

## Tech Memo 12.4: Tier 1 Scenario Analysis

Date: August 12, 2013 Project #: 11732

To: Transportation System Plan (TSP) Technical Advisory Committee (TAC) Members and Public Advisory Committee (PAC) Members

From: TSP Project Management Team

Project: Clackamas County Transportation System Plan Update

Subject: Analysis of draft 20-Year Capital Projects (Tier 1) Network

This memorandum summarizes the operational analysis performed on the draft 20-Year Capital Projects (Tier 1) network, hereafter referred to as the *Tier 1 Scenario*. The intent of this analysis is to identify any necessary changes to the 20-Year Capital Projects list or adjustments in project priorities to best meet the TSP goals and objectives.

### I. BACKGROUND

At this stage of the TSP update, the project lists for the Clackamas County Transportation System Plan (TSP) are being finalized according to the goals, priorities and available funding. This process will result in three project lists, shown in Table 1, which will define the County's transportation priorities for the next 20 years.

**Table 1 TSP Project List Organization**

Project List Name	Tier	Previous Name	Funding Available	Type of Projects Included
<b>20-Year Capital Projects</b>	1	Fiscally Constrained List	Approximately \$444 million (based on funding forecast)	Top recommended projects that can reasonably be undertaken given the current estimates of available funding.
<b>Preferred Capital Projects</b>	2	Preferred Project List	Approximately \$444 million (potential additional funding)	Additional recommended projects that the County hopes to undertake if additional funding becomes available during the next 20 years.
<b>Long-Term Capital Project Needs</b>	3	Vision Project List	None known	All other needed projects identified in the TSP update process. These are not expected to be funded or constructed by the County during the next 20 years, but they are still needed to meet the County's projected transportation needs.

The current draft project lists were developed based on a variety of information and input, including:

- An analysis of the transportation system and study intersections under existing conditions, the 2035 Low Build Scenario (includes funded projects as of summer 2012), and the 2035 Full Build Scenario (includes all planned projects in the previous TSP).
- A goal assessment of potential projects based on the vision, goals, and objectives of the TSP.

- Public input gathered via the Public Advisory Committee (PAC), three virtual workshops, and community outreach activities.
- Feedback from Geographic Area Priority (GAPS) groups, a Technical Advisory Committee (TAC), and County staff.

The current draft 20-Year Capital Projects (Tier 1) List reflects the recommended priorities coming out of PAC meeting #5C, held April 30, 2013. Maps and tables of the projects are available in *Appendix A*.

## II. TIER 1 SCENARIO

In order to further inform the prioritization process, an operational analysis was performed to assess how the transportation system operates with the projects currently on the draft 20-Year Capital Projects List (Tier 1 Scenario). The projects included in this analysis are listed and mapped in *Appendix A*. The intent of this analysis was to identify the following:

- Tier 1 Projects that need to be adjusted (project extents, description, and/or cost) in order to best address an identified deficiency,
- Tier 2 or 3 Projects that need to be elevated in priority to address an identified deficiency,
- Tier 1 Capacity Projects that do not address a projected deficiency and therefore may not be needed in the 20-year horizon, and
- Any remaining deficiencies in the transportation system not addressed by a project on the TSP list.

### A. Volume Development

The operational analysis relied on the development of link volumes and turning movement count volumes at key study intersections. As with the 2035 Low Build Scenario and 2035 Full Build Scenario assessed in earlier TSP efforts, this analysis assumed 2035 projected population and employment growth. Metro's recently released Joan Version 2 model was utilized to develop volumes, whereas earlier modeling efforts used the Joan Version 1 model. The key differences between these models are summarized in the materials provided in *Appendix B*. Based on discussions with Metro Travel Modeling staff, the differences between the two models are likely the result of the following:

#### 1. Changes in the 2035 Land Use Assumptions – Households and Employment

The Joan Version 2 model uses the 2035 Gamma forecast, whereas the Joan Version 1 model used the 2035 Beta forecast. The Gamma Forecast has approximately 8,000 fewer households overall, fewer households in the County, and a general decrease in household incomes (which is strongly associated with reduced access to automobiles and increased demand for transit service). The vehicle trip reduction is slightly larger when analyzing the 2-hour PM peak because more transit trips are generated. As a result of these changes in the 2035 land use and economic assumptions, the total

number of vehicles trips in 2035 decreased by 13% between the Beta Forecast and the Gamma Forecast.

## 2. Changes to the Travel Model

A key component of a travel model is the origin-destination (O-D) matrix, which allocates all of the trips generated in a traffic analysis zone (TAZ) to the other TAZs in the regional travel model. The travel survey used in the previous Metro model was conducted in 1994 and showed that 93.2% of all trips in the County were made by automobile. The updated Metro model utilized a new travel survey from 2011 which showed that 87.6% of trips in the County were made by automobile. Therefore, the change to the new travel survey data resulted in an additional 5% reduction in the overall number of trips made by automobile in 2035.

The combined effect of these two changes to the travel model is an 18% reduction in number trips made by automobiles and a resulting decrease in the travel volumes shown by the Joan Version 2 model in 2035. These changes are reflected in the link volumes and turning movement counts utilized in the Tier 1 Scenario analysis, as discussed further later in this memo.

## B. Study Intersections

Fifty intersections were selected for analysis under the Tier 1 Scenario (of the 125 intersections studied in the *Existing and Future Conditions Report*). Intersections were selected based on several factors, including:

- Intersections that were not projected to meet standards under the 2035 Low Build
- Intersections that were impacted by a Low Build project not included in the Tier 1 Scenario (i.e. in the vicinity of the Sunnybrook Extension)

The lane configurations and traffic control devices at the study intersections assumed for the Tier 1 Scenario are shown in *Appendix C*.

## III. KEY FINDINGS

The operational analysis assessed operations at both the study intersections and roadway segments in the County. The key findings from both analyses are detailed below.

## A. Intersection Operations

The intersection operations under the Tier 1 Scenario are shown in the figures in *Appendix D* and summarized in Table 2.

Table 2 Tier 1 Scenario Study Intersection Operations

ID	Intersection	Jurisdiction	Performance Standard	Low Build Project?	Meets Standard in 2035 Low Build?	Tier 1 Project?	Meets Standard in Tier 1 Scenario?
104	SE Johnson Creek Blvd/89th Ave	County	v/c = 1.1	No	No	2114	Yes
105	SE Johnson Creek Blvd/82nd Ave (OR 213)	ODOT	v/c = 0.99	No	No	U659	Yes (v/c=0.99)
107	SE Johnson Creek Blvd/I-205 SB Ramps	ODOT	v/c = 0.85	No	Yes	U087	Yes
116	SE King Rd/SE Fuller Rd	County	v/c = 0.99	No	No	U092	Yes
123	SE Lake Rd/SE International Way	County	v/c = 0.99	No	No	2115	Yes (v/c=0.99)
124	SE Harmony Rd/SE Linwood Ave	County	v/c = 0.99	No	No	U103	No (v/c=1.41)
125	SE Harmony Rd/SE Fuller Rd	County	v/c = 1.1	No	Yes		Yes (v/c=0.93)
126	SE Sunnyside Rd/SE Harmony Rd/SE 82nd Ave (OR 213)	ODOT	v/c = 1.1	No	Yes		Yes (v/c=0.99)
130	SE Sunnyside Rd/I-205 SB Ramps	ODOT	v/c = 0.85	No	No		Yes (v/c=0.81)
131	SE Sunnyside Rd/I-205 NB Ramps	ODOT	v/c = 0.85	No	No		Yes
136	SE Sunnybrook Blvd/SE 82nd Ave (OR 213)	ODOT	v/c = 0.99	Yes	No		Yes
138	SE Sunnybrook Blvd/I-205 NB Ramps	ODOT	v/c = 0.85	No	No		Yes
140	OR 224/SE Rusk Rd	ODOT	v/c = 0.99	No	No		Yes (v/c=0.97)
141	OR 224/SE Lake Rd/SE Webster Rd	ODOT	v/c = 0.99	No	No	2118	No (v/c=1.30)
143	OR 224/SE Johnson Rd	ODOT	v/c = 0.99	No	No	U928	Yes
144	SE Sunnyside Rd/SE 122nd Ave	County	v/c = 0.99	No	No	U123	Yes
146	SE Sunnyside Rd/SE 142nd Ave	County	v/c = 0.99	No	No		Yes
149	SE Sunnyside Rd/SE 172nd Ave	County	v/c = 0.99	No	Yes		Yes
153	OR 212/I-205 SB Ramps	ODOT	v/c = 0.85	No	No		Yes
155	OR 212/SE 82nd Dr	ODOT	v/c = 0.99	Yes	Yes		Yes (v/c=0.93)
157	OR 224/SE Hubbard Rd/135th Ave	ODOT	v/c = 0.99	No	No	2121	Yes (v/c=0.91)
158	OR 224/SSE 142nd Ave	ODOT	v/c = 0.99	No	No		Yes
159	OR 212/OR 224	ODOT	v/c = 0.99	No	No	U019 U915	Yes (v/c=0.95)
161	OR 212/SE 172nd Ave	ODOT	v/c = 0.99	Yes	No	U019	No (v/c=1.03)
165	OR 224/Springwater Rd	ODOT	v/c = 0.99	No	No	U915	Yes
201	SE Park Ave/SE River Rd	County	v/c = 0.99	No	Yes		Yes
219	SE Thiessen Rd/SE Hill Rd	County	v/c = 0.99	No	No		Yes
220	SE Thiessen Rd/SE Aldercrest Rd	County	v/c = 0.99	No	No	2113	Yes
223	SE Roots Rd/SE Webster Rd	County	v/c = 0.99	No	No		Yes
224	SE Jennings Ave/SE Webster Rd	County	v/c = 0.99	No	No		Yes
301	SW Childs Rd/SW Stafford Rd	County	LOS = D	No	No	U168 U169	Yes
302	SW Borland Rd/SW Stafford Rd	County	LOS = D	No	No	U167 U168	Yes

ID	Intersection	Jurisdiction	Performance Standard	Low Build Project?	Meets Standard in 2035 Low Build?	Tier 1 Project?	Meets Standard in Tier 1 Scenario?
303	SW Mountain Rd/SW Stafford Rd	County	LOS = D	No	No		Yes
401	Clackamas River Drive/Springwater Rd	County	LOS = D	No	No	U184 2107	Yes
402	S. Redland Rd/S. Holly Lane	County	V/C = 0.99	No	No	U197	Yes
403	S. Redland Rd/S. Ferguson Rd	County	LOS = D	No	No	U199	Yes
406	S. Henrici Rd/OR 213	ODOT	V/C = 0.75	No	No	2109	No (v/c=0.84)
408	South End Rd./OR 99E	ODOT	V/C = 0.75	No	No		Yes (LOS=F) (v/c=0.74)
409	S. Leland Rd/OR 213	ODOT	V/C = 0.80	No	No	2110 U441	Yes
412	Arndt Rd/NE Airport Rd	County	LOS = D	No	Yes		Yes (LOS=D) (v/c=0.97)
414	Arndt Rd/Knights Bridge Rd	County	LOS = D	No	Yes		Yes
415	Arndt Rd/S. Barlow Rd	County	LOS = D	No	Yes		Yes
416	OR 99E/S. Barlow Rd	ODOT	V/C = 0.75	No	No	2111	Yes
418	S. Spangler Rd/OR 213	ODOT	V/C = 0.75	No	No	1007	Yes
419	Mulino Rd/OR 213	ODOT	V/C = 0.80	No	Yes	1090	Yes
420	S. Union Mills Rd/OR 213	ODOT	V/C = 0.75	No	Yes	U302a	Yes
422	S. Union Mills Rd/S. Beavercreek Rd	ODOT	V/C = 0.75	No	No	U302a	Yes
501	OR 212/SE 282nd Ave	ODOT	v/c = 0.70	No	No		No (v/c=1.07)
502	OR 224/SE 232nd Ave	ODOT	v/c = 0.75	Yes	No	2106	Yes
503	OR 224/OR 211	ODOT	v/c = 0.80	No	No	U427	Yes

As shown in the figures and table above, forty-five of the study intersections meet standards under the Tier 1 Scenario. The majority of these intersections are directly impacted by a Tier 1 project, i.e. the addition of turn lanes or a change in traffic control. Others experience a change in projected volumes (either due to nearby improvements or model changes, as discussed above) that cause them to operate within standards. Five of the intersections do not meet standards under the Tier 1 Scenario. None of these intersections meet standards under the 2035 Low Build. Four of these are impacted by a Tier 1 project, but still fall short of standards.

## B. Roadway Segment Analysis

The roadway segment volumes provide a sense of the demand for travel on roadways. Figures are provided in *Appendix E* illustrating the roadway link volumes from the weekday evening peak hour for the Tier 1 Scenario. Overall, the figures reflect a reduction in link volumes during the weekday PM peak hour, compared to the 2035 Low Build and 2035 Full Build scenarios. This reflects the changes in the model described above, including a reduction in projected household growth and automobile travel. The model used to develop the volumes makes its forecast for the PM peak hour, which has a higher

percentage of total trips occurring by transit (compared to total daily trips). This could also contribute to the overall reduction in link volumes.

The level of congestion experienced on roadway segments was estimated using the roadway segment volumes from the Metro base model and the roadway segment capacity. The volume was compared to the capacity to calculate a volume-to-capacity ratio that is used to estimate the level of congestion. Figures are provided in *Appendix E* illustrating the relative congestion during the Tier 1 Scenario weekday evening peak hour on roadways based on the estimated roadway segment volumes and capacity. The figures reflect an overall reduction in congestion compared to the Low Build Scenario (particularly on I-205, OR 213, OR 212, OR 43, Carver Bridge and SE Sunnyside Rd). The Tier 1 Scenario segment congestion analysis shows only a few isolated points of congestion, including several roadways within Oregon City, on Arndt Rd, portions of I-205, and a couple of roadway segments within Damascus.

#### IV. RECOMMENDATIONS

The intersections that do not meet standards under the Tier 1 Scenario were further assessed to determine what changes to the TSP project lists are needed to address these deficiencies. The draft Tier 2 (Preferred Capital Projects) and Tier 3 (Long-Term Capital Project Needs) lists were reviewed to assess whether there are any capacity projects on these lists that would address the intersection deficiencies. The results of this assessment are shown in Table 3.

Table 3 Intersections that do not meet Standards under the Tier 1 Scenario

ID	Intersection	Performance Standard	Tier 1 Project?	Meets Standard in Tier 1 Scenario?	Tier 2 or Tier 3 Project?	Meets Standard with Tier 2 or Tier 3 Project?
124	SE Harmony Rd/SE Linwood Ave	v/c = 0.99	U103 (Grade-sep RR crossing)	No (v/c=1.41)	No	No (needs additional improvements)
141	OR 224/SE Lake Rd/SE Webster Rd – ODOT Intersection	v/c = 0.99	2118 (second WBL turn lane)	No (v/c=1.30)	No	No (needs additional NBL and SBL turn lanes, NBR turn lane)
161	OR 212/SE 172nd Ave– ODOT Intersection	v/c = 0.99	U019 (Sunrise imp)	No (v/c=1.03)	2122 (Second EBL turn lane) - Medium	Yes
406	S. Henrici Rd/OR 213– ODOT Intersection	V/C = 0.75	2109 (traffic signal or roundabout)	No (v/c=0.84)	No	No (needs additional through lane on OR 213)
501	OR 212/SE 282nd Ave– ODOT Intersection	v/c = 0.70		No (v/c=1.07)	2105 (Second SBR turn lane) – Tier 3	No (needs second EBL, additional through lane on OR 212)

Each of the intersections is discussed in more detail below:

1. SE Harmony Rd/SE Linwood Ave (124)

Project U103 creates a grade-separated railroad crossing at the intersection of SE Harmony Rd/SE Linwood Ave. With this improvement, the intersection is projected to operate at a v/c ratio of 1.41, which is well over standards. The projected volumes show a large number of vehicles traveling between the south leg (SE Harmony Rd) and east leg of the intersection (SE Harmony Rd). **The project team recommends modifying the description of project U103 to include appropriate intersection improvements at SE Harmony Rd/SE Linwood Ave.** Further study is needed to determine the appropriate intersection improvements. Potential treatments include additional turn-lanes or a reconfiguration of the intersection to two T-intersections (so that SE Railroad Ave and SE Linwood Ave converge before intersecting with SE Harmony Rd).

2. OR 224/SE Lake Rd/SE Webster Rd (141) – ODOT Intersection

Project 2118 adds a second left-turn lane on westbound OR 224 at SE Lake Rd/SE Webster Rd. With this improvement, the intersection is projected to operate at a v/c ratio of 1.30, well over the standard of 0.99. **The project team recommends modifying the description of project 2118 to include additional intersection improvements,** including a second left-turn lane and right-turn lane on northbound SE Webster Rd and a second left-turn lane on southbound SE Lake Rd.

3. OR 212/SE 172nd Ave (161) – ODOT Intersection

The intersection of OR 212/SE 172<sup>nd</sup> Ave operates just over the v/c ratio standard of 0.99. Project 2122, which adds a second eastbound left-turn lane on OR 212, is currently ranked as medium priority on the ODOT project list. This project would improve operations at the intersection to bring it within standards. **Therefore, the project team recommends moving project 2122 from medium to high priority.**

4. S. Henrici Rd/OR 213 (406) – ODOT Intersection

Project 2109 changes the traffic control at S. Henrici Rd/OR 213 to a signal or roundabout. With either improvement, the intersection operates over-capacity, largely due to the heavy volumes of northbound and southbound vehicles. As a signal, the intersection operates at a level-of-service (LOS) B, a delay of 10.1 seconds, and with a v/c ratio of 0.84. Therefore, while the intersection operates well in terms of the LOS and delay, it does not meet the v/c ratio standard of 0.75. **Therefore, the project team recommends either adjusting the performance standard at this intersection or modifying the description of project 2109 to include additional intersection improvements,** such as auxiliary northbound and southbound through lanes.

## 5. OR 212/SE 282<sup>nd</sup> Ave (501) – ODOT Intersection

The intersection of OR 212/SE 282<sup>nd</sup> Ave operates at a v/c ratio of 1.07, above the standard of 0.70. Project 2105, which is currently in Tier 3, adds a second right-turn lane on southbound 282<sup>nd</sup> Avenue. With this project, the intersection still operates well above the v/c standard of 0.70, largely due to the heavy volume of vehicles on OR 212 using a single through lane. **Therefore, the project team recommends either adjusting the performance standard at this intersection or modifying the description of project 2105 to include additional intersection improvements**, such as auxiliary eastbound and westbound through lanes and an additional eastbound left-turn lane.

## Recommendations to Address Roadway Congestion

The roadways that are projected to be congested were also further assessed to identify what changes are needed to the TSP project list to address these deficiencies. The most significant areas of congestion are discussed below.

### 1. OR 212

Within the Clackamas Regional Center/ Industrial Area, a portion of OR 212 near 172<sup>nd</sup> Ave is projected to be very congested. Project 2122, which adds a second eastbound left-turn lane at the OR 212/172<sup>nd</sup> Avenue intersection, is currently medium priority. As part of the intersection analysis (see discussion above), the project team recommends moving the project from medium to high priority to address deficient operations at the intersection of OR 212/SE 172<sup>nd</sup> Ave. This project would also likely ease congestion on OR 212.

### 2. Springwater Rd

The portion of Springwater Road near OR 224 within the Clackamas Regional Center/Industrial Area is projected to be very congested. In order to address this deficiency, **the project team recommends adjusting the description of project U184 (currently Tier 1) to widen Springwater Rd to 3 lanes with shoulders and pedways between OR 224 and Hattan Rd**. Based on the intersection operations at OR 224/ Springwater Rd, it is recommended to keep the bridge at 2 lanes.

### 3. Arndt Rd

The portion of Arndt Rd between OR 551 and Barlow Rd just east of I-5 in the Southwest County is projected to be very congested. Based on current development restrictions, Arndt Rd cannot be widened. Further study is necessary to determine a solution to the congestion projected for this area. **Therefore, the project team recommends a study to identify and consider roadway improvements to address access to I-5 within the Southwest County and address capacity deficiencies.**



## Additional Recommendations

Several of the intersections in the vicinity of the Clackamas Town Center (i.e. SE Harmony Rd/SE Fuller Rd, SE Sunnyside Rd/SE Harmony Rd/SE 82nd Ave (OR 213), and SE Sunnyside Rd/I-205 SB Ramps) operate just within volume to capacity (v/c) standards. While improvements were considered for the regional center in earlier stages of the TSP Update process (i.e. the Sunnybrook Extension and Harmony widening), they were removed from the project lists based on feedback from the PAC, TAC, and public. It is unlikely these intersections can support much additional growth in the Town Center beyond what is included in the model forecasts. New development under current regulations will become increasingly challenging. Thus, it is recommended that the County consider modifying the current v/c ratio standard and developing alternative performance standards for the regional center (as previously recommended in the *Dynamic Traffic Assignment* Memo). In order to accomplish this, **the project team recommends a study to develop alternative performance standards for the intersections within the Clackamas Regional Center.**

## V. NEXT STEPS

The results of the Tier 1 Scenario operational analysis and key findings were reviewed by the TAC during TAC Meeting #8 on July 18<sup>th</sup>, 2013. The TAC discussed changes that should be made to the 20-Year Capital Projects and adjustments in project priorities that should be made as a result of the findings. In addition, the TAC considered the feedback gathered during public outreach activities from this spring, including presentations at community and business meetings, and an online “virtual” open house. The TAC and PMT developed a set of recommendations and draft 20-Year Capital Projects list, referred to as the “Draft Recommendation to the Planning Commission.”

The PAC will discuss the projects, programs, and policies in the Draft Recommendations to the Planning Commission during PAC Meeting #6 on August 20<sup>th</sup>. Discussion will focus on recommendations that have changed based on public comment, the Tier 1 Scenario Analysis, and/or TAC input. The PAC will have an opportunity to discuss the changes made and come to consensus on final TSP recommendations to be sent to the Planning Commission. Public review of the final plan will occur October through December when it will be presented to the Planning Commission and Board of County Commissioners, respectively.

## LIST OF APPENDICES:

A: PAC Recommended Projects – Tables and Maps

B: Metro Modeling Materials

C: Tier 1 Scenario Lane Configurations and Traffic Control Devices at Study Intersections

D: Tier 1 Scenario Intersection Operations

E: Tier 1 Scenario Roadway Segment Analysis