Technical Report

Professional Services
Delaware Valley Regional Planning Commission
New Jersey Traffic Signal Retiming Initiative

Sweetbriar Avenue/Sloan Avenue
Mercer County Route 649

From Whitehead Road (CR 616) to Klockner Avenue,
NJ Transit Hamilton Rail Station,

In Hamilton Township, Mercer County, NJ

May 2022

Prepared For:

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Imperial
TRAFFIC & DATA COLLECTION

I. Summary

A. *Project Overview*

Under contract with Delaware Valley Regional Planning Commission (DVPRC), in cooperation with Mercer County and the New Jersey Department of Transportation, the Taylor Wiseman & Taylor (TWT) project team has completed traffic signal retiming work at four (4) signalized intersections along Sweetbriar Avenue/Sloan Avenue (Mercer County Route 649), in Hamilton Township, Mercer County. This work started in May 2018, following completion of Phase 1 of the contract which evaluated candidate corridors within Mercer County and established a consensus priority list. In accordance with the process jointly established by DVRPC, Mercer County and the TWT team, updated timing plans, including adjustments to cycle lengths, splits, and offsets, as well as the introduction of additional time-of-day coordination patterns, were implemented by March 20, 2022.

This project involved extensive traffic data collection, including automatic traffic recorder counts, peak hour turning movement counts, controller assessments and 'before' travel time runs. The collected data was analyzed using traffic engineering software including Synchro™ and Tru-Traffic™. New timing plans were developed for the corridor, which were implemented by the consultant team in March 2022. Fine-tuning and field observations were conducted throughout implementation, resulting in minor timing changes to those initially implemented. Final travel time runs were completed, and comparisons made to the 'before' condition. This report summarizes the activities, observations and results of this project.

B. *Results*

With implementation of the 1) updated timing plans, and 2) modifications to the corridor's time-of-day schedule, the TWT team has documented significant reductions in corridor travel times and delay. The Sweetbriar Avenue/Sloan Avenue corridor is arguably two corridors, as the traffic characteristics associated with the eastern signals on the corridor are more peak-hour oriented than Vetterlein Avenue, or even Whitehead Road. Nevertheless, the TWT team reduced overall weekday morning, mid-day, evening and weekend mid-day peak travel times by 17%, 22%, 25%, and 27%, respectively. Cumulative delay on the corridor was impacted more dramatically, as overall weekday morning, mid-day, evening and weekend delays were reduced by 47%, 94%, 85% and 85%. Summary results for the corridor are presented in **Table 1**. Detailed results, showing a further breakdown of this data is presented later in this report. The Tru-Traffic™ comparison (before retiming/after implementation) reports for the weekday morning, mid-day and evening, as well as Saturday peak hours are presented in **Appendix A**.

Cumulative delay on the Sweetbriar Avenue/Sloan Avenue corridor was reduced 94% during the typical weekday mid-day period.

Photo 1: Looking EB at Hamilton Rail Station/Klockner Road

Table 1
Before Retiming/After Implementation Results for
Coordinated Segment of Sweetbriar Avenue/Sloan Avenue
(Whitehead Road to Klockner Road)--Hamilton Township, Mercer County

Time Period	Travel Time (% Difference)			Cumulative Delay (% Difference)		
	EB	WB	Combined	EB	WB	Combined
Weekday AM	-3%	-28%	-17%	-8%	-61%	-47%
Weekday Mid-Day	-13%	-28%	-22%	-87%	-97%	-94%
Weekday PM	-15%	-33%	-25%	-57%	-95%	-85%
Saturday Mid-Day	-24%	-30%	-27%	-84%	-87%	-85%

C. Project Description

Sweetbriar Avenue/Sloan Avenue, Mercer County Route 649 is an urban minor arterial with a west to east orientation. Within the project area, the roadway is known as Sweetbriar Avenue to the west from Whitehead Road to American Metro Boulevard. From American Metro Boulevard to the east, the roadway is known as Sloan Avenue. The corridor project limits extend 1.17 miles along County Route 649 (Sweetbriar Avenue/Sloan Avenue) from Whitehead Road (CR 616) at the western limit to Klockner Road at the eastern limit.

The entire project corridor is in Hamilton Township, Mercer County. US Route 1 is easily accessible from the west end of Sweetbriar Road, north along Whitehead Road, with ramp access less than 0.20 miles to the north. Interstate 295 is accessible to the east end of the corridor from Sloan Avenue. The I-295 interchange is a full cloverleaf configuration with access to north and south I-295.

Land use along Mercer County Route 649 is a mixture of land uses, including a major transit station, industrial, residential and office complexes. The Ewing Lawrence Sewerage Authority is positioned on the west end to the north along Whitehead Road. Industrial manufacturing facilities are located to the west, and south along Whitehead Road. The western half mile stretch of Sweetbriar Avenue runs parallel to Assunpink Creek and remains undeveloped. Residential development is located on the northside of the corridor in the vicinity of Vetterlein Avenue. American Metro Boulevard provides access to medical facilities, commercial office space and the condominium complex, The Crossings at Hamilton Station.

At the east end of the corridor, the Hamilton Train Station is accessible from a signalized intersection with Klockner Road. The entrance to the train station is via the north approach leg of the signalized intersection. The Hamilton Train Station provides access to AMTRAK's Northeast Corridor and its regional destinations including New York City, Penn Station, as well as Philadelphia, 30th Street Station. Many commuters utilize the trains on a daily basis, including weekends, accessing the train station facility from I-295 from the east or Route 1 from the west.

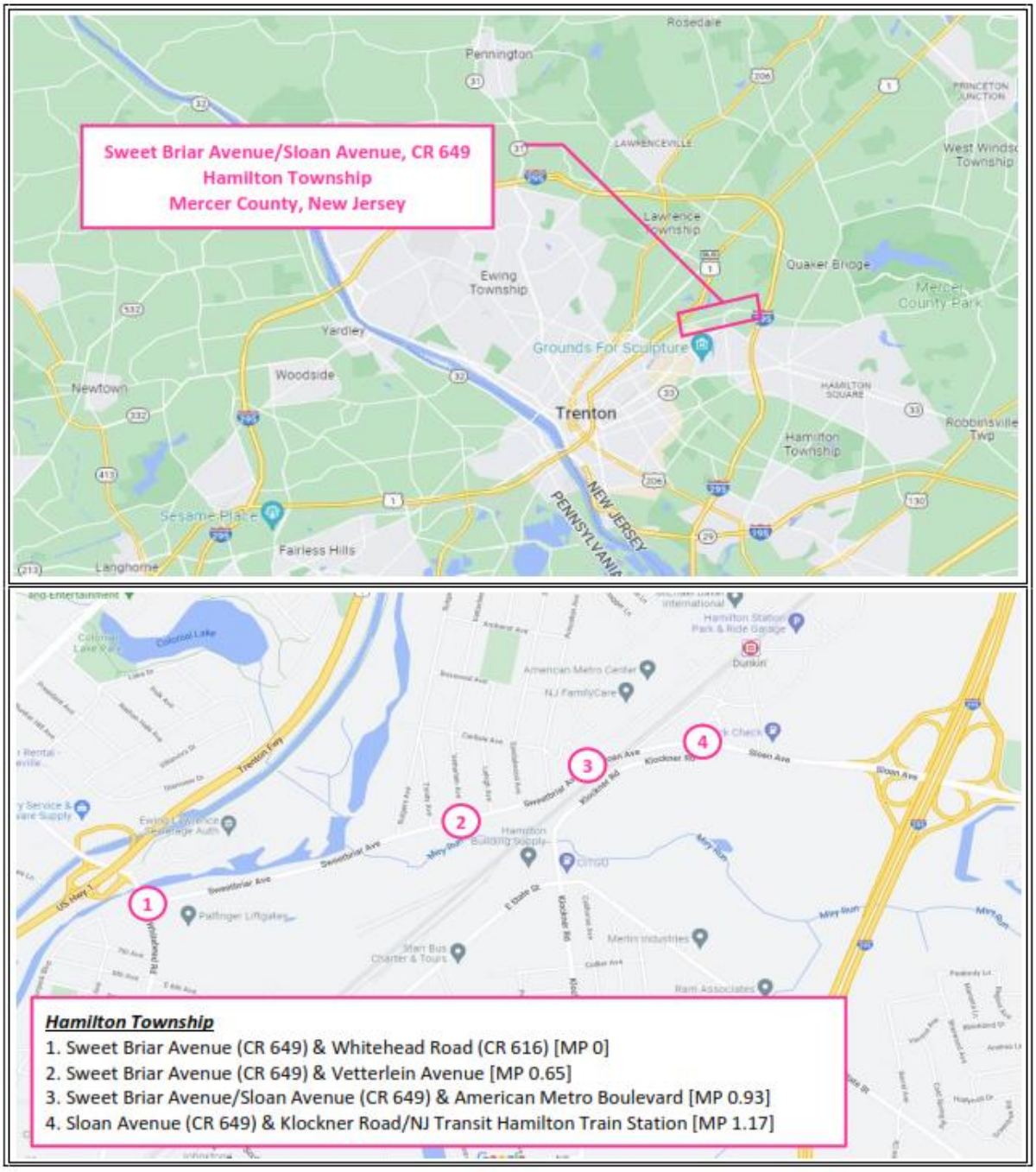
Within the project limits, four (4) signalized intersections exist. The following is a list of signalized intersections within the project limits:

1. Sweetbriar Avenue (CR 649) & Whitehead Road (CR 616) [MP 0]
2. Sweetbriar Avenue (CR 649) & Vetterlein Avenue [MP 0.65]
3. Sweetbriar Avenue/Sloan Avenue (CR 649) & American Metro Boulevard [MP 0.93]
4. Sloan Avenue (CR 649) & Klockner Road/NJ Transit Hamilton Train Station [MP 1.17]

The project corridor location is shown in **Exhibit 1**.

Exhibit 1 – Project Corridor Location and Intersections

LOCATION MAP
DVRPC NEW JERSEY SIGNAL TIMING INITIATIVE
CR 649 - SWEET BRIAR AVENUE AND SLOAN AVENUE
HAMILTON TOWNSHIP, MERCER COUNTY



All four intersections are included in the retiming work effort. Each of the four project intersections have an electrical plan and layout plan, issued by Mercer County Engineering Department. The existing day plan schedule for the project intersections was straightforward: the four signals under Mercer County jurisdiction operated with a single "free" plan 24 hours a day, 7 days per week. The existing timing directives for each intersection are shown in **Appendix B.**

II. Data Collection

A. Turning Movement Counts

Peak hour intersection counts were conducted at the project intersections during the weekday morning (6:30 AM to 9:30 AM), weekday mid-day (11:30 AM to 2:30 PM) and weekday evening (3:00 PM to 7:00 PM) peak hour periods. Saturday counts were taken between 10:00 AM and 4:00 PM. The manual turning movement counts (TMCs) were taken on Saturday, October 2, 2021 and Tuesday, October 5, 2021 by the TWT team. The TMCs are available on the project website, http://www.dvrpc.taylorwiseman.com/.

B. Automatic Traffic Recorder (ATR) Counts

In October 2021, automatic traffic recorder counts were taken by the TWT team as presented in Table 2:

Table 2
2021 Average Daily Traffic
Sweetbriar Avenue/Sloan Avenue

Location	Average Daily Traffic
Sweetbriar Avenue, west of Rutgers Avenue – WB Traffic	7,771 vehicles
Sweetbriar Avenue, west of Rutgers Avenue – EB Traffic	8,199 vehicles
Total ADT	**15,970 vehicles**
Sweetbriar Avenue, west of Sandalwood Avenue – WB Traffic	7,832 vehicles
Sweetbriar Avenue, west of Sandalwood Avenue – EB Traffic	8,239 vehicles
Total ADT	**16,071 vehicles**
Sloan Avenue, west of Klockner Road – WB Traffic	9,162 vehicles
Sloan Avenue, west of Klockner Road – EB Traffic	10,078 vehicles
Total ADT	**19,240 vehicles**

The twenty-four hour counts clearly show the fluctuation of traffic volumes the project corridor experiences on any given day. The western segment (west of American Metro Boulevard) of the corridor experiences almost twenty percent less traffic than the eastern section of the corridor. The automatic traffic recorder counts are available on the project website: http://dvrpc.taylorwiseman.com/.

C. *Travel Time Runs*

Travel time runs were collected within the project area both before and after initial timing plan implementation. Using a GPS enabled laptop and the software Tru-Traffic™, trip logs were recorded along eastbound and westbound Sweetbriar Avenue/Sloan Avenue. Tru-Traffic™ was also utilized during implementation to fine-tune splits and offsets.

D. *Traffic Signal Timing and Phasing Data*

Traffic signal timing and phasing data were obtained from the Mercer County Engineering Office for the project corridor. The existing timing directives are presented in **Appendix B**. Movement, sequence, and timing information, as well as various controller settings and time of day/date were field verified. The controller units were set to universal time utilizing smart phone applications and time variances were noted.

E. *Field Review of Existing Operations*

Field notes were collected at each of the locations on various intersection, signal, and traffic characteristics to assist in model development and signal optimization. Information gathered included lane geometry, storage lengths, number and types of signal heads, cabinet and pedestrian push button locations, and signal phasing.

Photo 2: Controller at Sweetbriar Avenue & Vetterlein Avenue. Note evidence of insect infestation.

Posted speed limits, left turn types (protected, protected/permitted, or permitted), turn restrictions, and the presence of roadway lighting and signal back plates were noted. Vehicle detection was observed for proper operation, both on the street and in the cabinet. Pedestrian push buttons were tested for proper operation during the field review. Any other unique characteristics were also recorded.

All corridor controllers are Econolite ASC/3-2100, in a NEMA TS-1 configuration. All detection on the corridor was functioning at the end of implementation. The controller cabinets, in general, were in poor condition. The controllers at Vetterlein Avenue, American Metro Boulevard and Hamilton Train Station/Klockner Road had notable snake, rodent and insect infestations. The presence of these intruders will likely impact the reliability of the traffic signals, as well as the health/safety of maintenance technicians accessing the controller assemblies.

III. Analysis and Implementation

A. *Modeling*

The TWT team developed a set of base Synchro™ models for management of the new traffic data, initial analysis of the intersection with and without various timing changes and a screening level review of each intersection's overall potential for capacity-level improvements using the Intersection Capacity Utilization (ICU) Methodology. Microscopic simulation using SimTraffic™ was used to assess the impact of unmet demand, turn pocket overflow, metering and spillback, and the effects of origin-destination pairs. Tru-Traffic™ was used to assist in offset determination in order to assess early release issues created when minor phases gap out and unused cycle time is typically sent back to the coordinated phases.

It is important to note that the delay minimization focus of the optimization routine in Synchro™ is helpful to a point in deriving improved cycle lengths and splits; however, this method does not necessarily favor corridor progression and bandwidth requirements. After development of the base models and supplemental evaluations in SimTraffic™, the UTDF file transfer feature with various spreadsheets was used to create base Tru-Traffic™ models for more in-depth optimization. Synchro summary reports are available on the project website: http://dvrpc.taylorwiseman.com/.

B. *Implementation*

During the week of March 14, 2022, the consultant team implemented the optimized timing plans into the Sweetbriar Avenue/Sloan Avenue project controllers (Whitehead Road to Klockner Road). The TWT team verified that each controller maintained a common time standard.

The traffic characteristics of this corridor are bifurcated as Vetterlein Avenue and Whitehead Road do not experience the traffic associated with the office complex at American Metro Boulevard or the transit-oriented trips at the NJ Transit Hamilton Rail Station. It was apparent that keeping the entire corridor in coordinated operation during off-peak times was counterproductive, as local delays experienced at the western signals were excessive. Accordingly, the two western signals (Vetterlein, Whitehead) are not in coordinated operation during some of the weekday off-peak.

The four signalized intersections on Mercer County Route 649 all operate in coordination via time base during peak commuter hours. There are no GPS units to keep the clocks in sync; and significant "drifting" of the common time-standard is expected. The time keeping function of the coordination unit is based on the 60 Hz line frequency of the utility serving the intersection. If the power is interrupted, or the line frequency varies to controllers utilizing Time Based Coordination, the internal controller clock relies on a battery which will result in time variations. The TWT team has inspected the corridor controllers for inconsistent drift and have found that drift is in fact occurring[1]. This drift was expected and does impact the effectiveness of the coordinated timing plan on the corridor. Given the overall "poor" condition of the controller assemblies on the corridor, Mercer County should consider installation of GPS pucks and mitigation of the insect/snake/rodent infestations. In the interim, Mercer County should consider inspection of controller clocks at least once a month, resetting them to universal time as necessary.

[1] *The controller at Sweetbriar Avenue and Vetterlein Avenue was inspected by the TWT team on Thursday, April 28, 2022 and the internal time clock had varied + 9 seconds from Naval Observatory time. Time variances such as these will sabotage the effectiveness of the coordinated timing plans on the CR 649 corridor.*

In addition to the general concerns about the common time standard and the integrity of the controller cabinets, the TWT team identified the following specific concerns:

Whitehead Road (CR 616):

- Pedestrian pushbutton on the southeast corner for NB pedestrian movement (Ø4) does not place a call in the controller.
- Pedestrian display on northeast corner for pedestrian phase 8 (WB) not displaying countdown.

Vetterlein Avenue:

- Detection for side street (SB) was inconsistent. Numerous false calls were observed during field view and implementation.
- Controller assembly had snake, spider and insect infestations which may impact reliability of the controller assembly.

Photo 3: Insect infestation at Vetterlein Avenue (April, 2022)

American Metro Boulevard:

- Ø1, the eastbound CR 649 left-turn phase, has a constant call on video detection.
- Pedestrian button on the northwest corner for pedestrian Ø4 (southbound) does not place call in controller
- UPS in cabinet not functioning and has been turned off.
- Rodents (Rats) were in cabinet during implementation. It is recommended that the nest be cleared from the controller assembly.

NJ Transit Hamilton Rail Station/Klockner Road:

- Pedestrian pushbutton missing on southwest corner for pedestrian Ø8 (southbound).
- Rodents were in cabinet during implementation. It is recommended that the nest be cleared from the controller assembly.

On the project, corridor coordinated operation was installed during the week from 6:30 AM to 7:30 PM, and from 8:00 AM to 8:00 PM on the weekend. The weekday programs include an AM, Mid-Day, PM and PM Off-Peak. The weekend program has a single coordinated timing plan. Cycle lengths on Mercer County Route 649 vary between 70 and 90 seconds throughout the AM, Midday, PM, PM off-peak and weekends. The corridor was observed during all (AM, Mid-Day, PM, PM Off-Peak, and weekend) timing plans. Minor changes were made to offset, split and cycle as necessary and were documented so that the final timing directives would reflect field conditions. A detailed summary of the implementing timing process is provided in **Appendix C**.

C. *Fine-Tuning of Signal Timings*

The TWT team observed each new timing plan at every intersection during its respective peak hour to ensure each phase split was appropriate for the traffic conditions present. If a movement or intersection was over capacity, split adjustments were made to manage queue spillback and blockage.

Photo 4: Looking WB from CR 649 at Whitehead Road (CR 616)

In addition to fine-tuning splits, offset adjustments often have a larger effect on the performance of the corridor. Offsets were adjusted at the coordinated intersections by conducting field observations along the corridor. During implementation, the TWT team utilized Tru-Traffic ™ in conjunction with a direct connect GPS unit to observe the operation of the progressive system. TWT team engineers can track the system time as well as their location within the time-space diagram for any time period. This effort results in several minor adjustments to split and offset times during a time period.

The revised signal timings are available from the project website, http://www.dvrpc.taylorwiseman.com. Updated signal timing directives were developed by the consultant team, with electronic and paper copies delivered to Mercer County and laminated copies placed in each controller.

IV. Results

A. *Before and After Data*

Travel time data along the corridor was collected before and after implementation of the initial timing plans during the weekday morning, mid-day, evening and the weekend mid-day peak hour periods.

With implementation of the new timing plans and maintenance of a uniform time clock between controllers, progression along Sweetbriar Avenue/Sloan Avenue (CR 649) between Whitehead Road and Klockner Road Avenue improved significantly, in both directions. For all four peak hour periods, the implemented retiming is producing positive results and significant savings in travel time, delay, the number of stops, and travel speed in both directions. Refer to **Appendix A** for the travel time summary reports for the time periods. **Table 3** summarizes both the directional and cumulative summary of performance metrics collected on Sweetbriar Avenue/Sloan Avenue (CR 649).

Table 3
Coordinated Segment of Sweetbriar Avenue/Sloan Avenue (CR 649)
(Whitehead Road to Klockner Road)
Hamilton Township, Mercer County
Peak Hour Travel Time and Delay Comparison based on Travel Time Runs completed with Tru-Traffic 10.0*

Direction		AM Peak		Mid-day Peak		PM Peak		Weekend Mid-day Peak	
		Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)
Eastbound	Existing	133	16	132	16	144	24	146	23
	Implemented	129	15	115	2	123	10	111	4
	Difference	-4	-1	-17	-14	-21	-13	-35	-19
	% Difference	**-3%**	**-8%**	**-13%**	**-87%**	**-15%**	**-57%**	**-24%**	**-84%**
Westbound	Existing	195	64	160	39	173	50	159	28
	Implemented	141	25	116	1	117	3	111	4
	Difference	-54	-39	-45	-38	-57	-47	-47	-25
	% Difference	**-28%**	**-61%**	**-28%**	**-97%**	**-33%**	**-95%**	**-30%**	**-87%**
Both Directions	Existing	164	40	147	28	159	37	152	26
	Implemented	137	21	115	2	119	5	111	4
	Difference	**-28**	-19	-32	-27	-40	-32	-41	-22
	% Difference	**-17%**	**-47%**	**-22%**	**-94%**	**-25%**	**-85%**	**-27%**	**-85%**

Eastbound: Whitehead Road to Klockner Road
Westbound: Klockner Road to Whitehead Road
Values as reported in Tru-Traffic summary report. Rounding errors possible.

B. Opportunities for Improvement

Sweetbriar Avenue/Sloan Avenue, Mercer County Route 649, had basic timing in place at the start of the project. As identified previously in the report, there are potential challenges to the sustainability of the updated timing on this corridor. The condition of the controllers on this corridor is a concern, as at least three of the controller assemblies have major rodent/insect/snake infestations. None of the controllers have GPS pucks installed, and the TWT team has already verified that the controller time clocks will drift every day which will impact the efficiency of the signal timing.

The Regional Traffic Signal Timing Initiative has shown that significant improvement in traffic operations is possible with the introduction of new timing plans as well as a common time standard on the Sweetbriar Avenue/Sloan Avenue (Mercer County Route 649) corridor. The consultant team recommends the following:

1. Regular surveillance and adjustment of controller clock time to ensure the individual controllers maintain a common time standard. Installation of GPS units in the cabinets would alleviate this need. Initially, we would recommend surveillance every 30-days adjusting the frequency based on the time drift observed.
2. Focus on maintenance of the traffic signal installations immediately. Identify and correct missing or malfunctioning vehicular and pedestrian detection on the corridor.
3. Clean or replace the controller cabinets on the corridor. Take preventative action to avoid snake, rodent and insect infestations.
4. Timing plans on the corridor should be revisited within 3-5 years.
5. Mercer County should consider use of a GPS unit in all future cabinets, ensuring that the controller time clocks are synchronized with atomic time daily.

C. Additional Resources/Project Data

Additional information, including project data, analysis files, and other detailed reports will be available on the project website at: http://www.dvrpc.taylorwiseman.com/

Appendix A

Travel Time & Delay Report for Sweet Briar Ave (CR 649) - AM Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 7:0

9 After-type runs, 5 of unverifiable origin, collected Wednesday 03/16/22 to Wednesday 03/23/22, over day(s) Wed, with starting times duri

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to NJ Transit Hamilton Rail Station (#4)									
Average Before (n=7)	133	27	106	16	32.6	0.6	610	34.8	2450.3
Std Dev Before (n=7)	*22*	*22*	*0*	*19*	*5.1*	*0.5*	*610*	*7.7*	*422.8*
Average After (n=9)	129	23	106	15	33.1	0.8	610	36.9	2464.1
Std Dev After (n=9)	*13*	*13*	*0*	*13*	*3.5*	*0.7*	*610*	*8.9*	*382.6*
Difference	-4	-4	0	-1	0.5	0.2	610	2.1	13.8
Std Dev Difference	*26*	*26*	*0*	*23*	*6.2*	*0.9*	*610*	*11.8*	*570.2*
% Difference	-3%	-17%	0%	-8%	1.60%	36.10%	610	6.10%	0.60%

Cumulative Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 7:0

15 After-type runs, 9 of unverifiable origin, collected Wednesday 03/16/22 to Wednesday 03/23/22, over day(s) Wed, with starting times du

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Whitehead Rd (CR 616) (#1)									
Average Before (n=7)	195	91	104	64	22.9	1.9	0	22.6	1520.3
Std Dev Before (n=7)	*31*	*31*	*0*	*28*	*3.5*	*1.5*	*0*	*13.5*	*545.4*
Average After (n=15)	141	37	104	25	30.9	0.7	0	12.3	941.6
Std Dev After (n=15)	*28*	*28*	*0*	*26*	*5.2*	*0.5*	*0*	*0.1*	*79.7*
Difference	-54	-54	0	-39	8	-1.2	0	-10.3	-578.7
Std Dev Difference	*42*	*42*	*0*	*39*	*6.3*	*1.5*	*0*	*13.5*	*551.2*
% Difference	-28%	-59%	0%	-61%	34.80%	-64.10%	0	-45.50%	-38.10%

Cumulative Summary of all runs, either direction through artery

14 Before-type runs, 14 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 7

24 After-type runs, 14 of unverifiable origin, collected Wednesday 03/16/22 to Wednesday 03/23/22, over day(s) Wed, with starting times d

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=14)	164	59	105	40	27.8	1.2	610	28.7	1985.3
Std Dev Before (n=14)	*41*	*42*	*1*	*34*	*6.6*	*1.3*	*610*	*12.3*	*672.8*
Average After (n=24)	137	32	105	21	31.7	0.7	610	21.5	1512.5
Std Dev After (n=24)	*24*	*24*	*1*	*22*	*4.7*	*0.6*	*610*	*13.3*	*788.5*
Difference	-28	-27	0	-19	4	-0.5	610	-7.2	-472.8
Std Dev Difference	*47*	*48*	*2*	*40*	*8*	*1.4*	*610*	*18.1*	*1036.5*
% Difference	-17%	-46%	0%	-47%	14.30%	-41.70%	610	-24.90%	-23.80%

Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 7:08:12 AM to 8:49:40 AM

9 After-type runs, 5 of unverifiable origin, collected Wednesday 03/16/22 to Wednesday 03/23/22, over day(s) Wed, with starting times during 6:57:40 AM to 8:54:26 AM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Vetterlein Ave (#2)											

Average Before (n=7)	71	3471	11	59	7	35.8	40	0.1	675	17.4	1291.4
Std Dev Before (n=7)	*23*	*0*	*23*	*0*	*19*	*7.5*	*0*	*0.4*	*675*	*5.7*	*398.7*
Average After (n=9)	62	3471	3	59	0	38.1	40	0	675	15.3	1142
Std Dev After (n=9)	*3*	*0*	*3*	*0*	*0*	*1.7*	*0*	*0*	*675*	*0.1*	*29.7*
Difference	-8	0	-8	0	-7	2.3	0	-0.1	675	-2.2	-149.4
Std Dev Difference	*23*	*0*	*23*	*0*	*19*	*7.7*	*0*	*0.4*	*675*	*5.7*	*399.8*
% Difference	-12%	0%	-72%	0%	-100%	6.40%	0%	-100.00%	675	-12.60%	-11.60%
to American Metro Blvd (#3)											
Average Before (n=7)	102	1507	17	85	12	34.1	40	0.4	656	27.9	1939.6
Std Dev Before (n=7)	*21*	*0*	*21*	*0*	*19*	*5.3*	*0*	*0.5*	*656*	*7.8*	*412.2*
Average After (n=9)	91	1507	6	85	1	37.1	40	0.1	656	23.1	1677.7
Std Dev After (n=9)	*8*	*0*	*8*	*0*	*4*	*3.1*	*0*	*0.3*	*656*	*4.7*	*218.2*
Difference	-11	0	-11	0	-11	3.1	0	-0.3	656	-4.8	-261.9
Std Dev Difference	*23*	*0*	*23*	*0*	*19*	*6.2*	*0*	*0.6*	*656*	*9.1*	*466.4*
% Difference	-11%	0%	-63%	0%	-89%	9.00%	0%	-74.10%	656	-17.20%	-13.50%
to NJ Transit Hamilton Rail Station (#4)											
Average Before (n=7)	133	1257	27	106	16	32.6	40	0.6	610	34.8	2450.3
Std Dev Before (n=7)	*22*	*0*	*22*	*0*	*19*	*5.1*	*0*	*0.5*	*610*	*7.7*	*422.8*
Average After (n=9)	129	1257	23	106	15	33.1	40	0.8	610	36.9	2464.1
Std Dev After (n=9)	*13*	*0*	*13*	*0*	*13*	*3.5*	*0*	*0.7*	*610*	*8.9*	*382.6*
Difference	-4	0	-4	0	-1	0.5	0	0.2	610	2.1	13.8
Std Dev Difference	*26*	*0*	*26*	*0*	*23*	*6.2*	*0*	*0.9*	*610*	*11.8*	*570.2*
% Difference	-3%	0%	-17%	0%	-8%	1.60%	0%	36.10%	610	6.10%	0.60%

Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 7:01:42 AM to 8:43:38 AM

15 After-type runs, 9 of unverifiable origin, collected Wednesday 03/16/22 to Wednesday 03/23/22, over day(s) Wed, with starting times during 6:44:17 AM to 8:50:23 A

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to American Metro Blvd (#3)											
Average Before (n=7)	44	1257	25	19	9	21.5	45	0.4	702	14	930
Std Dev Before (n=7)	*12*	*0*	*12*	*0*	*13*	*5.8*	*0*	*0.5*	*702*	*9.9*	*421.1*
Average After (n=15)	24	1257	5	19	0	36.8	45	0	702	5.9	459.3
Std Dev After (n=15)	*4*	*0*	*4*	*0*	*0*	*5.8*	*0*	*0*	*702*	*0*	*42.8*
Difference	-20	0	-20	0	-9	15.3	0	-0.4	702	-8.1	-470.8
Std Dev Difference	*13*	*0*	*13*	*0*	*13*	*8.2*	*0*	*0.5*	*702*	*9.9*	*423.2*
% Difference	-45%	0%	-79%	0%	-100%	71.40%	0%	-100.00%	702	-58.00%	-50.60%
to Vetterlein Ave (#2)											
Average Before (n=7)	76	1507	31	45	9	25.5	40	0.6	673	22.6	1520.3
Std Dev Before (n=7)	*13*	*0*	*13*	*0*	*13*	*4.1*	*0*	*0.8*	*673*	*13.5*	*545.4*
Average After (n=15)	52	1507	7	45	0	36.8	40	0	673	12.3	941.6
Std Dev After (n=15)	*8*	*0*	*8*	*0*	*0*	*5.3*	*0*	*0*	*673*	*0.1*	*79.7*
Difference	-24	0	-24	0	-9	11.3	0	-0.6	673	-10.3	-578.7
Std Dev Difference	*15*	*0*	*15*	*0*	*13*	*6.7*	*0*	*0.8*	*673*	*13.5*	*551.2*
% Difference	-32%	0%	-78%	0%	-100%	44.20%	0%	-100.00%	673	-45.50%	-38.10%
to Whitehead Rd (CR 616) (#1)											
Average Before (n=7)	195	3471	91	104	64	22.9	40	1.9	0	22.6	1520.3
Std Dev Before (n=7)	*31*	*0*	*31*	*0*	*28*	*3.5*	*0*	*1.5*	*0*	*13.5*	*545.4*
Average After (n=15)	141	3471	37	104	25	30.9	40	0.7	0	12.3	941.6
Std Dev After (n=15)	*28*	*0*	*28*	*0*	*26*	*5.2*	*0*	*0.5*	*0*	*0.1*	*79.7*
Difference	-54	0	-54	0	-39	8	0	-1.2	0	-10.3	-578.7
Std Dev Difference	*42*	*0*	*42*	*0*	*39*	*6.3*	*0*	*1.5*	*0*	*13.5*	*551.2*
% Difference	-28%	0%	-59%	0%	-61%	34.80%	0%	-64.10%	0	-45.50%	-38.10%

Travel Time & Delay Report for Sweet Briar Ave (CR 649) - MD Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11:0

9 After-type runs, 9 of unverifiable origin, collected Wednesday 03/23/22 to Wednesday 03/23/22, over day(s) Wed, with starting times durin

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to NJ Transit Hamilton Rail Station (#4)									
Average Before (n=7)	132	26	106	16	32.2	0.7	405	26	1771
Std Dev Before (n=7)	*9*	*9*	*0*	*14*	*2.3*	*0.5*	*405*	*4.8*	*203.9*
Average After (n=9)	115	8	106	2	37	0.2	405	21.5	1524.3
Std Dev After (n=9)	*9*	*9*	*0*	*4*	*2.8*	*0.4*	*405*	*4.7*	*194.6*
Difference	-17	-17	0	-14	4.8	-0.5	405	-4.5	-246.7
Std Dev Difference	*12*	*12*	*0*	*15*	*3.6*	*0.7*	*405*	*6.7*	*281.8*
% Difference	-13%	-67%	0%	-87%	14.90%	-68.90%	405	-17.40%	-13.90%

Cumulative Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

8 Before-type runs, 8 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 10:5

11 After-type runs, 11 of unverifiable origin, collected Wednesday 03/23/22 to Wednesday 03/23/22, over day(s) Wed, with starting times du

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Whitehead Rd (CR 616) (#1)									
Average Before (n=8)	160	56	104	39	27.1	1.1	0	10.5	724.7
Std Dev Before (n=8)	*22*	*22*	*0*	*22*	*3.8*	*0.6*	*0*	*4.9*	*242.5*
Average After (n=11)	116	12	104	1	36.6	0.1	0	7.8	594.9
Std Dev After (n=11)	*9*	*9*	*0*	*4*	*2.8*	*0.3*	*0*	*0.1*	*56.3*
Difference	-45	-45	0	-38	9.5	-1	0	-2.7	-129.8
Std Dev Difference	*24*	*24*	*0*	*22*	*4.7*	*0.7*	*0*	*4.9*	*248.9*
% Difference	-28%	-79%	0%	-97%	35.10%	-91.90%	0	-25.40%	-17.90%

Cumulative Summary of all runs, either direction through artery

15 Before-type runs, 15 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 10

20 After-type runs, 20 of unverifiable origin, collected Wednesday 03/23/22 to Wednesday 03/23/22, over day(s) Wed, with starting times du

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=15)	147	42	105	28	29.5	0.9	405	17.7	1213
Std Dev Before (n=15)	*22*	*23*	*1*	*22*	*4*	*0.6*	*405*	*9.3*	*582.3*
Average After (n=20)	115	10	105	2	36.8	0.1	405	13.9	1013.1
Std Dev After (n=20)	*9*	*9*	*1*	*4*	*2.8*	*0.4*	*405*	*7.6*	*492.6*
Difference	-32	-32	0	-27	7.3	-0.8	405	-3.8	-199.8
Std Dev Difference	*24*	*25*	*2*	*22*	*4.9*	*0.7*	*405*	*12*	*762.7*
% Difference	-22%	-76%	0%	-94%	24.80%	-83.90%	405	-21.20%	-16.50%

Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

7 Before-type runs, 7 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 11:03:49 AM to 12:40:43 PM

9 After-type runs, 9 of unverifiable origin, collected Wednesday 03/23/22 to Wednesday 03/23/22, over day(s) Wed, with starting times during 11:05:48 AM to 12:57:58 P

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Vetterlein Ave (#2)											
Average Before (n=7)	62	3471	3	59	0	38.2	40	0	488	11	824.7
Std Dev Before (n=7)	*4*	*0*	*4*	*0*	*0*	*2.6*	*0*	*0*	*488*	*0.1*	*29.5*
Average After (n=9)	60	3471	0	59	0	39.8	40	0	488	11	804.9
Std Dev After (n=9)	*3*	*0*	*3*	*0*	*0*	*1.9*	*0*	*0*	*488*	*0*	*20.2*
Difference	-3	0	-3	0	0	1.5	0	0	488	0	-19.8
Std Dev Difference	*5*	*0*	*5*	*0*	*0*	*3.2*	*0*	*0*	*488*	*0.1*	*35.8*
% Difference	-4%	0%	-87%	0%	N/D	4.00%	0%	N/D	488	-0.30%	-2.40%
to American Metro Blvd (#3)											
Average Before (n=7)	95	1507	10	85	5	36.1	40	0.3	497	18.9	1321
Std Dev Before (n=7)	*14*	*0*	*14*	*0*	*9*	*4.8*	*0*	*0.5*	*497*	*5.3*	*263.4*
Average After (n=9)	92	1507	7	85	2	36.7	40	0.2	497	18.1	1274.7
Std Dev After (n=9)	*7*	*0*	*7*	*0*	*4*	*3*	*0*	*0.4*	*497*	*4.7*	*184.7*
Difference	-3	0	-3	0	-3	0.7	0	-0.1	497	-0.7	-46.3
Std Dev Difference	*16*	*0*	*16*	*0*	*10*	*5.7*	*0*	*0.7*	*497*	*7.1*	*321.7*
% Difference	-3%	0%	-30%	0%	-62%	1.80%	0%	-22.20%	497	-3.90%	-3.50%
to NJ Transit Hamilton Rail Station (#4)											
Average Before (n=7)	132	1257	26	106	16	32.2	40	0.7	405	26	1771
Std Dev Before (n=7)	*9*	*0*	*9*	*0*	*14*	*2.3*	*0*	*0.5*	*405*	*4.8*	*203.9*
Average After (n=9)	115	1257	8	106	2	37	40	0.2	405	21.5	1524.3
Std Dev After (n=9)	*9*	*0*	*9*	*0*	*4*	*2.8*	*0*	*0.4*	*405*	*4.7*	*194.6*
Difference	-17	0	-17	0	-14	4.8	0	-0.5	405	-4.5	-246.7
Std Dev Difference	*12*	*0*	*12*	*0*	*15*	*3.6*	*0*	*0.7*	*405*	*6.7*	*281.8*
% Difference	-13%	0%	-67%	0%	-87%	14.90%	0%	-68.90%	405	-17.40%	-13.90%

Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

8 Before-type runs, 8 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 10:58:47 AM to 12:47:01 PM

11 After-type runs, 11 of unverifiable origin, collected Wednesday 03/23/22 to Wednesday 03/23/22, over day(s) Wed, with starting times during 11:02:04 AM to 12:54:0

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to American Metro Blvd (#3)											
Average Before (n=8)	30	1257	11	19	4	32.6	45	0.1	436	5.1	371.2
Std Dev Before (n=8)	*14*	*0*	*14*	*0*	*12*	*8.7*	*0*	*0.4*	*436*	*4.1*	*218.9*
Average After (n=11)	23	1257	4	19	0	37.9	45	0	436	3.7	279.3
Std Dev After (n=11)	*4*	*0*	*4*	*0*	*0*	*4.4*	*0*	*0*	*436*	*0*	*22.4*
Difference	-7	0	-7	0	-4	5.3	0	-0.1	436	-1.5	-91.8
Std Dev Difference	*14*	*0*	*14*	*0*	*12*	*9.7*	*0*	*0.4*	*436*	*4.1*	*220*
% Difference	-23%	0%	-61%	0%	-100%	16.30%	0%	-100.00%	436	-28.90%	-24.70%
to Vetterlein Ave (#2)											
Average Before (n=8)	58	1507	13	45	5	33.6	40	0.3	436	10.5	724.7
Std Dev Before (n=8)	*15*	*0*	*15*	*0*	*12*	*6.3*	*0*	*0.5*	*436*	*4.9*	*242.5*
Average After (n=11)	51	1507	7	45	0	37.2	40	0	436	7.8	594.9
Std Dev After (n=11)	*9*	*0*	*9*	*0*	*0*	*5*	*0*	*0*	*436*	*0.1*	*56.3*
Difference	-7	0	-7	0	-5	3.6	0	-0.3	436	-2.7	-129.8
Std Dev Difference	*17*	*0*	*17*	*0*	*12*	*8.1*	*0*	*0.5*	*436*	*4.9*	*248.9*
% Difference	-12%	0%	-51%	0%	-100%	10.70%	0%	-100.00%	436	-25.40%	-17.90%
to Whitehead Rd (CR 616) (#1)											
Average Before (n=8)	160	3471	56	104	39	27.1	40	1.1	0	10.5	724.7
Std Dev Before (n=8)	*22*	*0*	*22*	*0*	*22*	*3.8*	*0*	*0.6*	*0*	*4.9*	*242.5*
Average After (n=11)	116	3471	12	104	1	36.6	40	0.1	0	7.8	594.9
Std Dev After (n=11)	*9*	*0*	*9*	*0*	*4*	*2.8*	*0*	*0.3*	*0*	*0.1*	*56.3*
Difference	-45	0	-45	0	-38	9.5	0	-1	0	-2.7	-129.8

Std Dev Difference	*24*	*0*	*24*	*0*	*22*	*4.7*	*0*	*0.7*	*0*	*4.9*	*248.9*
% Difference	-28%	0%	-79%	0%	-97%	35.10%	0%	-91.90%	0	-25.40%	-17.90%

Travel Time & Delay Report for Sweet Briar Ave (CR 649) - PM Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

12 Before-type runs, 12 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 3:

8 After-type runs, 7 of unverifiable origin, collected Tuesday 03/15/22 to Wednesday 03/23/22, over day(s) Tue, Wed, with starting times duri

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to NJ Transit Hamilton Rail Station (#4)									
Average Before (n=12)	144	38	106	24	30.2	1.3	737	52.2	3365
Std Dev Before (n=12)	*21*	*21*	*0*	*15*	*4.9*	*0.8*	*737*	*12.5*	*596.6*
Average After (n=8)	123	17	106	10	34.6	0.6	737	42	2813.7
Std Dev After (n=8)	*11*	*11*	*0*	*11*	*3.1*	*0.5*	*737*	*8.7*	*382.7*
Difference	-21	-21	0	-13	4.4	-0.6	737	-10.2	-551.3
Std Dev Difference	*24*	*24*	*0*	*18*	*5.8*	*0.9*	*737*	*15.2*	*708.7*
% Difference	-15%	-56%	0%	-57%	14.60%	-50.00%	737	-19.50%	-16.40%

Cumulative Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

13 Before-type runs, 13 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 2:

14 After-type runs, 13 of unverifiable origin, collected Tuesday 03/15/22 to Wednesday 03/23/22, over day(s) Tue, Wed, with starting times d

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Whitehead Rd (CR 616) (#1)									
Average Before (n=13)	173	70	104	50	25.7	1.5	0	21	1370.6
Std Dev Before (n=13)	*29*	*29*	*0*	*26*	*4.4*	*0.7*	*0*	*10.8*	*509.1*
Average After (n=14)	117	13	104	3	36.4	0.2	0	13	956.6
Std Dev After (n=14)	*13*	*13*	*0*	*8*	*3.7*	*0.6*	*0*	*3.9*	*167.4*
Difference	-57	-57	0	-47	10.7	-1.2	0	-8.1	-414.1
Std Dev Difference	*32*	*32*	*0*	*27*	*5.8*	*0.9*	*0*	*11.5*	*535.9*
% Difference	-33%	-81%	0%	-95%	41.60%	-85.30%	0	-38.30%	-30.20%

Cumulative Summary of all runs, either direction through artery

25 Before-type runs, 25 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 3:

22 After-type runs, 20 of unverifiable origin, collected Tuesday 03/15/22 to Wednesday 03/23/22, over day(s) Tue, Wed, with starting times d

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=25)	159	54	105	37	27.9	1.4	737	36	2327.9
Std Dev Before (n=25)	*29*	*30*	*1*	*25*	*5.1*	*0.7*	*737*	*19.5*	*1151.9*
Average After (n=22)	119	14	105	5	35.7	0.4	737	23.5	1631.9
Std Dev After (n=22)	*13*	*12*	*1*	*10*	*3.5*	*0.6*	*737*	*15.4*	*949.9*
Difference	-40	-40	0	-32	7.9	-1	737	-12.5	-696
Std Dev Difference	*32*	*32*	*2*	*27*	*6.2*	*0.9*	*737*	*24.9*	*1493*
% Difference	-25%	-74%	0%	-85%	28.30%	-73.30%	737	-34.60%	-29.90%

Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

12 Before-type runs, 12 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 3:05:19 PM to 5:51:38 PM

8 After-type runs, 7 of unverifiable origin, collected Tuesday 03/15/22 to Wednesday 03/23/22, over day(s) Tue, Wed, with starting times during 2:43:09 PM to 5:54:35 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Vetterlein Ave (#2)											
Average Before (n=12)	60	3471	1	59	0	39.9	40	0	799	18.1	1327.3
Std Dev Before (n=12)	*3*	*0*	*3*	*0*	*0*	*1.9*	*0*	*0*	*799*	*0.1*	*39*
Average After (n=8)	62	3471	3	59	0	38.1	40	0	799	18	1351.1
Std Dev After (n=8)	*3*	*0*	*3*	*0*	*0*	*1.6*	*0*	*0*	*799*	*0.1*	*32.8*
Difference	3	0	3	0	0	-1.8	0	0	799	0	23.8
Std Dev Difference	*4*	*0*	*4*	*0*	*0*	*2.5*	*0*	*0*	*799*	*0.1*	*51*
% Difference	4%	0%	426%	0%	N/D	-4.40%	0%	N/D	799	-0.20%	1.80%
to American Metro Blvd (#3)											
Average Before (n=12)	98	1507	13	85	6	35.3	40	0.4	775	32.5	2229.3
Std Dev Before (n=12)	*18*	*0*	*18*	*0*	*9*	*5.3*	*0*	*0.5*	*775*	*8.8*	*449.8*
Average After (n=8)	101	1507	16	85	10	33.6	40	0.6	775	35.9	2367.6
Std Dev After (n=8)	*11*	*0*	*11*	*0*	*11*	*3.5*	*0*	*0.5*	*775*	*8.7*	*375.6*
Difference	3	0	3	0	4	-1.7	0	0.2	775	3.4	138.3
Std Dev Difference	*21*	*0*	*21*	*0*	*14*	*6.3*	*0*	*0.7*	*775*	*12.3*	*586*
% Difference	3%	0%	23%	0%	69%	-4.80%	0%	50.00%	775	10.40%	6.20%
to NJ Transit Hamilton Rail Station (#4)											
Average Before (n=12)	144	1257	38	106	24	30.2	40	1.3	737	52.2	3365
Std Dev Before (n=12)	*21*	*0*	*21*	*0*	*15*	*4.9*	*0*	*0.8*	*737*	*12.5*	*596.6*
Average After (n=8)	123	1257	17	106	10	34.6	40	0.6	737	42	2813.7
Std Dev After (n=8)	*11*	*0*	*11*	*0*	*11*	*3.1*	*0*	*0.5*	*737*	*8.7*	*382.7*
Difference	-21	0	-21	0	-13	4.4	0	-0.6	737	-10.2	-551.3
Std Dev Difference	*24*	*0*	*24*	*0*	*18*	*5.8*	*0*	*0.9*	*737*	*15.2*	*708.7*
% Difference	-15%	0%	-56%	0%	-57%	14.60%	0%	-50.00%	737	-19.50%	-16.40%

Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

13 Before-type runs, 13 of unverifiable origin, collected Tuesday 10/05/21 to Tuesday 10/05/21, over day(s) Tue, with starting times during 2:59:51 PM to 5:47:28 PM

14 After-type runs, 13 of unverifiable origin, collected Tuesday 03/15/22 to Wednesday 03/23/22, over day(s) Tue, Wed, with starting times during 3:02:38 PM to 5:50:30

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to American Metro Blvd (#3)											
Average Before (n=13)	37	1257	18	19	8	26.6	45	0.4	658	12.3	781.6
Std Dev Before (n=13)	*13*	*0*	*13*	*0*	*11*	*8.3*	*0*	*0.5*	*658*	*8.8*	*404.4*
Average After (n=14)	24	1257	5	19	0	35.9	45	0	658	5.5	430.3
Std Dev After (n=14)	*3*	*0*	*3*	*0*	*0*	*3.6*	*0*	*0*	*658*	*0*	*23.5*
Difference	-13	0	-13	0	-8	9.3	0	-0.4	658	-6.8	-351.3
Std Dev Difference	*13*	*0*	*13*	*0*	*11*	*9.1*	*0*	*0.5*	*658*	*8.8*	*405*
% Difference	-35%	0%	-71%	0%	-100%	35.20%	0%	-100.00%	658	-55.40%	-45.00%
to Vetterlein Ave (#2)											
Average Before (n=13)	68	1507	23	45	10	29.4	40	0.5	675	21	1370.6
Std Dev Before (n=13)	*17*	*0*	*17*	*0*	*13*	*6.9*	*0*	*0.7*	*675*	*10.8*	*509.1*
Average After (n=14)	53	1507	8	45	1	35.9	40	0.1	675	13	956.6
Std Dev After (n=14)	*7*	*0*	*7*	*0*	*2*	*4.4*	*0*	*0.3*	*675*	*3.9*	*167.4*
Difference	-15	0	-15	0	-9	6.5	0	-0.5	675	-8.1	-414.1
Std Dev Difference	*19*	*0*	*19*	*0*	*13*	*8.2*	*0*	*0.7*	*675*	*11.5*	*535.9*
% Difference	-23%	0%	-66%	0%	-94%	22.10%	0%	-86.70%	675	-38.30%	-30.20%
to Whitehead Rd (CR 616) (#1)											
Average Before (n=13)	173	3471	70	104	50	25.7	40	1.5	0	21	1370.6
Std Dev Before (n=13)	*29*	*0*	*29*	*0*	*26*	*4.4*	*0*	*0.7*	*0*	*10.8*	*509.1*
Average After (n=14)	117	3471	13	104	3	36.4	40	0.2	0	13	956.6
Std Dev After (n=14)	*13*	*0*	*13*	*0*	*8*	*3.7*	*0*	*0.6*	*0*	*3.9*	*167.4*
Difference	-57	0	-57	0	-47	10.7	0	-1.2	0	-8.1	-414.1

Std Dev Difference	*32*	*0*	*32*	*0*	*27*	*5.8*	*0*	*0.9*	*0*	*11.5*	*535.9*
% Difference	-33%	0%	-81%	0%	-95%	41.60%	0%	-85.30%	0	-38.30%	-30.20%

Travel Time & Delay Report for Sweet Briar Ave (CR 649) - Weekend MD Peak

Legend:

CTT:
Summarized Cumulative Travel Time since beginning of Run (seconds)

CPLSD:
Summarized Cumulative Posted Speed Limit Delay since beginning of Run (seconds)

CPLRT:
Summarized Cumulative Posted Speed Limit Running Time, or Travel Time since beginning of Run if maintaining Posted Speed Limit (seconds) = accumulation of DL/PLS since beginning of Run

CStopD:
Summarized Cumulative Stopped Delay since beginning of Run (seconds). The "Stopped Delay" is counted from when the speed drops below 5 mph after exceeding 15 mph until it exceeds 15 mph once again

CAS:
Summarized Cumulative Actual Average Speed since beginning of Run (mph) = CTL/CTT

CStops:
Summarized Cumulative number of Stops in Run. A "Stop" is counted when the speed drops below 5 mph after exceeding 15 mph

TV:
Summarized Through Volume (vph)

CPUFC:
Summarized Cumulative Fuel Consumption, from Penic & Upchurch model with TRANSYT7F-10 default coefficients (gal/hr) (= Cumulative (TL/5280*(0.51242*exp(0.024609*DS)/DS) + Delay/3600*(0.0468) + Stops*(3.8424*DS^1.657 + 1.681*DS^1.48922)/1.0E5)*TV)

CUFCOE:
Summarized Cumulative Carbon Monoxide Emissions using Synchro 7 formula (from unpublished Oak Ridge National Labs letter to Federal Highway Administration) and University of Florida model for Fuel Consumption (g/hr) (= Cumulative UFFC*69.9)

Cumulative Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

10 Before-type runs, 10 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 1

12 After-type runs, 12 of unverifiable origin, collected Saturday 03/26/22 to Saturday 03/26/22, over day(s) Sat, with starting times during 11:

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to NJ Transit Hamilton Rail Station (#4)									
Average Before (n=10)	146	40	106	23	29.6	1.3	463	32.6	2091.5
Std Dev Before (n=10)	*15*	*15*	*0*	*12*	*3.4*	*0.8*	*463*	*8.6*	*342.5*
Average After (n=12)	111	5	106	4	38.3	0.3	463	22.4	1528.9
Std Dev After (n=12)	*10*	*10*	*0*	*6*	*3.1*	*0.5*	*463*	*5.1*	*223.5*
Difference	-35	-35	0	-19	8.6	-1	463	-10.2	-562.6
Std Dev Difference	*18*	*18*	*0*	*14*	*4.6*	*1*	*463*	*10*	*408.9*
% Difference	-24%	-88%	0%	-84%	29.20%	-74.40%	463	-31.20%	-26.90%

Cumulative Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

10 Before-type runs, 10 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 1

11 After-type runs, 11 of unverifiable origin, collected Saturday 03/26/22 to Saturday 03/26/22, over day(s) Sat, with starting times during 11:

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to Whitehead Rd (CR 616) (#1)									
Average Before (n=10)	159	55	104	28	27.2	1.1	0	12.5	881.7
Std Dev Before (n=10)	*18*	*18*	*0*	*16*	*3.1*	*0.3*	*0*	*6*	*296.3*
Average After (n=11)	111	8	104	4	37.8	0.5	0	8.7	639.3
Std Dev After (n=11)	*7*	*7*	*0*	*5*	*2.3*	*0.5*	*0*	*0*	*24.8*
Difference	-47	-47	0	-25	10.6	-0.6	0	-3.8	-242.4
Std Dev Difference	*20*	*20*	*0*	*17*	*3.8*	*0.6*	*0*	*6*	*297.3*
% Difference	-30%	-86%	0%	-87%	39.00%	-58.70%	0	-30.30%	-27.50%

Cumulative Summary of all runs, either direction through artery

20 Before-type runs, 20 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 1

23 After-type runs, 23 of unverifiable origin, collected Saturday 03/26/22 to Saturday 03/26/22, over day(s) Sat, with starting times during 11:

	CTT	CPLSD	CPLRT	CStopD	CAS	CStops	TV	CPUFC	CUFCOE
to End of Artery									
Average Before (n=20)	152	47	105	26	28.4	1.2	463	22.6	1486.6
Std Dev Before (n=20)	*18*	*18*	*1*	*14*	*3.4*	*0.6*	*463*	*12.6*	*694.5*
Average After (n=23)	111	6	105	4	38.1	0.4	463	15.9	1103.4
Std Dev After (n=23)	*8*	*8*	*1*	*5*	*2.7*	*0.5*	*463*	*7.9*	*481.4*
Difference	-41	-41	0	-22	9.6	-0.8	463	-6.7	-383.2
Std Dev Difference	*19*	*20*	*2*	*15*	*4.3*	*0.8*	*463*	*14.8*	*845*
% Difference	-27%	-87%	0%	-85%	33.90%	-67.40%	463	-29.60%	-25.80%

Summary of runs Eastbound from Whitehead Rd (CR 616) (#1)

10 Before-type runs, 10 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 11:26:48 AM to 1:53:37 PM

12 After-type runs, 12 of unverifiable origin, collected Saturday 03/26/22 to Saturday 03/26/22, over day(s) Sat, with starting times during 11:05:54 AM to 1:52:44 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to Vetterlein Ave (#2)											
Average Before (n=10)	70	3471	11	59	4	34.5	40	0.3	473	13.9	953.1
Std Dev Before (n=10)	*7*	*0*	*7*	*0*	*6*	*3.2*	*0*	*0.5*	*473*	*5*	*212*
Average After (n=12)	58	3471	-1	59	0	41	40	0	473	10.7	769.1
Std Dev After (n=12)	*3*	*0*	*3*	*0*	*0*	*1.8*	*0*	*0*	*473*	*0*	*18.3*
Difference	-12	0	-12	0	-4	6.5	0	-0.3	473	-3.2	-184
Std Dev Difference	*8*	*0*	*8*	*0*	*6*	*3.7*	*0*	*0.5*	*473*	*5*	*212.8*
% Difference	-17%	0%	-113%	0%	-100%	18.80%	0%	-100.00%	473	-23.10%	-19.30%
to American Metro Blvd (#3)											
Average Before (n=10)	102	1507	17	85	7	33.7	40	0.7	478	22.7	1473.4
Std Dev Before (n=10)	*11*	*0*	*11*	*0*	*8*	*3.3*	*0*	*0.8*	*478*	*8.7*	*350.4*
Average After (n=12)	90	1507	5	85	4	38	40	0.3	478	18.7	1252.1
Std Dev After (n=12)	*9*	*0*	*9*	*0*	*6*	*3.8*	*0*	*0.5*	*478*	*5.1*	*218.5*
Difference	-13	0	-13	0	-3	4.3	0	-0.4	478	-4	-221.3
Std Dev Difference	*14*	*0*	*14*	*0*	*10*	*5*	*0*	*1*	*478*	*10.1*	*413*
% Difference	-12%	0%	-73%	0%	-46%	12.70%	0%	-52.40%	478	-17.70%	-15.00%
to NJ Transit Hamilton Rail Station (#4)											
Average Before (n=10)	146	1257	40	106	23	29.6	40	1.3	463	32.6	2091.5
Std Dev Before (n=10)	*15*	*0*	*15*	*0*	*12*	*3.4*	*0*	*0.8*	*463*	*8.6*	*342.5*
Average After (n=12)	111	1257	5	106	4	38.3	40	0.3	463	22.4	1528.9
Std Dev After (n=12)	*10*	*0*	*10*	*0*	*6*	*3.1*	*0*	*0.5*	*463*	*5.1*	*223.5*
Difference	-35	0	-35	0	-19	8.6	0	-1	463	-10.2	-562.6
Std Dev Difference	*18*	*0*	*18*	*0*	*14*	*4.6*	*0*	*1*	*463*	*10*	*408.9*
% Difference	-24%	0%	-88%	0%	-84%	29.20%	0%	-74.40%	463	-31.20%	-26.90%

Summary of runs Westbound from NJ Transit Hamilton Rail Station (#4)

10 Before-type runs, 10 of unverifiable origin, collected Saturday 10/02/21 to Saturday 10/02/21, over day(s) Sat, with starting times during 11:01:29 AM to 1:46:58 PM

11 After-type runs, 11 of unverifiable origin, collected Saturday 03/26/22 to Saturday 03/26/22, over day(s) Sat, with starting times during 11:02:19 AM to 1:47:56 PM

Node	CTT	DL	CPLSD	CPLRT	CStopD	CAS	PLS	CStops	TV	CPUFC	CUFCOE
to American Metro Blvd (#3)											
Average Before (n=10)	30	1257	11	19	3	30.4	45	0.2	501	6.9	460.3
Std Dev Before (n=10)	*8*	*0*	*8*	*0*	*6*	*6.1*	*0*	*0.4*	*501*	*5.5*	*240.6*
Average After (n=11)	22	1257	3	19	0	39.1	45	0	501	4.2	315
Std Dev After (n=11)	*2*	*0*	*2*	*0*	*0*	*3.2*	*0*	*0*	*501*	*0*	*13.7*
Difference	-8	0	-8	0	-3	8.8	0	-0.2	501	-2.7	-145.4
Std Dev Difference	*8*	*0*	*8*	*0*	*6*	*6.9*	*0*	*0.4*	*501*	*5.5*	*241*
% Difference	-26%	0%	-70%	0%	-100%	28.90%	0%	-100.00%	501	-38.90%	-31.60%
to Vetterlein Ave (#2)											
Average Before (n=10)	64	1507	19	45	5	30.5	40	0.3	479	12.5	881.7
Std Dev Before (n=10)	*15*	*0*	*15*	*0*	*9*	*6.3*	*0*	*0.5*	*479*	*6*	*296.3*
Average After (n=11)	47	1507	2	45	0	39.8	40	0	479	8.7	639.3
Std Dev After (n=11)	*4*	*0*	*4*	*0*	*0*	*2.9*	*0*	*0*	*479*	*0*	*24.8*
Difference	-17	0	-17	0	-5	9.2	0	-0.3	479	-3.8	-242.4
Std Dev Difference	*15*	*0*	*15*	*0*	*9*	*7*	*0*	*0.5*	*479*	*6*	*297.3*
% Difference	-27%	0%	-88%	0%	-100%	30.20%	0%	-100.00%	479	-30.30%	-27.50%
to Whitehead Rd (CR 616) (#1)											
Average Before (n=10)	159	3471	55	104	28	27.2	40	1.1	0	12.5	881.7
Std Dev Before (n=10)	*18*	*0*	*18*	*0*	*16*	*3.1*	*0*	*0.3*	*0*	*6*	*296.3*
Average After (n=11)	111	3471	8	104	4	37.8	40	0.5	0	8.7	639.3

Std Dev After (n=11)	*7*	*0*	*7*	*0*	*5*	*2.3*	*0*	*0.5*	*0*	*0*	*24.8*
Difference	-47	0	-47	0	-25	10.6	0	-0.6	0	-3.8	-242.4
Std Dev Difference	*20*	*0*	*20*	*0*	*17*	*3.8*	*0*	*0.6*	*0*	*6*	*297.3*
% Difference	-30%	0%	-86%	0%	-87%	39.00%	0%	-58.70%	0	-30.30%	-27.50%

Appendix B

Sloan Avenue (C.R.649) and Klockner Road
Hamilton Township, Mercer County, New Jersey
Equipment ID SG01350

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM		30		10		30		10
EXTENSION		2.0		2.0		2.0		2.0
MAX I		40		24		40		36
MAX II								
PED WALK		7				7		7
PED CLEAR		22				22		17
YELLOW		5.0		4.0		5.0		4.0
RED		2.0		2.0		2.0		2.0
MIN RECALL		ON		OFF		ON		OFF
PED RECAL		OFF		OFF		OFF		OFF
MAX RECALL		OFF		OFF		OFF		OFF
MEMORY		OFF		OFF		OFF		OFF
FLASH		**Y**		**R**		**Y**		**R**

Ø 2 Sloan Avenue EB

Ø 4 Klockner Road

Ø 6 Sloan Avenue WB

Ø 8 NJ Transit Complex Exit

CONTROLLER NOTES:

1) The manual control shall be disconnected.
2) Signal shall rest in phases 2 and 6 green.
3) Phase 4 and phase 8 are timed seperately and may be skipped in the absence of vehicular or pedestrian demand.

Sloan Avenue (C.R.649) and American Metro Boulevard
Hamilton Township, Mercer County, New Jersey
Equipment ID SG01340

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8	OVLP A	OVLP B	OVLP C
MINIMUM	7	21		7	7	21					
EXTENSION	2.0			2.0	2.0						
MAX I	10	21		20	10	21					
MAX II											
PED WALK		35		7		35					
PED CLEAR		19		13		8					
YELLOW	4.0	4.0		3.0	4.0	4.0					
RED		3.0		3.0		3.0					
MIN RECALL	OFF	OFF		OFF	OFF	OFF					
PED RECAL	OFF	OFF		OFF	OFF	OFF					
MAX RECALL	OFF	OFF		OFF	OFF	OFF					
MEMORY	OFF	OFF		OFF	OFF	OFF					
C.N.A.	OFF	ON		OFF	OFF	ON					
FLASH		**Y**		**R**					**Y**		

Ø 1 Sloan Avenue EB Lead Left
Ø 2 Sloan Avenue WB R.O.W.

Ø 4 American Metro Boulevard
Ø 5 Dummy Phase (Times with phase 1 to hold phase 6 pedestrian timer)
Ø 6 Dummy Phase (Start of pedestrian clearance activates Red Signal Ahead sign)
OVLP A Sloan Avenue EB R.O.W. (Parent Phases 1+2)
OVLP B American Metro Boulevard Right Turn (Parent Phases 1+4)
OVLP C Sloan Avenue WB Right Turn (Parent Phase 4)

CONTROLLER NOTES:

1) The signal shall rest in the Sloan Avenue R.O.W. walk.
2) Phase 1 shall only follow phase 4.
3) Sloan Avenue R.O.W. must follow phase 1.

Sweetbriar Road (C.R.649) and Vetterlein Avenue
Hamilton Township, Mercer County, New Jersey
Equipment ID SG01330

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM	6	60		6		60		
EXTENSION				2.0				
MAX I	6	60		20		60		
MAX II								
PED WALK								
PED CLEAR								
YELLOW	3.0	4.0		3.0		4.0		
RED		2.0		2.0		2.0		
MIN RECALL	ON	OFF		OFF		OFF		
PED RECAL	OFF	OFF		OFF		OFF		
MAX RECALL	OFF	ON		OFF		ON		
MEMORY	OFF	OFF		OFF		OFF		
FLASH		**Y**		**R**		**Y**		

Ø 1 Sweetbriar Road EB Lead Left
Ø 2 Sweetbriar Road WB R.O.W.

Ø 4 Vetterlein Avenue

Ø 6 Sweetbriar Road EB R.O.W.

CONTROOLER NOTES:

1) The manual control shall be disconnected.
2) Signal shall rest in phase 2 and 6 green.
3) Lead left phase 1 shall only follow phase 4.
4) Sweetbriar Road R.O.W. (2 and 6) must follow phase 1.

Whitehead Road (C.R.616) and Sweetbriar Avenue (C.R.649)
Hamilton Township, Mercer County, New Jersey
Equipment ID SG00950

CONTROLLER TIMING

PHASE	Ø 1	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 7	Ø 8
MINIMUM		15		6				6
EXTENSION		2.0		2.0				2.0
MAX I		31		20				20
MAX II								
PED WALK				5				7
PED CLEAR				18				13
YELLOW		5.0		4.0				4.0
RED		2.0		2.0				2.0
MIN RECALL		ON		OFF				OFF
PED RECAL		OFF		OFF				OFF
MAX RECALL		OFF		OFF				OFF
MEMORY		OFF		OFF				OFF
FLASH		**Y**		**R**				**R**

Ø 2 Whitehead Road SB

Ø 4 Whitehead Road NB

Ø 8 Sweetbriar Avenue

CONTROLLER NOTES:

1) The memory circuits shall be off.
2) Signal shall rest in phase 2 green.

Appendix C

Implemented Timings

New Jersey Traffic Signal Retiming Initiative

Sloan Ave & Sweet Briar Ave (CR 649)
Mercer County, New Jersey

Prepared for:
Delaware Valley Regional Planning Commission (DVRPC)

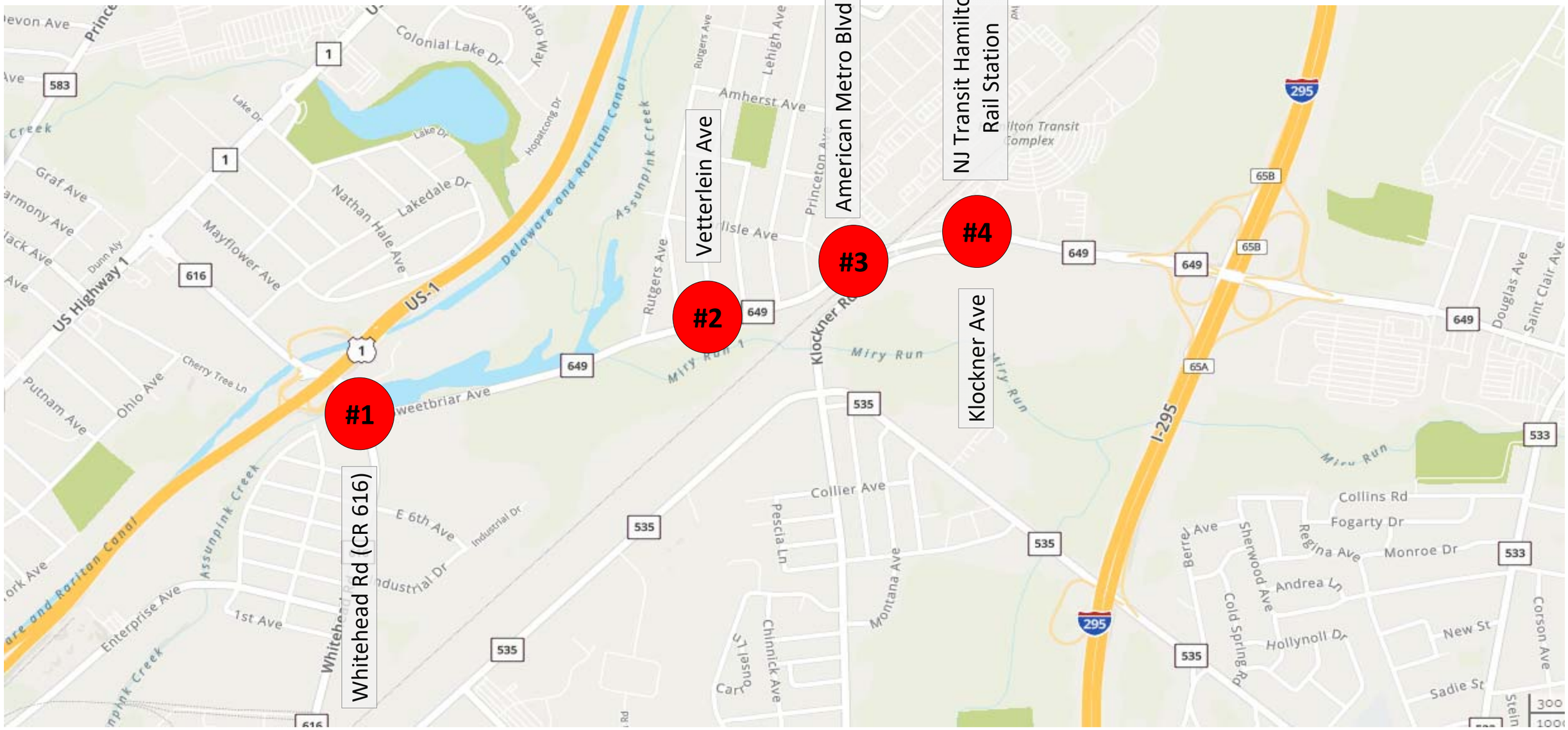
and

Mercer County, NJ

Prepared by:

Subcontracted with:

April 2022



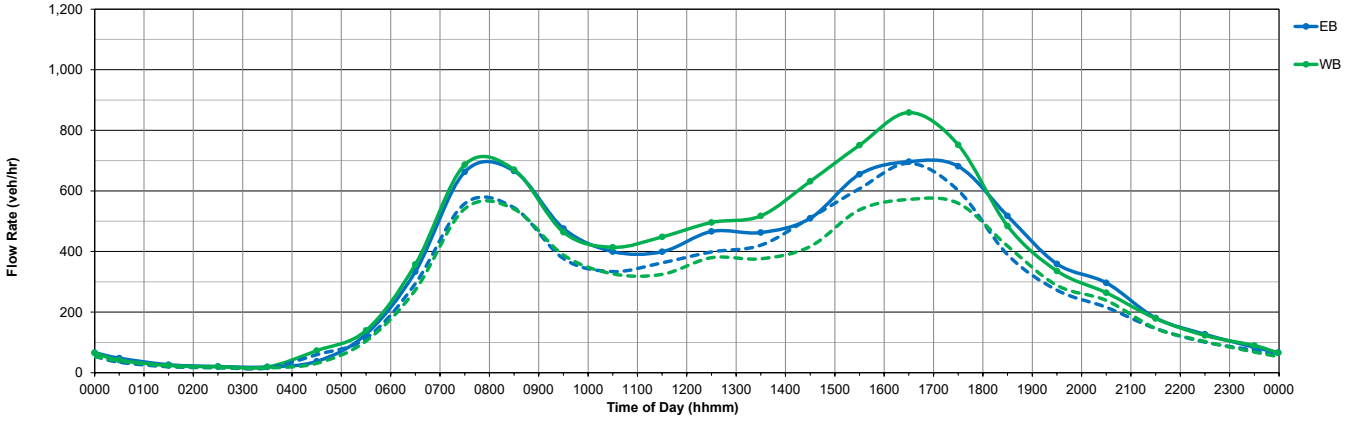
Project Intersection:

Figure 1
Traffic Signal Locations
Sloan Ave & Sweet Briar Ave (CR 649)

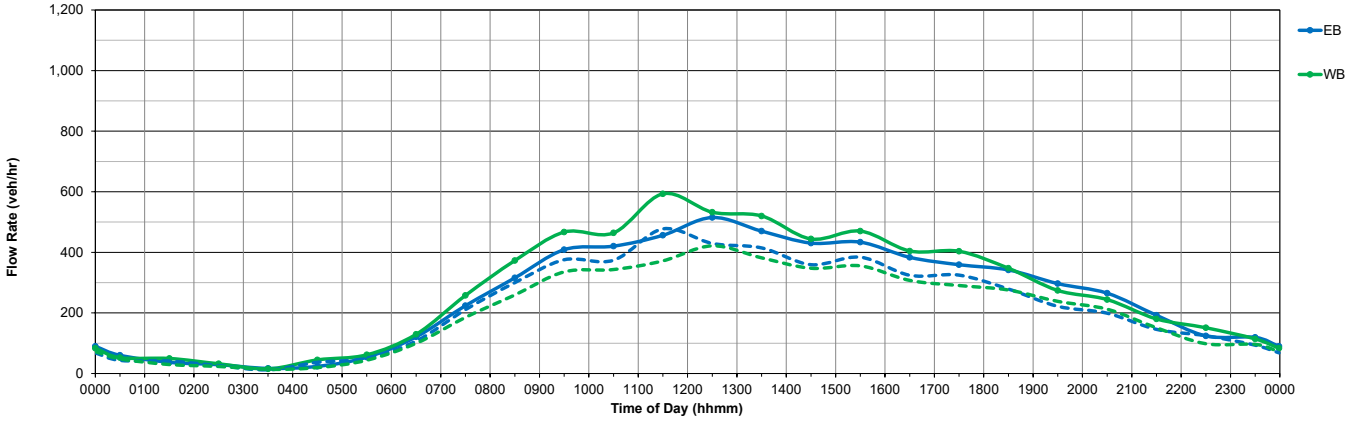
Hourly Volumes - Average for Three Count Locations on Sloan Ave/Sweet Briar Ave (CR 649)

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	39	35	52	33	49	38	51	49	49	50	60	52	62	50	48	41	61	51
0100	0200	20	16	27	23	29	25	37	24	19	30	37	50	45	45	27	24	41	48
0200	0300	17	20	16	18	21	20	27	19	22	23	29	32	24	30	21	20	27	31
0300	0400	22	17	18	19	15	19	23	24	17	15	17	15	12	22	19	19	14	19
0400	0500	34	66	36	77	39	73	40	80	39	69	24	45	16	27	38	73	20	36
0500	0600	128	137	127	136	143	158	113	125	125	141	54	62	27	50	127	139	40	56
0600	0700	333	337	337	371	351	369	345	381	302	330	121	130	48	62	334	357	84	96
0700	0800	671	652	679	710	650	688	694	701	621	681	224	258	83	128	663	687	154	193
0800	0900	640	685	685	657	717	731	668	651	618	627	316	373	153	196	666	670	235	285
0900	1000	480	448	480	473	466	453	489	472	466	473	409	467	215	285	476	464	312	376
1000	1100	409	387	409	408	403	431	404	448	374	397	420	464	313	314	400	414	367	389
1100	1200	372	429	386	414	411	472	403	424	423	503	456	593	350	346	399	448	403	470
1200	1300	505	462	444	497	444	466	445	504	493	550	515	533	377	453	466	496	446	493
1300	1400	442	487	458	487	436	532	468	530	510	552	470	520	353	413	463	518	412	466
1400	1500	489	574	491	652	491	609	527	645	549	677	431	444	380	347	510	632	405	396
1500	1600	687	730	602	730	679	707	668	753	637	835	434	470	375	350	655	751	404	410
1600	1700	687	855	668	887	723	881	740	880	667	791	384	404	332	351	697	859	358	378
1700	1800	668	736	689	784	713	787	691	777	646	677	359	404	358	326	682	752	358	365
1800	1900	475	458	495	450	534	494	559	497	524	523	342	347	336	292	518	485	339	320
1900	2000	357	306	346	301	346	330	374	356	372	388	297	274	291	261	359	336	294	268
2000	2100	270	235	302	257	290	286	324	267	299	274	265	244	205	176	297	264	235	210
2100	2200	146	177	146	145	203	185	190	187	219	200	192	180	115	135	181	179	154	158
2200	2300	102	105	114	103	137	113	127	127	155	166	124	151	92	87	127	123	108	119
2300	0000	68	68	82	73	77	94	83	83	110	130	119	114	52	68	84	90	86	91
Sub-total		8,061	8,422	8,091	8,705	8,370	8,961	8,493	9,006	8,257	9,103	6,099	6,628	4,613	4,811	8,255	8,840	5,356	5,719
Total		16,483		16,797		17,331		17,499		17,360		12,726		9,424		17,094		11,075	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

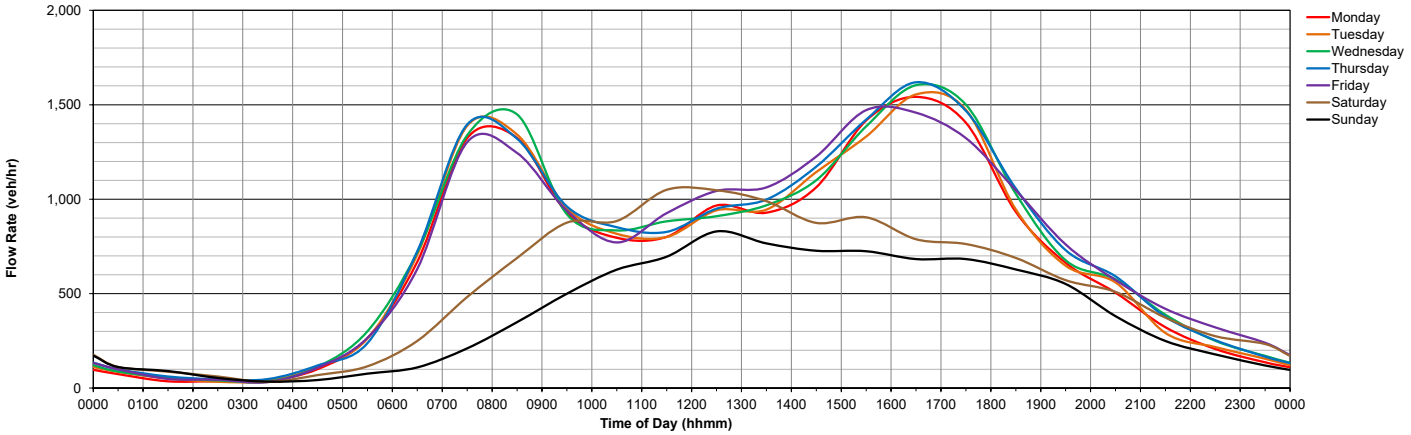
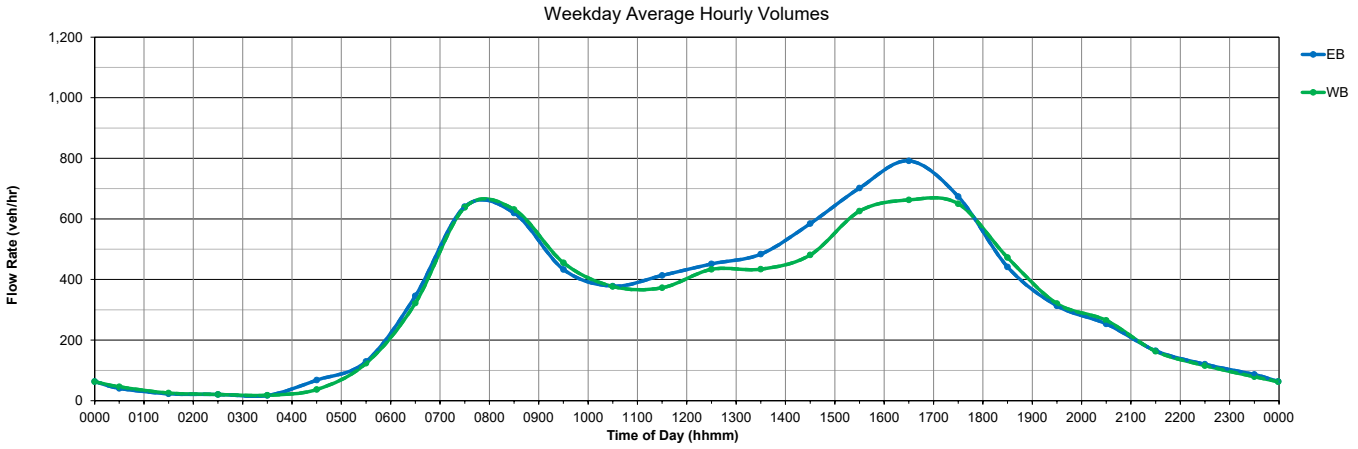
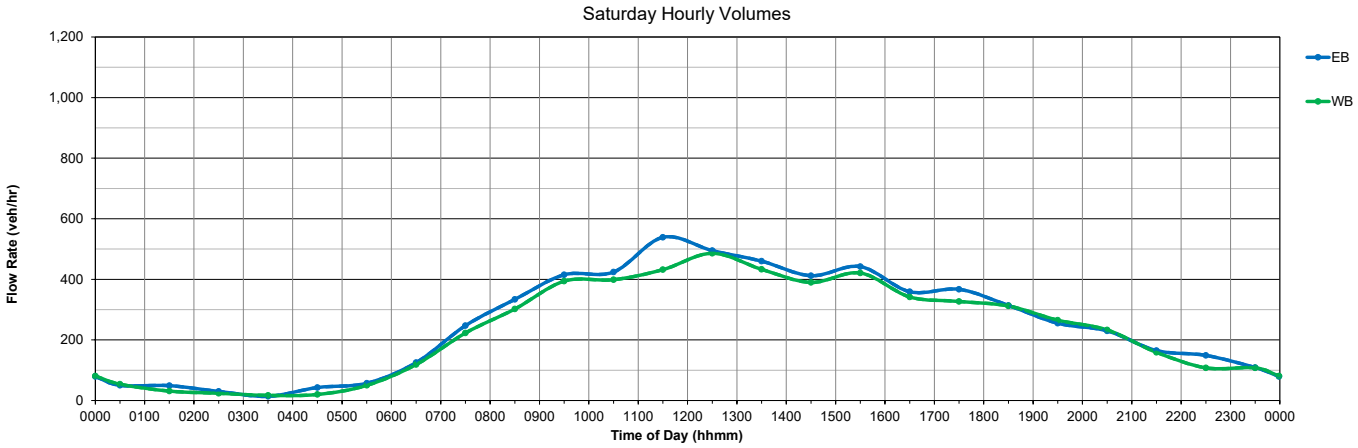


Figure 2
7-Day, 24-Hour Volumes
Average for Three Count Locations on Sloan Ave/Sweet Briar Ave (CR 649)

Hourly Volumes - Sweet Briar Ave (CR 649) West of Rutgers Ave

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	33	36	31	51	38	48	51	52	50	43	50	54	44	49	41	46	47	52
0100	0200	15	19	22	26	25	30	24	35	29	17	49	31	46	39	23	25	48	35
0200	0300	20	18	19	17	20	22	22	27	23	20	30	24	29	24	21	21	30	24
0300	0400	15	22	17	16	19	15	22	22	14	16	14	17	22	10	17	18	18	14
0400	0500	61	35	73	34	70	40	74	41	62	36	43	20	23	16	68	37	33	18
0500	0600	129	121	125	124	144	139	112	109	137	124	57	50	45	25	129	123	51	38
0600	0700	327	328	353	321	356	339	371	328	322	294	125	119	57	46	346	322	91	83
0700	0800	607	645	664	661	654	618	654	668	624	597	247	223	111	80	641	638	179	152
0800	0900	631	618	613	633	674	691	597	637	583	578	334	302	167	147	620	631	251	225
0900	1000	424	462	438	462	428	435	441	470	435	447	415	394	237	203	433	455	326	299
1000	1100	349	394	373	390	396	376	409	373	365	353	424	399	276	298	378	377	350	349
1100	1200	395	344	382	355	438	387	384	379	468	400	539	432	302	316	413	373	421	374
1200	1300	418	472	455	411	429	416	459	417	498	453	495	486	414	340	452	434	455	413
1300	1400	455	411	451	421	505	419	496	443	512	478	460	433	381	323	484	434	421	378
1400	1500	533	468	607	454	569	463	593	490	622	530	412	390	314	341	585	481	363	366
1500	1600	687	663	680	583	665	649	703	637	776	597	442	421	319	344	702	626	381	383
1600	1700	797	649	802	633	811	690	806	703	742	639	359	342	323	296	792	663	341	319
1700	1800	662	639	704	651	705	692	691	661	607	608	367	327	291	331	674	650	329	329
1800	1900	415	425	410	454	447	489	456	511	481	484	314	312	267	300	442	473	291	306
1900	2000	285	327	283	306	303	306	338	333	358	332	255	265	254	258	313	321	255	262
2000	2100	227	238	249	269	274	255	259	294	260	270	230	233	166	180	254	265	198	207
2100	2200	169	129	121	127	177	186	171	172	187	201	165	159	130	99	165	163	148	129
2200	2300	102	92	102	108	110	130	122	113	165	136	149	108	85	81	120	116	117	95
2300	0000	67	65	70	79	94	70	79	82	122	101	109	108	69	47	86	79	89	78
	Sub-total	7,823	7,620	8,044	7,586	8,351	7,905	8,334	7,997	8,442	7,754	6,084	5,649	4,372	4,193	8,199	7,772	5,228	4,921
	Total	15,443		15,630		16,256		16,331		16,196		11,733		8,565		15,971		10,149	





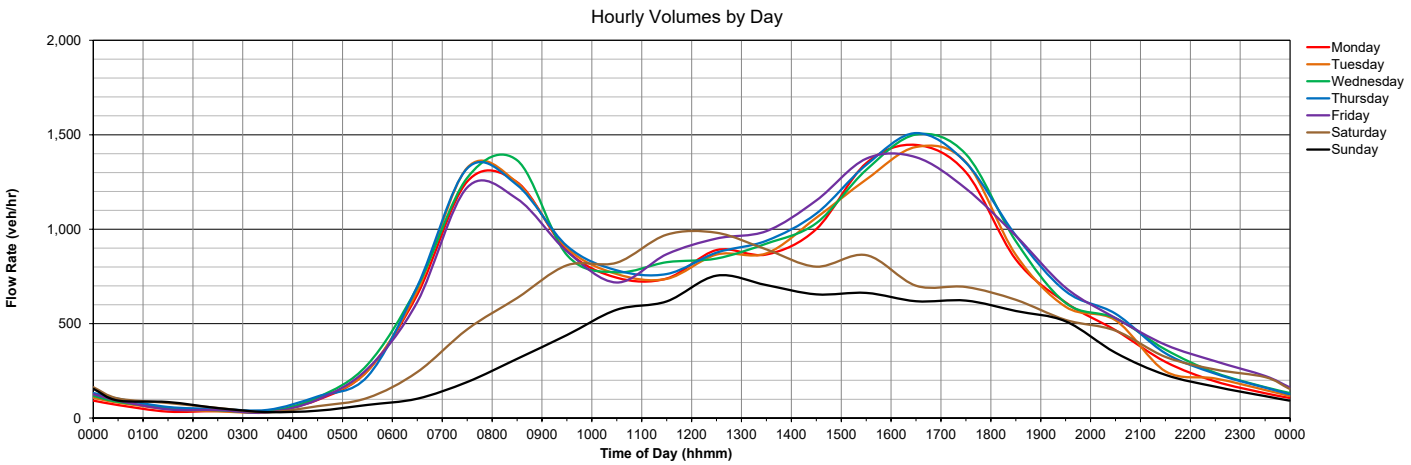
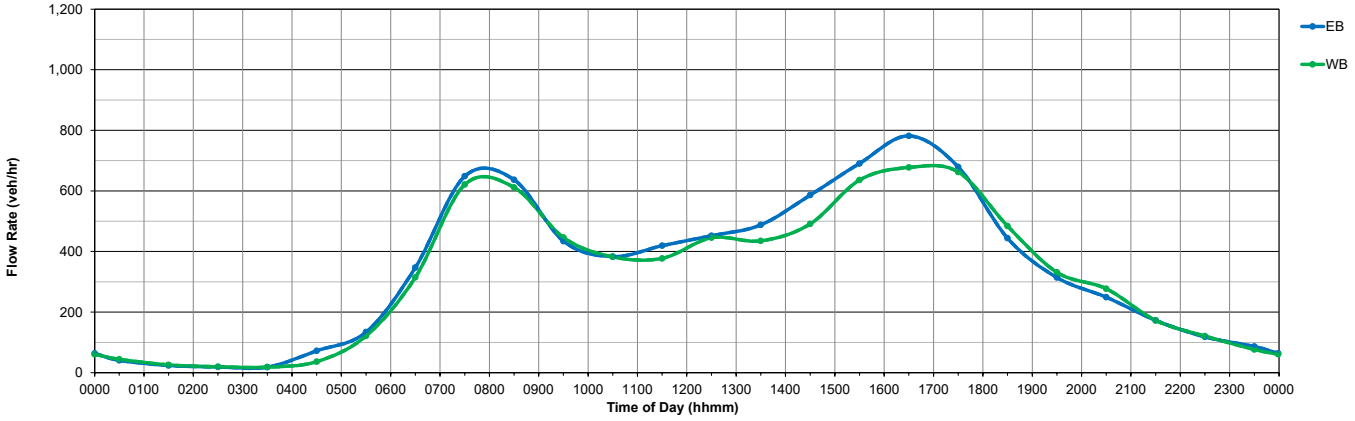


Figure 3
7-Day, 24-Hour Volumes
Sweet Briar Ave (CR 649) West of Rutgers Ave

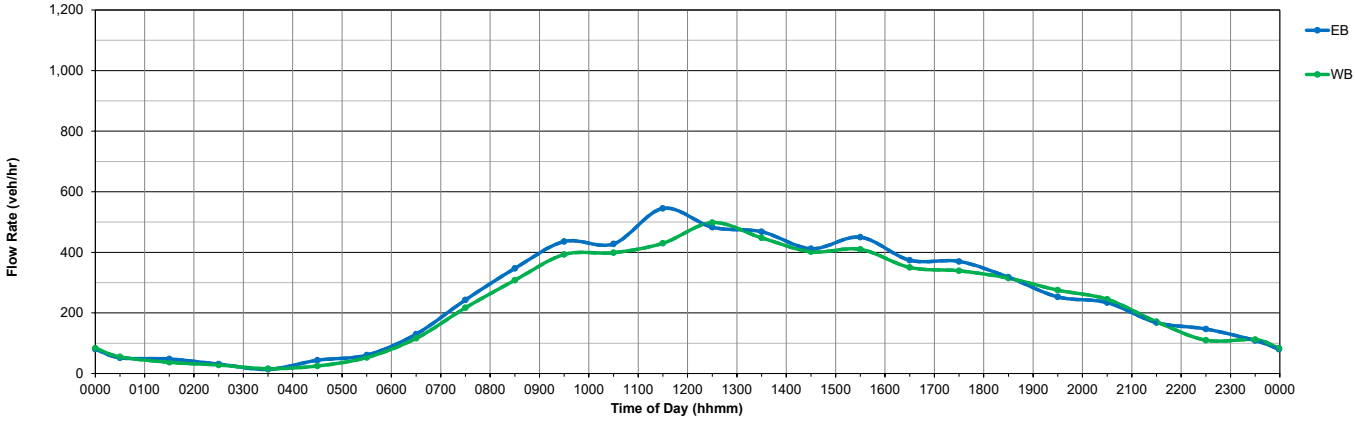
Hourly Volumes - Sweet Briar Ave (CR 649) West of Sandalwood Ave

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	36	37	33	51	38	48	48	44	49	43	52	55	43	55	41	45	48	55
0100	0200	15	20	24	27	26	28	24	36	29	19	48	37	43	42	24	26	46	40
0200	0300	19	17	17	16	19	21	18	25	22	20	31	28	30	20	19	20	31	24
0300	0400	15	21	18	17	19	15	24	22	16	17	14	16	22	11	18	18	18	14
0400	0500	68	33	78	36	73	38	77	39	66	37	44	25	29	16	72	37	37	21
0500	0600	135	122	127	124	151	135	120	105	139	121	61	53	47	26	134	121	54	40
0600	0700	329	312	360	318	356	334	368	325	323	285	130	116	59	42	347	315	95	79
0700	0800	608	629	662	625	654	603	665	657	653	591	243	217	116	81	648	621	180	149
0800	0900	647	584	620	617	699	660	617	621	601	576	347	308	173	143	637	612	260	226
0900	1000	418	448	446	443	426	434	439	465	441	441	436	393	253	206	434	446	345	300
1000	1100	353	398	381	393	401	383	414	379	368	359	428	399	290	301	383	382	359	350
1100	1200	395	342	382	357	443	387	399	393	478	408	545	430	314	333	419	377	430	382
1200	1300	417	483	454	421	423	420	464	435	503	469	483	498	422	360	452	446	453	429
1300	1400	460	418	450	428	508	413	499	439	522	477	468	448	383	315	488	435	426	382
1400	1500	530	467	606	471	556	477	608	512	632	528	412	402	310	358	586	491	361	380
1500	1600	673	664	666	591	643	654	702	653	769	617	450	410	327	355	691	636	389	383
1600	1700	780	669	788	636	813	714	801	721	727	648	374	350	327	309	782	678	351	330
1700	1800	662	647	709	669	703	697	696	666	626	634	370	339	303	337	679	663	337	338
1800	1900	417	436	414	459	455	499	453	526	481	501	318	315	269	307	444	484	294	311
1900	2000	289	332	281	318	308	314	333	342	360	351	253	275	251	267	314	331	252	271
2000	2100	227	254	247	292	268	264	250	300	255	276	234	245	166	186	249	277	200	216
2100	2200	167	134	152	160	175	191	178	178	192	200	168	171	128	107	173	173	148	139
2200	2300	102	98	100	109	109	132	122	124	158	142	147	110	82	85	118	121	115	98
2300	0000	68	65	70	75	92	69	82	74	122	100	109	112	67	50	87	77	88	81
Sub-total		7,830	7,630	8,085	7,653	8,358	7,930	8,401	8,081	8,532	7,860	6,165	5,752	4,454	4,312	8,241	7,831	5,310	5,032
Total		15,460		15,738		16,288		16,482		16,392		11,917		8,766		16,072		10,342	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

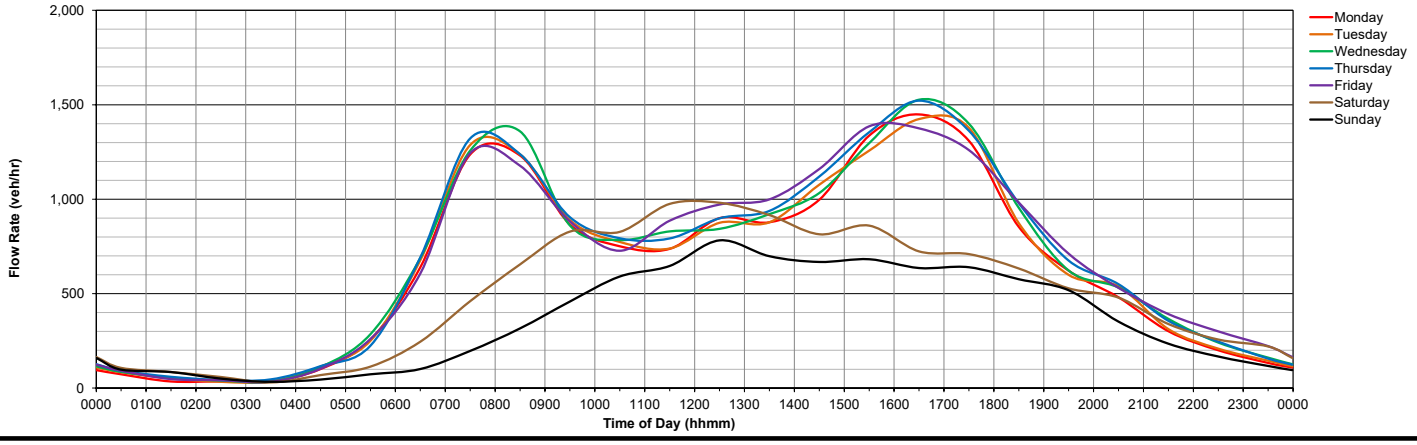
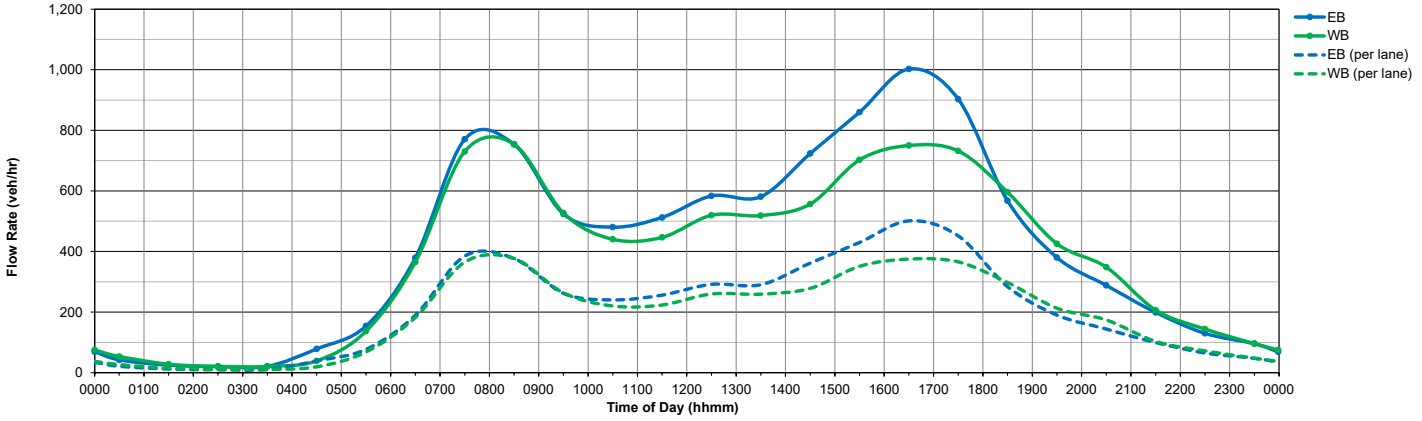


Figure 4
7-Day, 24-Hour Volumes
Sweet Briar Ave (CR 649) West of Sandalwood Ave

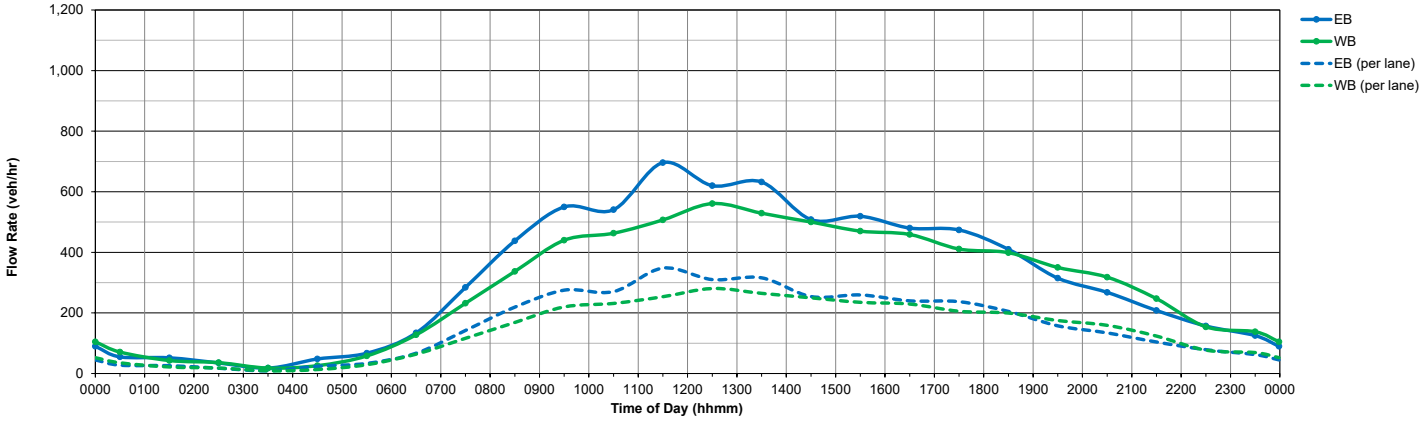
Hourly Volumes - Sloan Ave (CR 649) West of Klockner Ave

From	To	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	37	44	36	55	39	51	48	56	52	62	55	71	62	81	42	54	59	76
0100	0200	18	21	24	29	25	30	25	41	32	20	52	43	47	53	25	28	50	48
0200	0300	20	17	17	15	21	20	18	28	24	25	35	36	30	29	20	21	33	33
0300	0400	22	24	22	21	20	16	27	26	16	17	18	18	23	14	21	21	21	16
0400	0500	70	34	81	37	75	40	89	40	78	44	48	26	28	17	79	39	38	22
0500	0600	146	140	155	134	179	156	144	126	148	130	67	58	57	29	154	137	62	44
0600	0700	355	360	400	372	394	381	403	383	345	328	134	128	71	55	379	365	103	92
0700	0800	742	739	803	750	757	730	785	757	766	675	284	232	156	88	771	730	220	160
0800	0900	776	717	737	806	820	801	740	747	696	701	438	337	248	170	754	754	343	254
0900	1000	503	530	534	535	505	529	535	532	543	509	550	440	364	237	524	527	457	339
1000	1100	458	436	470	444	497	451	520	461	457	411	541	463	377	339	480	441	459	401
1100	1200	497	429	478	447	535	460	489	438	564	461	696	507	422	401	513	447	559	454
1200	1300	551	560	582	500	545	497	590	484	650	558	620	561	522	431	584	520	571	496
1300	1400	545	496	559	525	583	476	596	522	623	575	632	529	474	422	581	519	553	476
1400	1500	659	532	744	549	703	534	735	580	778	589	508	500	418	441	724	557	463	471
1500	1600	829	735	843	633	812	734	855	714	960	697	519	470	404	425	860	703	462	448
1600	1700	987	743	1,072	734	1,018	765	1,032	795	904	713	480	459	402	392	1,003	750	441	426
1700	1800	885	719	939	747	952	751	943	746	798	696	474	411	383	405	903	732	429	408
1800	1900	543	563	526	573	581	614	583	641	607	588	410	399	340	401	568	596	375	400
1900	2000	343	413	340	415	378	419	396	447	445	434	315	350	277	347	380	426	296	349
2000	2100	251	318	276	345	316	350	293	379	306	350	268	318	195	250	288	348	232	284
2100	2200	194	174	163	151	204	231	213	220	222	257	208	247	146	138	199	207	177	193
2200	2300	111	116	106	126	121	148	137	144	176	187	157	154	93	109	130	144	125	132
2300	0000	70	74	80	92	95	91	88	94	145	130	125	138	67	60	96	96	96	99
Sub-total		9,612	8,934	9,987	9,035	10,175	9,275	10,284	9,401	10,335	9,157	7,634	6,895	5,606	5,334	10,079	9,160	6,620	6,115
Total		18,546		19,022		19,450		19,685		19,492		14,529		10,940		19,239		12,735	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

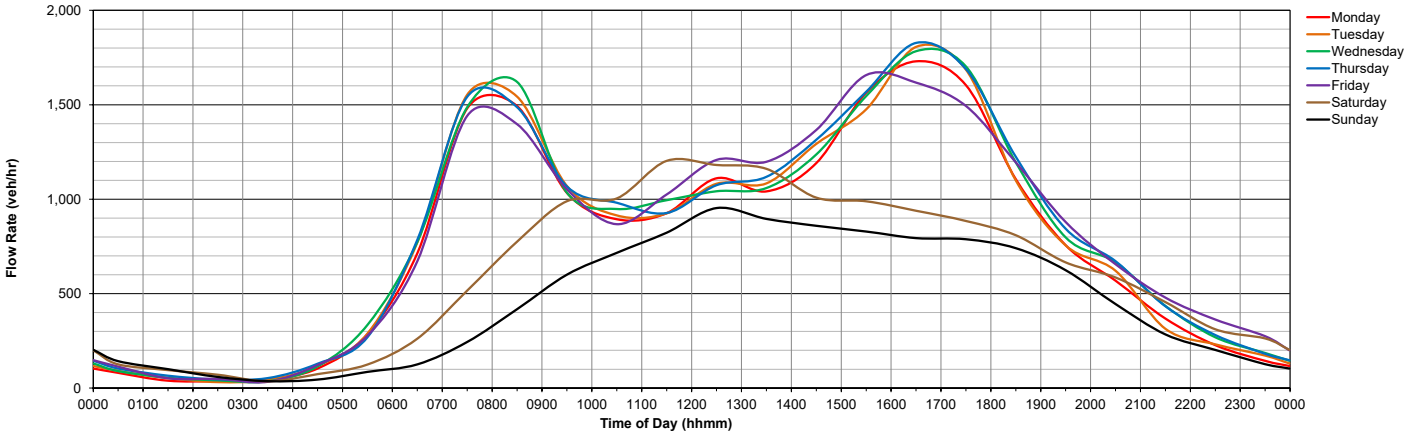
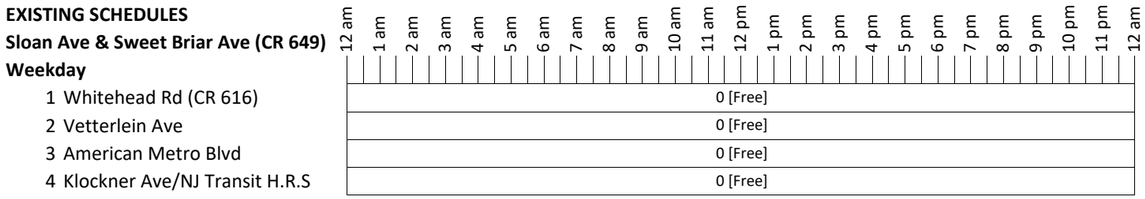
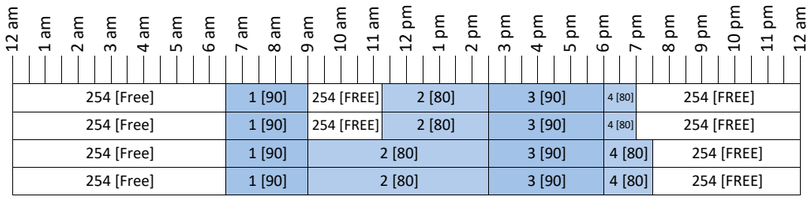


Figure 5
7-Day, 24-Hour Volumes
Sloan Ave (CR 649) West of Klockner Ave

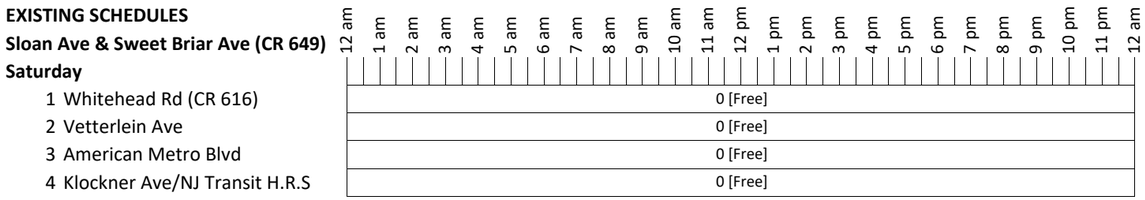
EXISTING SCHEDULES
Sloan Ave & Sweet Briar Ave (CR 649)
Weekday



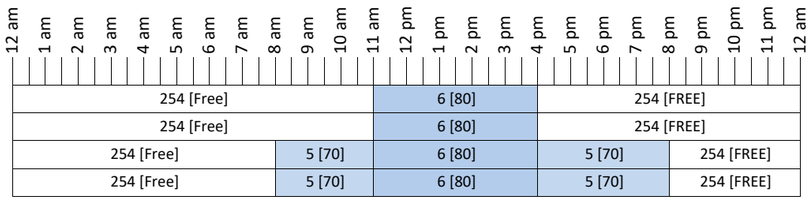
IMPLEMENTED SCHEDULES
Sloan Ave & Sweet Briar Ave (CR 649)
Weekday



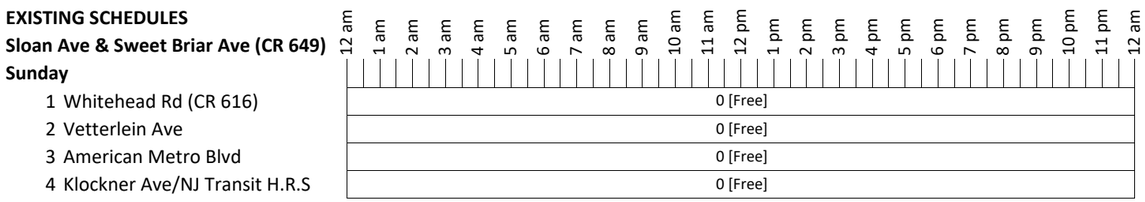
EXISTING SCHEDULES
Sloan Ave & Sweet Briar Ave (CR 649)
Saturday



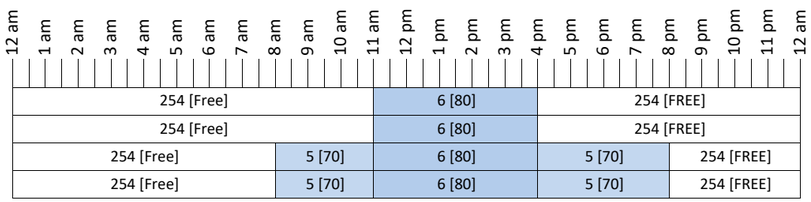
IMPLEMENTED SCHEDULES
Sloan Ave & Sweet Briar Ave (CR 649)
Saturday



EXISTING SCHEDULES
Sloan Ave & Sweet Briar Ave (CR 649)
Sunday

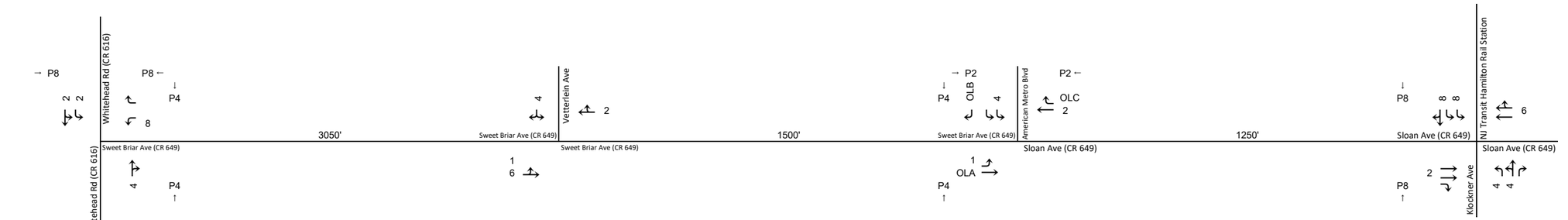


IMPLEMENTED SCHEDULES
Sloan Ave & Sweet Briar Ave (CR 649)
Sunday



LEGEND
A white box indicates FREE operation, a shaded box indicates coordinated operation.
The first number specifies the pattern, the second number [in brackets] is the cycle length (s).
Darker shades represent a longer cycle length.

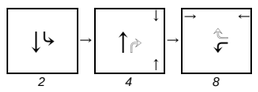
Figure 6
Day Plan Schedules
Sloan Ave & Sweet Briar Ave (CR 649)



Sequences — Signal ID: 1

Per	AM	MD	PM	PO	WA	WM
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1

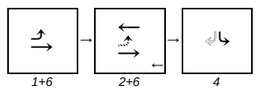
SEQUENCE 1



Sequences — Signal ID: 2

Per	AM	MD	PM	PO	WA	WM
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1

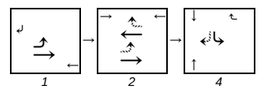
SEQUENCE 1



Sequences — Signal ID: 3

Per	AM	MD	PM	PO	WA	WM
Ex	1	1	1	1	1	1
Imp	1	1	1	1	1	1

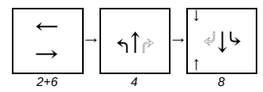
SEQUENCE 1



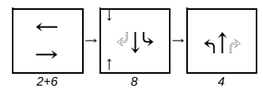
Sequences — Signal ID: 4

Per	AM	MD	PM	PO	WA	WM
Ex	1	1	1	1	1	1
Imp	2	2	2	2	2	2

SEQUENCE 1



SEQUENCE 2



Phase Diagrams

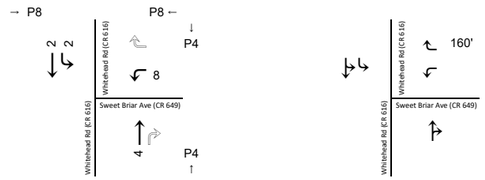
- Permissive Movement
- Protected + Permissive Movement
- Protected-Only Movement

NTS

Figure 7

Phase Sequence Diagrams

Sloan Ave & Sweet Briar Ave (CR 649)



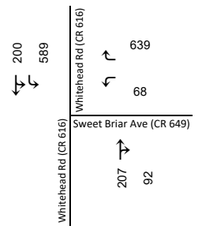
Phasing Diagram

Intersection Geometry

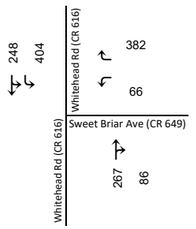
NTS

Hourly Volumes

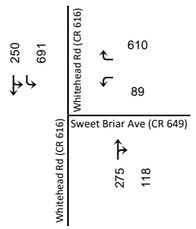
AM Peak



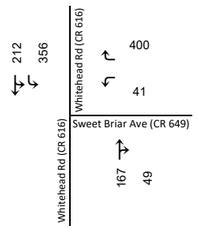
MD Peak



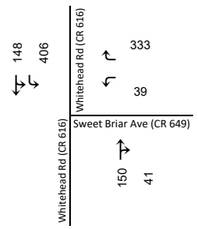
PM Peak



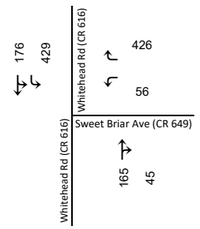
PM Off-peak



Weekend AM Peak

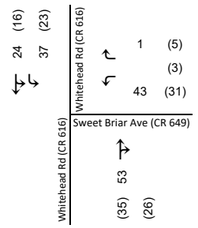


Weekend MD Peak



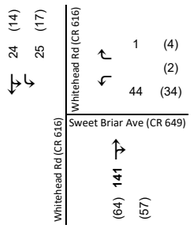
Existing Operations

AM Peak



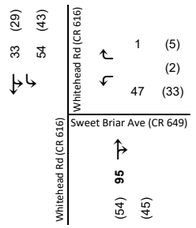
Summary	
Timing Pattern	Free
Actuated Cycle	75.8
Max v/C	0.89
Syn Delay	25 C
Sim Delay	(18)
ICU	59% B

MD Peak



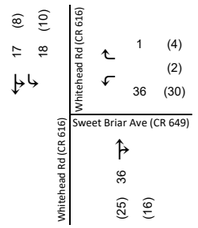
Summary	
Timing Pattern	Free
Actuated Cycle	77.2
Max v/C	1.20
Syn Delay	52 D
Sim Delay	(25)
ICU	58% B

PM Peak



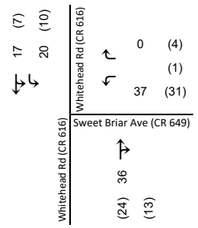
Summary	
Timing Pattern	Free
Actuated Cycle	81.6
Max v/C	1.07
Syn Delay	40 D
Sim Delay	(31)
ICU	69% C

PM Off-peak



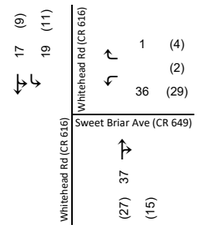
Summary	
Timing Pattern	Free
Actuated Cycle	67.1
Max v/C	0.74
Syn Delay	16 B
Sim Delay	(11)
ICU	48% A

Weekend AM Peak



Summary	
Timing Pattern	Free
Actuated Cycle	68.4
Max v/C	0.70
Syn Delay	17 B
Sim Delay	(10)
ICU	46% A

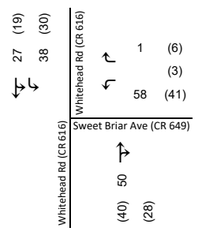
Weekend MD Peak



Summary	
Timing Pattern	Free
Actuated Cycle	68.5
Max v/C	0.72
Syn Delay	16 B
Sim Delay	(11)
ICU	49% A

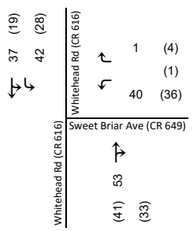
Proposed Operations

AM Peak



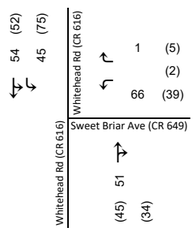
Summary	
Timing Pattern	1
Actuated Cycle	90
Max v/C	0.87
Syn Delay	26 C
Sim Delay	(22)
ICU	60% B

MD Peak



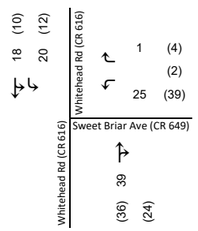
Summary	
Timing Pattern	2
Actuated Cycle	80
Max v/C	0.94
Syn Delay	34 C
Sim Delay	(23)
ICU	59% B

PM Peak



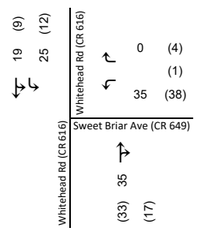
Summary	
Timing Pattern	3
Actuated Cycle	90
Max v/C	0.93
Syn Delay	35 C
Sim Delay	(43)
ICU	70% C

PM Off-peak



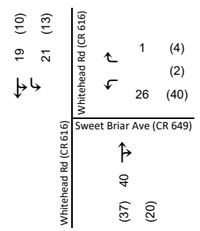
Summary	
Timing Pattern	4
Actuated Cycle	80
Max v/C	0.77
Syn Delay	17 B
Sim Delay	(14)
ICU	49% A

Weekend AM Peak



Summary	
Timing Pattern	5
Actuated Cycle	70
Max v/C	0.70
Syn Delay	19 B
Sim Delay	(13)
ICU	47% A

Weekend MD Peak



Summary	
Timing Pattern	6
Actuated Cycle	80
Max v/C	0.73
Syn Delay	17 B
Sim Delay	(14)
ICU	50% A

Operations with Improvements

No operational improvements recommended at this time.

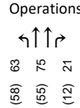
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

stop bar geometry

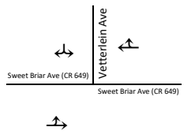
turning movement volume

Figure 8

Traffic Operations Analysis

Sweet Briar Ave (CR 649) & Whitehead Rd (CR 616)

Phasing Diagram



Intersection Geometry

Hourly Volumes

AM Peak

MD Peak

PM Peak

PM Off-peak

Weekend AM Peak

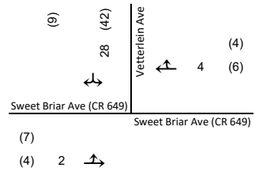
Weekend MD Peak

Existing Operations

AM Peak

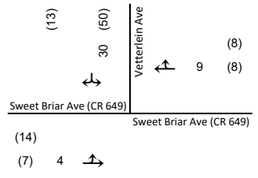
Summary	
Timing Pattern	Free
Actuated Cycle	85
Max v/C	0.62
Syn Delay	9 A
Sim Delay	(8)
ICU	57% B

MD Peak



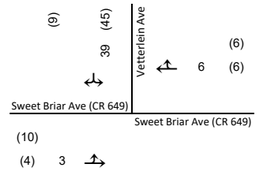
Summary	
Timing Pattern	Free
Actuated Cycle	77.3
Max v/C	0.42
Syn Delay	3 A
Sim Delay	(5)
ICU	45% A

PM Peak



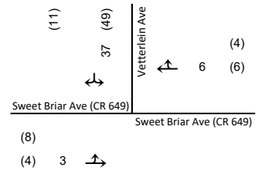
Summary	
Timing Pattern	Free
Actuated Cycle	79.8
Max v/C	0.64
Syn Delay	7 A
Sim Delay	(8)
ICU	65% C

PM Off-peak



Summary	
Timing Pattern	Free
Actuated Cycle	82.2
Max v/C	0.42
Syn Delay	6 A
Sim Delay	(6)
ICU	39% A

Weekend AM Peak



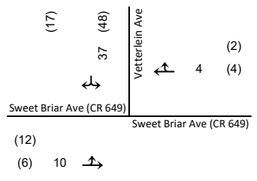
Summary	
Timing Pattern	Free
Actuated Cycle	82.4
Max v/C	0.36
Syn Delay	6 A
Sim Delay	(6)
ICU	49% A

Weekend MD Peak

Summary	
Timing Pattern	Free
Actuated Cycle	82.1
Max v/C	0.44
Syn Delay	6 A
Sim Delay	(6)
ICU	52% A

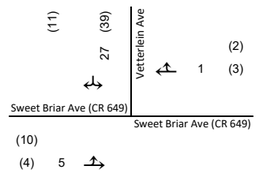
Proposed Operations

AM Peak



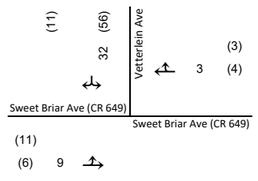
Summary	
Timing Pattern	1
Actuated Cycle	90
Max v/C	0.62
Syn Delay	8 A
Sim Delay	(6)
ICU	58% B

MD Peak



Summary	
Timing Pattern	2
Actuated Cycle	80
Max v/C	0.42
Syn Delay	3 A
Sim Delay	(4)
ICU	46% A

PM Peak

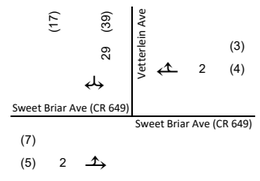


Summary	
Timing Pattern	3
Actuated Cycle	90
Max v/C	0.63
Syn Delay	7 A
Sim Delay	(5)
ICU	66% C

PM Off-peak

Summary	
Timing Pattern	4
Actuated Cycle	80
Max v/C	0.44
Syn Delay	4 A
Sim Delay	(4)
ICU	40% A

Weekend AM Peak



Summary	
Timing Pattern	5
Actuated Cycle	70
Max v/C	0.40
Syn Delay	3 A
Sim Delay	(5)
ICU	50% A

Weekend MD Peak

Summary	
Timing Pattern	6
Actuated Cycle	80
Max v/C	0.46
Syn Delay	4 A
Sim Delay	(5)
ICU	53% A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

63 75 21
(58) (55) (12)

stop bar geometry
Synchro delay (sec / veh)
SimTraffic delay (sec / veh)

Hourly Volume Diagrams

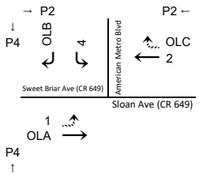
224 937 118

stop bar geometry
turning movement volume

Figure 9

Traffic Operations Analysis

Sweet Briar Ave (CR 649) & Vetterlein Ave



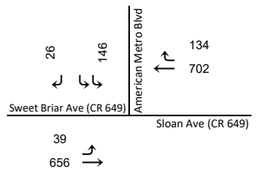
Phasing Diagram

Intersection Geometry

NTS

AM Peak

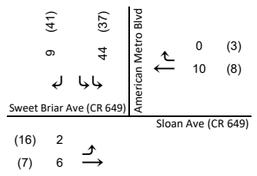
Hourly Volumes



Existing Operations

Summary	
Timing Pattern	Free
Actuated Cycle	84.1
Max v/C	0.69
Syn Delay	14 B
Sim Delay	(13)
ICU	56% B

Proposed Operations

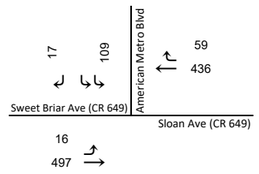


Summary	
Timing Pattern	1
Actuated Cycle	90
Max v/C	0.67
Syn Delay	11 B
Sim Delay	(10)
ICU	56% B

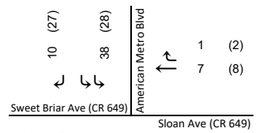
Operations with Improvements

MD Peak

Hourly Volumes

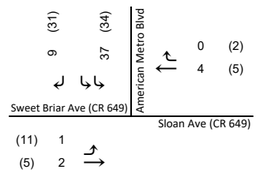


Existing Operations



Summary	
Timing Pattern	Free
Actuated Cycle	80.2
Max v/C	0.46
Syn Delay	9 A
Sim Delay	(9)
ICU	42% A

Proposed Operations



Summary	
Timing Pattern	2
Actuated Cycle	80
Max v/C	0.48
Syn Delay	6 A
Sim Delay	(8)
ICU	42% A

Operations with Improvements

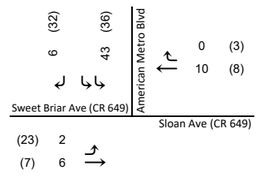
PM Peak

Hourly Volumes

Existing Operations

Summary	
Timing Pattern	Free
Actuated Cycle	84
Max v/C	0.67
Syn Delay	16 B
Sim Delay	(15)
ICU	59% B

Proposed Operations



Summary	
Timing Pattern	3
Actuated Cycle	90
Max v/C	0.67
Syn Delay	13 B
Sim Delay	(12)
ICU	59% B

Operations with Improvements

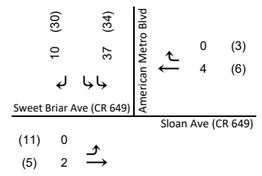
PM Off-peak

Hourly Volumes

Existing Operations

Summary	
Timing Pattern	Free
Actuated Cycle	77.4
Max v/C	0.40
Syn Delay	7 A
Sim Delay	(9)
ICU	43% A

Proposed Operations



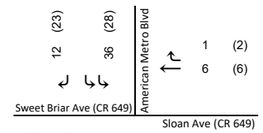
Summary	
Timing Pattern	4
Actuated Cycle	80
Max v/C	0.39
Syn Delay	6 A
Sim Delay	(8)
ICU	43% A

Operations with Improvements

Weekend AM Peak

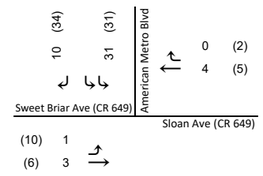
Hourly Volumes

Existing Operations



Summary	
Timing Pattern	Free
Actuated Cycle	77.6
Max v/C	0.38
Syn Delay	8 A
Sim Delay	(8)
ICU	40% A

Proposed Operations

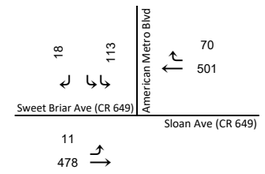


Summary	
Timing Pattern	5
Actuated Cycle	70
Max v/C	0.35
Syn Delay	6 A
Sim Delay	(8)
ICU	40% A

Operations with Improvements

Weekend MD Peak

Hourly Volumes



Existing Operations

Summary	
Timing Pattern	Free
Actuated Cycle	79.9
Max v/C	0.40
Syn Delay	9 A
Sim Delay	(9)
ICU	44% A

Proposed Operations

Summary	
Timing Pattern	6
Actuated Cycle	80
Max v/C	0.43
Syn Delay	7 A
Sim Delay	(8)
ICU	44% A

Operations with Improvements

No operational improvements recommended at this time.

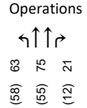
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

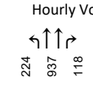


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



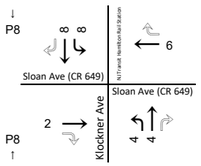
stop bar geometry

turning movement volume

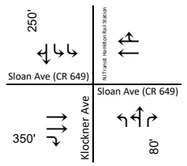
Figure 10

Traffic Operations Analysis

Sloan Ave (CR 649) & American Metro Blvd



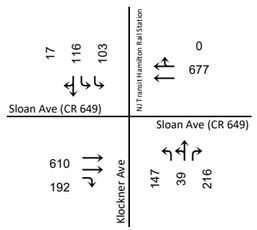
Phasing Diagram



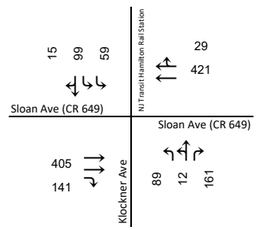
Intersection Geometry

Hourly Volumes

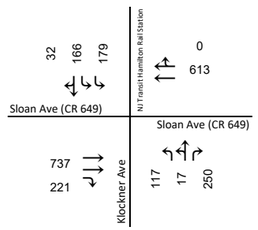
AM Peak



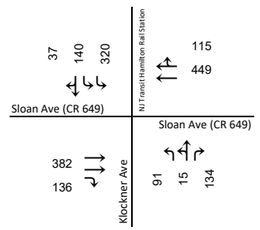
MD Peak



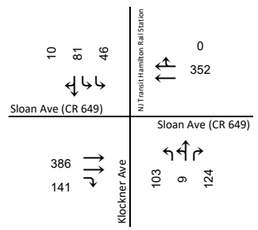
PM Peak



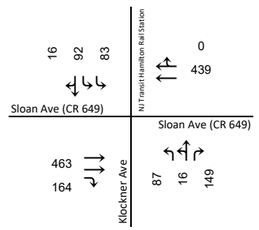
PM Off-peak



Weekend AM Peak

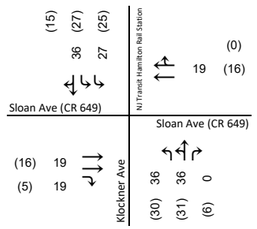


Weekend MD Peak



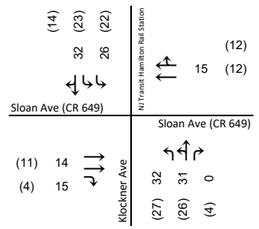
Existing Operations

AM Peak



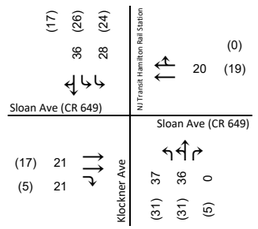
Summary	
Timing Pattern	Free
Actuated Cycle	73.2
Max v/C	0.60
Syn Delay	20 C
Sim Delay	(16)
ICU	58% B

MD Peak



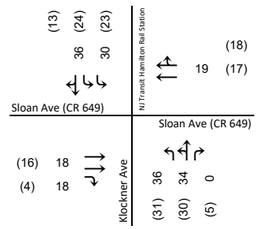
Summary	
Timing Pattern	Free
Actuated Cycle	67.4
Max v/C	0.50
Syn Delay	16 B
Sim Delay	(12)
ICU	45% A

PM Peak



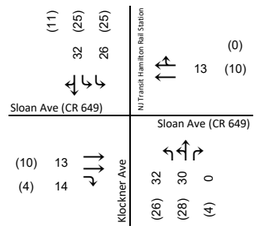
Summary	
Timing Pattern	Free
Actuated Cycle	74.5
Max v/C	0.70
Syn Delay	22 C
Sim Delay	(17)
ICU	60% B

PM Off-peak



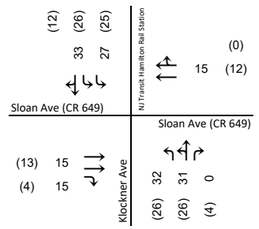
Summary	
Timing Pattern	Free
Actuated Cycle	72.8
Max v/C	0.69
Syn Delay	22 C
Sim Delay	(17)
ICU	59% B

Weekend AM Peak



Summary	
Timing Pattern	Free
Actuated Cycle	67
Max v/C	0.46
Syn Delay	16 B
Sim Delay	(12)
ICU	46% A

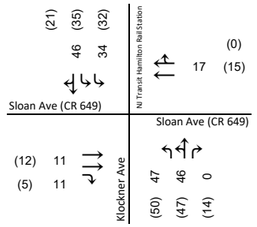
Weekend MD Peak



Summary	
Timing Pattern	Free
Actuated Cycle	68.1
Max v/C	0.56
Syn Delay	17 B
Sim Delay	(13)
ICU	45% A

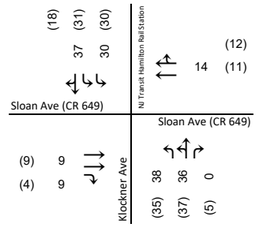
Proposed Operations

AM Peak



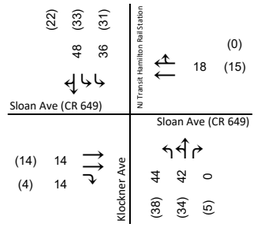
Summary	
Timing Pattern	1
Actuated Cycle	90
Max v/C	0.66
Syn Delay	18 B
Sim Delay	(18)
ICU	52% A

MD Peak



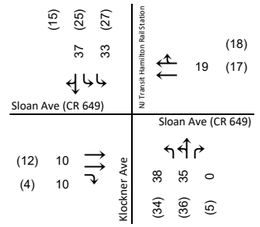
Summary	
Timing Pattern	2
Actuated Cycle	80
Max v/C	0.56
Syn Delay	15 B
Sim Delay	(13)
ICU	34% A

PM Peak



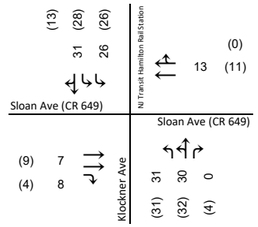
Summary	
Timing Pattern	3
Actuated Cycle	90
Max v/C	0.79
Syn Delay	22 C
Sim Delay	(17)
ICU	57% B

PM Off-peak



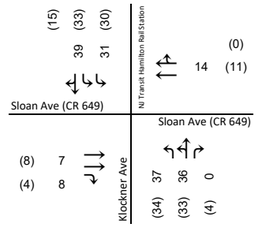
Summary	
Timing Pattern	4
Actuated Cycle	80
Max v/C	0.71
Syn Delay	20 B
Sim Delay	(18)
ICU	51% A

Weekend AM Peak



Summary	
Timing Pattern	5
Actuated Cycle	70
Max v/C	0.48
Syn Delay	13 B
Sim Delay	(12)
ICU	33% A

Weekend MD Peak



Summary	
Timing Pattern	6
Actuated Cycle	80
Max v/C	0.62
Syn Delay	15 B
Sim Delay	(13)
ICU	34% A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

stop bar geometry

turning movement volume

Figure 11

Traffic Operations Analysis

Sloan Ave (CR 649) & NJ Transit Hamilton Rail Station/Klockner Ave

AM Peak	Existing	Implemented	Difference
Total Delay (hr)	35	32	-8.6%
Total Stops	3,982	3,627	-8.9%
Total Travel Time (hr)	96	94	-2.1%
Fuel Consumed (gal)	152	146	-3.9%
MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	30	22	-26.7%
Total Stops	2,404	2,069	-13.9%
Total Travel Time (hr)	73	65	-11.0%
Fuel Consumed (gal)	106	97	-8.5%
PM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	50	44	-12.0%
Total Stops	4,475	4,134	-7.6%
Total Travel Time (hr)	117	110	-6.0%
Fuel Consumed (gal)	173	165	-4.6%
PM Off-peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	21	19	-9.5%
Total Stops	2,565	2,278	-11.2%
Total Travel Time (hr)	63	61	-3.2%
Fuel Consumed (gal)	98	94	-4.1%
Weekend AM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	14	13	-7.1%
Total Stops	1,974	1,691	-14.3%
Total Travel Time (hr)	51	49	-3.9%
Fuel Consumed (gal)	81	77	-4.9%
Weekend MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	18	16	-11.1%
Total Stops	2,381	2,053	-13.8%
Total Travel Time (hr)	61	59	-3.3%
Fuel Consumed (gal)	97	93	-4.1%

Figure 12

Synchro Network Measure of Effectiveness

Sloan Ave & Sweet Briar Ave (CR 649)

Synchro Intersection Delay Summary:

Number of intersections where:	AM	MD	PM	PO	WA	WM
delay decreased	3	3	4	3	3	3
delay increased ≤ 5 sec/veh	1	1	0	1	1	1
delay increased > 5 sec/veh	0	0	0	0	0	0

Intersection Delay and LOS Summary

Int. ID	Side Street	AM				MD				PM				PO				WA				WM			
		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS		Delay (hr)		Int. LOS	
		Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp	Ex	Imp
1	Whitehead Rd (CR 616)	25	26	C	C	52	34	D	C	40	35	D	C	16	17	B	B	17	19	B	B	16	17	B	B
2	Vetterlein Ave	9	8	A	A	3	3	A	A	7	7	A	A	6	4	A	A	6	3	A	A	6	4	A	A
3	American Metro Blvd	14	11	B	B	9	6	A	A	16	13	B	B	7	6	A	A	8	6	A	A	9	7	A	A
4	Klockner Ave/NJ Transit Hamilton Rail Station	20	18	C	B	16	15	B	B	22	22	C	C	22	20	C	B	16	13	B	B	17	15	B	B

Figure 13

Synchro Intersection Measure of Effectiveness

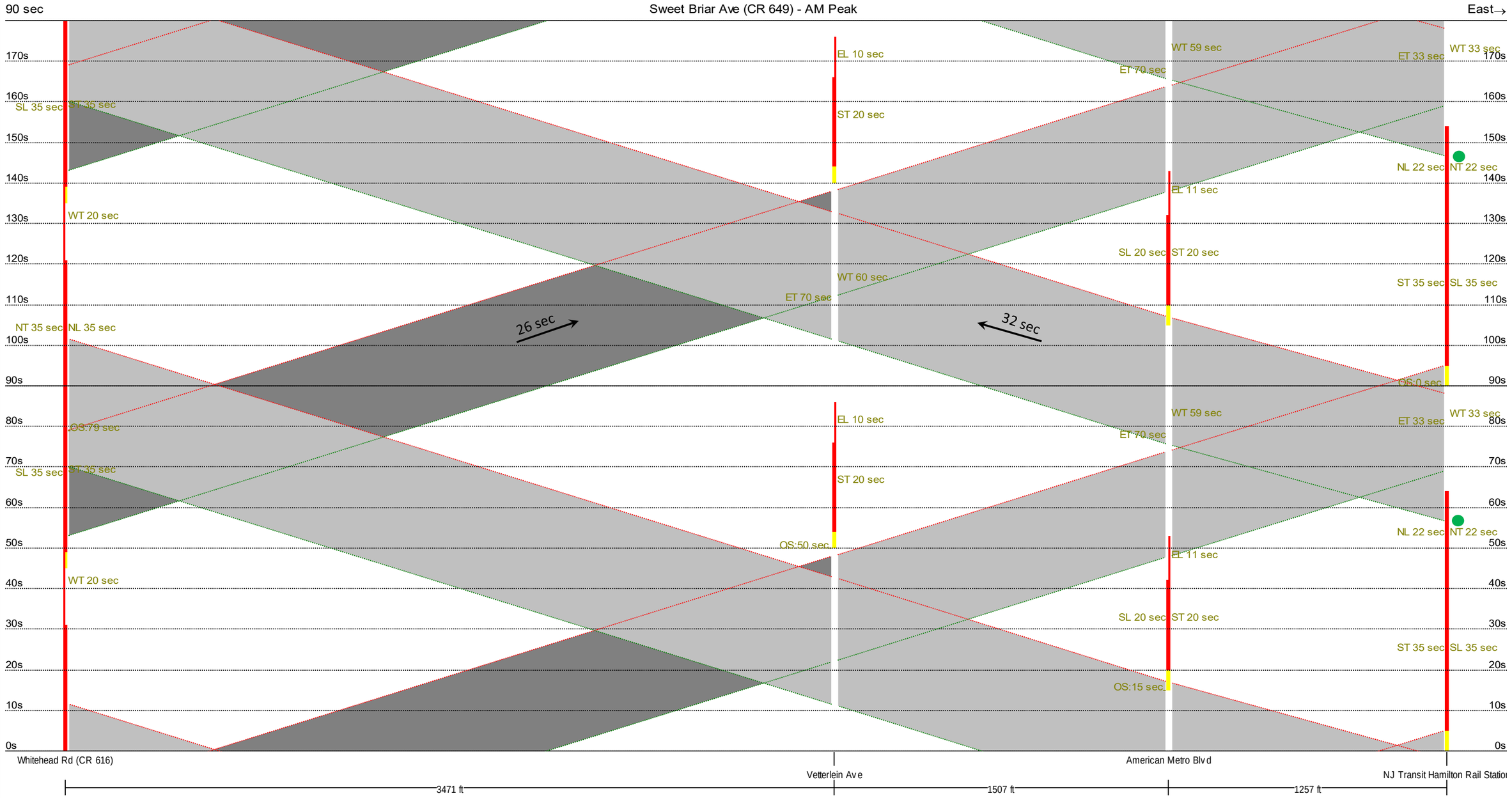
Sloan Ave & Sweet Briar Ave (CR 649)

AM Peak	Existing	Implemented	Difference
Total Delay (hr)	36	35	-1.7%
Total Stops	3,033	2,674	-11.8%
Total Travel Time (hr)	121	121	-0.2%
Fuel Consumed (gal)	112	112	0.0%
MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	24	23	-4.2%
Total Stops	2,002	1,893	-5.4%
Total Travel Time (hr)	84	83	-0.6%
Fuel Consumed (gal)	78	77	-0.6%
PM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	50	47	-5.6%
Total Stops	3,831	3,627	-5.3%
Total Travel Time (hr)	143	141	-1.3%
Fuel Consumed (gal)	126	124	-1.3%
PM Off-peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	21	20	-4.8%
Total Stops	2,032	1,888	-7.1%
Total Travel Time (hr)	83	82	-0.8%
Fuel Consumed (gal)	79	78	-1.8%
Weekend AM Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	14	13	-7.8%
Total Stops	1,490	1,420	-4.7%
Total Travel Time (hr)	65	65	-0.5%
Fuel Consumed (gal)	64	63	-0.5%
Weekend MD Peak	**Existing**	**Implemented**	**Difference**
Total Delay (hr)	19	19	-1.6%
Total Stops	1,840	1,584	-13.9%
Total Travel Time (hr)	80	80	-0.3%
Fuel Consumed (gal)	77	75	-2.3%

Figure 14

SimTraffic Network Measure of Effectiveness

Sloan Ave & Sweet Briar Ave (CR 649)



DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

MERCER COUNTY NEW JERSEY

iteris

Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

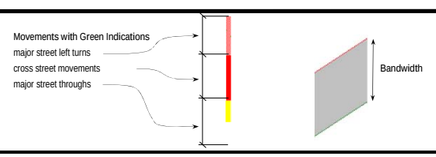
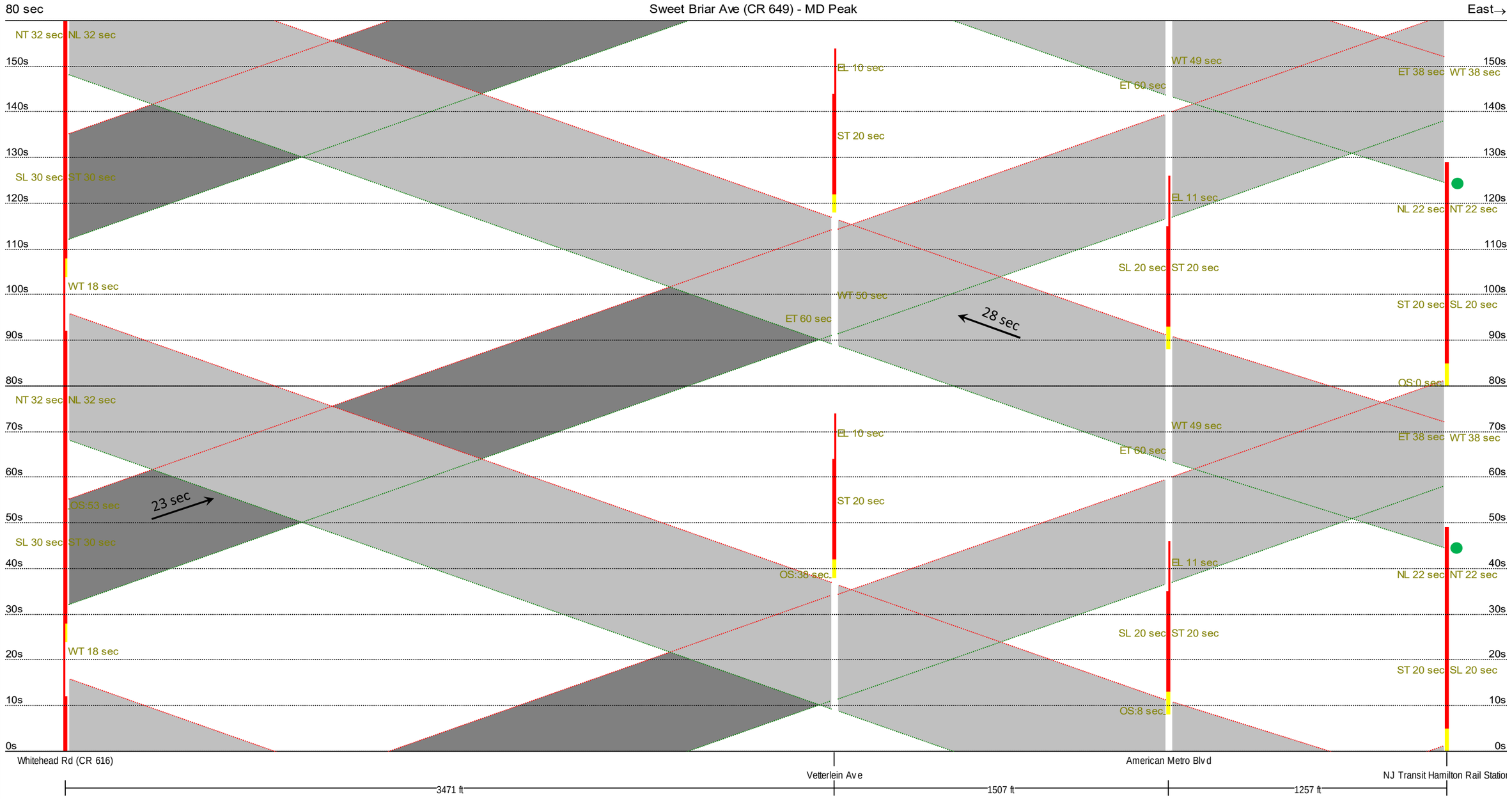


Figure 15

Time-Space Diagram

Sloan Ave & Sweet Briar Ave (CR 649) - AM Peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

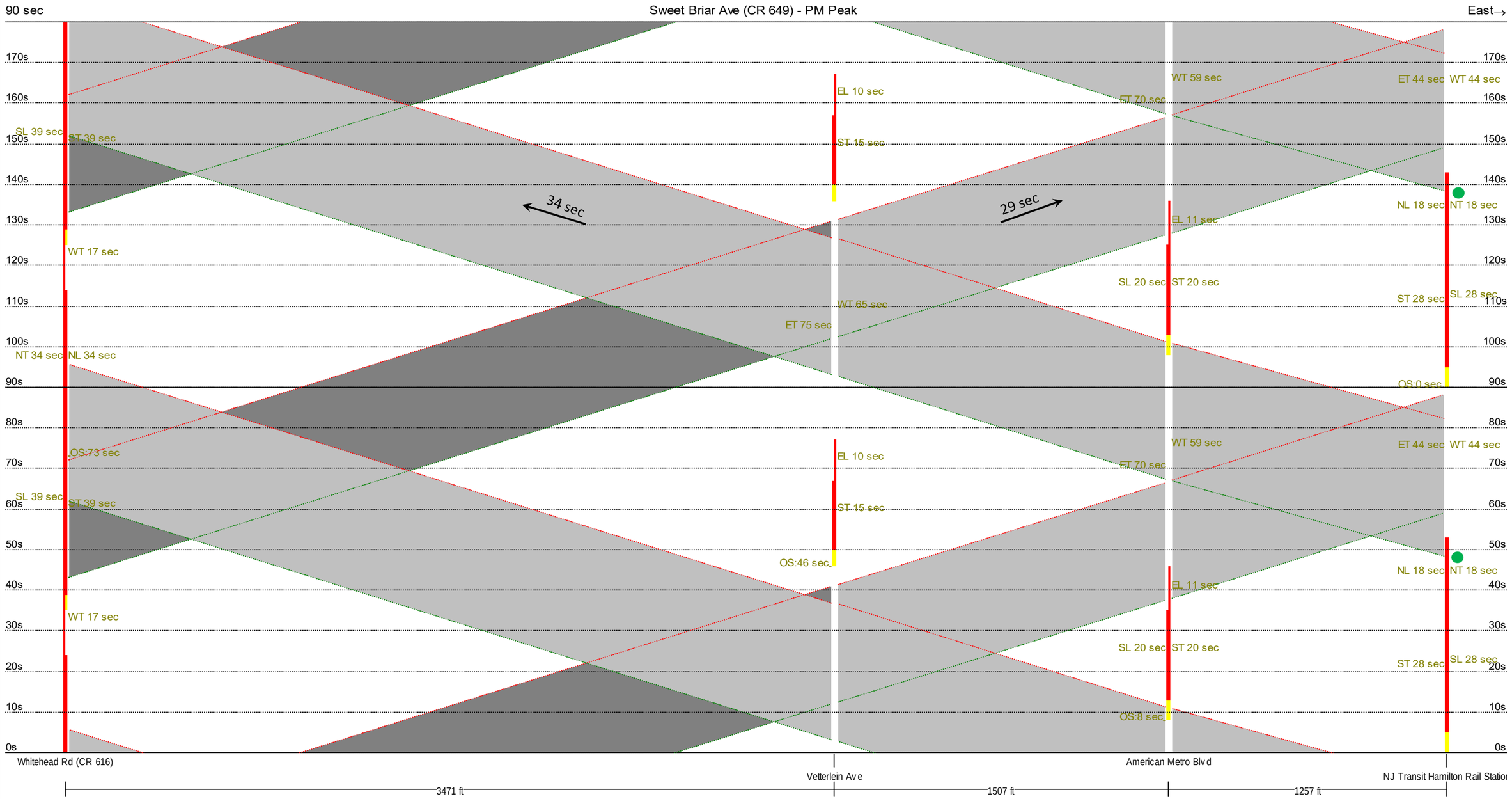
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 16

Time-Space Diagram

Sloan Ave & Sweet Briar Ave (CR 649) - MD Peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

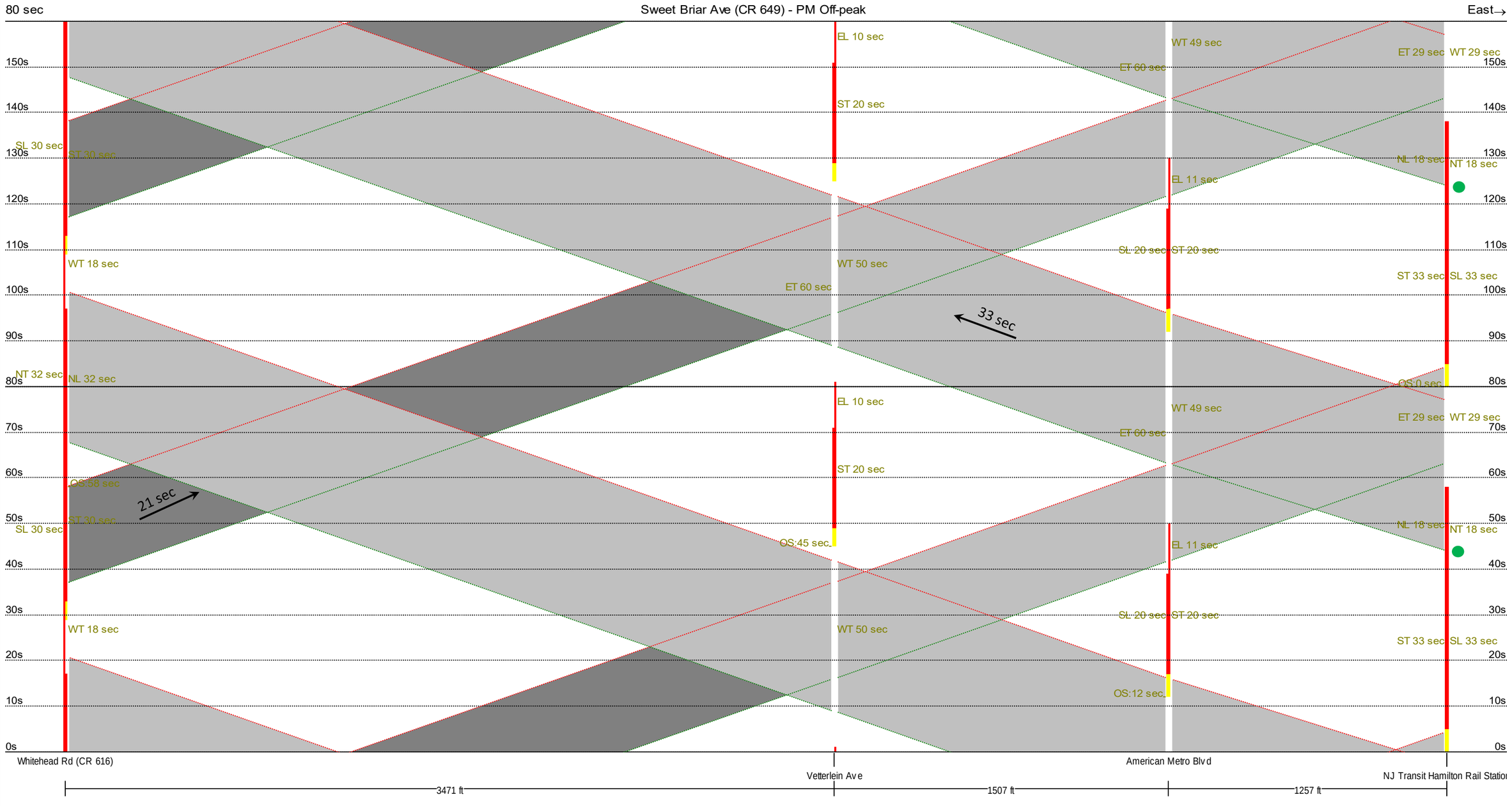
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 17

Time-Space Diagram

Sloan Ave & Sweet Briar Ave (CR 649) - PM Peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

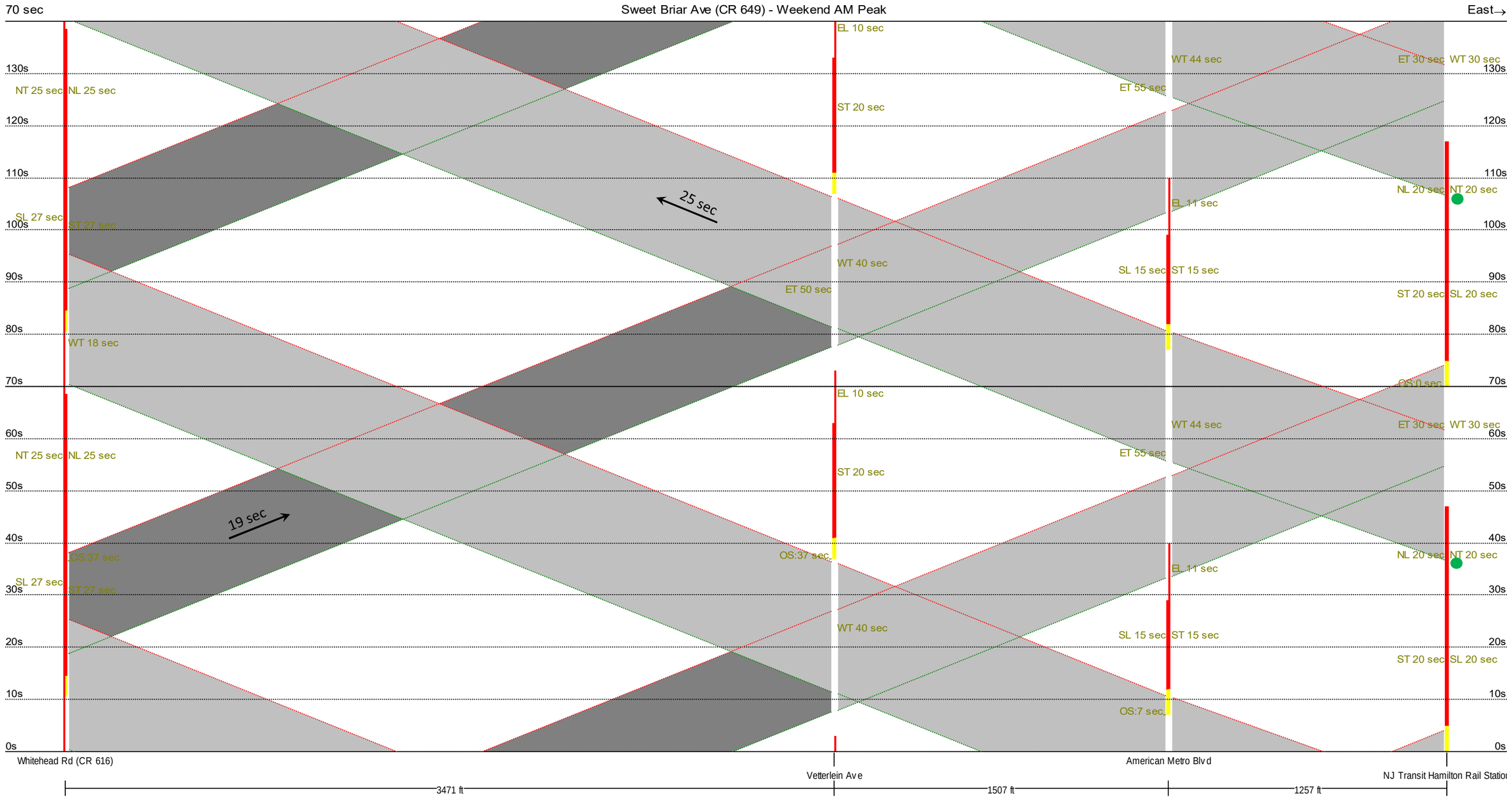
Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 18

Time-Space Diagram

Sloan Ave & Sweet Briar Ave (CR 649) - PM Off-peak Period



Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 19

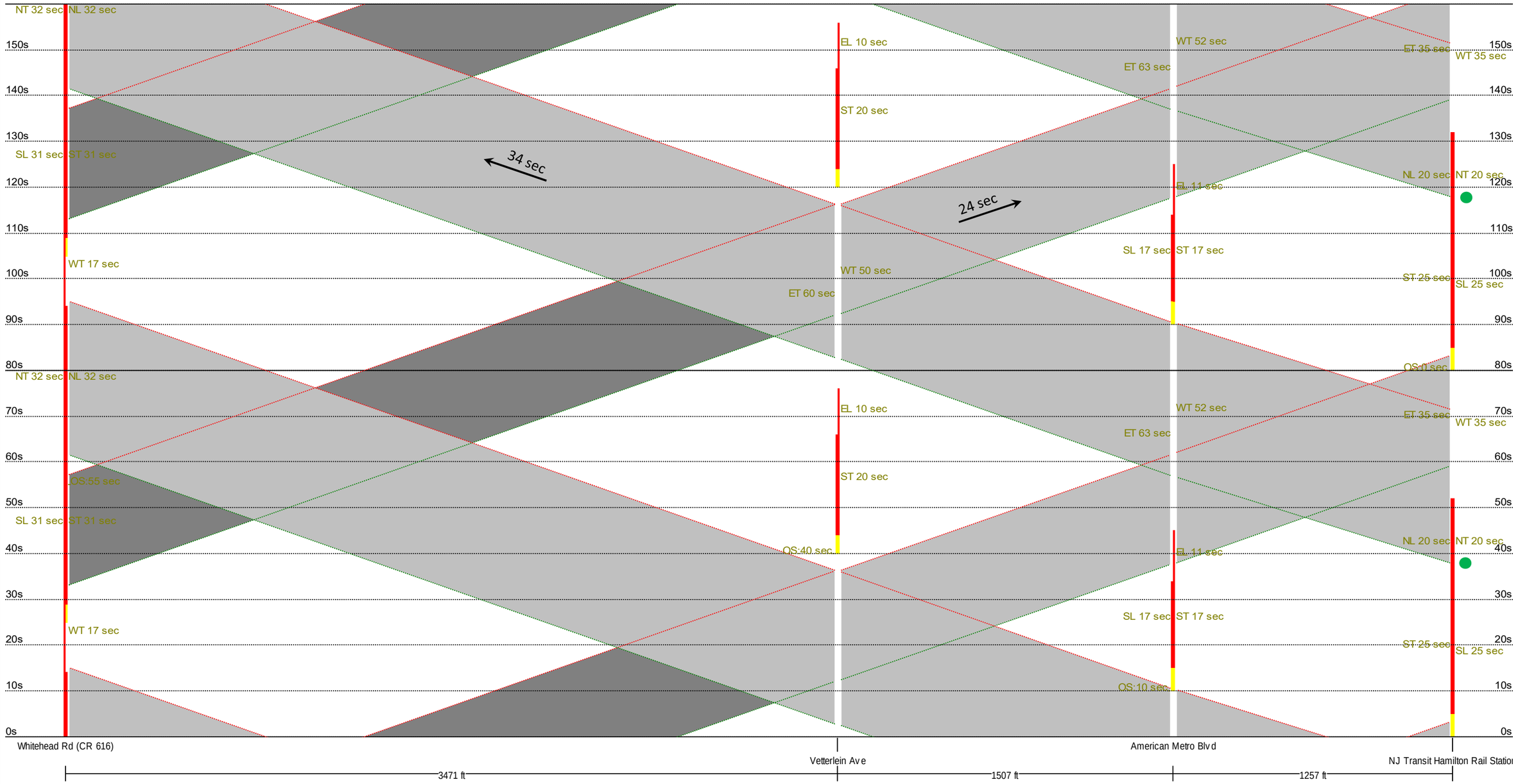
Time-Space Diagram

Sloan Ave & Sweet Briar Ave (CR 649) - Weekend AM Peak Period

80 sec

Sweet Briar Ave (CR 649) - Weekend MD Peak

East→



Whitehead Rd (CR 616) — Vetterlein Ave — American Metro Blvd — NJ Transit Hamilton Rail Statio

3471 ft — 1507 ft — 1257 ft

Signal Timing
Cycle Length (see upper left)
Splits (labeled next to signal indications)
Offset (labeled at reference point)
Planned Early Release

Movements with Green Indications
major street left turns
cross street movements
major street throughs

Bandwidth

Figure 20

Time-Space Diagram

Sloan Ave & Sweet Briar Ave (CR 649) - Weekend MD Peak Period

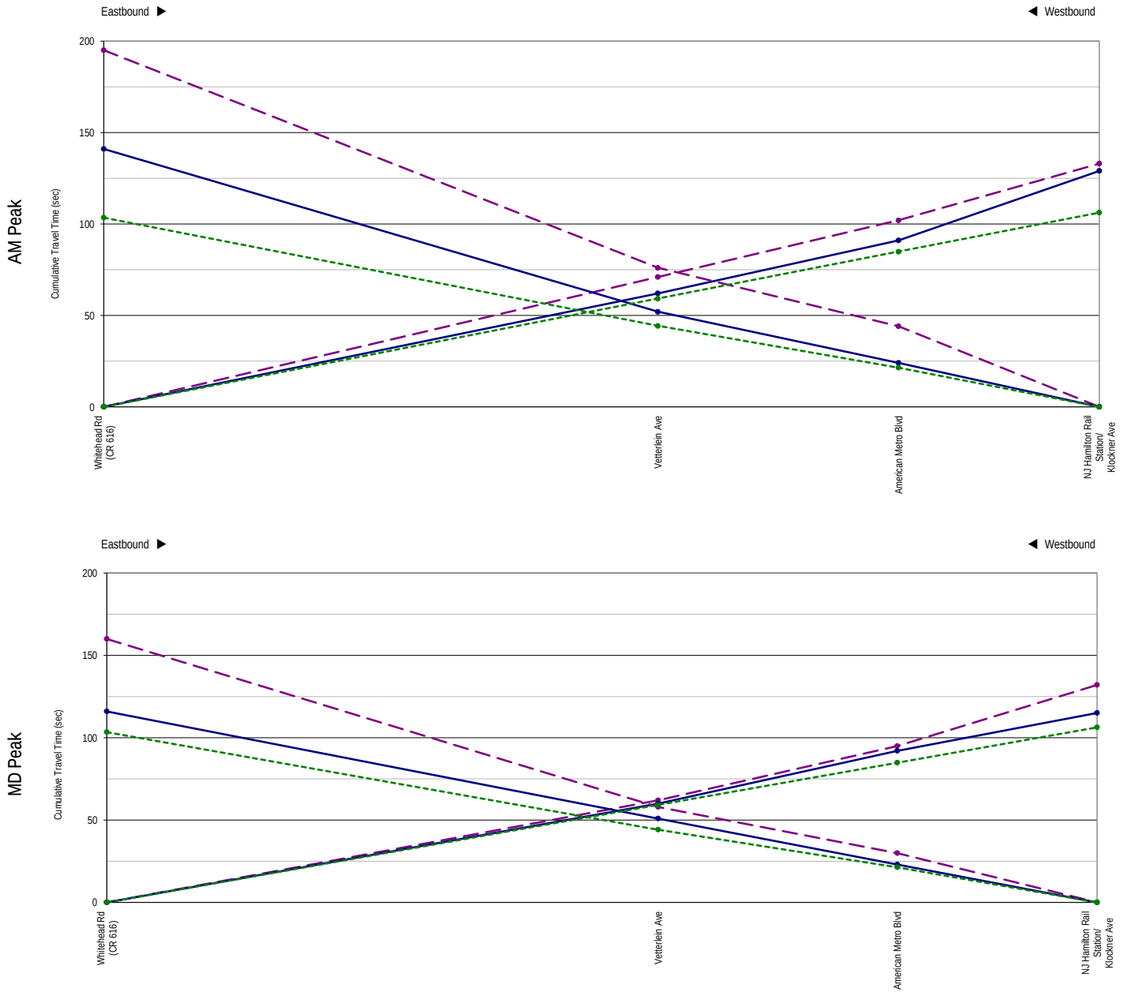
Average Total Travel Time & Delay

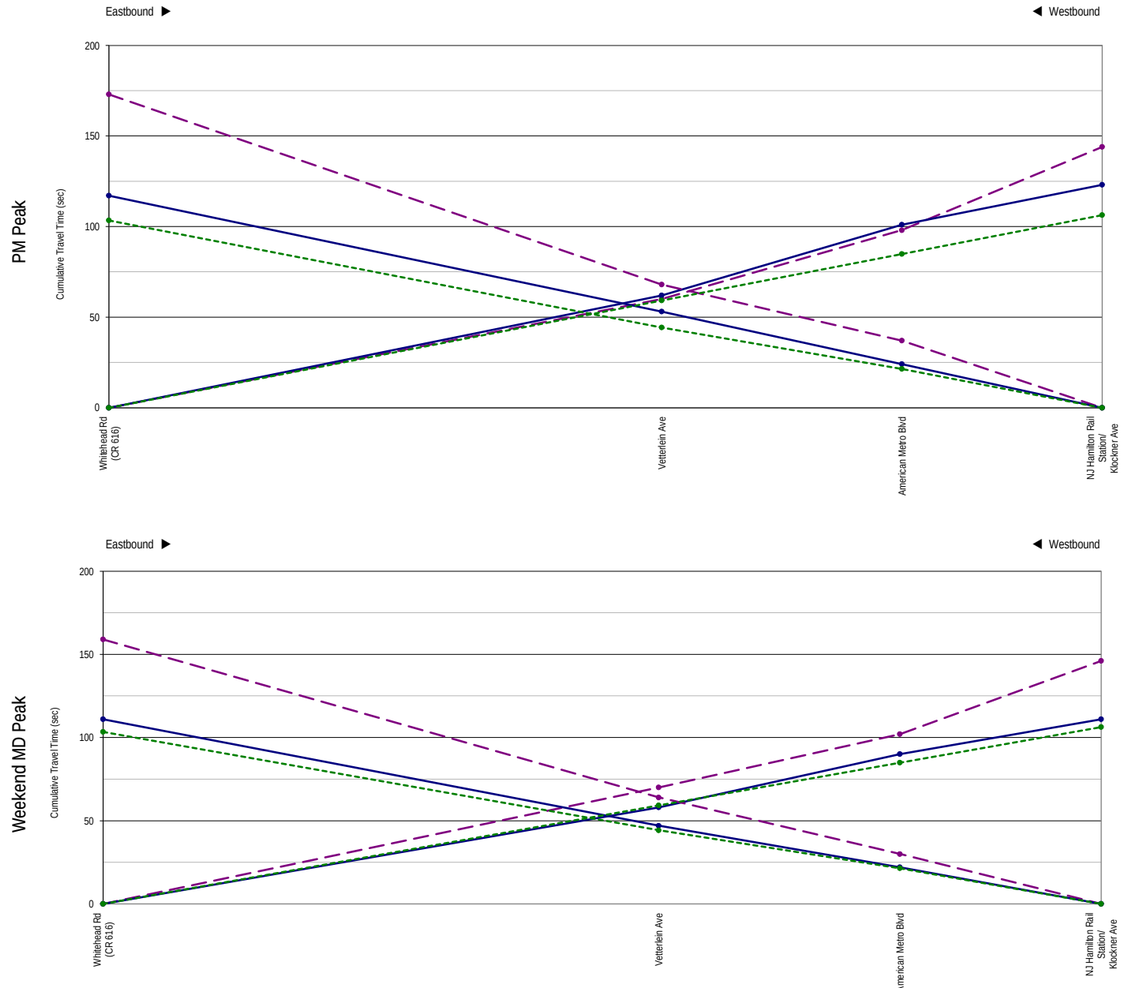
Sweet Briar Ave (CR 649): 1.2 miles

		AM Peak		MD Peak		PM Peak		Weekend MD Peak	
		Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)
Eastbound	Existing	133	27	132	26	144	38	146	40
	Implemented	129	23	115	8	123	17	111	5
	Difference	-4		-17		-21		-35	
	% Difference	-3.0%	-14.8%	-12.9%	-65.4%	-14.6%	-55.3%	-24.0%	-87.5%
Westbound	Existing	195	91	160	56	173	70	159	55
	Implemented	141	37	116	12	117	13	111	8
	Difference	-54		-44		-56		-48	
	% Difference	-27.7%	-59.3%	-27.5%	-78.6%	-32.4%	-80.0%	-30.2%	-87.3%

Eastbound : Whitehead Rd (CR 616) to NJ Transit Hamilton Rail Station

Westbound : NJ Transit Hamilton Rail Station to Whitehead Rd (CR 616)





Existing
Implemented
Free Flow

Figure 21

Average Travel Time & Delay

Sloan Ave & Sweet Briar Ave (CR 649)

Mercer County, NJ - Sloan Ave & Sweet Briar Ave (CR 649) Detection/Observation Summary				
ID	**Intersection**	**Controller Type**	**Communication Type & Controller Date/Time Status During Field Notes (Nov '21)**	**Notes/Issue Summary from Initial Field Notes (Observed 11/23/2021)**
1	Sweet Briar Ave (CR 649) & Whitehead Rd (CR 616)	Econolite ASC/3	No GPS or comm. Date OK. Time 3 seconds fast.	Pedestrian pushbutton on southeast corner for pedestrian Ø4 (northbound) does not place call in controller. Pedestrian display on northeast corner for pedestrian Ø8 (westbound) not displaying countdown.
2	Sweet Briar Ave (CR 649) & Vetterlein Ave	Econolite ASC/3	No GPS or comm. Date OK. Time 9 seconds fast.	Cabinet had snake and spider infestation during field notes in November but was cleared out mostly by implementation in March. A couple snakes were in cabinet along with many large spiders. May be worth clearing out and stuffing the conduit with copper or other sealant. Ø4 (southbound) was showing intermittent false calls during our observations. Could be due to either shadows or picking up calls from the adjacent lanes. Either way, there were several cycles where the side street serviced with no demand, so worth reviewing detector zone. Ø1 (eastbound left-turn), Ø2 (westbound) and Ø6 (eastbound) have no detection and showing no calls in controller (not an issue, just observation for free operation behavior).
3	Sweet Briar Ave-Sloan Ave (CR 649) & American Metro Blvd	Econolite ASC/3	No GPS or comm. Date OK. Time 2 seconds slow.	Ø1 (eastbound left-turn) has a constant call on video detection, so will service each cycle regardless of demand and utilize all allotted time to that phase. Ø2 (westbound) and Ø6 (eastbound) have no detection and showing no calls in controller (not an issue, just observation for free operation behavior). Wiring and programming of the cabinet is unique as there are several enabled dummy phases that run with overlaps (Ø5 and Ø6). Pedestrian button on the northwest corner for pedestrian Ø4 (southbound) does not place call in controller. UPS in cabinet not functioning as it is clearly turned off. Rodents were in cabinet during implementation, clear nest in back of cabinet.
4	Sloan Ave (CR 649) & NJ Transit Hamilton Rail Station-Klockner Ave	Econolite ASC/3	No GPS or comm. Date OK. Time 3 seconds fast.	Pedestrian pushbutton missing on southwest corner for pedestrian Ø8 (southbound). Looks to have been hit by a turning truck and knocked off pole. Rodents were in cabinet during implementation, clear nest in back of cabinet.