CHAPTER SEVEN – MODEL RESULTS & METROPOLITAN TRANSPORTATION SYSTEM EVALUATION

INTRODUCTION

After the model is calibrated to existing traffic volumes, it is then possible to evaluate what effects planned road projects and growth patterns will have upon the road network. This is achieved by using projected land use data - as described in Chapter Six - coupled with road improvements planned by local jurisdictions. As with all models, they are a tool to evaluate the impacts of future change. It is important to recognize the strength of a regional model is in the evaluation of corridor-based volumes and regional trends. Attention should be given to those corridors that show multiple points of congestion, rather than single segments. Specific spot forecasts and evaluation are better left to micro-level evaluation through other means.

The 2010 Tri-City Travel Demand Model focuses on four alternative scenarios for future analysis of area roadways:

- 2020 No-Build – 2020 land use, with no new projects
- 2020 Build – 2020 land use, with 2020 list of projects
- 2030 No-Build – 2030 land use, with no new projects
- 2030 Build – 2030 land use, with 2020 and 2030 list of projects

The model replicates traffic patterns during a typical weekday PM peak-hour of travel for the scenario year. This chapter will detail the findings of the above scenarios, as well as the results of the base year (2010). The modeling horizon corresponds to "best available" data that drive the model. Year 2030 forecasts are felt to be an accurate representation of the plan's 2032 horizon year. Alternatively, a growth factor (2.5 to 3%/yr) could be applied to 2030 forecasts. Forecast volumes are meant to illustrate trends and not absolute flows. It is important to remember that while the model is calibrated well to regional volumes, there may be some areas of congestion which may not appear in model results. Conversely, there may be some locations where the model may reflect congested conditions where none exist. Additionally, there may be areas where congestion is prominent during a different period of day, than the PM peak-hour. In these instances, BFCG staff and local jurisdictions have reviewed results and have separately listed known areas of concern that may not otherwise appear in the evaluation.

FINANCIALLY CONSTRAINED PROJECT LISTS

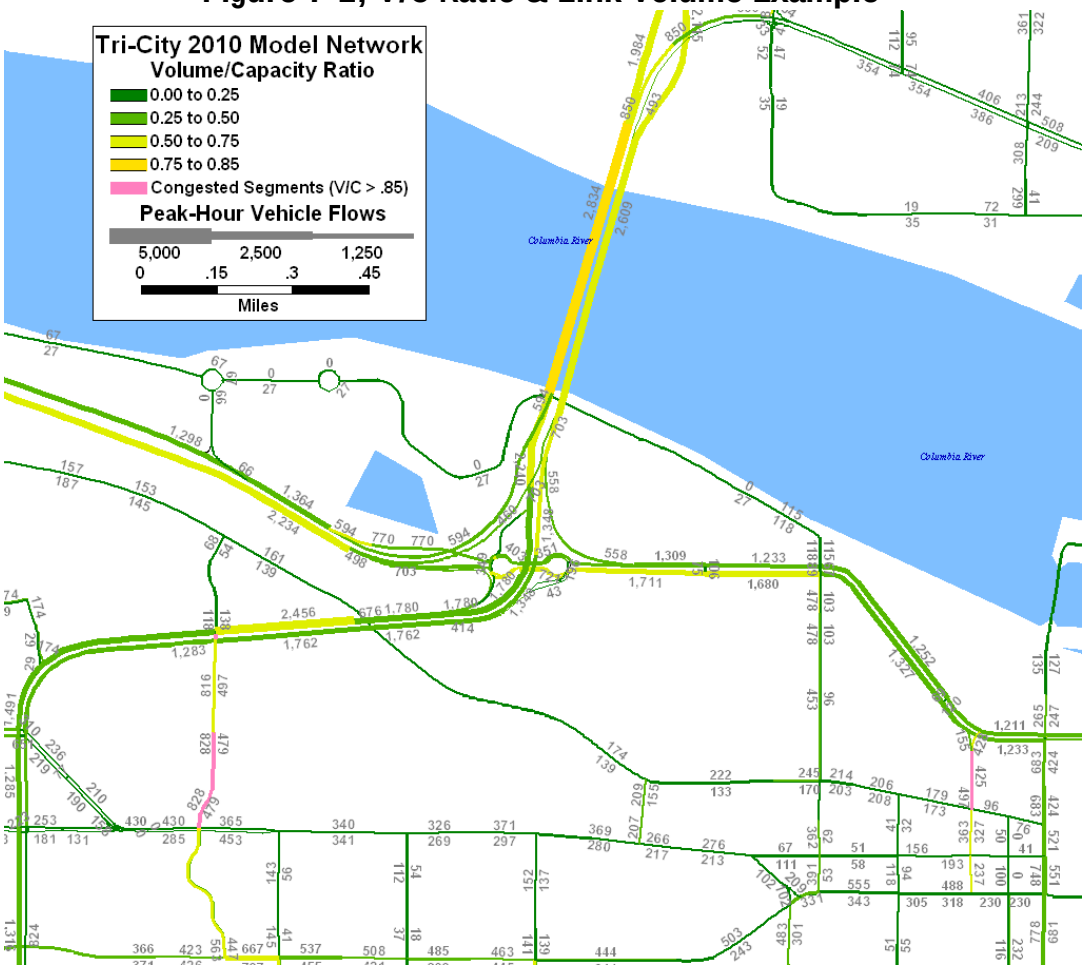
The "build" scenarios for 2020 and 2030 were completed using corresponding land use forecasts for that particular year, coupled with an assortment of road improvements projected to be built by local jurisdictions. These "Project Listings" are unique to each jurisdiction and have been reviewed for consistency with local agency Transportation Improvement Programs (TIPs), local comprehensive plans, and assorted sub-area plans. Projects have been identified by local agency staff, while being constrained by projected available revenues. A detailed explanation of the financial forecast, and its' relation to the project lists, can be found in Chapter Nine. Individual jurisdictional project lists for both urban and rural jurisdictions are provided in Appendix H. Projects lists identified as "Urban" have been included within the modeling scenarios and, in some cases, include projects outside the current federally recognized urban/rural boundary. These are included to allow evaluation of projects in areas anticipated to become urban during the timeframe of this planning document.

PORTRAYING CONGESTION/LEVEL OF SERVICE

The modeling package can portray results in a variety of measures - some lending themselves well to written discussions regarding congestion, and others that do not. One measure widely understood that lends itself well to visual portrayal of results is using projected volumes against the capacity of a roadway. This chapter will rely on Volume to Capacity (V/C) ratios for the purposes of discussion regarding potential congestion. In the simplest terms, a road segment with little or no volume would have a V/C ratio near zero, while a segment operating at its' stated capacity would have a V/C ratio equal to one. As a general rule, V/C ratios in excess of .85 indicate congestion is likely upon that segment.

V/C ratios are shown through a range of colors, beginning with green tones near zero escalating to yellow tones up to a V/C equal to .85. Segments with a V/C in excess of .85 are considered congested and shaded in pink for emphasis. Projected PM peak-hour volumes upon each road segment are shown both by a graduated line thickness and also numerically above the roadways. Figure 7-1 below provides a model image portraying V/C ratios, with volumes reflected by thickness of line and labels upon each segment. This (2010 calibration) example shows SR 395 Blue Bridge southbound having a V/C in the .75 - 1.00 range, with the northbound V/C ratio in the .50 - .75 range. V/C ratios in excess of .85 are evident upon segments of Yelm and Benton Streets in Kennewick.

Figure 7-1, V/C Ratio & Link Volume Example



The example provided on the previous page also shows how model results may not always mirror actual conditions. Benton Street in Kennewick is not a heavily used route, yet appears as congested within the graphic. As a reminder, a regional model is best utilized by evaluating trends upon complete corridors rather than individual network links in the model. In this case, Benton St appears as the most attractive route for the model, although Fruitland and Washington Streets are typically used by most passing through, or accessing, downtown Kennewick. It is important to implement this filter between corridors and individual links, as evaluations move into the forecast years.

Level of Service (LOS) is a widely used term in evaluation of transportation facilities. Level of Service can be measured at intersections and along roadway segments, with a scale similar to a report card where A is favorable and F is undesirable. Within the urban area, member jurisdictions have adopted LOS D as being acceptable. LOS calculations at intersections vary depending upon the type of intersection control (stop or signal), whether all approaches are controlled, and the delays associated with those controls. LOS calculations upon road segments vary as well, dependent upon a variety of factors including: roadway class, segment speed, frequency of access points, presence of pedestrians/bicyclists, turn lanes, and terrain. While neither intersection nor roadway LOS calculations are feasible to complete at the regional level, V/C ratios do provide a context that can be comparable. For instance, a V/C equal to .85 or above would be indicative of an LOS E or F.

2010 BASE-YEAR RESULTS

The base year for the model was 2010 and closely reflects the traffic volumes, as they existed during the PM peak-hour of a typical weekday that year. The base-year scenario is typically used as a control to ensure the model is calibrated to actual traffic counts – as congestion is evident to all drivers who experience conditions upon the local roadways. Areas that result in V/C ratios in excess of .85 (indicating congestion) during the base-year were:

- SR 240 eastbound between Route 10 and Stevens Drive
- George Washington Way near I-182
- SR 240 eastbound to I-182 westbound (near Aaron headed toward Queensgate)
- Gage Blvd eastbound, east of Steptoe
- Yelm Street at Intersections with SR 395 and Kennewick Ave
- SR 395 southbound ramp movements between SR 397 I/C and Court St I/C
- I-182 eastbound ramp to Rd 100
- Road 100 between Sandifur and I-182 I/C
- Road 68 northbound north of I-182 I/C

The greatest volumes travel upon the SR 240, I-182, and SR 395 corridors that stretch throughout the Tri-City area. Congestion is mostly limited to areas surrounding these state routes and their connection to local arterials. Delays at signalized intersections result in the predominance of delays upon these routes.

OTHER OPERATIONAL CONCERNS NOT IDENTIFIED BY MODEL

There invariably are locations in all models whose actual conditions are not reflected well within the model. BFCG staff and local jurisdictions have reviewed the model findings, and have identified locations where volumes are higher than portrayed by the model, or otherwise

realized as being congested based upon other conditions. Identification of these locations is important when considering the base-year model, because locations that appear low within the calibrated model are likely to model similarly in future scenarios. The following locations have been identified as areas of congestion where the model results do not adequately portray existing conditions:

- SR 240 "Bypass" – delays at six signalized intersections on route
- SR 395, Hildebrandt to Yelm – delays at seven signalized intersections along route
- I-182 Interchanges at Road 100 and Road 68 - ramp delays accessing local arterials
- Clearwater Blvd.- Edison St. to SR 395
- SR 397 (Ainsworth Ave) - 4th Ave to 10th Ave westbound

OPERATIONAL CONCERNS FOR AM PEAK-HOUR

There are several locations in the model area that have operations problems during the morning commute, or other periods outside the PM peak-hour. With the model focus upon the PM peak-hour, and the predominant travel patterns in the area, these locations are likely to not appear within the model results. BFCG staff, with the help of WSDOT and the local jurisdictions, has compiled the following list to identify these locations.

- SR 240 westbound ramp to I-182 westbound
- SR 240 "Bypass" – delays at six signalized intersection on route
- Queensgate – eastbound access to I-182 eastbound
- Columbia Center Blvd – northbound access to SR 240 westbound
- Burden/Road 68 accessing I-182 westbound
- I-182 eastbound off ramp to SR 240 northbound
- At-grade railroad crossings on Leslie, Edison, Washington St./Fruitland, SR 397

ALTERNATIVE SCENARIOS

The future scenarios for 2020 and 2030 were completed using the 2020 and 2030 forecasted land use described in Chapter 6 coupled with project lists for the period between 2011-2020, and another for 2021-2030. For the "No-Build" scenarios, the road network remained as it was in the year 2010. In the Tri-City area, several capacity affecting projects have been built or are currently underway. So, while it may not be realistic to expect a road network with no improvements to the 2010 road network, these scenarios are a good representation of how conditions can deteriorate if continuing efforts aren't made to handle needed capacity.

"Build" scenarios incorporate the projects contained within the financially constrained project listings described in Chapter Nine (lists found in Appendix H). The 2020-Build scenario incorporates all projects expected to be built between 2010 and 2020. The 2030-Build scenario reflects the addition of those projects expected to be built by 2030. Graphics are provided under each build scenario to show where projects are anticipated.

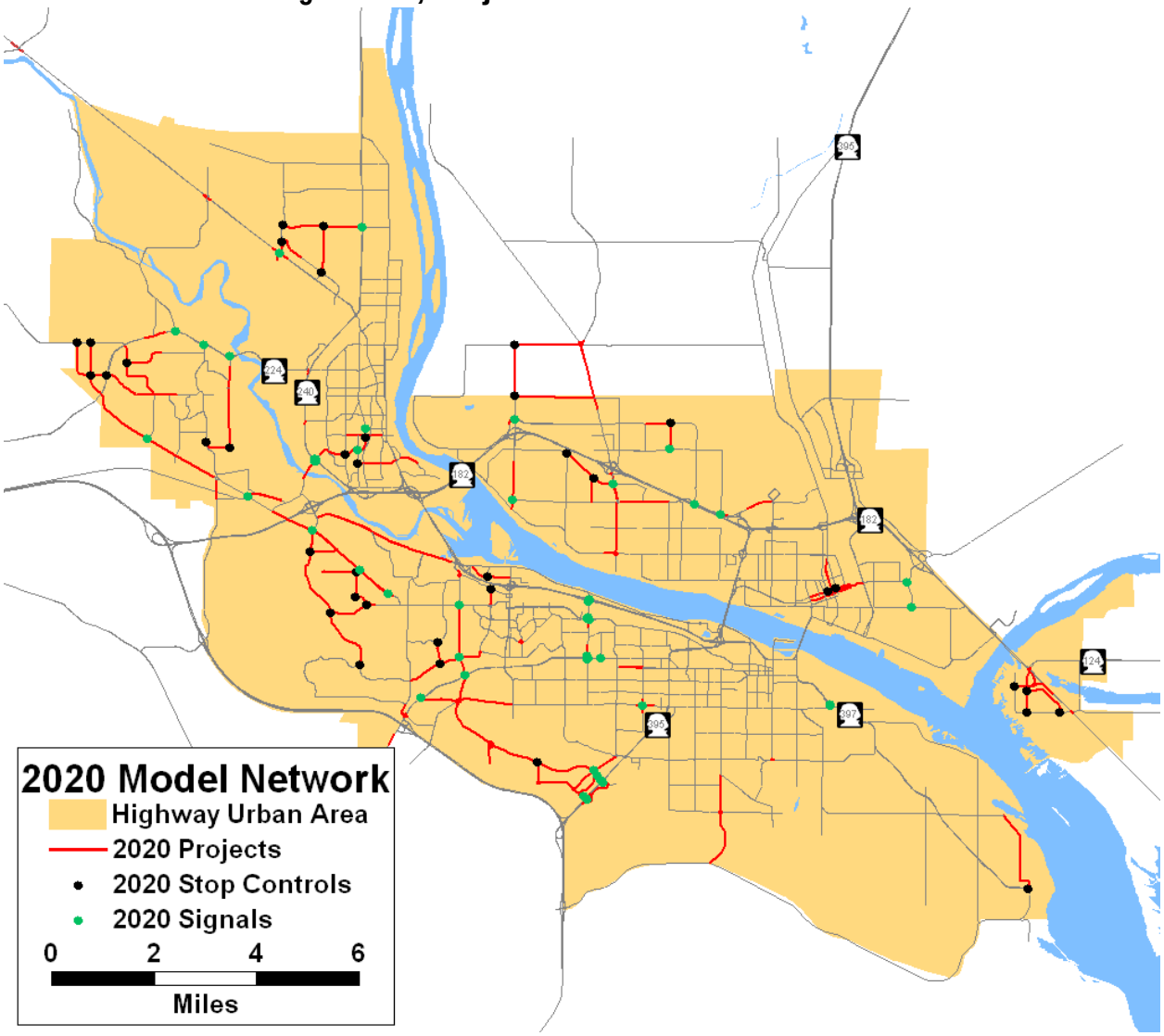
DEFICIENCY IDENTIFICATION

2020 "No-Build" – Under this scenario, conditions at the locations listed in the base year findings have worsened, with congestion projected on numerous segments in those vicinities. As indicated earlier, many projects have occurred or are in progress to address conditions at some of these locations. Areas of congestion are primarily along major corridors or their interchanges with area highways. Some of the deficiencies new, or worsened, within the 2020 No-Build scenario are listed below:

- SR 240 westbound – Kingsgate to Stevens
- George Washington Way/Lee southbound – south of Lee
- I-182 westbound ramps from SR240 southbound and SR240 northbound
- I-182 eastbound ramp from SR240 northbound/GWW
- Queensgate southbound west of Columbia Park Trail
- Columbia Park Trail westbound – east of Leslie
- Gage Blvd, westbound east of Bellerive, and eastbound east of Steptoe
- 27th Ave eastbound – east of SR 395
- SR 395 Blue Bridge southbound and Bridge approach northbound
- SR 397 southbound – south of 10th Ave
- I-182 eastbound ramp to Rd100 and westbound ramp from Rd 100
- I-182 eastbound ramp to Rd 68
- Road 68 northbound and southbound between I-182 and Burden
- Burden eastbound east of Rd 68
- SR 395 southbound ramp from SR 395 (@ SR 397) and southbound loop @ I-182

2020 "Build" – In this scenario, a significant number of projects have been built - some complete or underway, and others that are expected prior to 2020. In total, one hundred and fifty-four projects were listed by local jurisdictions in the 2010-2020 timeframe. Approximately one hundred of these projects affected network capacity and were built into the model. These projects consist of roadway widening, new roadways, added turn lanes, signalization or stop controls at intersections, etc. Major projects include: completion of Steptoe extension, new Southridge Area roadways, Extension of Queensgate across the Badger "saddle", Lewis Street Overpass, extensions of Paradise and Burden roads, and completion of the Duportail Bridge. Figure 7-2 (located on following page) shows the location of assorted projects built into the 2020 Build scenario. Road projects are shown in red, with added stop controls identified as black dots and signals as green dots. As a reminder, a complete listing of projects and project details can be found in Appendix H.

Figure 7-2, Projects for 2020 Build Scenario



Understandably, these projects reduce or eliminate many of the deficiencies listed under the 2020 No-Build scenario. However, some locations with projected congestion still remain and solutions to address these deficiencies should be identified. Listed below are some of the forecasted deficiencies for the 2020-Build scenario.

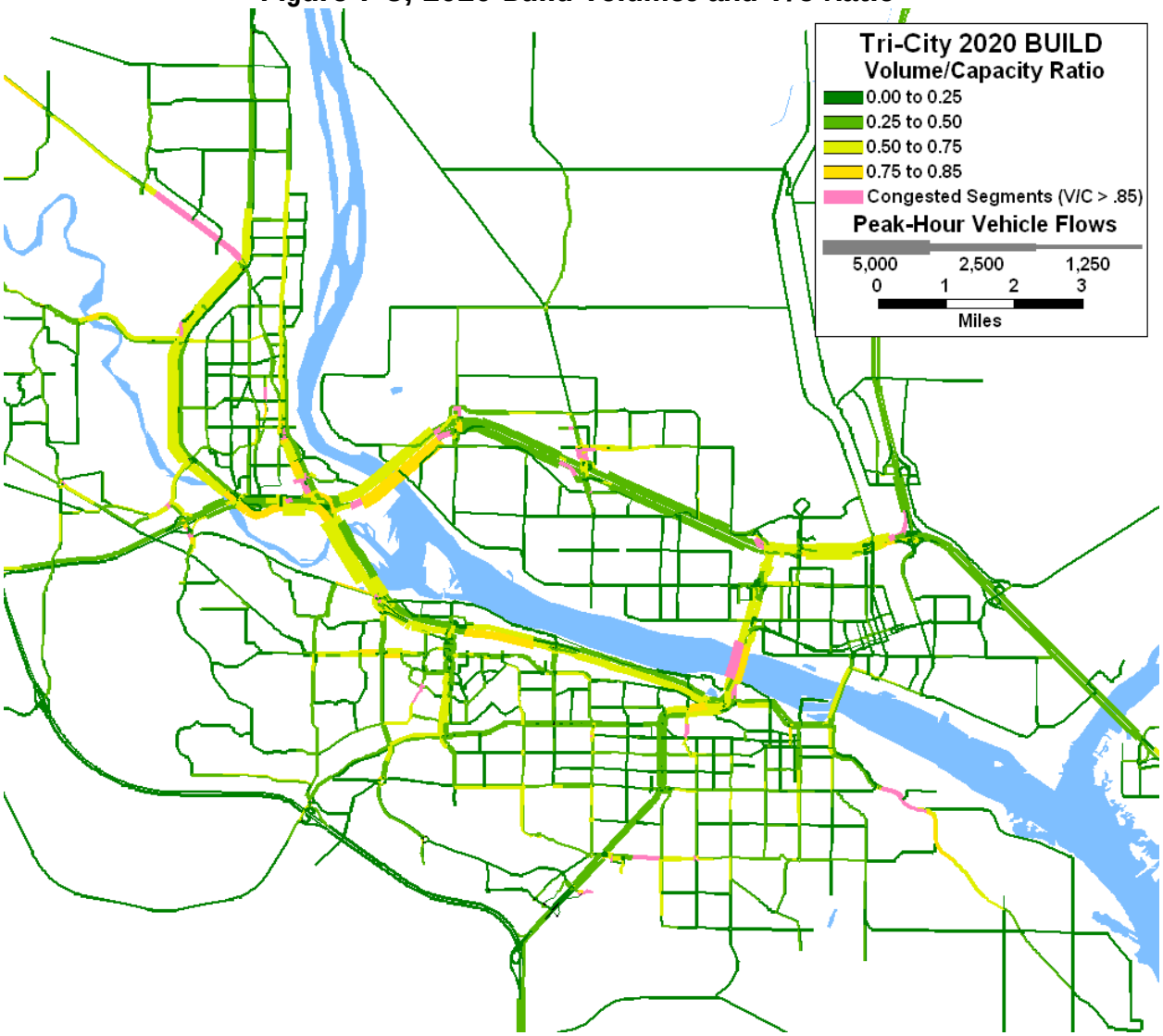
- SR 240 eastbound between Kingsgate and Stevens Dr
- George Washington Way/Jadwin southbound from Lee to I-182
- Duportail westbound – southbound south of Queensgate
- Queensgate southbound – south of I-182 I/C
- Center Parkway – south of Quinault
- 27th Ave and 36th Ave eastbound – east of SR 395
- SR 395 Blue Bridge southbound and northbound access prior to bridge
- SR 397 Southbound – south of 10th Ave
- I-182 eastbound ramp to Rd 100 and westbound ramp from Rd 100
- Rd 100 north of I-182 – both directions

(2020 Build deficiency list continued from previous page)

- I-182 eastbound ramp to Rd 68
- Rd 68 north of I-182 – both directions
- Burden Blvd eastbound – east of Rd 68
- SR 395 ramps southbound from SR 395 (@ SR 397) and southbound loop ramp at I-182

Figure 7-3 below portrays vehicular PM peak-hour flows and the corresponding V/C forecasted for the 2020-Build scenario. Locations forecasted to operate at congested conditions are shaded in pink in the graphic.

Figure 7-3, 2020-Build Volumes and V/C Ratio

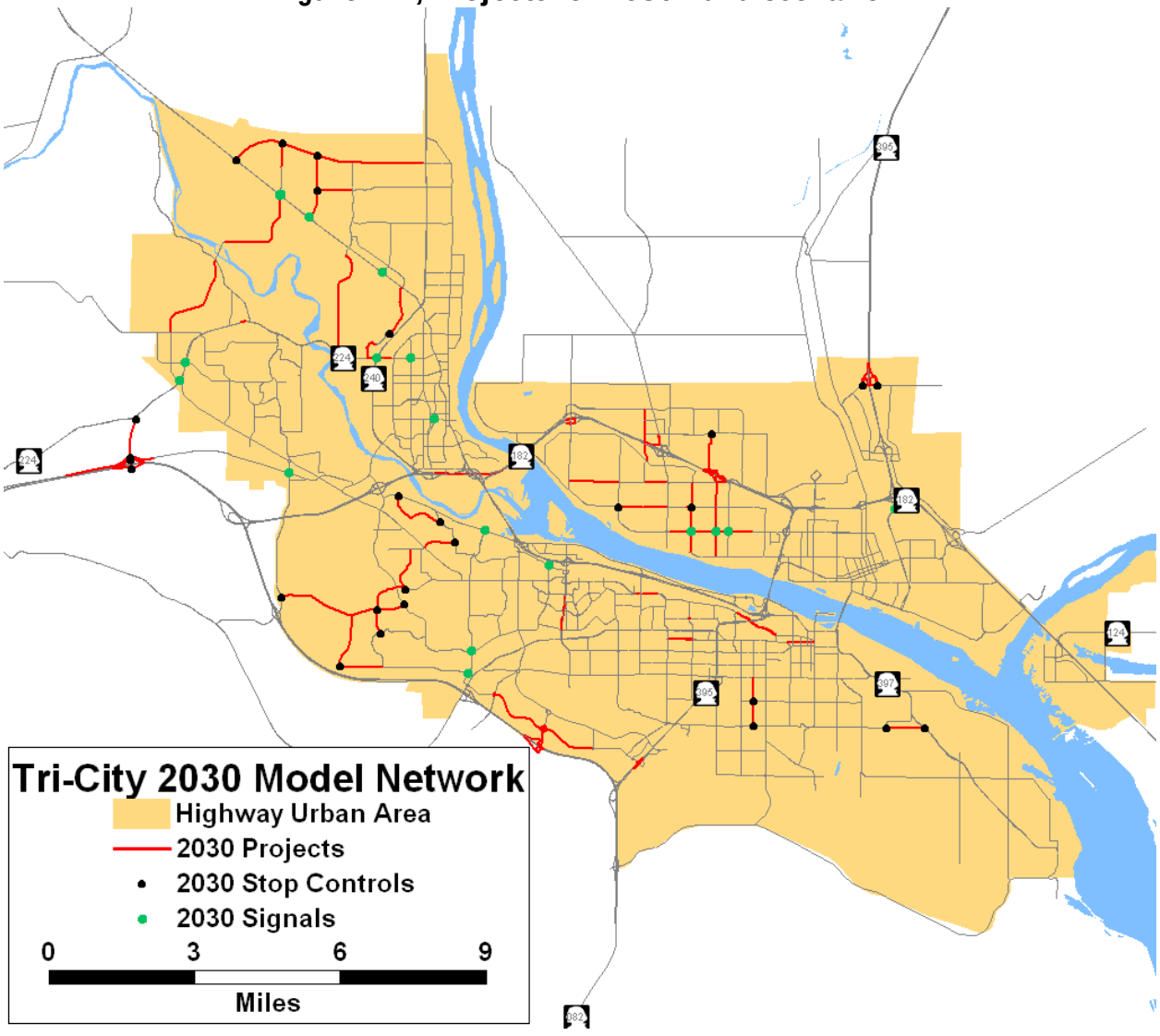


2030 "No-Build" – As expected, the results of this scenario depicts the gridlock that might be expected with no capacity improvements to the road network. Most interchanges and their connection to local arterials depict some level of congestion. Numerous segments along

arterials are projected to operate as congested. Under this scenario, the Blue Bridge is well above capacity, while the I-182 bridge is forecast near its' capacity while carrying volumes in excess of those forecast for the SR 240 Causeway. The deficiencies under this scenario are too numerous to list, but additional detail can be found in Appendix F. As indicated in the 2020 No-Build section, it is unrealistic to assume no capacity improvements would be built over a twenty-year period. With continued attention to area needs, we anticipate being able to avoid the conditions forecast under this scenario.

2030 "Build" – As in the 2020-Build scenario, many significant projects have been built into this forecast. Jurisdictional project lists contained eighty-six projects in the 2020-2030 period, which are modeled in addition to those found in the 2020-Build scenario. Project highlights include the extension of Keene Rd to Twin Bridges, Red Mountain Interchange, Jones Rd extension, Badger sub-area arterials, Road 76 I-182 Underpass, as well as new interchanges at SR224/SR240, Road 52, Foster Wells, and Center Parkway. Figure 7-4 shows the assorted projects contained within the 2030 Build scenario using themes matching the 2020 Build graphic.

Figure 7-4, Projects for 2030 Build Scenario



As demonstrated in the 2020 scenarios, many of the deficiencies shown under the "No-Build" scenario are reduced or eliminated with the "Build" scenario. Some of the projects within this scenario have resulted in significant shifts in forecasted traffic flows. While these shifts are largely forecasted to improve conditions in their vicinity, there do remain some locations projected to operate as congested. These locations are identified below.

- George Washington Way southbound south of Lee
- SR 240 southbound ramp to I-182 eastbound and SR240 southbound from GWW
- SR 240 roundabout at Steptoe/Columbia Park Trail
- Gage Blvd westbound prior to Bellerive and eastbound prior to Quinault
- Center Parkway south of Quinault
- SR 397 south of 10th Ave
- SR 395 Blue Bridge both northbound and southbound
- I-182 Bridge eastbound
- Road 100 north of I-182 and I-182 eastbound loop to Road 100
- Road 68 northbound north of I-182
- SR 395 southbound ramps from SR 395 southbound (at SR 397) and loop southbound in Argent vicinity

While the locations above are forecasted to exceed desirable levels of congestion, it is important to note that in some locations conditions are forecast to improve compared against other scenarios. These improved conditions are the result of improvements upon nearby facilities. Put another way, it is important to recognize when a location no longer shows congestion under a particular scenario and recognize why. The following observations were made between the 2030-Build and 2020-Build scenario results.

- With the extension of Keene Road to Twin Bridges and Jones Road to Kingsgate, SR 240 southbound (west of Stevens) no longer appears as congested. This could be partly a result of reduced employment upon the Hanford Site, but employment projections for the Horn Rapids "Triangle" were significant and off-set Hanford reductions to some degree. These routes appear to be attractive alternatives to the SR 240 corridor. This is evidenced upon northern portions of the SR 240 "Bypass" as well, where volumes are forecast at levels slightly lower than current conditions.
- Conditions on Road 68 in I-182/Burden vicinity and upon I-182 ramps improved significantly with the addition of the Road 52 Interchange and the accompanying Road 76 Underpass. While still shown as congested, conditions are forecast to improve with these additions.

STAFF MODEL OBSERVATIONS

It is also important to identify locations where conditions are forecasted to deteriorate given the road projects planned and the projections for housing, employment, and land use. Consideration should be given to potential improvements that could help alleviate congestion at the following locations, by either providing capacity improvements or alternatives to the road network or planned development.

- SR 395 Blue Bridge and I-182 Bridges are forecast to operate very near their stated capacities and at levels of congestion in both directions on the Blue Bridge and eastbound upon I-182 Bridge. Volumes upon the I-182 Bridge are forecast to surpass

volumes on the heavily travelled SR 240 Causeway by the year 2030.

- Road 100 is forecast as congested under all scenarios, with congestion getting progressively worse in the future. Attention should be given to the I-182 Interchange and north of I-182 to ensure capacity is sufficient to handle anticipated development.
- SR 397 south of 10th Ave also appears congested under most scenarios. While not forecast to carry heavy volumes, this portion of the corridor may require capacity improvements to carry forecasted loads.
- George Washington Way between Lee and I-182 appear congested under all scenarios with the number of congested segments increasing in forecast years given anticipated development. Attention should be paid for effective ways to cause this corridor to operate more efficiently.
- Quennsgate southbound at I-182 Interchange also appears under most scenarios. With planned improvements to Duportail Bridge and extension of Queensgate over Badger Mountain, it is important to ensure capacity is sufficient that handle these flows.

Appendix F provides an assortment of graphics to display model results for the varying scenarios described in this chapter. For additional detail about the Tri-City Travel Demand Model, please contact the Transportation Programs Office at the BFCG.

CONCLUSIONS

Solutions to many of the existing and anticipated deficiencies are included in the current Metropolitan TIP, while others are addressed in the twenty-year constrained and un-met need lists found in Appendix H. Local area staffs appear to have good understanding of the challenges they face with their existing system and anticipated growth. Projects appear appropriate and to address locations most in need.

With the network deficiencies identified throughout the model area, it is clear that significant capacity improvements will be needed to serve the needs of the growing Tri-City community. The projects included in this modeling effort are significant and high in cost; yet do not solve forecasted congestion in all areas. Officials will need to ensure revenues are applied to those projects that reap the greatest benefit while being aware of the impacts of anticipated development.

Attention should be paid to development of alternative modes and options, to help alleviate congestion on area roadways, with continued emphasis upon public transit use and carpool/vanpool operations. This is of particular importance with regard to the work commute, given the heavy percentage of employees located north and northwest of the urban area. Development in appropriate areas should ensure bicyclists and pedestrians have adequate facilities available, so that travel via automobile may not be required on a daily basis. Area commuters struggle with barriers in our commute, both man-made and natural, that further restrict travel. Finding solutions to these barriers will be key, as officials work to provide a system that allows freedom of movement across the area.

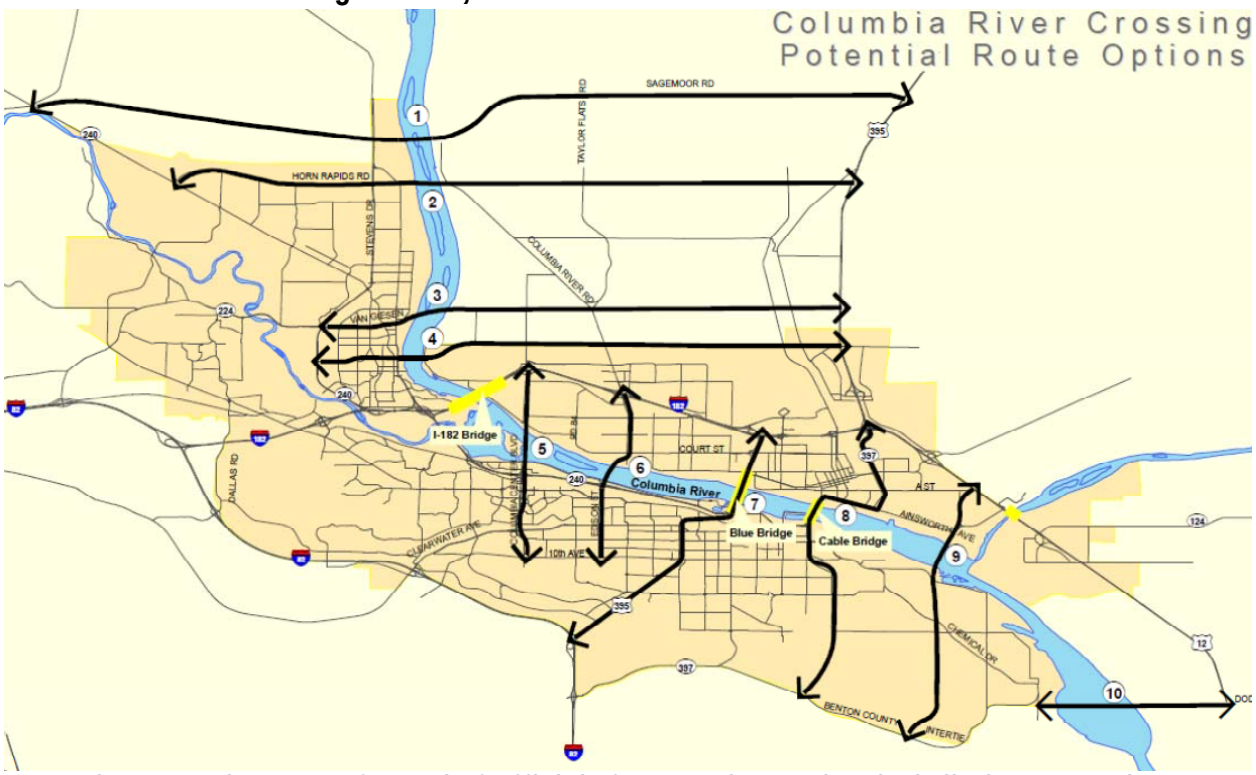
OTHER LONG RANGE PLANNING CONSIDERATIONS

Columbia River Crossing Study/Tri-Cities

Completed during 2010, the Columbia River Crossing Study was initiated due to numerous discussions and previous work accomplished in the Tri-City area, focusing on congestion at the Pioneer Memorial (Blue) Bridge. The Benton-Franklin Council of Governments (BFCG) initiated the study and partnered with the Cities of Pasco, Kennewick, and Richland, along with Benton and Franklin Counties and the Ports of Benton, Pasco, Kennewick and Walla Walla.

The scope of the study was defined to review up to ten crossing locations, to consider fatal flaws in any of the alternatives, and to winnow those ten alternatives ultimately to three locations to move forward into the formal environmental processes. Figure 7-5 shows the ten locations evaluated during this study.

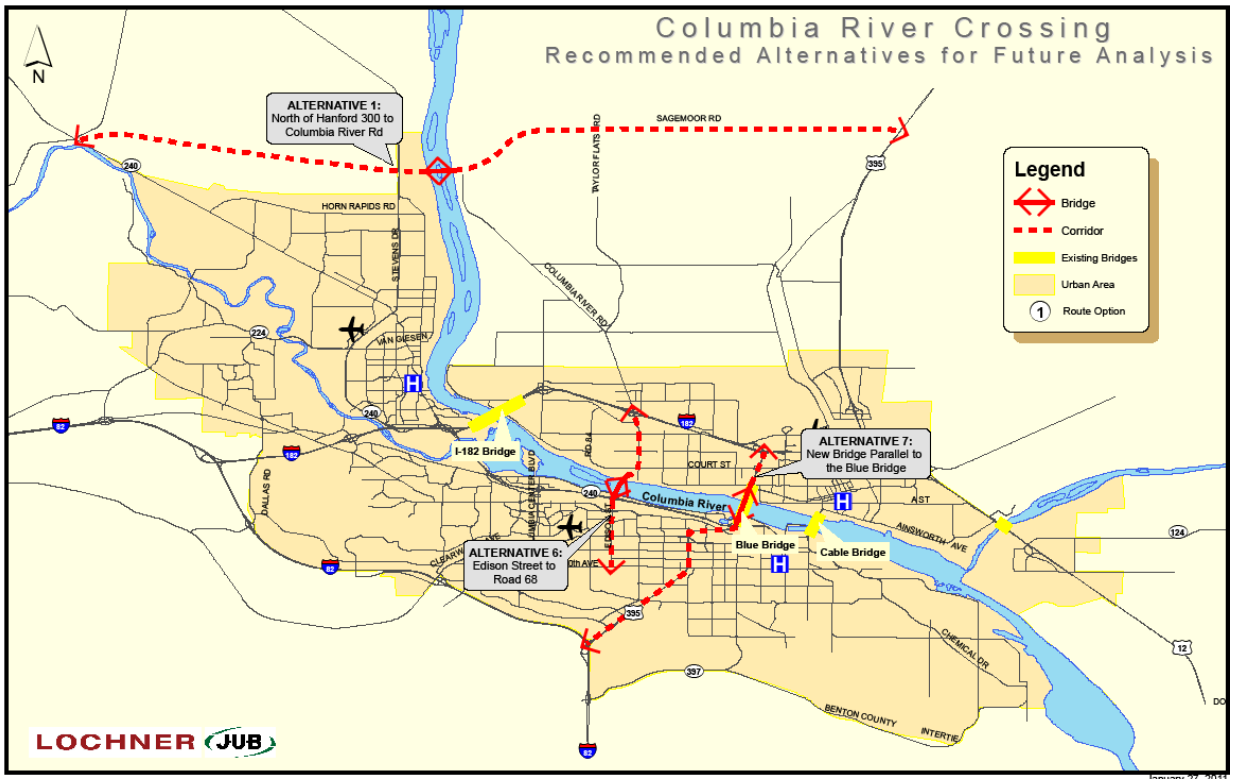
Figure 7-5, Ten CRCS Evaluation Locations



A Steering Committee was formed of officials from study member jurisdictions. Members screened options based upon congestion, system connectivity, economic benefit, environmental concerns, project costs, and community support. Based upon information provided by the consultant group, the Steering Committee agreed that the alternatives below (and shown in Figure 7-6 on next page) should be carried forwarded into more detailed engineering and environmental analysis.

- Alternative 1 – A new span located north of the Hanford 300 Area connecting to Columbia River Road and W Sagemoor Road on the east
- Alternative 6 – A new span from Edison Street in Kennewick to Road 68 in Pasco
- Alternative 7 – An additional bridge span parallel to existing US 395 "Blue Bridge"

Figure 7-6, CRCS Alternatives for Future Analysis



US 395 Corridor Study

The US 395 corridor through the Tri-Cities has many limitations, including substandard interchanges from I-182 to SR 240, and several signalized at-grade intersections through the City of Kennewick. The highway functions more as a city arterial than a major north-south U.S. route between the Canadian and Mexican borders.

WSDOT is currently working upon a study to document conditions throughout this corridor and suggest solutions to the many challenges upon the corridor. At this time, the study is not yet complete but recognition of the current study was desired within this plan.

A 1995 consultant study jointly managed by WSDOT and ODOT considered alternative routings for US 395 from north of Pasco to I-84 in Oregon. There was strong local opposition in Oregon to relocating the highway to not pass through the cities of Hermiston and Stanfield. The study, thus, recommended retaining the existing US 395 routing, in full recognition of the on-going congestion problems in the Tri-Cities.

At such time as US 395 congestion and resultant accidents in Pasco and Kennewick approach intolerability, major capacity and safety improvements will have to be made. Due to the extent of abutting developments, such improvements will have extreme costs. Recent funding efforts have targeted small sections of this corridor, focusing on a few intersections and an interchange improvement. Anticipated conditions along this corridor warrant a more detailed study of alternative routings or increased capacity through or around the area.