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**APPENDIX I:  
PROJECTS  
COST ESTIMATE  
MEMO AND  
DETAILED  
PROJECT  
LIST**



**DAVID EVANS  
AND ASSOCIATES INC.**

**DATE:** January 15, 2022  
**TO:** Don Odermott, Transportation Planning Manager, City of Hillsboro  
**FROM:** Jenna Hori, P.E., David Evans & Associates  
**SUBJECT:** Transportation System Plan Cost Estimate Methodology

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### **Overview**

This memo describes the process for producing cost estimates and breakdowns for capital projects included in the updated Hillsboro Transportation System Plan (TSP).

Cost estimates were developed by applying length-based templates for various project types to estimated project lengths, using available mapping and project descriptions. Structures and other significant items not captured by the linear templates were added on a project-by-project basis. Percentage based costs for design and overall contingencies were assigned by project type. Right-of-way costs were also determined using templates to estimate the approximate area of right of way acquisition required and reviewed and adjusted on a project-by-project basis during review.

All costs are provided in 2021 dollars. Year over year escalation of construction costs was assumed to be 4.5%. A commonly used value of 3.5% appeared to be too low to accurately reflect increases in recent years and 4.5% was selected by the City of Hillsboro.

When available, cost estimates produced by other agencies based on more detailed design information were used in the TSP in lieu of template based estimates. These include estimates produced by Washington County, Metro, ODOT and the City of Hillsboro. Estimates were escalated to 2021 dollars using a 4.5% annual increase.

### **Project Standards and Design**

Typical sections and pavement types were based on design standards for each specific roadway classification, as identified on the Functional Classification Plan included in Chapter 5 of the TSP. The following design standards were used in the development of cost templates:

- Washington county standards in [WASHINGTON COUNTY ROAD STANDARDS](#) were used for county roads.
- City of Hillsboro design standards from [2018 Design and Construction Standards - Section 200 \(hillsboro-oregon.gov\)](#) were used for city roads.



- Projects within the South Hillsboro development area used roadway sections from [SUBCHAPTER 12.65 SOUTH HILLSBORO PLAN DISTRICT \(qcode.us\)](#).

Project lengths were determined from GIS map information or measured on Google Maps based on conceptual maps and project descriptions.

The TSP list includes several projects to improve roads along the urban growth boundary. County roads along the urban growth boundary were assumed to be fully reconstructed from subgrade and were estimated using cost templates for complete road construction, not as overlay or widening projects.

Turn lanes lengths for intersection improvements were determined by traffic analysis of future projected traffic volumes. Turn lane lengths were compiled from analysis work done by various consultants and City of Hillsboro on prior projects. Lengths for turn lanes not determined through prior analysis were assumed based on engineering judgement as needed.

### **Cost Template Development**

A template was created for each roadway project type on the TSP list to determine the linear construction costs. Roadway projects were defined by jurisdiction, functional class, number of lanes and pavement type. Separate templates were created for new road construction, as well as widening or complete street improvements on existing roads. Approximately 65 design templates were created to cover each type of project on the TSP Road List and Intersection Improvement List.

Local Road templates were created for each set of design standards to calculate the costs that would be excluded from Transportation Development Tax (TDT) credits during the cost breakdown analysis.

The templates include inputs for the widths of each typical section component (new pavement, bike facilities, sidewalk, landscape strip), pavement and aggregate depths, inclusion of features such as illumination and fiber optic conduit extension, and the right of way width required. The templates account for basic storm sewer conveyance and include items for storm pipes, inlets and manholes based on standard spacing. Approximately 20 quantifiable items were used to develop quantities for each template. Quantities were calculated based on this information and the templates produce a construction cost per 100 LF for each project type.

To generate earthwork quantities, road projects were typically assumed to follow the profile of the existing grade with minor variation. Additional volume required is assumed to be accounted for in project contingencies. Projects with bridge approaches or unusual terrain had additional costs covered in lump sum costs added above the template-based quantities.

Intersection capacity improvements were estimated by applying a widening template to each leg of the intersection, as applicable. Each approach leg was looked at individually so that the correct jurisdiction and road classification could be used when applying a template.



## **Unit Pricing**

Unit pricing for projects that are anticipated to be delivered through public contracting was based on bid history for a selection of projects delivered by the City of Hillsboro and Washington county in years 2016-2019. Unit prices from these sample projects were escalated to 2021 dollars assuming a 4.5% increase per year.

ODOT bid tabs were reviewed for comparison, but it was assumed that the projects on the TSP list may not capture the economies of scale realized on many ODOT projects. The selected TSP template unit prices are generally higher than the ODOT data available. The TSP unit prices were also modified to account for the additional cost items that were not counted. For example, the recommended unit price for concrete sidewalk was adjusted from \$6.50 per square foot to \$9.50 per square foot to account for the cost of driveways and curb ramps, which are incidental to that item but add additional costs up to \$1,200 each.

Projects delivered through private contracting, and therefore not subject to BOLI Prevailing Wage rate laws for public works projects, often utilize lower unit prices. Many of the TSP projects are anticipated to be delivered by private contractors for TDT credit and so a second set of unit prices was developed for use. Cost data was provided to DEA for four projects delivered in the South Hillsboro development area from 2016-2020 that were submitted for TDT or TSDC credit.

An analysis of these project costs led to the development of unit prices for privately delivered projects that were reviewed by the South Hillsboro development partners. After feedback and iterative reviews of the cost estimates, the selected unit prices resulted in templates that were, on average, 26% lower in overall cost than publicly delivered projects.

The anticipated project delivery method for each project (Public, Private or Mixed) used to assign templates and estimate costs was provided by the City of Hillsboro.

## **Additional Costs**

The following items were added to the templates on a percentage basis:

- Erosion control: 5% of construction costs
- Removal of structures and obstructions: 2% of construction costs
- Signs: 0.5% of construction costs
- Traffic control: 2% of construction costs, 1% used on new roads where the only traffic control required would be at tie in on end of project. Adjusted higher on some projects.
- Mobilization: 8% of construction costs typical for publicly delivered projects, 5% on privately delivered projects, 2% used on projects in South Hillsboro area meeting specific requirements

The mark up percentages were determined based on reviewing total cost estimates and actual costs for completed projects as well as reviewing assumptions used in the development of estimates for the 2015 South Hillsboro Financing Plan.



Significant costs items not captured in the templates were added for specific projects as needed. Add-On costs include:

- Railroad crossings: Cost assumed for reconstruction of crossing area and replacement or upgrade of crossing signal equipment, possible track or crossing panel replacement work.
  - “Minor” crossing assumed for 2 lane road crossing of railroad tracks at \$750,000 each
  - “Major” crossing assumed for wider roads or rail crossing at/near at intersection at \$1,250,000 each
- Bridge costs: Unit cost of \$315 per SF determined by City of Hillsboro from recent project actual costs. Bridge lengths were estimated and may vary from actual lengths once designed.
- Wetland impacts: Impact areas for wetlands were assumed based on Significant Natural Resource areas shown on Hillsboro maps. The cost of impact was assumed to be \$175,000 per acre.
- Signals: Traffic signals costs of \$375,000 were provided by the City of Hillsboro.
  - Fractions of this cost were used for modifications of existing signalized intersections.
- Retaining walls: When added, \$70 per SF was assumed for modular block walls or MSE walls.
  - Generally retaining walls were not estimated, and project contingencies are expected to cover minor walls.
  - Roads where major wall needs were identified may have them included as add on costs. Very approximate heights were estimated based on Google Maps images of the project area and terrain at anticipated creek crossings.

Any costs not described above are expected to be covered by project contingencies.

### **Soft Costs and Contingencies:**

Costs assumptions for preliminary and final engineering, permitting, construction inspection and support were determined by the City of Hillsboro and referred to in documentation collectively as “Soft Costs”. These were added to construction costs and included in total project cost.

For publicly delivered projects, the following Soft Cost values were assumed:

- 30% of construction costs for new roads and intersection improvements
- 40% of construction costs for existing road realignments or other modifications to existing
- 45% of construction costs for projects that included a railroad crossing

For privately delivered projects, the following Soft Cost values were assumed:

- 20% of construction costs for new roads as actual Soft Costs
- 25% of construction costs for existing road enhancements and intersection improvements as actual Soft Costs
- Only 13.5% of Softs Costs are eligible for TDT credit, per the TDT code. This amount was used in TDT credit calculations. Soft Costs above this amount were shown as Private Development Costs or TSDC credit on eligible projects.



An overall 30% contingency was selected by the City of Hillsboro for use on all publicly delivered projects.

A 25% contingency was selected for privately delivered projects. A 15% contingency was used for projects that met certain criteria, including: greenfield road construction, being fully located within the limits of South Hillsboro development site and on land already owned by assumed project delivery partners. Review of actual costs and TDT credits issued supported lowering contingency values for these projects from previous assumptions. Further analysis of contingencies used on specific projects may be done for the development of the South Hillsboro Financing Plan.

### **Right of Way**

Right of way costs were estimated using an approximate price per square foot of right of way needed for each land use type along the project, and an assumed cost of \$10,000 flat fee per adjacent parcel for the complete assessment, negotiations, etc. Parcels were counted using the tax lot lines shown on [Hillsboro Maps \(hillsboro-oregon.gov\)](http://HillsboroMaps(hillsboro-oregon.gov)).

Typical prices were estimated for both developed and undeveloped residential property and developed and undeveloped commercial/industrial property. Projects were assigned a category with a weighted cost per square foot based on the estimated land use, or blend of, that was present along the length of the project. Categories included developed residential, undeveloped residential, mixed of developed and undeveloped residential, developed commercial and industrial, undeveloped commercial and industrial, mix of developed and undeveloped commercial and industrial.

The amount of right of way required was based on the amount needed identified by the project template, using jurisdictional design standards. For widening of an existing roadway, the difference between the template and existing conditions was used. In some cases, the width of right of way estimated in the project cost was increased based on the intent to preserve additional right of way for future widening or decreased based on existing right of way already owned by the City.

Estimated costs for large commercial acquisitions were provided by the City of Hillsboro during the cost review process and added on to the template based right of way estimates.

### **TDT and TSDC Credit Calculations**

Portions of reach project eligible for Transportation Development Tax (TDT) credit were calculated in accordance with the Transportation Development Tax code for Washington County. The City of Hillsboro provided a list of projects anticipated to be fully or partially delivered through private contracting that would be eligible for TDT credit. All TDT and Transportation System Development Charges (TSDC) credit amounts are calculated using the privately delivered cost templates based on non-BOLI regulated labor rates.

A non-creditable street section of 56' total right of way width, which includes 29' paved asphalt plus 1.5' concrete gutters on each side, was assumed to be the financial responsibility of developers on privately



delivered projects. Within the South Hillsboro development area, the section is 57' total right of way width, which corresponds to the L3 Local Road typical section.

For each project, the construction cost of the Local Road portion was considered non-creditable and included as Developer Out of Pocket Cost on applicable projects. The remaining project elements beyond this Local Road section were considered TDT creditable and counted as Public Costs through Credits Issued.

Per TDT code, projects on the TDT Project list received 100% credit for eligible cost. Projects not on the list were calculated to receive 75% (Arterials) or 50% (Collectors) credit for eligible costs. Some projects were identified by the City as future TDT projects and were estimated as if they were included on the project list. The November 2021 TDT Project list was reviewed to determine fully eligible projects, and several additional projects were counted as 100% eligible based on City of Hillsboro expectation that they would be added to the list in the future.

Additional project components were identified as TSDC credit eligible based on the TSDC project list in Exhibit C of the 2021 South Hillsboro TSDC Update Memo. These included bike lanes on neighborhood routes as well as some specific Soft Costs above the 13.5% eligible for TDT credit. The TSDC credits were combined with TDT credit amounts in the Public Costs through Credits Issued category in the summaries developed for the TSP.

### **Revenue Sources**

Anticipated project funding opportunities were identified and reviewed by the City of Hillsboro. These estimates were used to calculate estimated revenue needs from each of the major transportation funding sources anticipated to fund the TSP project list. Funding sources considered include TUF Pathways, MSTIP, TDT, COH Pavement Management Program, federal funding, and Port of Portland obligations.

The potential funding opportunities for each project were identified on the TSP summary tables. The total anticipate revenue needed for each of these funding programs, as well as total cost obligations from private development, was calculated to support further development of financing plans but is not intended to be used on a project-by-project basis.

### **Review and Summaries**

Final cost estimates, as well as the calculation methods, were provided to the City and the private development firms involved in the South Hillsboro development for review. The new planning cost estimates were compared to projects of a similar type that have been completed recently in the area to validate the overall costs and the selected mark ups for contingencies and other non-quantified items. A review of earlier cost estimates done for the 2015 South Hillsboro Financing Plan, compared to the actual costs of completed projects, was done to help select some of the values for percentage-based costs and as additional validation for the assumptions used to create the templates. Feedback from



these reviews was used to refine the templates as well as make spot adjustments to specific projects where more detail was available about the site and estimated project delivery.

Construction and right of way costs for each project were summarized in Table 6.1 and Table 6.2 of the TSP. Drafts of these tables were reviewed by the City on a project-by-project basis and revised as necessary to ensure that project descriptions, assumptions and bottom line costs were as accurate as possible. Costs for projects in the South Hillsboro area are subject to additional refinements as they undergo more scrutiny during the development of an updated financing plan for this area.

Costs for undergrounding existing utilities were estimated for each linear road project. A cost of \$300/LF was provided by the City of Hillsboro. This was applied to all road projects that had existing overhead utilities present and calculated separately from total project costs. Utility undergrounding was not calculated for any intersection improvements not associated with a linear road project. Utility undergrounding costs are not included in any project cost summaries in Tables 6.1 or 6.2.

The cost estimates provided for the TSP include a high level of detail for planning level estimates typically produced for such a document. Consideration was given to the location, existing conditions, estimated timeline and delivery of each project to determine if unique factors considered. The estimate spreadsheet includes detailed records of project assumptions that went into determining final costs.

Summary information about proposed capital projects in the TSP was provided using the cost estimate spreadsheet, which includes tables of data such as which types of improvements are included (capacity, bicycle facilities, pedestrian facilities, safety enhancement) and whether it is a new or modified roadway. Using this data, the cost estimate can be used to calculate information such as total lengths or counts of specific improvement types and other data that can help summarize the overall plan.











