front in the NEPA documents can help streamline the environmental process and help to minimize the need for an environmental re-evaluation. If a Record of Decision is reached on an alternative that does not include tolls, the environmental clearances would need to be re-evaluated before a toll facility could be pursued.

- Each of the second-tier projects determined to be warranted for further consideration of tolling will need to be studied in more detail within an Investment Grade Study. An Investment Grade Study would include further optimization of toll rates, traveler origin-destination surveys, more detailed economic development analysis and further refinement of inputs into traffic models. In addition, more detailed capital and operating and maintenance cost estimates would be developed. The final Investment Grade Study would then be conducted at a level of detail suitable for pursuing actual toll project financing. A study of this nature typically requires 6 to 9 months to complete; ideally it would be programmed to be completed at the same time or before the environmental clearances for a project are obtained.

- A detailed financial plan will need to be prepared for each project. A process for additional funding will need to be determined for those projects that cover less than 100 percent of their capital costs through tolling. The toll revenues could be combined with a number of other funding mechanisms (federal, state or local).

INSTITUTIONAL ARRANGEMENTS

Numerous options are available for the governance of a statewide system of express toll lanes or other toll projects. This group of next steps deals with the need to establish roles and responsibilities for the various entities who would be involved in implementation, the need for any legislative changes, and the organizational or structural needs of CTE in the future.

- Because implementation will likely involve a number of players, it will be important to clearly define the role and responsibilities of each early in the process. The key players will be CDOT, CTE and potentially a wide range of outside service providers (general engineering consultant, traffic and revenue consultant, legal, bond counsel, financial advisor, and bond underwriter). Primary areas in which roles and responsibilities should be defined include:

  - **Operations and Maintenance** – CTE will need to coordinate the operation and maintenance process with other entities, such as CDOT, other toll providers or even other private contractors, if they decide to out-source the operation and maintenance of the facility. It is important to note that a high level of maintenance is critical from a sales standpoint. Therefore, the maintenance provider must be able to ensure that the toll facility will always be a "priority" in their business operation.

  - **Back Office Functions** – These functions are administrative in nature, with probably the most significant function being that of billing and collections. This could be performed by CTE, could be conducted under an agreement with another toll provider such as the E-470 Authority, or could be out-sourced to a private contractor.

  - **Right-of-Way/Construction** – It will be important for CTE and CDOT to come to an agreement on how right-of-way and construction efforts will be handled. It is currently anticipated that CTE would lease right-of-way from CDOT. It is expected that CTE would be responsible for the construction of all toll facilities, while all "free" or general purpose lanes would remain the responsibility of CDOT. These, or other arrangements, should be institutionalized.

- The current legislation which enables the Colorado Tolling Enterprise, mandates that the new toll systems be interoperable with those systems which currently exist – namely E-470 and the Northwest Parkway. Thus, from a user's standpoint, the system would be "seamless" – one transponder, one bill, etc. Methods to ensure this interoperability should be considered and detailed.

- The existing legislation should be reviewed to ensure that the proposed toll projects meet the guidelines of the legislation. If necessary, appropriate revisions to the legislation should be proposed. If the I-70 west project proceeds, in a scenario in which tolls are applied to all traffic, it may be necessary to obtain a change in legislative authority for CTE. Current enabling legislation does not permit tolling of existing capacity.

- Finally, dependent on the outcome of the legislative review and the other institutional arrangements, the structure and organization of CTE, as currently constituted, should be examined. Changes should be considered if they are necessary to efficiently manage and operate the toll system.

Appendix A
Final Unit Cost Assumptions

Colorado
Tolling Enterprise Board

	Units	$/Unit or % Construction	Item Description
Right of Way Acquisition			
- Land - Undeveloped	Acre	$ 10,000	Cost of various types of Land and other right of way related items
- Land - Rural Residential Acreage	Acre	$ 125,000	
- Land - Urban/Sub Residential Acreage	Acre	$ 250,000	
- Land - Urban/Suburban Industrial (vacant)	Acre	$ 40,000	
- Improvements - Rural Residential	L.S. Each	$ 100,000	Displacements taken by alignment
- Improvements - Urban/Sub Residential	L.S. Each	$ 250,000	Displacements taken by alignment
- Improvements - Comm./Indust. Urban/Sub	L.S. Each	$ 800,000	Displacements taken by alignment
- Acquisition, Condemnation, and Admin.	%	40%	Contingency shown as a % of the Total R/W costs - Land + Improvements.
- Relocation Contingency	%	25%	Contingency applied to the costs for Improvements only.
Utility Relocations			
- Along Existing Alignment	Mile	$ 200,000	Cost of relocating utilities for strategies that widen or reconstruct a corridor, but not limited to electric, gas, water, telephone, fiber optic, pipelines, and sanitary sewers.
- Along New Alignment	Mile	$ 50,000	Cost of relocating utilities for strategies that build on new alignment including, but not limited to electric, gas, water, telephone, fiber optic, pipelines, and sanitary sewers.
Grading & Drainage (Mainline)			
- Major Grading and Drainage: Urban Highway Reconstruction 4 to 6 Lanes	CL Mile	$1,300,000	includes grading and drainage
- Major Grading and Drainage: Level, 4-Lane Highway on New Location	CL Mile	$1,000,000	includes grading and drainage
- Major Grading and Drainage: Rolling, 4-Lane Highway on New Location	CL Mile	$3,000,000	includes grading and drainage
- Erosion Control	CL Mile	$200,000	Sodding, seeding, ditch paving, ditch checks, etc.
- Fence	Lin. Ft.	$7.50	Used for new right-of-way only, both sides of roadway
Pavement, Shoulders & Base			
- Light Duty - 2-Lane Outer Roadway Pavement and base	Sq. Yd.	$40.00	Cost for pavement, shoulders and base. (for use on Outer Roadways)
- Heavy Duty -4 or 6-Lane Divided Pavement and Base	Sq. Yd.	$50.00	Cost for pavement, shoulders and base.
- Median Barrier	Lin. Ft.	$50.00	Cost for concrete median barrier and express toll lane barriers, where applicable
- Existing Pavement Removal	Sq. Yd.	$3.00	Cost for removal and disposal of existing asphalt and concrete pavement if required
Interchanges (Excluding Bridges)			

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	Units	$/Unit or % Construction	Item Description
- 1-Lane Ramp (on structure)	Per Lin. Foot of Ramp	$3,000	Cost for one-lane ramp on elevated structure.
- 1-Lane Ramp (on earth)	Per Lin. Foot of Ramp	$270	Cost for one-lane ramp at grade.
- Cross-road Reconstruction	Per Lin. Foot	$600	Cost to reconstruct cross-roads impacted by roadway widening or reconstruction.
- Typical Diamond Interchange (new)	Lump Sum	$4,000,000	Cost for new interchange, excluding bridges
- Typical Diamond Interchange (reconstruction)	Lump Sum	$6,500,000	Cost for reconstructing an existing interchange, excluding bridges.
- Lighting	Per Intch.	$ 550,000	Cost for full interchange lighting (based on diamond configuration)

Bridges/Structures			
- Roadway over/under	Sq. Ft.	$100	Costs for construction of a roadway over or under an existing roadway.
- Railroad over	Lin. Ft.	$10,000	Costs for construction of a single track railroad bridge over roadway corridor
- Elevated Roadway Structure	Sq. Ft.	$100	Costs for construction of an elevated roadway over or parallel to an existing roadway corridor.
- Bridge Removal	EA	$20,000	Costs for removal of existing bridges
- Retaining Wall	Per Sq. Ft. of Face	$50	Cost of miscellaneous wall usage based on front face

Miscellaneous			
- Maintenance of traffic during construction	% of Total Roadway Costs Excluding Bridges	4%	Costs for all traffic items to construct project including, temporary median barrier, impact attenuators, pavement marking, signs, lighting, traffic signals, message boards, flashing arrow boards, barricades, reflectorized drums, and other channelizing devices, applied to construction costs, excluding bridge costs.
- Mobilization	% of Construct. Costs	5%	Contractor Mobilization Costs - % of total construction costs only
- Traffic Control	% of Total Roadway Costs Excluding Bridges	4%	Costs for signage, pavement marking, special toll lane markings, buffers, way-finding, etc., applied to construction costs, excluding bridge costs.
- Construction Inspection	% of Construct. Costs	17%	Costs for inspection of construction projects, to include cost for construction staking. Construction costs only.

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	Units	$/Unit or % Construction	Item Description
- Engineering - Design	% of Construct. Costs	8%	Design of all items, including detailed design and plans, right of way strip maps and descriptions, geotechnical investigations, surveying, aerial mapping, and utility relocation coordination, construction costs and other misc items
- Program Management and Administration	% of Construct. Costs	4%	cost of administration of project, applied to construction costs and other misc. items
- Contingency	% of Construct. Costs	20%	Contingency funds applied to construction costs