RTC REGIONAL SIGNAL TIMING PLANS

PILOT BEFORE/AFTER REPORT: 162ND/164TH AVENUE NORTH

NOVEMBER 2025

PREPARED FOR:

Southwest Washington Regional Transportation Council

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PROJECT BACKGROUND

The Infrastructure Investment and Jobs Act (IIJA) created the Carbon Reduction Program (CRP), a new competitive grant program that funds projects designed to reduce transportation emissions. The Southwest Washington Regional Transportation Council (RTC) received CRP funding to improve traffic signal timing in Clark County, with the goal of reducing congestion, improving air quality, and supporting safer travel.

RTC is working with local agencies and DKS to develop regional signal timing plans for major corridors. The project builds on RTC's Congestion Management Process (CMP) by focusing on corridors where updated timing plans can make the greatest difference.

The prioritization process combined data analysis and agency input to identify where improvements would be most effective. Historical performance data, a weighted ranking approach, and local knowledge helped guide the selection of seven pilot corridors. These corridors will serve as the first step in applying coordinated signal timing strategies across the region.

The pilot corridors will help set a foundation for broader improvements that make travel more reliable, reduce emissions, and create safer conditions for all users. The full methodology is summarized in the Corridor Prioritization Memorandum (Appendix A).

PILOT CORRIDOR EVALUATION: 162ND/164TH AVENUE NORTH

As part of this effort, this report summarizes the evaluation completed under the regional signal timing plans pilot for 162nd Avenue/164th Avenue from Mill Plain Boulevard to 78th Street, including 14 study intersections (13 existing and one future). The traffic signals at Fourth Plain Boulevard, 73rd Street, and 78th Street are owned and operated by the Washington Department of Transportation (WSDOT). 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.

This seven-mile long north-south study corridor has a 40 miles per hour (MPH) posted speed limit and transitions from a six-lane street to four-lane street north of SE 1st Avenue. The northbound right turn lane drops north of the intersection while the southbound lane addition is present about 215-feet after vehicles enter the intersection. This study corridor is a key route through east Vancouver, Washington, connecting the surrounding communities in ~~central~~ Clark County, Washington. The businesses and residents along this corridor attract a mix of local commuters, retail users, and freight and traffic. In 2023, weekday counts were taken along the study corridor at NE 28th Street to estimate average annual daily traffic (AADT) and 12,614 vehicles were counted on this section of the corridor. There are also exclusive bus lanes along the study corridor to service the multiple C-TRAN transit routes including Route 30 and 74, which operate with a frequency of about every 30 minutes.

Coordinated signal timing aims to enhance directional traffic flow by creating vehicle platoons that can move through multiple intersections with fewer stops. Updates to the 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 162nd – 164th corridor and reduced delays for side streets and left turn phases.

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. It should be noted that the two southernmost intersections (6th Street and 1st Street) are geographically closer to Mill Plain Boulevard, which is associated with another study corridor (Corridor 5: 162nd – 164th South Corridor). Therefore, the PM cycle length at these intersections is not consistent with the rest of the corridor. Minor adjustments to the TOD time intervals were also part of the update as follows:

- Morning (AM) plan: 6:00 a.m. to 9:30 a.m. (previous signal timing plan began at 6:30 a.m.)
- Midday (MD) plan: 9:30 a.m. to 3:30 p.m.
- Evening (PM) plan: 3:30 p.m. to 6:30 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 162ND – 164TH AVENUE CORRIDOR (IN SECONDS)

CROSS STREET	EXISTING				PROPOSED			
	AM	MD	PM	WKN	AM	MD	PM	WKN
6TH ST TO 1ST ST • 6TH ST • 1ST ST	120	120	120	120	Cycle lengths unchanged; signal timings updated		130	Signal timings updated
11TH ST TO 23RD ST • 11TH ST • 15TH ST (NORTH) • 18TH ST • 23RD ST	120	120	120	120	Cycle lengths unchanged; signal timings updated			
28TH ST TO POPLAR ST • 28TH ST • 39TH ST • POPLAR ST/45TH ST	120	120	120	Free	Cycle lengths unchanged; signal timings updated			120
59TH ST (FUTURE)	NA	NA	NA	NA	120	120	120	120
65TH ST TO 78TH ST • 65TH ST • FOURTH PLAIN BLVD • 73RD ST • 78TH ST	Free	Free	Free	Free	120	120	120	120

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 northbound and southbound. The updated signal timing along the project corridor was implemented during the week of September 15th, 2025. Before data was obtained from a full month of historical records, while after data was selected from the period of September 22nd to October 25th, 2025, representing five weeks following implementation. 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 Thursdays from the period of September 23rd to October 22nd, 2025 excluding October 7th and October 14th (due to travel time outliers on those dates not representing typical daily travel time values), but included 12 days of travel time data)
- After (weekend): Saturdays from September 22nd to October 25th, 2025 excluding October 18th, 2025 (due to a protest in the area impacting travel times), but included four days of travel time data)

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)	
		NORTHBOUND (MILL PLAIN BLVD TO 78TH ST)	SOUTHBOUND (78TH ST TO MILL PLAIN BLVD)
WEEKDAY	AM Peak: 7am to 9am	-2 (0.3%)	-43 (7.1%)
	MD Peak: 11am to 1pm	-19 (3.4%)	-25 (4.3%)
	PM Peak: 4pm to 6pm	-65 (9.4%)	-27 (4.0%)
	Daily (24-hour)	-11 (2.1%)	-15 (2.7%)
WEEKEND	WKN Peak: 11am to 1pm	-9 (1.7%)	-27 (4.4%)

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 northbound and southbound directions, across weekdays and weekends, with the implemented TOD plan periods indicated for reference.

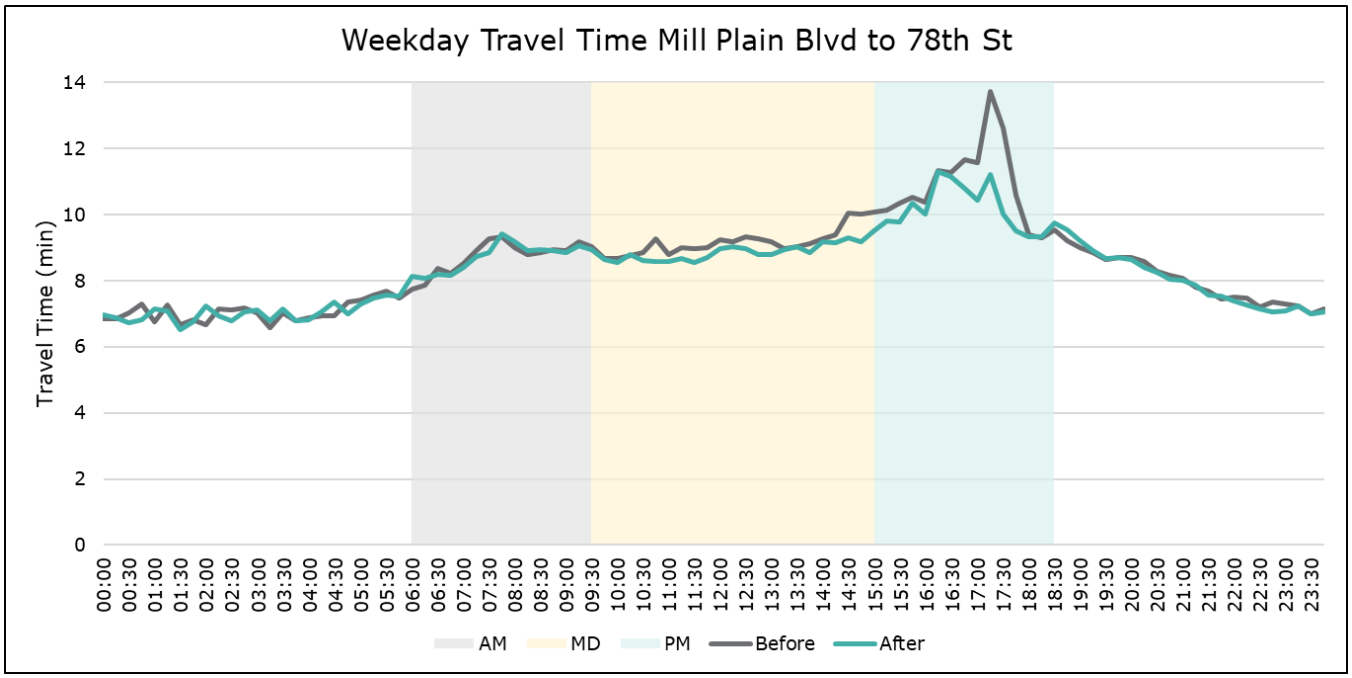

FIGURE 1. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKDAY)

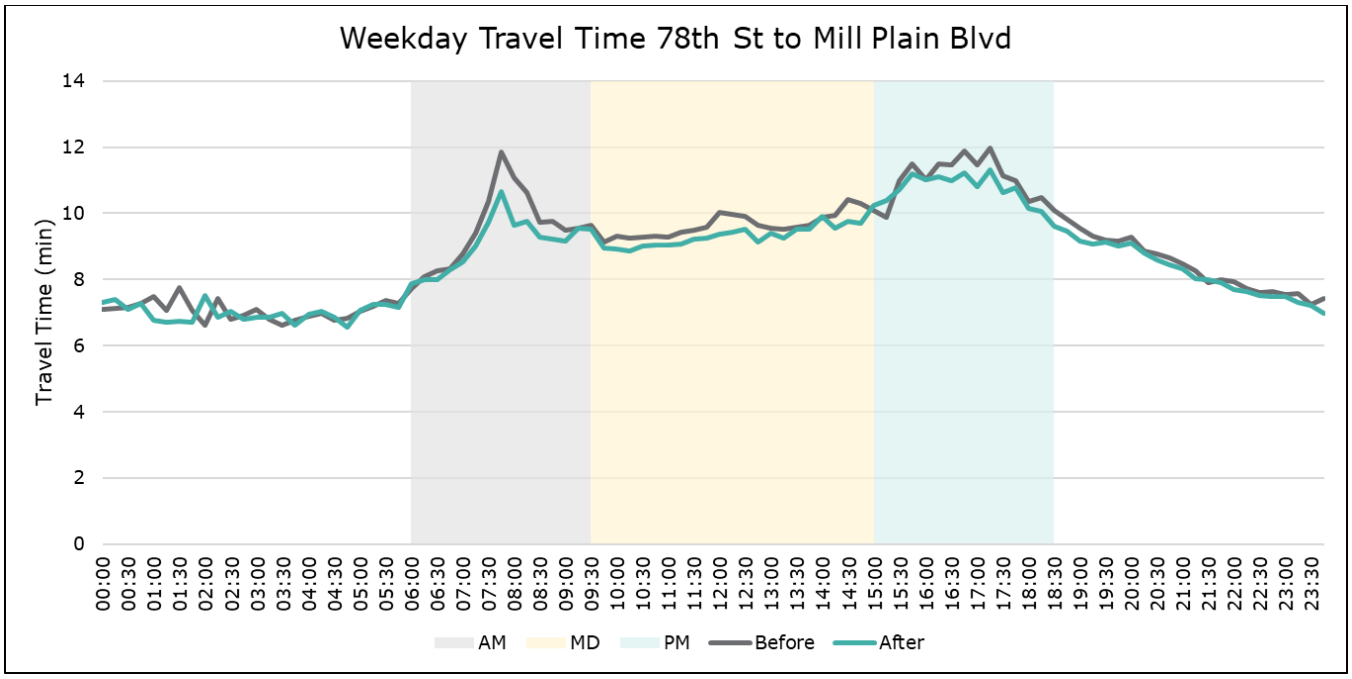

FIGURE 2. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKDAY)

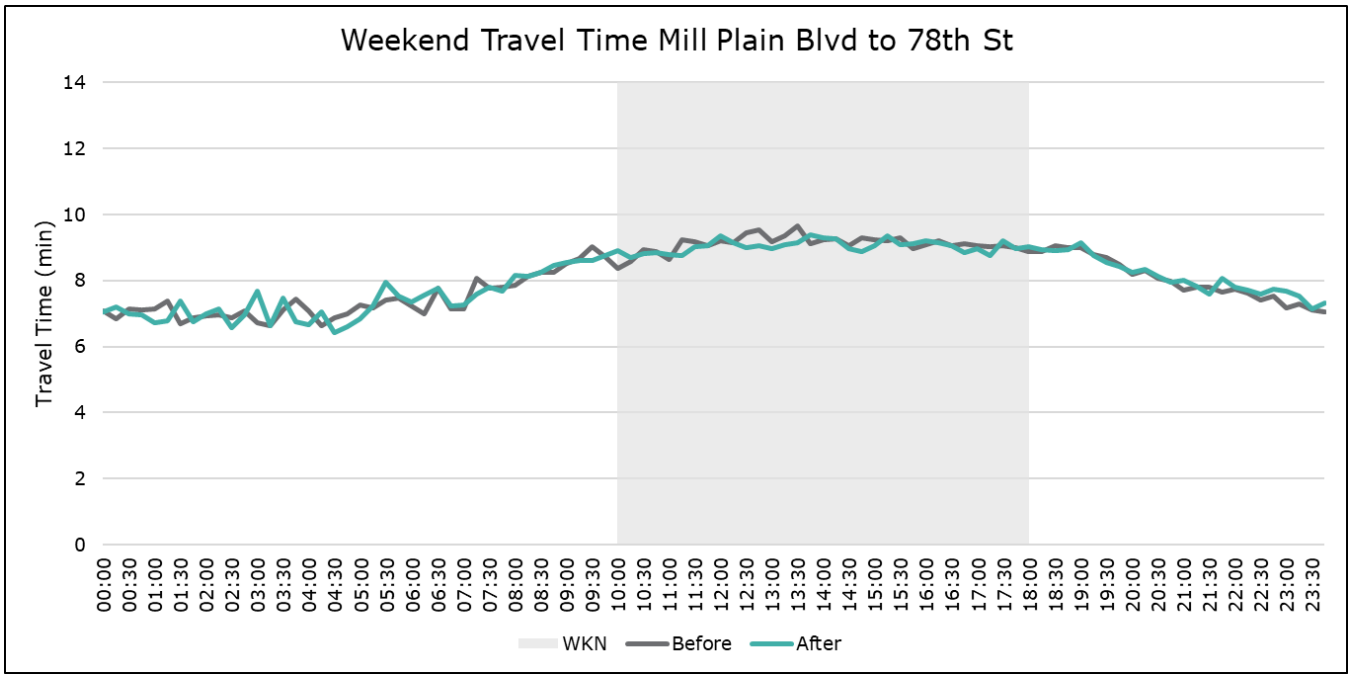

FIGURE 3. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (NORTHBOUND, WEEKEND)

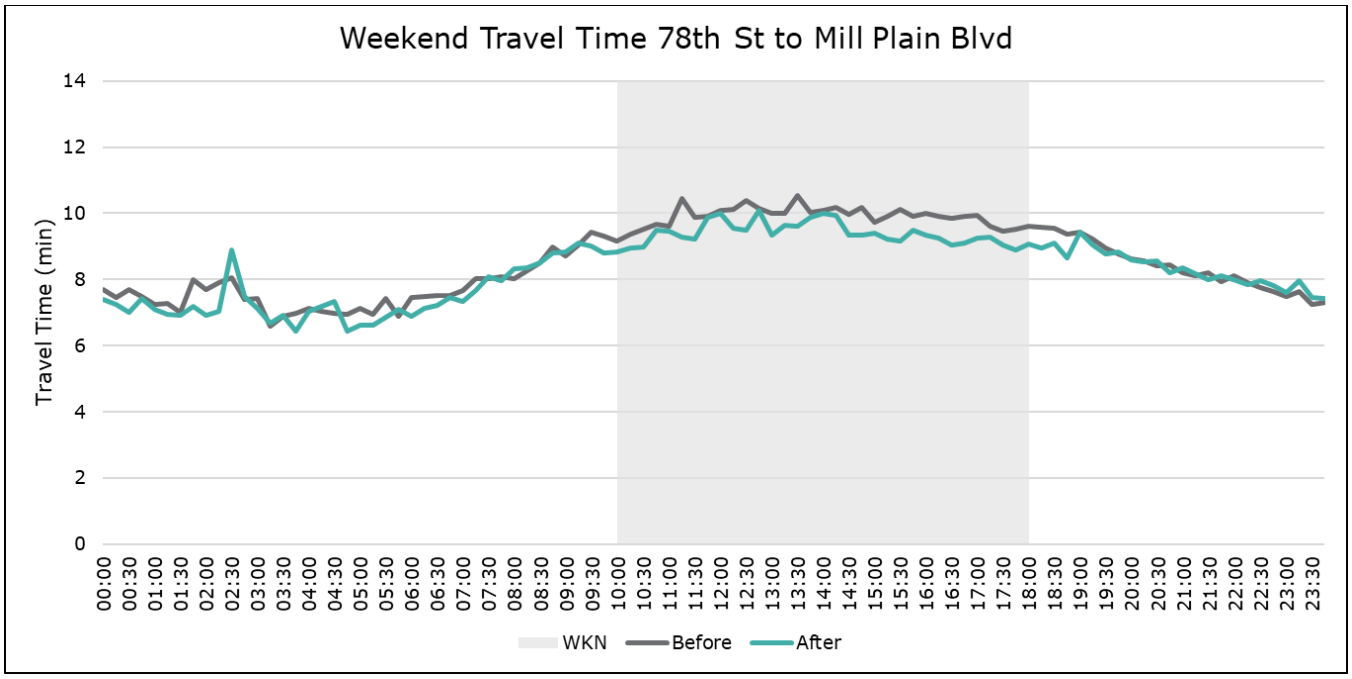

FIGURE 4. TRAVEL TIME COMPARISON FOR PROJECT CORRIDOR (SOUTHBOUND, WEEKEND)

One of the primary objectives of this project was to improve traffic flow along the corridor. Under existing conditions, traffic congestion was most prominent near major intersections such as Mill Plain Boulevard, 18th Street, and Fourth Plain Boulevard. 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. Under proposed conditions, daily travel time savings resulted across all analysis periods for the project corridor between Mill Plain Boulevard and 78th Street. The general shape of the travel time curves remains consistent before and after implementation, but notable reductions are observed during the peak periods in the peak directions, especially in the weekday southbound AM period, weekday northbound PM period, and weekend southbound direction.

For weekdays, travel time improvements are greater in one direction for each period 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 midday period timing plans appear more consistent between both directions, but the updated AM period timing plans appear to favor southbound progression, resulting in limited northbound improvement, while the PM period timing plans favor northbound progression but still produced notable southbound travel time reductions. For weekends, southbound travel time improvements are greater than the northbound direction.

Compared to Corridor 5, this corridor shows greater overall improvement. Corridor 5 includes fewer intersections and carries higher volumes, and its exiting coordination limited the extent of achievable signal optimization. In contrast, this corridor is longer and previously included several uncoordinated intersections. Introducing coordination at these intersections established fixed cycle lengths that constrain operational flexibility compared to free-mode operation. While this resulted

in occasional increases in delay at higher-volume intersections where demand exceeded available green time, it improved overall traffic progression and consistency along the corridor.

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 about two minutes southbound in the AM and nearly three minutes northbound in the PM.

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 a following section.

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)	146	116	244	165	128 (-12.3%)	112 (-3.4%)	219 (-10.2%)	138 (-16.4%)

CORRIDOR PERFORMANCE MEASURES	BEFORE				AFTER			
	AM	MD	PM	WKN	AM	MD	PM	WKN
TOTAL STOPS (STOPS)	13402	10711	19506	14431	10214 (-23.8%)	9104 (-15.0%)	16038 (-17.8%)	11281 (-21.8%)
FUEL CONSUMED (GAL)	574	512	833	621	530 (-7.7%)	493 (-3.7%)	782 (-6.1%)	570 (-8.2%)
CO EMISSIONS (KG)	40.14	35.77	58.23	43.42	37.06 (-7.7%)	34.43 (-3.7%)	54.66 (-6.1%)	39.84 (-8.2%)
NO_X EMISSIONS (KG)	7.81	6.96	11.33	8.45	7.21 (-7.7%)	6.70 (-3.7%)	10.64 (-6.1%)	7.75 (-8.3%)

As shown in Table 3, the performance measures for the updated timing plans along 162nd – 164th corridor indicate a general improvement in corridor performance:

- Total delay reduced between three and 16 percent, indicating improvement in traffic flow and reduced vehicle idling
- Total stops reduced by up to 24 percent, suggesting improvement of progression and fewer interruptions.
- Fuel consumption, CO emissions, and NO_X emissions were reduced by four to eight percent.

The reductions indicated that the updated plans improve corridor efficiency by providing smoother flow and reducing vehicle idling during majority of peak periods, both weekday and weekend.

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 162nd – 164th 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

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

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 $922,169, while the fuel consumption savings in dollars is $381,459, resulting in a combined annual benefit of $1,303,628, with an estimated three-year total of $3,910,883 to reflect the anticipated duration of improvements.

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

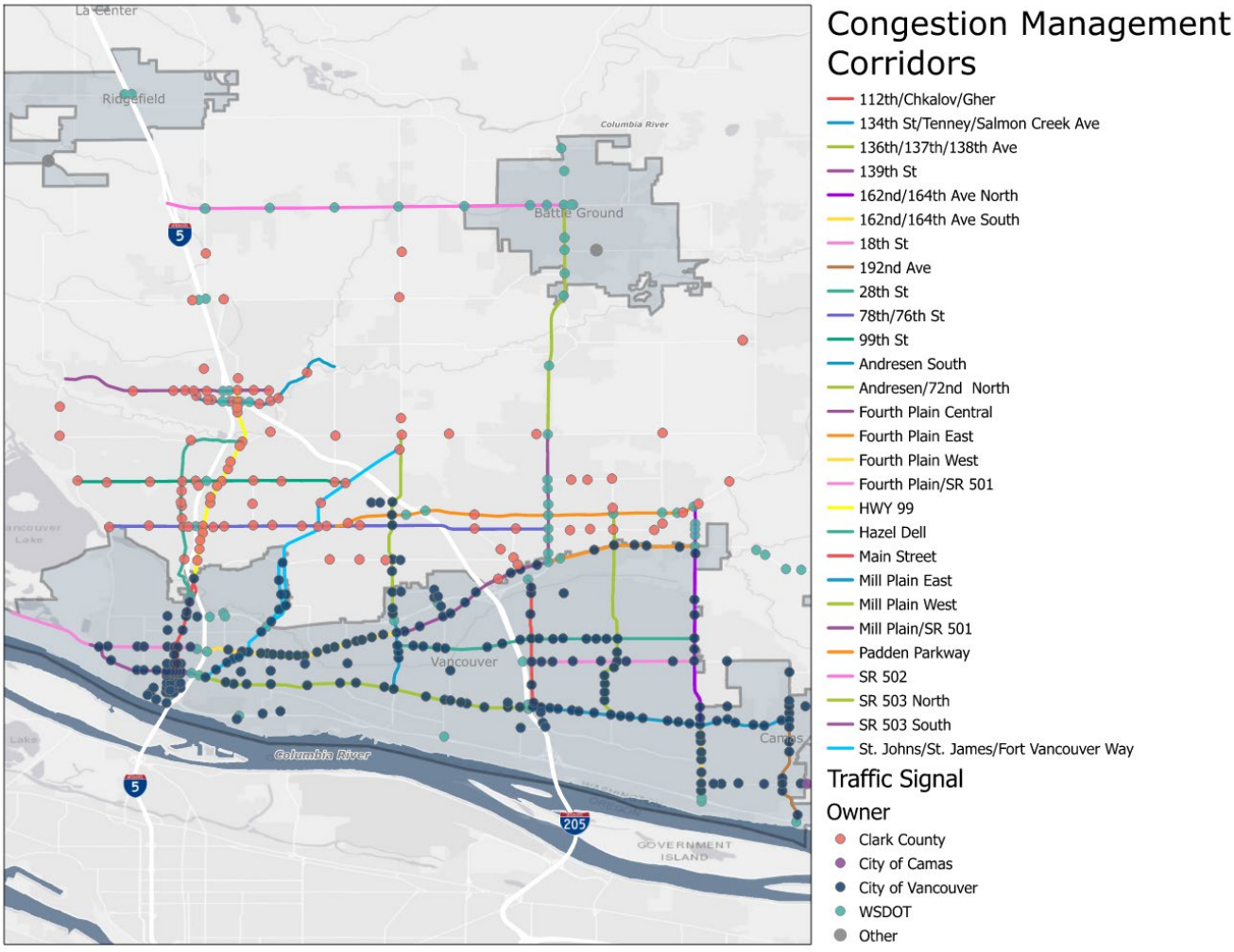

Table 1 lists the 28 CMP corridors identified for prioritization by the VAST/TSMO Steering Committee. The corridors are arranged in alphabetical order.

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: April 25, 2025

TO: Judith Perez Keniston | RTC

FROM: Eileen Chai EIT, Ilana Burstein P.E., Pam O'Brien, P.E., 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 162nd Avenue/164th Avenue from SR 14 to 78th Street for Corridor 5 (South) and Corridor 14 (North), including 23 study intersections.

EXISTING CONDITIONS

The traffic signals along 162nd Avenue/164th Avenue study corridor (except for three on SR 500) are owned and operated by City of Vancouver (City). The traffic signals at Fourth Plain Boulevard, 73rd Street, and 78th Street are owned and operated by the Washington Department of Transportation (WSDOT). Most of the 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 SR 14 ramps, owned by the City, and those on SR 500, owned by WSDOT, use Trafficware local software and are connected to the WSDOT ATMS.now central system.

Of the 23 study intersections, four operate in free mode during the weekday and seven operate in free mode during the weekend, with the rest operating in coordination mode. Figures 1 and 2 below summarize the timing plans according to the weekday and weekend Time of Day (TOD) schedule along the corridor.

DATA

Historical Turning Movement Counts (TMCs) collected in 2023 were provided by local agencies for eight study intersections, primarily for specific time periods such as PM peak (eight) and AM peak (two). 2024 TMCs were collected for the remaining study intersections and time periods. Signal as-build, phasing plans and signal timings were provided by City and WSDOT. It should be noted that special signal strategies are implemented at several intersections along the 162nd Avenue/164th Avenue study corridor. For instance, Transit Signal Priority (TSP) at Mill Plain Boulevard and left-turn phase reservice at 20th Street, 12th Street, and Mill Plain Boulevard.

FIGURE 1. 162ND AVENUE/164TH AVENUE WEEKDAY TIMING PLAN SCHEDULE

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	20:00	20:30	21:00	21:30	23:59
SR 14 EB	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
SR 14 WB	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
C-Tran	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
34th St/Cascade Park Dr	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
29th St/Village Loop	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
McGillivray Blvd	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
20th St/Village Loop	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
15th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
12th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
Mill Plain Blvd	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
6th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
1st St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
11th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
15th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
18th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
23rd St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
28th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
39th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
Poplar St/45th St	F	F	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	2	2	2	F	F	F	F	F
65th St	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	F	F	F	F
Fourth Plain Blvd	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	F	F	F	F
73rd St	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	F	F	F	F
78th St	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	F	F	F	F
	Free		AM Plan						MD Plan												PM Plan						Off-Peak Plan			Free				

Plan 1 = 120 sec Plan 2 = 120 sec Plan 3 = 120 sec

FIGURE 2. 162ND AVENUE/164TH AVENUE WEEKEND TIMING PLAN SCHEDULE

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	20:00	20:30	21:00	21:30	23:59
SR 14 EB	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
SR 14 WB	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
C-Tran	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
34th St/Cascade Park Dr	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
29th St/Village Loop	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
McGillivray Blvd	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
20th St/Village Loop	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
15th St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
12th St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
Mill Plain Blvd	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
6th St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
1st St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
11th St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
15th St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
18th St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
23rd St	F	F	F	F	F	F	F	F	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	F	F	F	F	F	F	F
28th St	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	F	F	F	F
39th St	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	F	F	F	F
Poplar St/45th St	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	F	F	F	F
65th St	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	F	F	F	F
Fourth Plain Blvd	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	F	F	F	F
73rd St	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	F	F	F	F
78th St	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	F	F	F	F
	Free								Saturday Plan																			Free						

Plan 2 = 120 sec

OBSERVED TRAFFIC ISSUES

DKS conducted field observations of traffic conditions along the 162nd Avenue/164th Avenue study corridor in November of 2024 during weekday peak periods. It should be noted that the northern segment, from 6th Street to 78th Street, was added to the study scope after the initial field observation period. Therefore, field observations for those intersections were conducted in December 2024.

The following sections summarize the notable observed characteristics and issues of each study intersection and input from the City. All the observed issues will be considered when the new signal timing plans are developed.

162ND AVENUE/164TH AVENUE & SR 14 EASTBOUND RAMPS

- This intersection is coordinated under an east-west coordination plan.
- During the AM peak, the intersection experienced minimal congestion.
- During the midday peak, the eastbound exit ramp had a buildup of roughly 10 vehicles, which typically cleared within the cycle. Northbound experienced light queues while waiting for other phases and queues could clear within the cycle.
- During the PM peak, the eastbound traffic experienced long queues of 15 to 20 vehicles but were manageable and typically cleared within the cycle.

162ND AVENUE/164TH AVENUE & SR 14 WESTBOUND RAMPS

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM peak.
- The southbound right-turn slip lane experienced light congestion entering SR 14 during the midday peak and experienced heavy congestion during the PM peak.

162ND AVENUE/164TH AVENUE & C-TRAN

- This intersection is coordinated under a north-south coordination plan and features only northbound and southbound signal heads.
- The C-Trans access at this intersection is exclusive to buses. The northbound and southbound phases primarily remained green unless interrupted by the arrival of a northbound bus requiring a left turn or by pedestrians crossing.

162ND AVENUE/164TH AVENUE & 34TH STREET/CASCADE PARK DRIVE

- This intersection is coordinated under a north-south coordination plan.
- During the AM peak, this intersection experienced some congestion:
  - The southbound and eastbound left-turn queues accumulated approximately seven vehicles but could clear within a cycle.

- The westbound left-turn queue accumulated approximately 10 to 15 vehicles. The phase was not sufficient to clear queues within a cycle.
- Northbound experienced long queues and almost spilled back to the upstream intersection (C-Trans) but queues could clear within a cycle.

- During the midday peak, southbound experienced heavy queuing, particularly in the right-most through lane accessing the SR 14 ramps. Additionally, the southbound and westbound left-turn movements experienced significant congestion. The phases were not sufficient to clear queues within a cycle. Notably, the westbound left-turn queues exceeded the storage length.
- During the PM peak, the southbound direction experienced some queueing in the right-most through lane, while the northbound and westbound left-turn movements had long queues that failed to clear within a cycle.

162ND AVENUE/164TH AVENUE & 29TH STREET/VILLAGE LOOP

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM peak.
- During the midday peak, the northbound platoon from the upstream intersection (34th Street/Cascade Parkway Drive) built up and encountered a stop-and-go pattern.
- During the PM peak, the northbound direction experienced some queuing from the upstream intersection at 34th Street/Cascade Parkway Drive, though it did not lead to heavy congestion.

162ND AVENUE/164TH AVENUE & MCGILLIVRAY BOULEVARD

- This intersection is coordinated under a north-south coordination plan.
- The intersection had minimal congestion observed during all peak periods.

162ND AVENUE/164TH AVENUE & 20TH STREET/VILLAGE LOOP

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM peak.
- During the midday peak, the northbound and southbound movements accumulated some queues while waiting for the other phases but cleared quickly.
- During the PM peak, the northbound direction experienced short queues while waiting for other phases, but these queues cleared quickly. The eastbound left-turn movement had approximately five vehicles queuing, which failed to clear within a cycle. Additionally, one vehicle was observed running a red light to turn left at the end of the yellow phase for the through movement.

162ND AVENUE/164TH AVENUE & 15TH STREET

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM peak.
- During the midday peak, the northbound and southbound movements accumulated some queues while waiting for the other phases but cleared quickly. The eastbound left-turn movement had approximately five vehicles queuing, which failed to clear within a cycle. One

vehicle was observed running a red light for the left turn movement during the through movements green phase.

- During the PM peak, the intersection approaches accumulated some queues while waiting for the other phases but cleared quickly.

162ND AVENUE/164TH AVENUE & 12TH STREET

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM peak.
- During the midday peak, both northbound and southbound directions built up and experienced a stop-and-go pattern. Additionally, the northbound direction experienced queueing caused by buses dwelling and temporarily blocking traffic.
- During the PM peak, the northbound left-most through lane experienced spillback from the downstream intersection at Mill Plain Boulevard; however, the queue did not extend to the upstream intersection at 15th Street.

162ND AVENUE/164TH AVENUE & MILL PLAIN BOULEVARD

- This intersection is coordinated under a north-south coordination plan.
- During the AM peak, the northbound left-turn movement experienced some congestion and did not fully clear within the cycle.
- During the midday peak, the eastbound and westbound movements accumulated some queues while waiting for the other phases but cleared quickly.
- During the PM peak:
  - The southbound and westbound movements accumulated some queues while waiting for other phases, but these queues cleared quickly.
  - The eastbound movements experienced heavy congestion, with queues nearly spilling back to the upstream intersection at 160th Avenue.
  - The northbound left-turn queue exceeded its storage length, spilling back to the upstream intersection at 12th Street and affecting the left-most through lane. It should be noted that northbound left-turn congestion was not observed during the December 2024 observations. This may have been a special case, potentially caused by congestion from I-205 leading to the observed delays.

162ND AVENUE/164TH AVENUE & 6TH STREET

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM peak. It is worth noting that observations were conducted a week before Thanksgiving, and there is an elementary school at the northwest corner of the intersection. Increased traffic may be expected for the northbound left-turn movement outside the holiday season.
- During the midday peak period, northbound and southbound movements accumulated some queues while waiting for other phases but cleared quickly.

- During the PM peak hour, the northbound left-turn movement experienced long queues, approximately 12 to 15 vehicles accumulated and failed to clear within a cycle.

162ND AVENUE/164TH AVENUE & 1ST STREET

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during the AM and PM peak.
- During the midday peak, the intersection approaches accumulated some queues while waiting for the other phases but cleared quickly.

162ND AVENUE/164TH AVENUE & 11TH STREET

- This intersection is coordinated under a north-south coordination plan.
- During the AM peak period, the intersection experienced minimal congestion. School buses were observed traveling from neighborhoods on both the eastbound and westbound approaches.
- During the midday peak, congestion remained minimal.
- During the PM peak, northbound traffic appeared heavier than southbound. The eastbound and westbound approaches experienced minimal congestion. Northbound and southbound approaches accumulated some queues while waiting for side street phases but could clear.

162ND AVENUE/164TH AVENUE & 15TH STREET

- This intersection is coordinated under a north-south coordination plan.
- The intersection experienced minimal congestion during all observation peak periods.

162ND AVENUE/164TH AVENUE & 18TH STREET

- This intersection is coordinated under a north-south coordination plan.
- During the AM peak, northbound and southbound experienced minimal congestion. The eastbound and westbound left-turn movements experienced some congestion and did not fully clear within the cycle.
- During the midday peak, movements from all approaches accumulated some queues while waiting for the main street phases but queues could clear.
- During the PM peak, the northbound approach experienced heavy congestion, with queues nearly spilling back to the upstream intersection at 15th Street. Specifically, the northbound left-turn movement did not fully clear within a single cycle. The southbound approach also experienced congestion, with queues nearly reaching the upstream intersection at 23rd Street. Meanwhile, the eastbound and westbound approaches encountered some congestion and queues accumulated while waiting for the main street phases but were able to clear.

162ND AVENUE/164TH AVENUE & 23RD STREET

- This intersection is coordinated under a north-south coordination plan.

- This intersection experienced minimal congestion during all observation peak periods. It should be noted that westbound traffic volumes were higher than eastbound during the AM and PM peak periods, likely due to the daycare center and drive-through coffee store.

162ND AVENUE/164TH AVENUE & 28TH STREET

- This intersection is coordinated under a north-south coordination plan during weekday peak periods and operates free during the weekend midday period.
- During the AM peak, southbound accumulated some queues while waiting for the side street phases but it did not spill back. Congestion remained minimal on other approaches.
- During the midday peak, the southbound platoon from the upstream intersection built up and encountered a stop-and-go pattern. The northbound accumulated some queues while waiting for the side street but cleared quickly.
- During the PM peak, the northbound left-turn movement was heavy, with the last vehicle in the queue completing the turn on yellow indication. The eastbound left-turn movement was also heavy, with queues unable to fully clear within a cycle. The southbound approach accumulated a long queue of around 15 vehicles while waiting for side street phases, but it was able to clear.

162ND AVENUE/164TH AVENUE & 39TH STREET

- This intersection is coordinated under a north-south coordination plan during weekday peak periods and operates free during the weekend midday period.
- During the AM peak period, the intersection experienced minimal congestion, except for the southbound left-turn movement, which was heavy and did not clear within a cycle, likely due to school access. School buses were observed traveling on both the eastbound and westbound approaches.
- During the midday period, the southbound platoon from the upstream intersection built up, leading to a stop-and-go pattern. Other approaches experienced minimal congestion.
- During the PM peak, the southbound left-turn movement experienced some congestion but could clear within the cycle. Westbound and northbound accumulated some queues while waiting for other phases but cleared quickly once the signal turned green.

162ND AVENUE/164TH AVENUE & 45TH STREET/POPLAR STREET

- This intersection is coordinated under a north-south coordination plan during weekday peak periods and operates free during the weekend midday period.
- During the AM peak, the intersection experienced minimal congestion, except for the southbound movement, which accumulated some queues while waiting for side street phases.
- During the midday and PM peaks, northbound and southbound experienced some congestion, with PM congestion heavier than midday. While waiting for the side street phases, queues accumulated about 10 vehicles in the midday peak and 20 vehicles in the PM peak.

162ND AVENUE/164TH AVENUE & 65TH STREET

- This intersection operates free at all peak periods.

- During the AM peak, the intersection experienced minimal congestion, except for the southbound movement, which accumulated queues from Fourth Plain Boulevard platoon while waiting for other phases.
- During the midday peak, the intersection experienced minimal congestion.
- During the PM peak, southbound accumulated some queueing while waiting for other phases, but could clear quickly. Northbound experienced heavy congestion, especially due to heavy northbound queues from Fourth Plain Boulevard, which caused spillback and impacted vehicles entering the intersection.

162ND AVENUE/164TH AVENUE & SR 500 & FOURTH PLAIN BOULEVARD

- This intersection operates free at all peak periods.
- During the AM and midday peak periods, all approaches accumulated some queues while waiting for other phases but could clear quickly.
- During the PM peak, the intersection experienced some congestion, especially for northbound and southbound movements when platoons arrived from upstream intersections. The northbound queue nearly reached the end of the leg, causing spillback at 65th Street. However, most traffic was still able to pass through within the cycle.

162ND AVENUE/164TH AVENUE/SR 500 & 73RD STREET

- This intersection operates free at all peak periods.
- The intersection experienced minimal congestion during all observation peak periods. The northbound and southbound approaches accumulated only a few vehicles (less than 10) while waiting for side street phases.

162ND AVENUE/164TH AVENUE/SR 500 & 78TH STREET

- This intersection operates free at all peak periods.
- The intersection experienced minimal congestion during the AM and midday peak periods.
- During the PM peak, westbound traffic was heavy due to school-related activity, and pedestrian volumes increased as students passed through the intersection. The northbound and southbound approaches accumulated some vehicles while waiting for side street phases.
- It should be noted that school-related movements may also occur during the AM peak, but the AM observation might have taken place after this period.