RTC REGIONAL SIGNAL TIMING PLANS

PILOT BEFORE/AFTER REPORT: FOURTH PLAIN BOULEVARD EAST

NOVEMBER 2025

PREPARED FOR:

Southwest Washington Regional Transportation Council

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TABLE OF CONTENTS

PROJECT BACKGROUND 1

PILOT CORRIDOR EVALUATION: FOURTH PLAIN BOULEVARD EAST 1

PERFORMANCE ANALYSIS 3

TRAVEL TIME COMPARISON 4

PROJECT CORRIDOR 5

EMISSION COMPARISON 8

SAFETY 11

APPENDIX 12

LIST OF FIGURES

FIGURE 1. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (EASTBOUND, WEEKDAY) 5

FIGURE 3. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (WESTBOUND, WEEKDAY).....6

FIGURE 5. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (EASTBOUND, WEEKEND) 6

FIGURE 7. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (WESTBOUND, WEEKEND).....7

LIST OF TABLES

TABLE 1: TIMING PLAN CYCLE LENGTHS FOR STUDY INTERSECTIONS ALONG THE PROJECT CORRIDOR (IN SECONDS) 3

TABLE 2. AVERAGE TRAVEL TIME SAVING FOR THE PROJECT CORRIDOR 5

TABLE 3. SYNCHRO PERFORMANCE MEASURES FOR THE PROJECT CORRIDOR 9

PROJECT BACKGROUND

The Southwest Washington Regional Transportation Council (RTC) is managing a new regionally competitive grant program, the Carbon Reduction Program (CRP), established by the Infrastructure Investment and Jobs Act (IIJA). The CRP authorizes grant funding for projects designed to reduce transportation emissions.

RTC was awarded funds to develop updated traffic signal timing to improve traffic flow, air quality, and safety on prioritized corridors in the Clark County urban area. RTC, in coordination with local agencies in Clark County, Washington and DKS, are developing regional signal timing plans along major corridors in Clark County.

The list of corridors considered in the prioritization process utilized the RTC Congestion Management Process (CMP) corridors as the candidates for updated signal timing. Major tasks for this project include evaluating and prioritizing non-freeway CMP corridors to develop and apply new signal timing strategies based on existing conditions and regional goals.

The process involved evaluating historical performance data, applying a weighted ranking scheme, and incorporating agency input. This approach guided the selection of 7 pilot corridors and helped define the project goals of **improving traffic flow, air quality, and safety**. The full prioritization methodology is documented in the project's *Corridor Prioritization Memorandum*, included as Appendix A, outlining the 3-step approach used to prioritize corridors for the regional signal timing plans pilot.

PILOT CORRIDOR EVALUATION: FOURTH PLAIN BOULEVARD EAST

This report summarizes the evaluation completed under the regional signal timing plans pilot for Fourth Plain Boulevard East, from State Route (SR) 503 / NE 117th Avenue to NE 162nd Avenue. This project corridor includes eight signalized intersections, six of which are owned and operated by the City of Vancouver (City). The signalized intersection at SR 503 is owned and operated by the Washington State Department of Transportation (WSDOT), while the signalized intersection at NE 121st Avenue is owned by the City and operated by WSDOT. Among the eight study intersections, two currently operate in free mode and the rest operate in coordination mode. A review of existing conditions was conducted to assess corridor operations and identify key needs. The findings are detailed in the *Existing Conditions Memorandum*, included as Appendix B.

The project corridor extends about two and a half miles east to west with a 40 miles per hour (MPH) posted speed limit and two through-lanes in each direction. This corridor is a key route connecting Vancouver, Orchards, and the surrounding communities in Clark County, Washington. The businesses along this corridor range from community commercial to industrial, attracting a mix of local commuters, freight and regional recreational traffic. In November 2024, weekday counts were taken along Fourth Plain Boulevard at NE 137th Street to estimate average annual daily traffic (AADT) and 29,235 vehicles were counted on this section of the corridor. C-TRAN route 74 travels along Fourth Plain Boulevard from the Van Mall Transit Center to 164th Avenue and continues south on 164th Avenue, connecting the Mill Plain Transit Center on Mill Plain Boulevard.

Updates to the signal timing plans include optimizing local and coordination timings, adding leading pedestrian intervals (LPIs) at locations that do not currently have Accessible Pedestrian Signals

(APS) push buttons, sequences, and offsets to enhance operational performance. In addition to the project goals, the benefits of these updates also support improved traffic flow along Fourth Plain Boulevard and reduced delays for side streets and left turn phases.

Coordinated signal timing aims to enhance directional traffic flow by creating vehicle platoons that can move through multiple intersections with fewer stops. Note that signal timing at the Fourth Plain Boulevard & 162nd Avenue intersection will remain uncoordinated. They will be coordinated with the signals on the north/south 162nd Avenue/164th Avenue corridor and implemented with future study corridors.

It should also be noted that signal timings at the intersections of Fourth Plain Boulevard & SR 503/117th Avenue and Fourth Plain Boulevard & 121st Avenue are coordinated under a north-south coordination plan as part of the SR 503 South study corridor and were implemented in February/March 2025. The offsets will tie together the six coordinated intersections from the different coordination plans along Fourth Plain East to progress east and west movements.

Table 1 below presents a comparison of the before and after signal timing plans, shown as cycle lengths by weekday and weekend Time of Day (TOD) schedules. Minor adjustments to the TOD time intervals were also part of the update as follows:

- West of 131st Avenue; at the 117th Avenue and 121st Avenue intersections:
  - Morning (AM) plan: 6:00 a.m. to 9:00 a.m.
  - Midday (MD) plan: 9:00 a.m. to 2:30 p.m. (previously two signal timing plans, first ending at 11:30 a.m. and second ending at 2:30 p.m.)
  - Evening (PM) plan: 2:30 p.m. to 7:00 p.m.
  - Weekend (WKN) plan: 10:00 a.m. to 6:00 p.m.

- East of 131st Avenue:
  - Morning (AM) plan: 6:00 a.m. to 10:30 a.m. (previous signal timing plan started at 6:30 a.m. and ended at 10:30 a.m.)
  - Midday (MD) plan: 10:30 a.m. to 2:30 p.m.
  - Evening (PM) plan: 2:30 p.m. to 7:00 p.m.
  - Weekend (WKN) plan: 10:00 a.m. to 6:00 p.m.

TABLE 1: TIMING PLAN CYCLE LENGTHS FOR STUDY INTERSECTIONS ALONG THE PROJECT CORRIDOR (IN SECONDS)

CROSS STREET	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
SR 503 TO 121ST AVE	125	130	150	125	130	Cycle length unchanged; signal timings updated	Cycle length unchanged; signal timings updated	140
131ST AVE TO 147TH AVE / WARD AVE	120	110	110	110	130			
156TH AVE / 157TH AVE	Free				130			
162ND AVE	Free				Free			

PERFORMANCE ANALYSIS

An analysis was conducted to compare the performance of the updated ("after") coordinated signal timing plans against the former ("before") plans. The analysis aims to address three key areas that align with the project goals of improving traffic flow, enhancing air quality, and promoting safety. Analysis includes:

- Travel time performance, based on real-world traffic data
- Emission impacts, derived from simulation model
- Safety impacts, a brief qualitative review based on signal timing updates and corresponding performance measures

TRAVEL TIME COMPARISON

Travel time data along the study corridor was obtained from TomTom, a location-based company that provides traffic analytics using Global Positioning System (GPS)-based data. TomTom provides high-resolution, anonymized GPS data aggregated from a wide range of connected devices, including navigation devices, mobile applications, and fleet vehicles. TomTom allows users to select routes between two points along roadways and produce cumulative travel time results for the selected routes.

This analysis evaluates the project corridor directionally, both eastbound and westbound. The updated signal timing along the project corridor was implemented during the week of May 12th, 2025. Before data was obtained from a full month of historical records, while after data was selected from the period of September 15th to October 18th, 2025, representing five weeks following implementation. To better represent typical traffic conditions after the timing update, this period was selected as the after period since it's after the summer break, making it a more stable and representative timeframe with the schools along the corridor in session.

The before period is based on data from the same month in the previous year, September 23rd to October 19th, 2024 and serves as a reliable baseline for the before and after analysis.

The analysis periods are defined as follows:

- Before (weekday): Tuesdays, Wednesdays, and Thursdays from the period of September 23rd to October 19th, 2024
- Before (weekend): Saturdays from September 23rd to October 19th, 2024
- After (weekday): Tuesdays, Wednesdays, and Thursday from September 15th to October 18th, 2025, excluding the week of October 7th, 2025 (due to travel time outliers that week not representing typical daily travel time values) but included 12 days of travel time data
- After (weekend): Saturdays from September 22nd to October 18th, 2025

  For each direction of travel, data was aggregated by 15-minute time-of-day intervals. Average travel times were calculated for each interval over the corresponding analysis period. It should be noted that the travel time savings shown in Table 2 below are based on common peak periods for consistency since the before and after periods have different TOD intervals. Additionally, the weekend analysis includes only four Saturdays in both the before and after periods. This limited dataset may result in gaps or variability in the results. It is anticipated that using a longer data range would help eliminate these data gaps and produce more reliable outcomes.

PROJECT CORRIDOR

Travel time data was analyzed for the coordinated grouping of signals along the project corridor to evaluate the overall impact of the updated signal timing plans. Table 2 summarizes the average travel time savings for each direction and evaluation period.

TABLE 2. AVERAGE TRAVEL TIME SAVING FOR THE PROJECT CORRIDOR

ANALYSIS PERIOD	TIME PERIOD	TRAVEL TIME SAVINGS (SEC)	
		EASTBOUND (117TH AVE / SR 503 TO 162ND AVE)	WESTBOUND (162ND AVE TO 117TH AVE / SR 503)
WEEKDAY	AM Peak: 7am to 9am	-2 (0.5%)	-30 (6.8%)
	MD Peak: 11am to 1pm	-5 (1.3%)	-1 (0.3%)
	PM Peak: 4pm to 6pm	-9 (1.9%)	-71 (12.6%)
	Daily (24-hour)	-7 (2.0%)	-9 (2.3%)
WEEKEND	WKN Peak: 11am to 1pm	-1 (0.1%)	-2 (0.4%)

Figures 1 through 4 complement the summary in Table 2, showing before and after travel time data through the corridor. These figures present average travel time in 15-minute intervals throughout the day for both eastbound and westbound directions, across weekdays and weekends, with the implemented TOD plan periods indicated for reference.

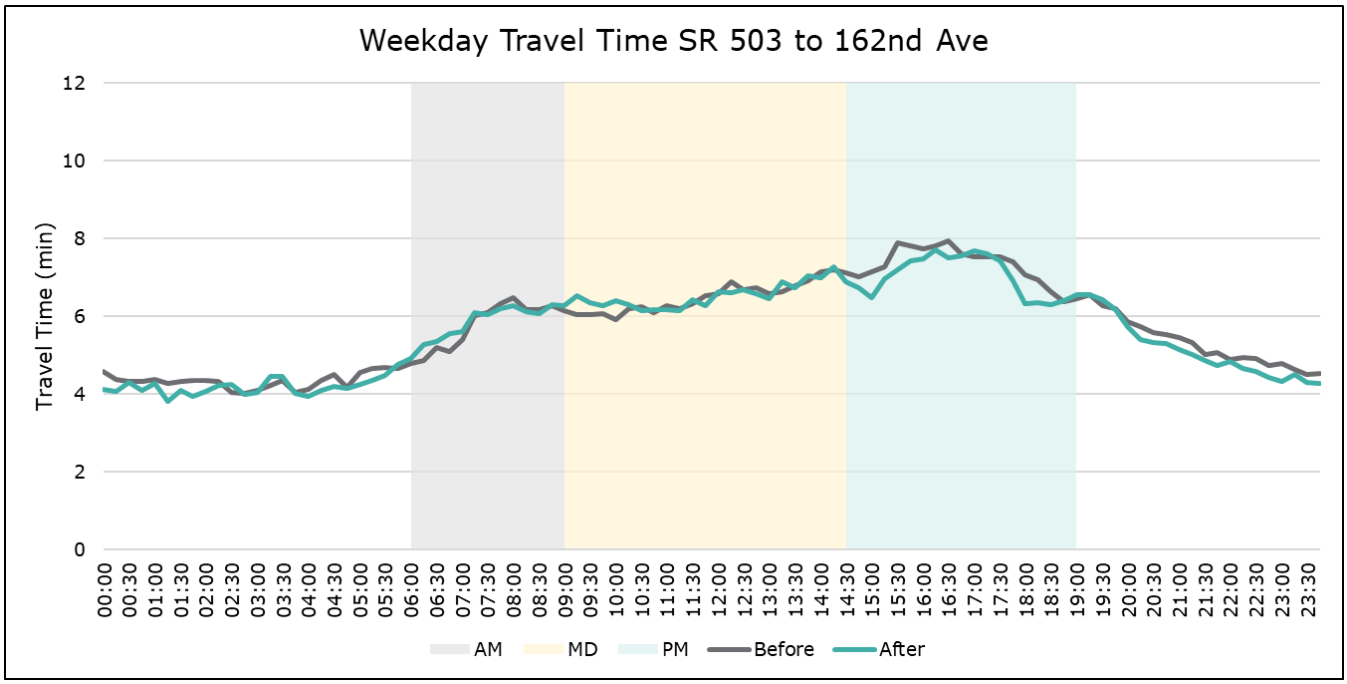

FIGURE 1. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (EASTBOUND, WEEKDAY)

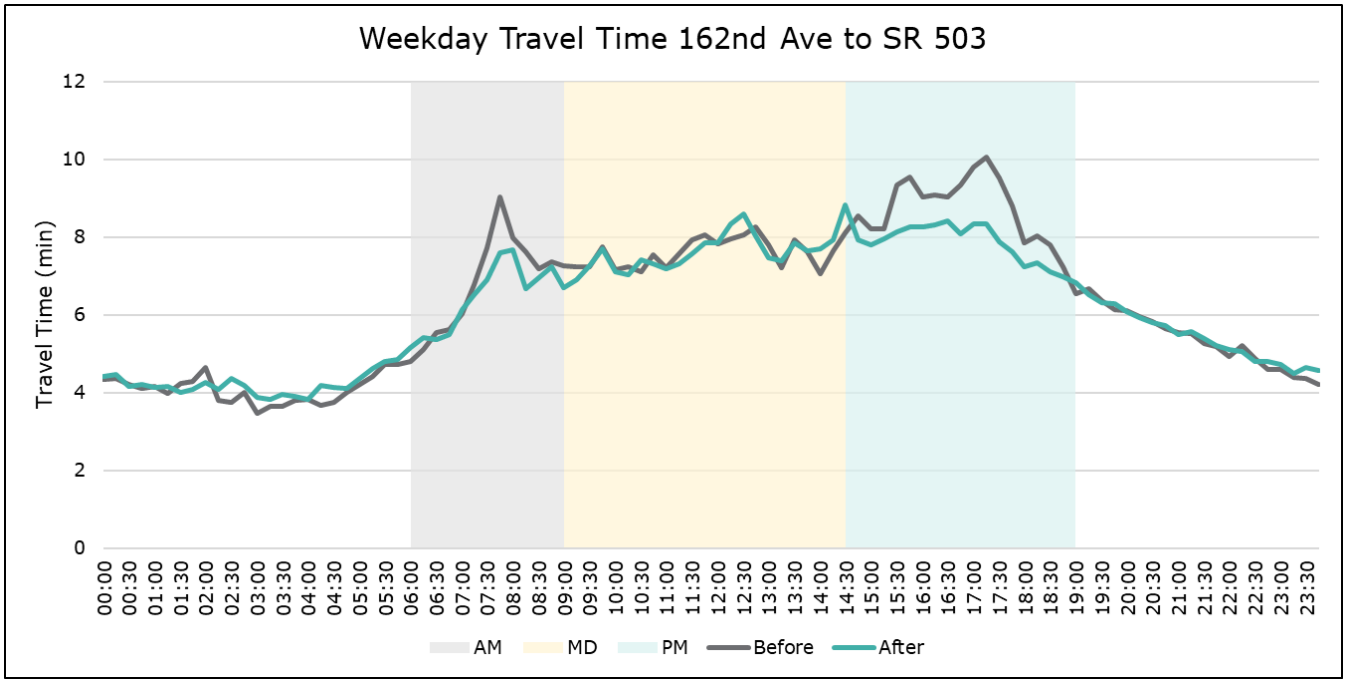

FIGURE 2. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (WESTBOUND, WEEKDAY)

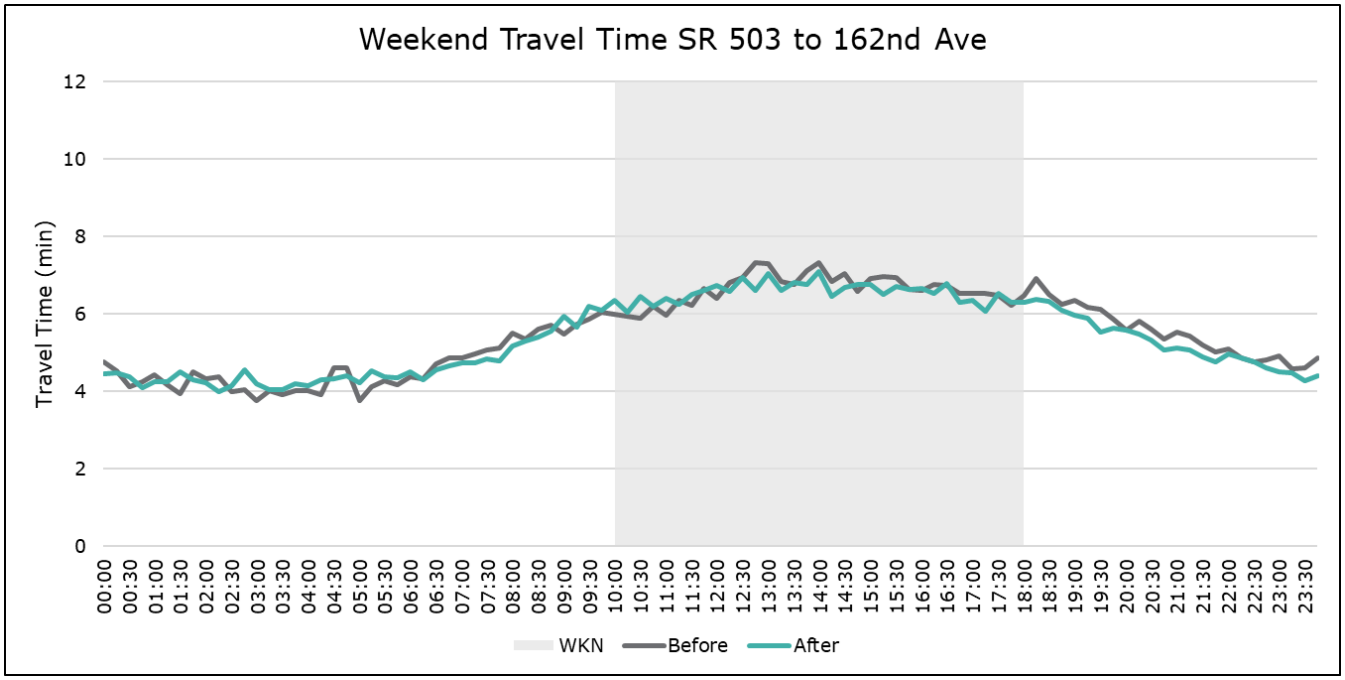

FIGURE 3. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (EASTBOUND, WEEKEND)

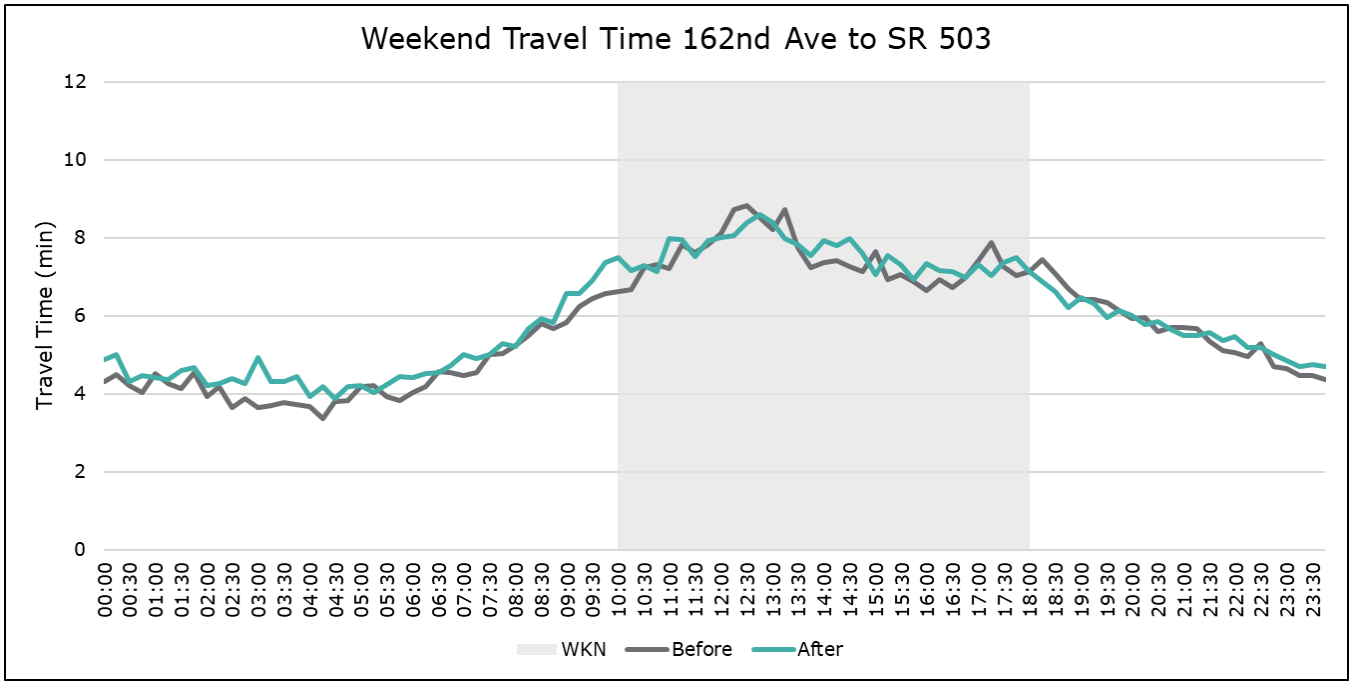

FIGURE 4. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (WESTBOUND, WEEKEND)

One of the primary objectives of this project was to improve mainline progression along the corridor. Under existing conditions, traffic congestion was most prominent west of 131st Avenue, to and from SR 503. Under proposed conditions, daily travel time savings resulted across all analysis periods for the project corridor between SR 503 and 162nd Street. The corridor also includes several schools, and traffic associated with school drop-off and pick-up periods further increases congestion during the morning and afternoon peaks. The general shape of the travel time curves remains consistent before and after implementation, but notable reductions are observed during the peak periods, especially in the weekday westbound direction.

For weekdays, westbound travel time improvements are greater than the eastbound direction as shown in both figures and table above. A common challenge in implementing coordinated signal timing is achieving a balance between both travel directions since optimizing offsets to favor one direction can often reduce performance in the opposite direction. In this case, the updated timing plans appear to favor westbound progression more for vehicles while still providing some travel time reduction eastbound. For weekends, travel time shows minimal improvements in both directions.

While the tabulated results present average travel time savings over the two-hour peak period, the travel time plots illustrate that the most significant improvements occur during the most congested portions of each period, up to nearly two minutes westbound in the AM and PM.

Congestion on SR 500 often causes traffic to spill back onto the Fourth Plain Boulevard corridor during the peak periods, particularly at the SR 503 and Fourth Plain Boulevard intersection and the 121st Avenue and Fourth Plain Boulevard intersection. As SR 500 becomes congested, vehicles queue westbound to access SR 500, while a large volume of vehicles exit SR 500 to travel eastbound along the corridor. This congestion was found to have a large impact on corridor travel

times and overall travel time reliability in both directions. Across the 12 days of weekday and four days of weekend travel time data collected, daily travel times for each peak period along the corridor varied by up to nearly three and a half minutes. This high variation in operations indicates inconsistent congestion. In the eastbound direction, the PM peak has the most notable range of more than two and a half minutes, and in the westbound direction, all weekday and weekend peak periods show a large range between a minute and almost three and a half minutes.

Additional reasons for the daily travel time variability likely include school-related traffic along the corridor. Pioneer Elementary School has early release days on Wednesdays at 12:10 PM, while Frontier Middle School has early release days approximately two Wednesdays per month at 1:50 PM. These changing schedules contribute to travel time variability.

Additionally, this corridor carries substantial side-street and left-turn volumes. Reallocating green time to these movements has minimized their delays and improved overall intersection operations. As a result, all movements along the corridor are operating well, reflecting a balanced improvement rather than mainline-only optimization.

It should be noted that the existing and proposed travel times are not a direct comparison. The updated signal timing plans introduced LPIs and longer pedestrian crossing times, reallocating some green time from the mainline to side streets, many lower-volume side streets. This adjustment likely reduced the apparent travel time benefits but improved overall corridor safety, discussed in the safety section.

Across the corridor, should additional funding become available, capital improvement projects beyond signal timing adjustments should be evaluated at the SR 503 and Fourth Plain intersection and the Fourth Plain and 121st Avenue intersection. WSDOT, for example, has identified a project to implement EB and WB displaced left-turns from Fourth Plain Blvd to SR 500/SR 503 which is included in the Regional Transportation Plan. Signal optimization alone provides limited long-term benefit under increasing demand, and additional geometric or capacity improvements are likely needed to achieve further operational benefits.

EMISSION COMPARISON

Emission performance was evaluated using reports generated by Synchro, a traffic signal optimization and simulation tool that estimates intersection-level measures of effectiveness (MOEs), including but not limited to total delay, number of stops, fuel consumed, Carbon Monoxide (CO) emissions, and Nitrogen Oxides (NO_X) emissions.

Two Synchro models were used for this analysis:

- Existing model, representing the before conditions
- Fine-tuned model, reflecting the updated signal timing plans

It should be noted that Synchro provides an effective and widely accepted method for assessing the relative emission benefits of signal timing improvements. Though the results are based on modeled estimates and may not fully represent realistic conditions.

Additionally, the results from Synchro do not account for the presence of hybrid and electric vehicles, which produce significantly lower or zero emissions. According to Washington State vehicle registration data, approximately 4 percent of residential vehicles in Clark County were hybrids and 2 percent were electric as of 2024. While this could theoretically reduce the estimated emission savings to some extent, the impact is not included in this analysis due to the current limitations of the modeling tool. Table 3 shows the performance measures for the updated signal timing plans for the project corridor.

TABLE 3. SYNCHRO PERFORMANCE MEASURES FOR THE PROJECT CORRIDOR

CORRIDOR PERFORMANCE MEASURES	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
TOTAL DELAY (HOURS)	165	158	240	198	149 (-9.7%)	169 (+7.0%)	239 (-0.4%)	223 (+12.6%)
TOTAL STOPS (STOPS)	11590	12714	16188	14111	10288 (-11.2%)	11691 (-8.0%)	15847 (-2.1%)	13347 (-5.4%)
FUEL CONSUMED (GAL)	432	453	586	524	408 (-5.6%)	451 (-0.4%)	581 (-0.9%)	534 (+1.9%)
CO EMISSIONS (KG)	30.21	31.68	40.95	36.59	28.49 (-5.7%)	31.49 (-0.6%)	40.61 (-0.8%)	37.30 (+1.9%)
NO_X EMISSIONS (KG)	5.88	6.16	7.97	7.12	5.54 (-5.8%)	6.13 (-0.5%)	7.90 (-0.9%)	7.26 (+2.0%)

As shown in Table 3, the performance measures for the updated timing plans along the Fourth Plain East Boulevard indicate general improvements in stops and emissions. Overall, the updated timing plans resulted in reductions across most measures during the analysis periods:

- Total delay reduced by up to 10 percent, except the midday and weekend plans show increases of up to 13 percent.
- Total stops reduced between two and 11 percent, suggesting improvement of progression and fewer interruptions.
- Fuel consumption, CO emissions, and NO_X emissions were reduced by up to six percent on weekdays, except the weekend period shows an increase of two percent.

The reductions indicated that the updated plans improve corridor efficiency by providing smoother flow and reducing vehicle idling during the analysis periods. An increase in total delay was observed during the midday and weekend periods; this increase is due to the higher cycle lengths than the existing conditions, creating longer side street delays and due to adding LPIs. Total delay

in Synchro represents delay for all intersections along the corridor, including side streets. Still, the total stops decrease in both periods, vehicle idling (fuel consumption, CO emissions, and NOx emissions) decreases in the midday period and about a one to two percent change in the weekend period, indicating improved mainline progression along the corridor. This increase may reflect variability in modeled signal operations, and small changes in arrival patterns can disproportionately affect delay estimates.

The performance measures model outputs for all periods do not fully reflect actual corridor operations.

The Synchro model includes the eight coordinated intersections along the corridor; however, the two endpoint intersections (SR 503 at Fourth Plain Boulevard and 162nd Avenue at Fourth Plain Boulevard) are coordinated primarily in the north–south direction as part of separate corridors (Corridor 1: SR 503 South and Corridor 14: 162nd/164th Avenue North). The six mid-corridor intersections are coordinated in the east–west direction. Because the endpoint intersections are not coordinated with the rest of the Fourth Plain Boulevard system, Synchro assigns higher total delay values at these locations. As a result, the model overstates overall corridor delay and emissions compared to actual observed operations. Therefore, while the modeled performance measures provide useful comparative insight, they likely underestimate the full operational benefits achieved through the updated timing plans.

The model outputs for total delay and fuel consumption savings were used to estimate the cost-related benefits of the updated signal timing. The outputs from Synchro models were estimated based on peak hour volumes. Therefore, a TOD factor, calculated using 24-hour tube count volumes along the corridor, was applied to convert the peak hour savings into daily savings. It should be noted that only weekday output was included in the daily benefit calculations.

Re-timing signals in congested transportation corridors is a low cost, transportation systems management and operations strategy that can improve travel time and reduce delay. This strategy can also reduce the number of collisions due to smoother traffic flow and fewer stops, and can minimize the number of drivers who divert to side streets to avoid congestion on the main corridor. This project provides an opportunity to quantitatively demonstrate that signal timing is a cost-effective approach to addressing operational challenges in the Clark County region.

The benefits for the Fourth Plain Boulevard East corridor were estimated using delay savings and fuel savings. The reduced hours of delay was multiplied by a dollar-per-hour value. This value represents the 2024 average value of time, adjusted using the Consumer Price Index[1] (CPI) from the U.S. Bureau of Labor Statistics. For fuel savings, the dollar-per-gallon value was based on the 2024 annual average gasoline price in Washington State, obtained from the U.S. Energy Information Administration. Based on these assumptions, the estimated annual delay savings in dollars is -$55,588, while the fuel consumption savings in dollars is $95,236, resulting in a combined annual benefit of $39,648, with an estimated three-year total of $118,945 to reflect the anticipated duration of improvements.

[1] https://www.bls.gov/cpi/data.htm

SAFETY

Arterial corridors serve various needs that can affect roadway safety. Many of these segments are characterized by high vehicle volumes and relatively high motor vehicle operating speeds, while also featuring mixed land use (e.g., residential, commercial, and services) that encourage walking, cycling, and public transit use. This results in a mix of local and through corridor traffic demands, increasing the potential for conflicts between vehicles, pedestrians, cyclists, and transit users using the corridor for different purposes, presenting potential safety challenges.

According to the Crash Modification Factors[2] (CMF) Clearinghouse, coordinated signal timing has been associated with a 17 percent reduction in crashes of all severities, including property damage only (PDO) crashes. Coordination can also offer the following additional benefits:

- **Reduce Arrivals on Red.** Improving coordination can lower the number of drivers who arrive during the red phase, which also reduces stops. This decreases the likelihood of several crash types, including angle collisions (by reducing the opportunity for red-light running) and rear-end collisions.
- **Influence Operating Speeds.** By timing signal coordination based on a desired motor vehicle operating speed and messaging that to drivers, a coordinated system can reduce speeds and reduce speed differential through the corridor, both of which can reduce the number and severity of collisions.
- **Reduce Left Turn Crashes.** Permissive left turn phases are a common safety challenge at signalized intersections. Improved platooning can result in larger gaps for those left-turning drivers, reducing the likelihood of a collision with opposing through vehicles.
- **Reduced Anxiety to Support Decision-making**. Congestion can increase the stress level of motorists, negatively affecting how they interact with the system and each other. Reducing the frustration of driving by reducing congestion, changing stop-and-go traffic along a corridor to a smoother, more comfortable experience, can result in reduced aggression on the road, leading to a safer corridor.

Additionally, this corridor adds LPIs at locations that do not currently have APS push buttons. An LPI allows pedestrians to enter the crosswalk at an intersection 3-7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles make their turns, making them more visible to drivers. Research indicates a 13 percent reduction in pedestrian-involved crashes at signalized intersections when LPIs are added.[3]

[2] Crash Modification Factors Clearinghouse (CMF ID: 6856)

[3] Crash Modification Factors Clearinghouse (CMF ID: 9918)

APPENDIX

Southwest Washington
Regional Transportation Council

APPENDIX A. CORRIDOR PRIORITIZATION MEMORANDUM

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PRIORITIZATION METHODOLOGY MEMO

DATE: June 4, 2024

TO: Judith Perez Keniston | RTC

FROM: Maggie Lin & Michael Mauch | DKS Associates

SUBJECT: SWRTC Regional Signal Timing Plans Project #24070-000
FINAL Corridor Prioritization Memorandum

PROJECT BACKGROUND

Southwest Washington Regional Transportation Council (RTC) is the metropolitan planning organization (MPO) for Clark County, Washington. The Carbon Reduction Program (CRP) was established by the Bipartisan Infrastructure Law (BIL) to provide funds for projects designed to reduce vehicle greenhouse gas (GHG) emissions. RTC is leading this project, with the support of other VAST TSMO Steering Committee members, and will use CRP funds to implement updated signal timing plans along priority corridors within urban Clark County.

As a growing community, Clark County has seen significant population growth in the last decade and estimates a population of nearly 700,000 by 2045. The region's public roadway network includes both major interregional corridors and major arterial corridors that connect cities and communities. The intent of the regional traffic signal timing project is to help the region lower GHG emissions by making more efficient use of the existing transportation system, particularly as economic and population growth within the region continues.

PROJECT OVERVIEW

The goals of this project include improving mobility, safety, and air quality; while meeting the demands of all modes by reducing traffic signal delay. To accomplish this, the key components of the project scope include prioritizing and improving traffic signal timing and coordination along priority transportation corridors:

- Review the existing conditions along the signalized roadway corridors within urban Clark County,
- Prioritize the corridors based on screening criteria,
- Develop and deploy improved traffic signal coordination plans that meet the operational objectives and project goals.

The project team identified a list of corridors to be considered in the corridor prioritization process and potential candidates for updating the corridor signal timing. The RTC Congestion Management Process (CMP) corridors were used as the basis for corridor identification. The CMP corridors include freeway and arterial corridors. This project only considers the non-freeway CMP corridors. Figure 1 provides a map of the non-freeway CMP corridors and traffic signal locations in the region. Note that the signals shown in this map were from data collected in 2021. Any updates to the signal locations are not reflected in this map as it only intends to provide a high-level overview of the signal locations in the region. An online version of this map is also available through this link: https://shorturl.at/akCH9

FIGURE 1 CORRIDORS TO BE CONSIDERED FOR PRIORITIZATION

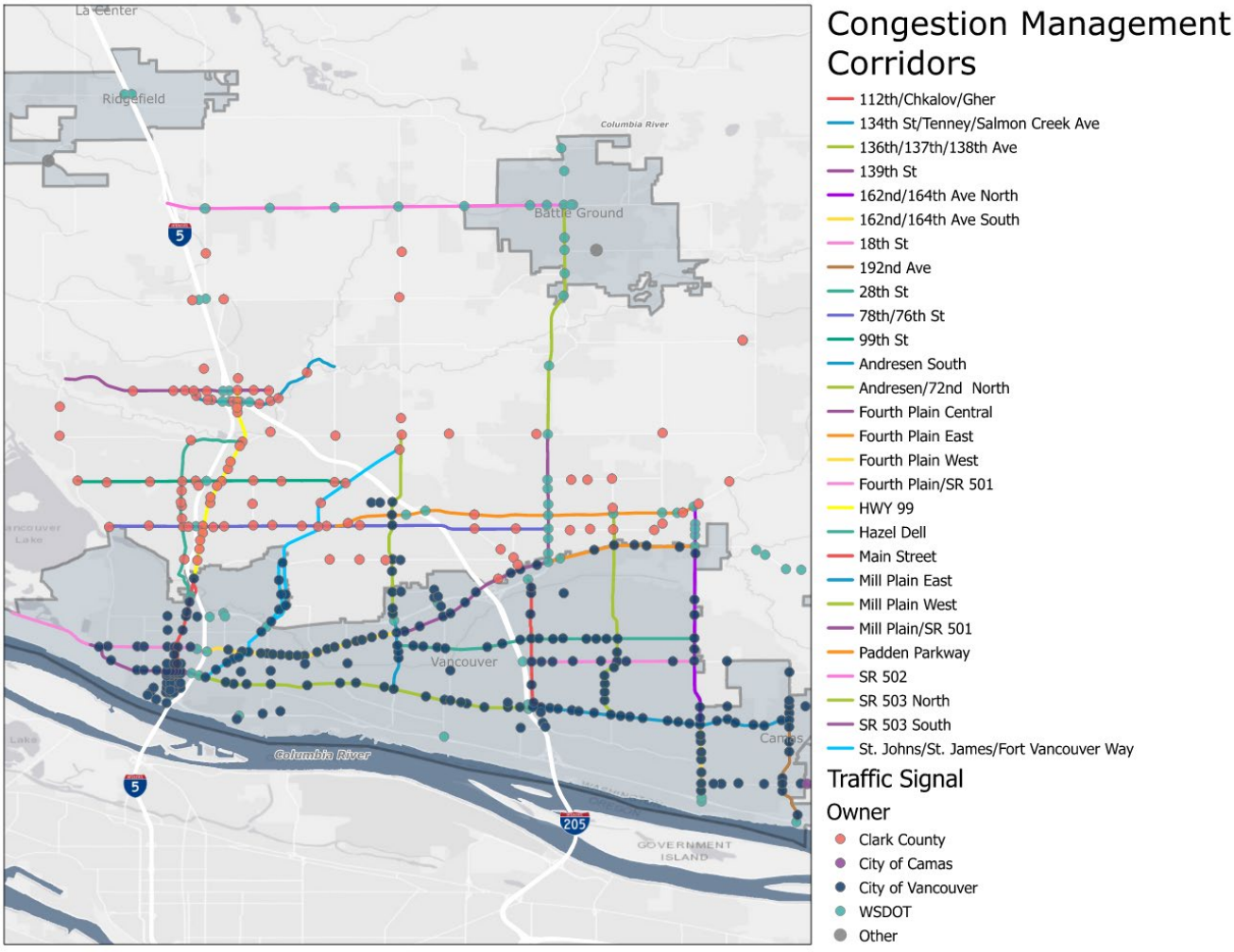

Table 1 lists the 28 CMP corridors identified for prioritization by the VAST/TSMO Steering Committee. The corridors are arranged in alphabetical order.

TABLE 1: CORRIDORS BEING EVALUATED

CORRIDOR NAME AND DESCRIPTION
112TH/CHKALOV/GHER (FROM SR 500 TO MILL PLAIN)
134TH ST/TENNEY/SALMON CREEK AVE (FROM NE 139TH ST TO NE 50TH AVE)
136TH/137TH/138TH AVE (FROM PADDEN PKWY TO MILL PLAIN)
139TH ST (FROM NW 36TH ST TO NE 29TH AVE)
162ND/164TH AVE NORTH (FROM WARD RD TO MILL PLAIN)
162ND/164TH AVE SOUTH (FROM MILL PLAIN TO SR 14)
18TH ST (FROM 112TH AVE TO 162ND AVE)
192ND AVE (FROM SE 1ST ST TO SR 14)
28TH ST (FROM ANDRESEN RD TO 162ND AVE)
78TH/76TH ST (FROM LAKESHORE AVE TO SR 503/117TH AVE)
99TH ST (FROM LAKESHORE AVE TO ST JOHN RD)
ANDRESEN SOUTH (FROM SR 500 TO MILL PLAIN)
ANDRESEN/72ND NORTH (FROM 119TH ST TO SR 500)
FOURTH PLAIN CENTRAL (FROM ANDRESEN RD TO SR 503/117TH AVE)
FOURTH PLAIN EAST (FROM SR 503/117TH AVE TO 162ND AVE)
FOURTH PLAIN WEST (FROM I-5 TO ANDRESEN RD)
FOURTH PLAIN/SR 501 (FROM NW LOWER RIVER RD TO I-5)
HAZEL DELL (FROM HWY 99 TO 63RD ST)
HWY 99 (FROM 139TH ST TO ROSS ST)
MAIN STREET (FROM ROSS ST TO MILL PLAIN)
MILL PLAIN EAST (FROM I-205 TO 192ND AVE)
MILL PLAIN WEST (FROM I-5 TO I-205)
MILL PLAIN/SR 501 (FROM FOURTH PLAIN TO I-5)
PADDEN PARKWAY (FROM 78TH ST TO 162ND AVE)
SR 502 (FROM I-5 TO SR 503)
SR 503 NORTH (FROM SR 502 TO 119TH ST)
SR 503 SOUTH (FROM 119TH ST TO FOURTH PLAIN/SR 500)
ST. JOHNS/ST. JAMES/FORT VANCOUVER WAY (FROM NE 72ND AVE TO MILL PLAIN)

CORRIDOR PRIORITIZATION METHODOLOGY

This section describes the methodology to evaluate the existing corridor performance and prioritize the corridors for the signal coordination efforts. As mentioned in the previous section, CMP corridors and key urban corridors confirmed by VAST TSMO Steering Committee members were used as the initial list of corridors considered for this project.

A three-step approach was used to prioritize the needs for updating the traffic signal timing plans for the County's urban corridors. Each of the steps are described in the subsections below.

1. Evaluate the corridor performance based on historical data.
2. Develop a weighting scheme and corridor ranking.

3. Obtain agency input on additional information and identify the set of corridors to be re-timed.

STEP 1. EVALUATE CORRIDOR PERFORMANCE BASED ON HISTORICAL DATA

For each of the County's urbanized CMP corridors considered in this process, the following corridor performance measures were quantified and evaluated:

- **Traffic Volume** – to measure and compare the utilization of each corridor (in vehicles per hour during the peak hour on an average non-holiday weekday).
- **Travel Time and Travel Time/Mile** – to measure the impacts of congestion on the signalized corridors, two measures will be used: corridor travel time and travel-times per mile (sometimes called "pace"). TomTom travel time data served as the primary data source for the travel time measures.
- **Speed/Posted Speed Percent** – The peak period speed to posted speed ratio (expressed as a percentage) captures the impact of peak period traffic congestion on the corridor's overall performance.
- **CCI (Corridor Capacity Index)** – The corridor capacity index is an indicator of congestion. The higher the ratio, the more traffic congestion a driver is likely to experience. The corridor capacity index is an aggregation of the volume/capacity ratios for the individual general-purpose segments that make up a facility within a corridor.
- **Transit ridership** – To gauge transit utilization within each corridor, the measure selected was the count of transit riders utilizing the study corridors.
- **Safety** – Three measures were selected to quantify safety along the study corridors:
  1) Total corridor crashes (2017 -2022),
  2) Crashes per centerline-mile of the corridor, and
  3) A binary "high crash corridor" designation as identified in local road safety plans.

The performance of the corridors may vary by time of day; that is, the AM peak, midday, and PM peak performance may differ. For the vast majority of the analysis corridors in the region, PM peak dominated the corridor utilization; therefore, PM peak period was used in the evaluation for all of the analysis corridors. In addition, four of the corridors also experienced significant AM period utilization, so AM peak period was also used in the evaluation for those three corridors, i.e. Main Street, Andresen/72nd North, 139th Street, and Mill Plain/SR501.

STEP 2. DEVELOP WEIGHTING SCHEME AND CORRIDOR RANKING

DKS developed a corridor ranking methodology based on the relative importance of the performance metrics listed in Step 1. "Weights" are assigned to each of the performance metrics and represent the comparative level of importance.

Table 2 shows the draft criteria weighing factors proposed by DKS in this process.

TABLE 2: DRAFT WEIGHTING FACTORS

PERFORMANCE MEASURE	WEIGHTING FACTOR
TRAFFIC VOLUME	5
TRAVEL TIME	0
TRAVEL TIME/MILE	2
SPEED / POSTED SPEED PERCENT	4
CCI	2
2019 TRANSIT RIDERS	3
TOTAL CORRIDOR CRASHES (2017-2022)	0
CRASHES/MILE	3
HIGH CRASH CORRIDOR	0

A few of the corridor performance metrics identified in Step 1 were not used (with a zero weight) in the draft weighting factors, either because they were redundant or because another performance measure more appropriately captured the underlying phenomena or events. For example, corridor travel time is directly dependent on the corridor distance; including this would favor longer corridors over shorter ones. As such, it was given a "0" weight. Instead, the corridor's travel times per mile (Travel Time/Mile) was used, which normalized the corridors' performance, removing the bias toward longer corridors. Likewise, the Total Corridor Crashes was not used, and Crashes/Mile was selected to represent the corridors crash rates.

A corridor prioritization workshop was included during the April 24th VAST/TSMO Steering Committee meeting. Local agency staff were asked to collaboratively review the draft weighting criteria and develop the final weighting factors based on consensus from the group. Table 3 lists the agency's inputs on weighting collected during the meeting and the final weighting factor used in the process.

TABLE 3: FINAL WEIGHTING FACTORS

PERFORMANCE METRIC	AGENCY INPUT					FINAL WEIGHTING FACTOR
	WSDOT	CLARK COUNTY	VANCOUVER	C-TRAN	RTC	
TRAFFIC VOLUME	5	5	5	4	5	**4.8**
TRAVEL TIME	0	0	0	0	0	**0**
TRAVEL TIME/MILE	3	2	2	2	2	**2.2**
SPEED / POSTED SPEED PERCENT	2	3	3	3	3	**2.8**
CCI	4	4	4	4	4	**4**
2019 TRANSIT RIDERS	3	4	4	5	4	**4**
TOTAL CORRIDOR CRASHES (2017-2022)	0	0	0	0	0	**0**
CRASHES/MILE	4	4	3	3	3	**3.4**
HIGH CRASH CORRIDOR	0	0	0	0	0	**0**

The corridor ranking was updated based on the final weighting factors and presented to the VAST members during the April 24th meeting.

TABLE 4: CORRIDOR RANKING RESULTS

CORRIDOR RANKING	CORRIDOR NAME AND DESCRIPTION	PEAK PERIOD
1	SR 503 South (from 119th St to Fourth Plain/SR 500)	PM
2	Mill Plain East (from I-205 to 192nd Ave)	PM
3	112th/Chkalov/Gher (from SR 500 to Mill Plain)	PM
4	Fourth Plain West (from I-5 to Andresen Rd)	PM
5	162nd/164th Ave South (from Mill Plain to SR 14)	PM
6	Fourth Plain East (from SR 503 (117th Ave) to 162nd Ave)	PM
7	18th St (from 112th Ave to 162nd Ave)	PM
8	Main Street (from Ross St to Mill Plain)	AM
9	HWY 99 (from 139th St to Ross St)	PM
10	SR 503 North (from SR 502 to 119th St)	PM
11	136th/137th/138th Ave (from Padden Pkwy to Mill Plain)	PM
12	Mill Plain West (from I-5 to I-205)	PM
13	Andresen/72nd North (from 119th St to SR 500)	AM
14	162nd/164th Ave North (from Ward Rd to Mill Plain)	PM
15	Andresen South (from SR 500 to Mill Plain)	PM
16	28th St (from Andresen Rd to 162nd Ave)	PM
17	139th St (from NW 36th St to NE 29th Ave)	AM
18	78th/76th St (from Lakeshore Ave to SR 503 (117th Ave))	PM
19	99th St (from Lakeshore Ave to St John Rd)	PM
20	Fourth Plain Central (from Andresen Rd to SR 503 (117th Ave))	PM
21	192nd Ave (from SE 1st St to SR 14)	PM
22	Mill Plain/SR 501 (from Fourth Plain to I-5)	AM
23	134th St/Tenney/Salmon Creek Ave (from NE 139th St to NE 50th Ave)	PM
24	SR 502 (from I-5 to SR 503)	PM
25	Padden Parkway (from 78th St to 162nd Ave)	PM
26	Hazel Dell (from Hwy 99 to 63rd St)	PM
27	St. Johns/St. James/Fort Vancouver Way (from NE 72nd Ave to Mill Plain)	PM
28	Fourth Plain/SR 501 (from NW Lower River Rd to I-5)	PM

Table 4 shows the resulting corridor ranking using the weighting factors listed in Table 3. As noted in Step 1, four of the corridors had both AM and PM peak performance metrics considered. Only the higher ranking between AM and PM of each corridor is presented in this table.

STEP 3. ADDITIONAL AGENCY INPUTS

At the April 24th meeting, the agencies also discussed other factors needing to be considered in the development of a final list of prioritized corridors. Several agencies also provided additional information after the meeting. Consideration factors that may impact the decision of whether to prioritize a corridor for signal retiming included:

- Whether a recent signal timing effort has been conducted on a corridor
- Whether a signal timing effort is planned/programmed for a corridor in the next few years
- Whether a construction project is planned/schedule for a corridor and if it has an impact on this project
- Whether a corridor is identified as an existing or future BRT route

These factors will be considered in the development of signal timing plans. For example, a corridor with a construction project schedule in 2025 may be removed from the priority list for developing updated signal timing plans as this project would likely be completed by the end of 2025. These details will be discussed between RTC, the local agencies, and DKS and the final decisions will be documented.

NEXT STEPS

DKS will start to collect data and develop existing conditions models for the top two corridors in May 2024, and move forward with developing updated signal timing plans for the top two corridors and deploying the new timing plans afterwards. Additional corridors will be added throughout the study, with the project concluding in December 2025.

APPENDIX B. EXISTING CONDITIONS MEMORANDUM

DKS 1050 SW 6TH AVENUE, SUITE 600 • PORTLAND, OR 97204 • 503.243.3500 • DKSASSOCIATES.COM

TECHNICAL MEMORANDUM - DRAFT

DATE: March 5, 2025

TO: Judith Perez Keniston | RTC

FROM: Brianna Velasquez, EIT, Ilana Burstein, PE and Pamela O'Brien, PE, PTOE | DKS Associates

SUBJECT: SWRTC Regional Signal Timing Plans
Task 4 Existing Conditions

Project #24070-000

This memorandum highlights the existing conditions, the data used, and traffic operation observations along Corridor 6: NE Fourth Plain Boulevard from State Route 503 to State Route 500/NE 162nd Avenue, referred to as Fourth Plain East hereinafter.

EXISTING CONDITIONS

The traffic signals along Fourth Plain East are mostly owned and operated by the City of Vancouver, except for the traffic signal at the State Route (SR) intersection which is owned and operated by the Washington State Department of Transportation (WSDOT). The coordinated intersection at NE 121st Avenue is owned by the City of Vancouver, and operated by WSDOT. Traffic signals owned by the City use Q-Free MaxTime local software and are connected to the City's MaxView central system via their communications network. The intersections owned by WSDOT, use Trafficware local software and are connected to the WSDOT ATMS.now central system.

Of the eight study intersections, two operate in free mode, with the rest operating in coordination mode. Figure 1 and Figure 2 below summarize the timing plans according to the weekday and weekend Time of Day (TOD) schedule.

DATA

WSDOT provided hourly Turning Movement Counts (TMCs) for SR 503 & Fourth Plain Blvd and Fourth Plain Blvd & 121st Avenue from the SR 503 South corridor from 2023 and 2024. Historical TMCs collected in 2023 from previous projects were used for eight study intersections. November 19th, 2024 TMCs were collected for the remaining intersections and peak periods.

Weekend mid-day peak hour (11:00 a.m. to 1:00 p.m.) TMCs were collected November 16th, 2024 at all intersections except NE Fourth Plain Blvd & SR 503, and vehicle volumes were balanced and distributed based on Weekday traffic patterns for the NE Fourth Plain Blvd & SR 503 intersection.

Signal as-build, phasing plans, and signal timings were provided by WSDOT and by the City of Vancouver.

FIGURE 1: FOURTH PLAIN EAST EXISTING WEEKDAY TIMING PLAN SCHEDULES

Intersection	0:00	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	23:59
SR 503 / NE 117th Avenue	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F	F
NE 121st Avenue	F	2	2	2	2	2	2	4	4	4	4	4	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1	F	F	F
NE 131st Avenue	F	F	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	3	F	F	F
NE 137th Avenue	F	F	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	3	F	F	F
NE 143rd Avenue	F	F	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	3	F	F	F
NE Ward Avenue / NE 147th Avenue	F	F	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	3	F	F	F
NE 156th Avenue / NE 157th Avenue	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
NE 162nd Avenue	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	Free		AM Plan								Midday Plan								PM Plan								Midday	Free		

Pattern 1 = 150s | Pattern 2 = 125s | Pattern 2 = 120s | Pattern 3 = 130s | Pattern 3 = 110s | Pattern 4 = 110s | Pattern 4 = 125s

FIGURE 2: FOURTH PLAIN EAST EXISTING WEEKEND TIMING PLAN SCHEDULES

Intersection	0:00	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	23:59
SR 503 / NE 117th Avenue	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F	F
NE 121st Avenue	F	F	F	F	F	F	F	F	F	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	F	F	F	F	F
NE 131st Avenue	F	F	F	F	F	F	F	F	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	F	F	F
NE 137th Avenue	F	F	F	F	F	F	F	F	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	F	F	F
NE 143rd Avenue	F	F	F	F	F	F	F	F	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	F	F	F
NE Ward Avenue / NE 147th Avenue	F	F	F	F	F	F	F	F	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	F	F	F
NE 156th Avenue / NE 157th Avenue	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
NE 162nd Avenue	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	Free							Midday Plan																				Free		

Pattern 3 = 110s | Pattern 4 = 125s

OBSERVED TRAFFIC ISSUES

DKS conducted field observations of traffic conditions along the Fourth Plain East study corridor on Tuesday, November 19th, 2024 during morning, mid-day, and evening peak periods.

The following sections summarize notable observed characteristics at each intersection. All the observed issues will be considered when the new signal timing plans are developed.

NE FOURTH PLAIN BOULEVARD & SR 503

- This intersection is coordinated under a north-south coordination plan as part of the SR 503 South corridor.
- Traffic operations are from July 2024 observations:
  - Heavy traffic was observed during all peak periods. The heaviest traffic volumes were observed for the southbound through and westbound left turn movements which lead to Interstate 205 and Interstate 5.
  - In the southbound direction, the through movement had congestion all day, while the turning movements had little to no queuing.
  - Westbound congestion at this intersection affects the adjacent intersection NE 121st Avenue.
  - The westbound left-turn green phase cannot run concurrently with the eastbound-left turn green phase due to the dual left turns.
  - In the northbound direction, all queues were adequately served in one cycle during the a.m. and mid-day peak periods. In the pm peak period, the northbound queue extended about a quarter-mile back from the signal.

NE FOURTH PLAIN BOULEVARD & NE 121ST AVENUE

- This intersection is part of the SR 503 South corridor.
- This intersection is coordinated under an east-west coordination plan with the SR 503 intersection about 900-feet away. The westbound queue from the SR 503 intersection spilled back. The eastbound queue at this intersection also reached the SR 503 intersection during the evening peak period.
- A majority of the westbound traffic queued in the inside through lane preparing to merge into the dual left lanes to SR 503. The lane utilization factor in Synchro was adjusted.
  - About 2-to-1 vehicles queued in the inside westbound through lane.
    - Westbound through lane utilization factor - fLU= $\frac{1000}{(2 \, x \, 666)}$ = 0.75
- All minor street queues were adequately served during all peak periods. All storage lengths were sufficient.
- The westbound and southbound left lanes as well as the eastbound right lane serve school buses.

NE FOURTH PLAIN BOULEVARD & NE 131ST AVENUE

- Phase splits adequately served all movements during the morning and mid-day peak periods, and all storage lengths were sufficient.
- The heaviest traffic was during the evening peak period; many large, heavy vehicles with slow start up times made the eastbound left turn, up to three vehicles waited longer than a cycle.
- Long queues, particularly northbound, formed on the side streets during the red time but cleared quickly.

NE FOURTH PLAIN BOULEVARD & NE 137TH AVENUE

- The southbound left turn queue extended beyond the storage length by the start of the green phase in all periods. The striped median prevented the queue from blocking other traffic, but up to five vehicles had to wait longer than one cycle.
- During the morning and evening peak periods, a few vehicles making the eastbound left turn had to wait more than one cycle.

NE FOURTH PLAIN BOULEVARD & NE 143RD AVENUE

- This intersection is split phased for the north and south directions.
- The north leg leads into a residential neighborhood while the south leg primarily serves the commercial centers on either side of NE 143rd Avenue. A queue of up to five vehicles built on the minor streets during the major movements. All queues were adequately served during all peak periods. All storage lengths were sufficient.
- Most eastbound/westbound traffic arrived on green while traveling through the intersection.

NE FOURTH PLAIN BOULEVARD & NE WARD ROAD/147TH AVENUE

- All storage lengths were sufficient, and all queues were adequately served during the morning and mid-day peak periods, but during the evening peak period, the eastbound left turn queue reached the end of its storage length and at least one vehicle per lane had to wait more than one cycle. The southbound left turn queue also had a few vehicles waiting for more than one cycle.

NE FOURTH PLAIN BOULEVARD & NE 157TH AVENUE

- This intersection operates in Free mode during all times of day.
- This intersection had minimal queuing during all observation periods. Most eastbound/westbound traffic arrived on green while traveling through the intersection.
- All side street and left turn queues were adequately served during all peak periods.
- The southbound queue did not exceed more than five vehicles and there was fairly even distribution between left and through-right queues.
- The northbound queue did not exceed more than ten vehicles. The majority of northbound vehicles turned left. The left turn lane also serves public transit buses.
- The westbound right and southbound through lanes served short school buses while standard school buses and public transit utilized the eastbound and westbound through lanes.

NE FOURTH PLAIN BOULEVARD & NE 162ND AVENUE (SR 500)

- This intersection operates in Free mode during all times of day.
- Phase splits adequately served all movements. All queues cleared and most vehicles traveled through the intersection without stopping.
- All storage lengths were sufficient. During morning and evening peak periods, northbound through queues occasionally extended to the downstream intersection (NE 65th Street).
- Most of the right turn movements, except westbound, have a vertical five-section signal head with yellow and green arrows that enable overlapping right-turn phases.
- U-turns are permitted on every leg, but overhead signs indicate they must yield to right turns. Minimal u-turns were observed.
- The east leg quickly narrows from two to one eastbound through lane. During all peak periods, especially in the morning, most vehicles traveling eastbound through or southbound left queued in the inside lane to avoid having to merge just east of the signal.
    - About 5-to-1 vehicles queued in the inside southbound left turn lane while 2-to-1 vehicles queued in the inside eastbound through lane.
        - Southbound left lane utilization factor - fLU= $\frac{205}{(2\ x\ 170)}$ = 0.60
        - Eastbound through lane utilization factor - fLU= $\frac{298}{(2\ x\ 199)}$ = 0.75
- Less than a ¼-mile east from this intersection is the access road to Pioneer Elementary School and Frontier Middle School, and NE 162nd Avenue bisects many residential areas. In the morning, the northbound left and right, plus southbound through serve school buses.
- This intersection also serves public transit buses, specifically eastbound right and northbound left lanes.
- This intersection is also part of the 162nd/164th corridor, which is concurrently being evaluated for new timings.