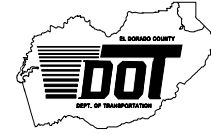




**COUNTY OF EL DORADO
DEPARTMENT OF TRANSPORTATION**



INTEROFFICE MEMORANDUM

Date: July 28, 2005
To: File
From: Craig McKibbin, Senior Traffic Civil Engineer
Subject: **Development of Project Cost Estimates.**

This memo is a follow-on document to the earlier "Development of the Fee Program Project Lists" memo prepared by John Heiser (May 12, 2005). The following describes how the project cost estimates associated with the fee program's proposed projects were developed and the assumptions used in the calculation of those cost estimates. The attached spreadsheets show the project by project details of the cost estimates.

Background

Once the project lists defined what projects should be included in the proposed fee program and what the project scope was, the next task was to develop the cost estimate for each of the projects. Existing cost estimates were used when available, but for most projects entirely new estimates were needed due to either it being a completely new project or due to the scope of the project being significantly revised.

The basic estimating methodology was to develop an estimated construction cost using previously developed standardized costs, typically a millions of dollars per mile figure, and adjusting those to approximately January 1, 2005, to account for inflation. The project delivery costs were calculated as a percentage of this construction cost estimate. Right of way costs were then calculated based on estimates of the new right of way needed multiplied by a millions of dollars per acre figure. Finally, these three estimates were added together to provide a total estimated project cost for each project on the project list.

Right of Way

DOT used the following process in estimating the right of way costs for the proposed local road improvements projects identified on the 2004 General Plan (2004 GP) and the 1996 General Plan as modified by the Writ (Writ) lists.

The first step in the development of right of way costs was to identify the amount of new right of way required for each project. Where a proposed project had already been analyzed for right of way needs, those figures were used as is, after an adjustment for inflation if necessary. For projects that were identified as having adequate right of way or a requirement for the dedication of the necessary right of way, no right of way costs were calculated or included in the total project costs. This was only the case on a few projects. The remainder of the projects required the development of right of way needs.

Most of the right of way requirements were based on only providing enough additional right of way for the construction and maintenance of the proposed project. Two projects, the Missouri Flat Road Connector and the Saratoga Way Extension, include acquisition of the right of way necessary for the ultimate 2004 General Plan project (2025) even though only the first phase of those projects are proposed for construction in the proposed fee program. Both of these projects are new roads crossing generally undeveloped land and it was felt it would be more responsible to obtain all the future right of way in one set of negotiations instead of obtaining a portion now and then returning to the land owners in a few years and repeating the process for the remaining needs.

DOT estimated the required new right of way area for the projects by comparing the existing right of way with the amount of right of way required by the proposed project. Existing right of way information was obtained from such sources as subdivision maps, records of surveys, parcel maps, current road projects under design or construction that have identified the existing right of way, and the like. The new right of way requirements were based on the requirements and information contained in Table TC-1 of the 2004 General Plan, the County's Design Manual, and project designs where they existed. From this information the difference was calculated between the two right of way areas. All these calculations were developed in tenths of an acre in keeping with the level of detail of the fee program.

Several repetitive right of way situations exist on the proposed project list. In those cases, DOT did the above calculation once and then used them for all the remaining identical projects. Left turn pocket projects were assumed to require new right of way of 0.1 acres based on a 12-foot wide lane and a weighted average length of 500 feet total for the turn pocket itself and its associated tapers. Two-way left turn lanes, passing lanes, and single additional through lanes were assumed to require an additional 1.5 acres per mile based on a new 12-foot wide lane.

For land costs, DOT utilized a summary of land costs that had been generated by the Department that was in turn based on recent appraisals and rough current market rates for single family residential, multi-family residential, and non-residential properties located on the County's West Slope. The land cost figures contained in that summary were then averaged for each of those three land uses for the three main areas of concern – El Dorado Hills, Cameron Park/Shingle Springs, and the rest of the West Slope area.

These averaged land use costs were then adjusted to incorporate a 25% contingency factor. The contingency factor was included to address such issues as real estate market fluctuations, potential need for slope easements for cuts and fills, building relocation/removal, business relocation costs, and the acquisition process itself. The acquisition process costs include all the staff, legal, consultant, etc. costs expended in actually obtaining title to the land. All of the costs described here are highly variable due to issues not readily apparent, such as a recalcitrant land owner, and are therefore best treated as a contingency item.

The following table shows the final land cost estimates, with the contingency included, used in the fee program calculations. They are shown in millions of dollars per acres.

Area Location:	Residential	Multi-Family	Commercial	Industrial
El Dorado Hills	\$1.4/acre	\$1.4/acre	\$1.1/acre	\$1.1/acre
Cameron Park/Shingle Springs	\$0.6/acre	\$0.6/acre	\$0.8/acre	\$0.8/acre
Outlying Areas	\$0.3/acre	\$0.3/acre	\$0.7/acre	\$0.3/acre

The final step in the process was to calculate the final right of way cost estimates. The additional right of way area obtained as the first step was simply multiplied by the estimated land cost for the appropriate land use and location as shown in the above table. The estimated right of way costs for improvement projects that traverse through multiple land use designations relied on the above process, except that the individual right of way costs in each designated land use area were calculated separately and then added together for a final amount. This provided most of the right of way cost estimates for the projects on both the 2004 GP and Writ lists.

For certain specific projects, primarily those along the Highway 50 corridor, DOT reviewed existing project reports and plans, or commissioned consultants to prepare reports on a proposed project, to assess the right of way needs. These reports typically contained a dollar figure for right of way. In these cases this figure was used for the fee program cost estimates after being adjusted for inflation if necessary.

Examples of these existing project reports included the Caltrans Project Reports (PRs) or Project Study Reports (PSRs) for the Silva Valley Parkway interchange and the High Occupancy Vehicle (HOV) lanes, the plans for the new Missouri Flat interchange, and plans for the El Dorado Hills Boulevard interchange. An example of a major assessment report commissioned by the County was the URS report, "Planning Level Cost Study for US 50 Interchange Improvements", dated March 16, 2005.

The Department developed a "generic" average right of way cost for a traffic signal based on past history with traffic signal projects, projects nearing construction and having identified right of way costs, the land costs shown above, and project specific

variables that can impact on the right of way needed for the project. These variables include such items as intersection realignments, the number of turn lanes, utility relocations, drainage infrastructure requirements, and environmental constraints and mitigation requirements. Based on this analysis the generic right of way cost was set at \$0.25 million per intersection.

The right of way cost estimates included on both the reimbursement agreements and reimbursement commitments lists came from such sources as the individual development agreements, various public facilities financing plans, developer right of way cost estimates, and estimates prepared by the Department.

Construction

DOT used the following process in estimating the construction costs for the proposed projects identified on the 2004 GP and the Writ lists. The Department utilized prior project specific cost estimates where they existed and where the estimates had been completed in a fairly rigorous manner. Other cost estimates were generated as needed using a more generalized methodology based on a dollars per mile figure for conversion of a roadway from one type to a new type, or in the case of a new road, the dollars per mile for construction of the specific type of roadway.

Caltrans Project Reports (PRs) and Project Study Reports (PSRs) provided some of the construction cost information used by the Department. The following describes where this was done:

1. U.S. Highway 50 High Occupancy Vehicle (HOV) lanes: The cost estimate for the HOV lanes came from Caltrans' Project Report – 03-ED-50, KP 0.25/R14.67 (PM 0.16/R9.11) Median Lanes for HOV – dated June 2002. This 2002 cost estimate for the HOV lanes was then adjusted for inflation and to add a contingency amount as described below.
2. Silva Valley Parkway Interchange: The cost estimate for this interchange improvement came from Caltrans Project Report – 03-ED-50, PM 1.7 Silva Valley Parkway Interchange – dated 1991. This 1991 cost estimate for the interchange was then adjusted for inflation and to add a contingency amount as described below.
3. El Dorado Road Interchange: The cost estimate for this interchange improvement came from Caltrans Project Study Report – 03-ED-50, KP 22.54, EA 198-3A770K – dated August 2000. This 2000 cost estimate for the interchange was then adjusted for inflation and to add a contingency amount as described below.

The URS report, "Planning Level Cost Study for US 50 Interchange Improvements" provided planning level construction cost estimates for four of the Highway 50

interchanges – Bass Lake Road, Cambridge Road, Cameron Park Drive, and Ponderosa Road/South Shingle Road. These costs did not need to be adjusted for inflation, but a contingency amount was added as described below.

The two remaining interchange projects, El Dorado Hills Boulevard/Latrobe Road and Missouri Flat Road, are ongoing County projects and as such already have significant design work completed and hence fairly firm cost estimates. These cost estimates were used in the proposed fee program with minor adjustments for inflation and contingency costs.

Cost estimates for the proposed freeway auxiliary lanes were assumed to be \$3.3 million per lane mile based on other cost information regarding the costs of adding lanes to freeway projects, specifically from a DOT memo prepared in connection with the El Dorado Hills Boulevard interchange (“El Dorado Hills Interchange Project Phase 1.3 and Ultimate cost estimate”, Matt Smeltzer, December 13, 2004). This cost of \$3.3 million includes the increase to reflect the 25 percent contingency. The lengths of these auxiliary lanes were measured from the on-ramp terminus to the off-ramp terminus of the next interchange. These costs were then combined with the appropriate interchange costs to reflect that one half of the total auxiliary lane costs between the two interchanges would be included in each of the two interchanges.

For the remaining proposed road improvement projects, DOT used a document generated in 2002 by the Department titled “Roadway Improvement Costs for Planning Estimates” and dated June 11, 2002. This report was prepared in anticipation of the need to do planning level cost estimating for the General Plan discussions and approval. The Department reviewed the records of several projects constructed in the County during the preceding few years and then constructed a cost matrix for the conversion of one type of roadway into a new one – e.g., a rural two-lane road into a four-lane road.

This analysis made assumptions regarding existing cross-sections, horizontal and vertical alignments, and structural sections, on roads that were often built in the past when the standards were not as well defined as the current standards or reflective of current engineering thought. For many of these roads, the analysis assumed the existing roadway section would need to be removed and replaced with a new structural section. Additionally, the cost estimates looked at clearing and grubbing, earthwork, asphalt concrete (AC), and aggregate base (AB), for any new widening of the roadway. Concrete curb, gutter and sidewalk were included in the analysis for roads in urban areas. Additional minor costs such as storm water pollution prevention, traffic signage and striping, traffic control during construction, drainage and utility facility construction or relocation, and project mobilization were also included in the analysis.

The road improvement costs contained in the 2002 analysis were then updated to “End of Third Quarter 2004” dollars using the Caltrans construction cost index figures to reflect inflation in the cost of road construction. This cost index varies due to market

changes in material costs, such as steel used in bridges and petroleum used in asphalt production, and changes in the labor market.

Finally, a 25 percent increase in the construction costs was included for contingencies. This contingency amount is to cover those items that may be of an unusually large quantity, or higher unit cost, once a more project specific detailed line item cost estimate is prepared during the design phase of the project. Additionally, it is intended to cover those unexpected items of construction that come up during project construction that add to the cost of the project. Examples might be a utility line that now needs to be relocated because it was in a different location than expected, or a sudden storm that causes damage that will have to be replaced with additional cost. Finally, this contingency is added to reflect the uncertainty of this level of cost estimating and the need to not underestimate the costs which would lead to an under funded fee program.

All of these factors were combined to update the information contained in the 2002 report and to create an updated "Road Construction Cost Matrix" (attached). DOT then utilized that updated "Road Construction Matrix" table to develop those project construction costs where no other estimates had been completed. The matrix provides construction cost estimates in millions of dollars per mile of road, not per lane mile. Two sets of costs are provided in the matrix, roads without curb, gutter and sidewalk, and roads with curb, gutter and sidewalk, denoted as "c,g,s". Road construction cost estimates were based upon the appropriate "From" and "To" categories. For example the conversion of a Major Two-lane Highway to a Four-lane Divided Arterial without curb, gutter, or sidewalk, would be \$4.7 million per mile of road. A simple multiplication of the dollar figure from the matrix times the length of the road in miles gave the total construction cost of the proposed project.

In a few specific cases the above estimating methodology did not work. These included the proposed passing and climbing lanes on State Route 49 and passing lanes 193, miscellaneous left turn pockets, two-way left turn lanes, single additional through lanes, new two-lane roads. The following discusses how these were handled and what assumptions were made to develop cost estimates for them:

- New Two-Lane Road: DOT estimated \$2.2 million per mile. The cost estimate assumes construction of a new two-lane road to be equivalent to the conversion of a Minor Two-Lane Highway to a Major Two-Lane Highway in the construction cost matrix. The 2002 analysis assumed this type of conversion would require the removal of the existing roadway due to inadequate road geometrics and all new construction. The Department used this as being equivalent to the construction of a new two-lane road.
- Single Additional Through Lane: DOT estimated \$1.9 million per mile. The cost estimate assumes the new portion of the road way is equivalent to one new 12-foot wide travel lane. Similar to the new two-lane road, the Department used the cost in the matrix shown for the conversion of a Minor Two-Lane Highway to a Major Two-Lane Highway as a base. This cost was then prorated, based on the road cross

section, and additional adjustments made for minor reconstruction of existing road facilities, driveways, utilities relocations, drainage facility relocations and reconstruction, etc.

- Passing Lanes on State Route 49 (Rattlesnake Bar Road to SR193): DOT estimated approximately \$1.0 million dollars per half mile of passing lane based upon a passing lane being equivalent to a 12-foot wide travel lane. This is similar to the Single Additional Through Lane with the exception that due to the location of the project, many of the cost adjustments in that analysis were deemed inappropriate and therefore were not included here. However, the cost was adjusted back upwards slightly to reflect the remoteness of the location for construction logistics.
- Passing/Climbing Lanes for State Route 49 (SR 193 (in Cool) to County Line (north)): DOT estimated \$5.4 million per mile for two passing lanes of one quarter mile length each. The improvements include 12-foot wide dual purpose passing/climbing lanes. The cost estimates were prepared by Matt Smeltzer of DOT and are summarized in a memo, "Highway 49 Potential Improvement Projects Cost Estimate for Budget Purposes", dated December 28, 2004. The significantly higher costs per mile are due to the very difficult terrain in the American River Canyon.
- Two-Way Left Turn Lanes: DOT estimated \$1.9 million per mile. The cost estimate assumes the new roadway is equivalent to one new 12-foot wide travel lane. The assumed cost of \$1.9 million per mile is equivalent to that of the Single Additional Through Lane described above.
- Left Turn Pockets: DOT assumed \$0.2 million per left turn pocket. These are for isolated left turn pockets not included in any other project. The cost estimate assumes the left turn pocket is 12 feet wide with an average weighted length of 500 feet for the pocket itself and its associated tapers. The cost of \$0.2 million per turn pocket is the prorated amount, comparing lengths, of the \$1.9 million per mile shown above for Single Additional Through Lanes and Two-Way Left Turn Lanes.

The construction cost estimate for a new traffic signal improvement at an intersection was set at \$0.5 million each. The Department developed, and used, a "generic" average project construction cost for a traffic signal based on past history with traffic signal projects, projects nearing construction and having more detailed construction cost estimates, and project specific variables that can impact on the construction effort needed for the project. These variables include such items as intersection realignments, the number of turn lanes, utility relocations, drainage infrastructure requirements, and environmental constraints and mitigation requirements.

While some intersections will require much less work, primarily those with adequate width and turn lanes, others will require significantly higher costs due to such complexities as realignment of through lanes, new curb, gutter and sidewalk, additional turning lanes needed, extension and/or reconstruction of culverts and other drainage facilities. The construction cost estimate is simply an average since these complexities

cannot be determined for all of the intersections at this time. The signal construction costs include, but are not limited to, the masts and arms, control boxes, reconstruction or new construction of the roadway, construction of curb, gutter, and sidewalk as needed, and utility connections. The 25 percent contingency factor is included in the \$0.5 million figure.

DOT has tentatively identified over one hundred intersections in the County that may satisfy signal warrants now or during the next ten years. For the proposed fee program, the Department assumed six signals will be constructed per year, for a total of sixty during the life of the proposed fee program.

The construction cost estimates included on both the reimbursement agreements and reimbursement commitments lists came from several sources. These included the individual development agreements, various public facilities financing plans, developer construction cost estimates, and estimates prepared by the Department. For those estimates prepared by DOT, the above methods were used to maintain consistency among the various project lists.

As noted above, all cost estimates have been adjusted to bring them up to what was current dollars when the proposed fee program cost estimates were prepared. This was done by comparing the Caltrans construction cost index figure for the end of the third quarter 2004 with the index figures for the appropriate years. The end of the third quarter 2004 figure was used because it was the last published figure at the time the Department was making the estimates for the program.

The following table shows the changes in the Caltrans cost index used by the Department in adjusting older cost estimates. In this way all of the estimates contained in the proposed fee program are all based on “current dollars”.

End of Year	Index #	Inflation to Current
2004 (3 rd Quarter)	167.1	0.00%
2003	148.6	12.45%
2002	142.2	17.51%
2001	154.1	8.44%
2000	146.2	14.30%
1999	139.2	20.04%
1998	128.6	29.94%

Project Delivery

Project delivery costs were calculated as a simple percentage of the construction costs. These project delivery costs include administration, planning, design, environmental, inspection, and project management. In those instances where any of this work is contracted out to private consultants, it also includes costs for consultants’ time and materials. As noted above, right of way delivery costs are included in the right of way contingency factor and as such, are not included in this project delivery cost. Again,

because the proposed projects vary greatly in their complexities, it was decided that a “generic” project delivery cost estimating approach would be most suitable. While this may over estimate the costs of a simple project, it will underestimate the costs on a difficult and complex project.

Project delivery costs were calculated using a figure of 40, 45 or 50 percent of the project’s construction costs. For projects with construction costs under \$1 million dollars, 45 percent was included for project delivery. For those projects with construction costs of over \$1 million dollars, 40 percent was included for project delivery. An additional five percent of the construction cost was added to the above figures for those projects that include Caltrans involvement. This is to cover the additional administration, planning, design, environmental, inspection, and project management usually required to meet the State’s requirements.

The Department developed a “generic” average project delivery cost for a traffic signal based on past history with traffic signal projects, projects nearing construction and having identified project delivery costs, the percentages shown above, and project specific variables that can impact on the project delivery effort needed for the project. These variables include such items as intersection realignments, the number of turn lanes, utility relocations, drainage infrastructure requirements, and environmental constraints and mitigation requirements. Based on this analysis the generic project delivery cost was set at \$0.25 million per intersection.

The project delivery cost estimates included on both the reimbursement agreements and reimbursement commitments lists came from such sources as the individual development agreements, various public facilities financing plans, developer cost estimates, and estimates prepared by the Department.

Other Costs

Preliminary Study Reports: These reports were added to the project lists to address potential future construction needs. The cost estimates that were used are reflective of the costs of preliminary study reports DOT has completed in the past.

Fee Program Development and Updates: This line item is for funding the initial traffic impact fee development as called for in the General Plan, as well as periodic updates. The Department calculated this estimate based on the initial fee program development costs, one major fee program development update in approximately 2010 and eight annual fee program updates by 2015. DOT estimated a total of \$4 million for the fee program development and updates. The \$4 million also includes costs for consultants’ time and materials. The initial fee development program was estimated to cost approximately \$1.6 million, as was the major fee program update. DOT estimated the eight annual fee program updates will cost approximately \$0.5 million each.

Transit Service Improvements: This line item provides funding to assist with capital improvements and capital purchases in support of transit service in the County. DOT assumed \$5 million dollars for future transit service improvements and capital purchases by 2015. Capital improvements and purchases include, but are not limited, to new busses and new Park and Ride lots. To reach a total estimated cost, DOT based the calculations on an assumed purchase of six transit buses and an assumed construction of two new Park and Ride lots between now and 2015. DOT estimated new buses cost approximately \$0.5 million each and the construction and land acquisition for a new Park and Ride lot is approximately \$1 million.

CDM:cdm

Pc: Elizabeth Diamond, Interim Director, Department of Transportation
Steve Borroum, Acting Deputy Director, Transportation Planning & Land Devel.

Attachments