

# Technical Report

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

**Kresson Road, Camden County Route 671**  
From Haddonfield-Berlin Road (CR 651) to NJ Route 73

**In Cherry Hill and Voorhees Townships,  
Camden County, NJ**

October 20, 2021

Prepared For:



Prepared By:



## I. Summary

### A. *Project Overview*

Under contract with Delaware Valley Regional Planning Commission (DVPRC), in cooperation with the New Jersey Department of Transportation, Camden County, Cherry Hill Township and Voorhees Township, the Taylor Wiseman & Taylor consultant project team has completed traffic signal retiming work at ten (10) signalized intersections along Kresson Road (Camden County Route 671) in northwest Camden County. The initial assessment of corridors throughout Camden County, completed in the Spring of 2017, determined that Kresson Road had adequate equipment and significant need for signal retiming. The ten Camden County traffic signals included in the project have 2 NJDOT-maintained signals near either end of the project arterial (NJ State Route 73 to the east and Brace Road, NJ State Route 154, to the west). The retiming work started in January 2020 and concluded in March 2021 with the installation of new traffic signal controllers (at 7 out of 10 locations), GPS antenna for time synchronization and new timing plans.



**Photo 1: Kresson Road (CR 671) and Springdale Road (CR 673)**

Between the initial project meetings in 2017 and implementation in 2021, field data collection activities were conducted, including peak hour turning movement counts, automatic traffic recorder counts, controller assessments and 'before' travel time runs. The collected data was analyzed using traffic engineering software including Synchro™ and Tru-Traffic™. Implementation of the timing plans was impacted by the COVID-19 pandemic, which has dramatically changed travel patterns in March 2020 to the present day. Fine-tuning and field observations were conducted throughout implementation, resulting in minor timing changes to those initially implemented. Follow-up field verifications, and 'after' travel time runs, were done in April – May 2021. This brief report summarizes the activities, observations, and results of this project.

### B. *Project Description*

Kresson Road, Camden County Route 671, is a west to east oriented urban minor arterial. The project corridor extends 6.16 miles, from Haddonfield-Berlin Road (Camden County Route 561, MP 0.0) on the western limit in Cherry Hill Township to NJ Route 73 (MP 6.16) on the eastern limit in Voorhees Township. Interstate 295 and the New Jersey Turnpike pass underneath two bridges on Kresson Road between Covered Bridge Road and Browning Lane.

Land use along Kresson Road is predominantly residential, educational, and institutional. A group of small businesses are located on the west end of the project between Haddonfield-Berlin Road (MP 0.0) and Brace Road (MP 0.38). Three Cherry Hill public schools are located along the corridor: James Johnson Elementary School (MP 1.01), Rosa International Middle School (MP 1.54) and Cherry Hill East High School (MP 3.44). Major institutions along the corridor include the Betty and Milton Katz Jewish Community Center and Temple Emanuel at Springdale Road (MP 3.04), Temple Beth Sholom at Cropwell Road (MP 3.93) and the Temple Beth-El, as well as a few medical facilities are located on the east end between Evesham Road (MP 4.67) and Centennial Boulevard (MP 4.86). Within the project limits (Haddonfield-Berlin Road, CR 651 to the west and NJ Route 73 to the east), twelve (12) signalized intersections were included as part of the retiming project:

1. Kresson Road (CR 671) & Haddonfield Berlin Road (CR 561)
2. Kresson Road (CR 671) & Brace Road (NJ 154)\*
3. Kresson Road (CR 671) & Covered Bridge Road
4. Kresson Road (CR 671) & Browning Lane
5. Kresson Road (CR 671) & Markkress Road
6. Kresson Road (CR 671) & Heartwood Drive
7. Kresson Road (CR 671) & Springdale Road (CR 673)
8. Kresson Road (CR 671) & Oakley Drive-Cherry Hill East High School Entrance
9. Kresson Road (CR 671) & Cropwell Road (CR 675)
10. Kresson Road (CR 671) & Evesham Road (CR 544)
11. Kresson Road (CR 671) & Centennial Boulevard
12. Kresson Road (CR 671) & Berlin Kresson Road (NJ 73)\*

*\*Intersection maintained by New Jersey Department of Transportation. No timings were changed at these intersections.*

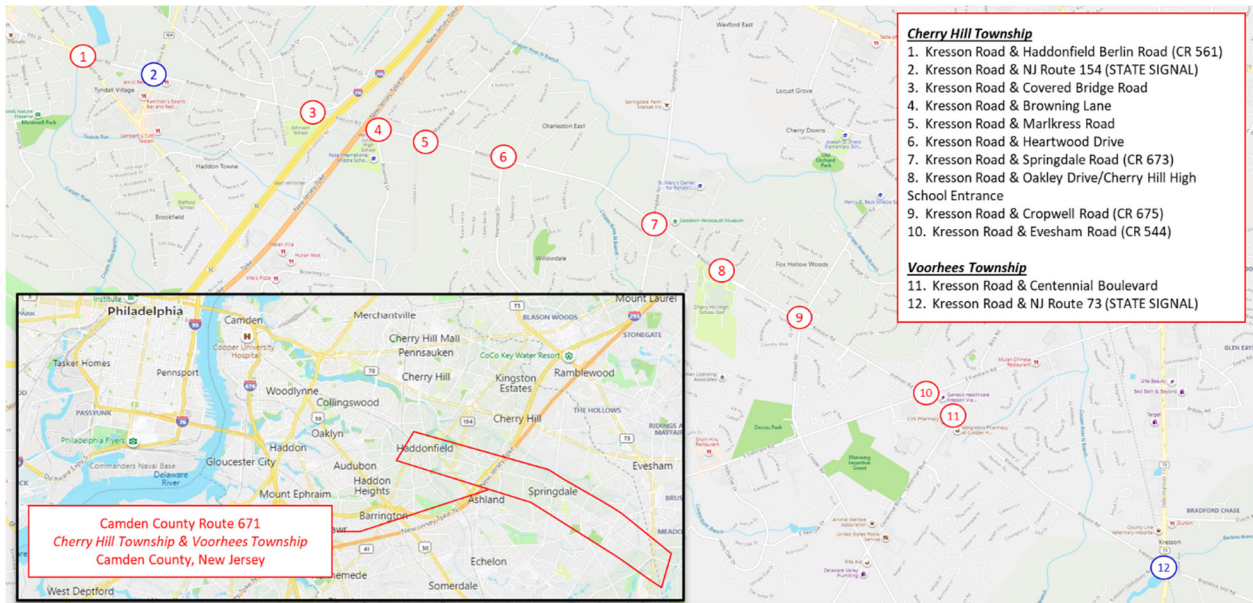
The project location is shown in **Figure 1**.

### ***C. Project Impact of COVID-19 Pandemic***

COVID-19, a highly contagious respiratory illness caused by a virus, impacted the Kresson Road Signal Retiming Effort as both the State of New Jersey and the Federal Government imposed restrictions which influenced travel behavior in 2020 and 2021. Important milestones in the COVID-19 fight included:

- New Jersey Governor Murphy Executive Order 104, March 16, 2020: Closed Movie Theaters, Casinos, Gyms. Restricted Restaurants and Bars to take out and delivery services. Closed all public and private schools (including pre-kindergarten, colleges, and universities).
- New Jersey Governor Murphy Executive Order 107, March 21, 2020: Directs all New Jersey residents to effectively “stay at home” until further notice. This order resulted in non-essential businesses closing or telecommuting from home.

**Figure 1**  
**Kresson Road (Camden County Route 671) Traffic Signal Retiming Project**



- New Jersey Governor Murphy Executive Order 150, June 3, 2020: Provided for outdoor dining protocols for New Jersey restaurants.
- New Jersey Governor Murphy Executive Order 157, June 26, 2020: Provided guidance for non-essential retail operations and individualized instruction at gyms and fitness centers.
- New Jersey Governor Murphy Executive Order 175, August 13, 2020: Provided guidance for schools to reopen subject to critical health and safety protocols.
- New Jersey Governor Murphy Executive Order 183, September 1, 2020: Allowed for reopening of indoor dining (25% capacity) on September 4, 2020.
- Executive Order 219 on February 3, 2021: Governor Murphy increases capacity limit from 25% to 35% for certain business including indoor dining and religious services.
- Executive Order 220 on February 12, 2021: Governor Murphy provides instruction for allowing parent and guardian spectators at youth sporting events and setting indoor capacity to 35%.
- Executive Order 225 on February 22, 2021: Governor Murphy increases capacity limit on indoor gatherings and religious gatherings to 50%.
- Executive Order 230 on March 11, 2021: Governor Murphy increases capacity limit on indoor dining to 50%.
- Executive Order 238 on May 3, 2021: Governor Murphy removed all percentage capacity limits for indoor and outdoor businesses; a lifting of the prohibition on indoor bar seating and an end to the outdoor gathering limit.
- Executive Order 242 on May 24, 2021; Governor Murphy eliminated major COVID-19 restrictions, moves forward with most significant reopening steps since the beginning of the crisis.



From a traffic engineering perspective, traffic volumes decreased significantly as New Jersey residents complied with stay-at-home directives. Business operations changed significantly to comply with social distancing and other public health protocols. The consultant team delayed implementation of new timings waiting for traffic volumes to stabilize and increase from the height of the restrictive period in March-September 2020.

In March 2021 the consultant team, working with the New Jersey Department of Transportation, Camden County, Cherry Hill Township, Voorhees Township, and the Delaware Valley Regional Planning Commission, moved forward with implementation of the new signal timings on the Kresson Road corridor. Restrictions impacting the corridor during implementation included:

- Cherry Hill Township public schools were operating on a hybrid schedule. The schools on Kresson Road operated completely remote on Mondays and ran at half-capacity during the remainder of the school week.
- Retail occupancy was restricted to 50% of building capacity, including employees.
- Restaurants and bars operated outdoor dining sites, also allowing 50% of indoor capacity with appropriate social distancing.
- Businesses had implemented telecommuting and remote work policies to protect health of employees.
- Ridership on public transit had reduced due to potential exposure to COVID-19.
- Many businesses closed in New Jersey directly attributed to COVID-19 protocols and restrictions.

**Traffic Variations on Kresson Road:** The consultant team did conduct a single automatic traffic recorder count in 2021 to attempt to determine variations on average daily traffic over the study period. The count location, which was between Springdale Road and Malkress Road, showed a significant reduction in daily volume between February 2020 and April 2021. The count was taken at the same location in 2020 and 2021. The results show a significant reduction in daily traffic. Although the reduction may be attributed to COVID-19, it should also be noted that Kresson Road Bridge over the New Jersey Turnpike was under reconstruction from May 2020 to the present day. This NJ Turnpike project will lengthen and reconstruct the bridge. The new bridge will be 16 feet wider, but it will not provide additional travel lanes on Kresson Road. The construction of the new bridge resulted in lane closures on Kresson Road which may have caused diversions from the roadway.

The traffic volumes, presented later in this report, clearly show a reduction in average daily traffic between the start of the project and signal timing implementation. 2021 ADT on a typical Tuesday, Wednesday and Thursday were 13%, 18% and 17% lower than 2020 volumes. Saturday volumes were 21% lower. It is difficult to determine the actual cause of traffic reduction. Certainly, the hybrid operation of the schools, work at home telecommuting as well as the Turnpike Bridge Construction are all factors which should be considered. In any case, volumes were significantly reduced and the traffic reduction should be considered when reviewing project benefits.

**D. Existing Signal Documentation/Operation:**

Typically, signalized intersections in New Jersey may have signal timing directives, electrical plans and layout plans. The consultant team reviewed record archives in Camden County, Cherry Hill Township and Voorhees Township with a focus on signal timing documentation. The consultant team requested and received available records from the New Jersey Department of Transportation. **Table 1** presents the results of the consultant team’s record search:

**Table 1**  
**Kresson Road (Camden County Route 671)**  
**Record Archive Results**

Intersection Cross Street	Record
Haddonfield-Berlin Road (CR 561)	Layout Plan, Timing Directive
Brace Road (NJ Route 154)	Layout Plan, Electrical Plan, Timing Directive,
Covered Bridge Road	Layout Plan, Timing Directive (on Plan)
Browning Lane	Layout Plan, Timing Directive
Marlkress Road	Layout Plan, Photo of Timing Directive
Heartwood Drive	Layout Plan with Timing Directive on Plan
Springdale Road (CR 673)	Layout Plan with Timing Directive on Plan
Oakley Drive/Cherry Hill East High School Entrance	Electrical Plan, Timing Directive
Cropwell Road (CR 675)	Layout Plan, Photograph of Revised Layout Plan with Timing Directive on Plan
Evesham Road (CR 544)	Layout Plan with Outdated Timing Directive on Plan
Centennial Boulevard	Nothing found
New Jersey Route 73	Timing Directive on Plan Sheets (System has now gone adaptive)

The historical signal timing records are found in **Appendix A**.

**E. Results**

With implementation of the 1) updated timing plans, 2) modifications to the corridor’s time-of-day schedule, and, 3.) potential decreases in corridor volume attributed to the COVID-19 health emergency and the Kresson Road Bridge over the New Jersey Turnpike, the project consultant team has documented significant reductions in corridor travel times and delay. Eastbound weekday morning, mid-day, evening, and weekend mid-day peak travel times have been reduced by 26.0%, 7.9%, 29.6%, and 13.8%, respectively. Westbound weekday morning, mid-day, evening, and weekend mid-day peak travel times have been reduced by 34.1%, 3.2%, 22.4% and 11.9%, respectively. Cumulative (combined eastbound and westbound) travel time on Kresson Road has been reduced 30.8%, 5.1%, 26.2% and 12.8% during the weekday morning, mid-day, evening, and weekend mid-day time periods. Cumulative stops have decreased 59.6% in the weekday morning, 25.0% in the weekday mid-day, 55.4% in the weekday evening and 48.6% in the weekend mid-day peak period.

**“Cumulative stops have decreased 59.6% in the weekday morning, 25.0% in the weekday mid-day, 55.4% in the weekday evening and 48.6% in the weekend mid-day peak period.”**

**II. Data Collection**

**A. *Turning Movement Counts***

Peak hour intersection counts were conducted on February 12, 2020 at the twelve project intersections during the weekday morning (7:00 a.m. to 9:00 a.m.), weekday mid-day (12:00 p.m. to 2:00 p.m.), evening (2:45 p.m. to 5:45 p.m.) and off-peak (6:30 p.m. to 7:30 p.m.) hour periods. Saturday counts were taken on February 8, 2020 between 10:00 a.m. to 3:00 p.m and 5:00 p.m. to 6:00 p.m. It should be noted that while no state orders were restricting gatherings, occupancy or behavior, the spread of COVID-19 was being monitored and companies, government, institutions, and individuals were beginning to consider and implement work from home policies at this time. The TMCs are available on the project website, <http://dvrpc.taylorwiseman.com>.

**B. *Automatic Traffic Recorder (ATR) Counts***

In February 2020, automatic traffic recorder counts were taken at four locations on Kresson Road. Volumes were recorded twenty-four hours a day over the week starting February 7, 2020. The summarized data is presented in **Table 2**. The automatic traffic recorder (ATR) counts are available on the project website, <http://dvrpc.taylorwiseman.com>.

**Table 2**  
**2020 Average Daily Traffic (ADT) – Kresson Road**

<u>Location of ATR and Traffic Direction</u>	<u>Average Daily Traffic</u>
<b>Kresson Road between Brace Road and Covered Bridge Road – EB</b>	<b>5422</b>
<b>Kresson Road between Brace Road and Covered Bridge Road – WB</b>	<b>4819</b>
<b>Total ADT</b>	<b>10241</b>
<b>Kresson Road between Heartwood Drive and Springdale Road – EB</b>	<b>6095</b>
<b>Kresson Road between Heartwood Drive and Springdale Road – WB</b>	<b>6724</b>
<b>Total ADT</b>	<b>12819</b>
<b>Kresson Road between Cropwell Road and Evesham Road – EB</b>	<b>4495</b>
<b>Kresson Road between Cropwell Road and Evesham Road – WB</b>	<b>4371</b>
<b>Total</b>	<b>8866</b>
<b>Kresson Road between Centennial Boulevard and NJ Route 73 – EB</b>	<b>4111</b>
<b>Kresson Road between Centennial Boulevard and NJ Route 73 – WB</b>	<b>4071</b>
<b>Total</b>	<b>8183</b>

**C. Comparisons between 2020 and 2021 ATR data on Kresson Road between Springdale Road and Marlkrass Road:**

As referenced earlier in the report the consultant team collected automatic traffic recorder counts on Kresson Road between Springdale Road and Marlkrass Road in April 2021 during final implementation of the new controller timings. The purpose of this one count was to determine the impact of the COVID-19 pandemic and/or the Kresson Road Bridge over the NJ Turnpike construction on the project corridor. The counts were recorded during similar time periods in the year, so there is little seasonal variation influencing the data. Possible justification for volume reductions include the Kresson Road Bridge construction, hybrid school schedules in Cherry Hill Township, governmental orders restricting building capacity and work from home schedules associated with the COVID-19 pandemic. **Table 3** and **Figure 2** show the comparison of the two datasets.

**Table 3**  
**Comparison of Daily Traffic Volumes on Kresson Road (Springdale to Marlkrass Roads)**  
**February 2020—April 2021**

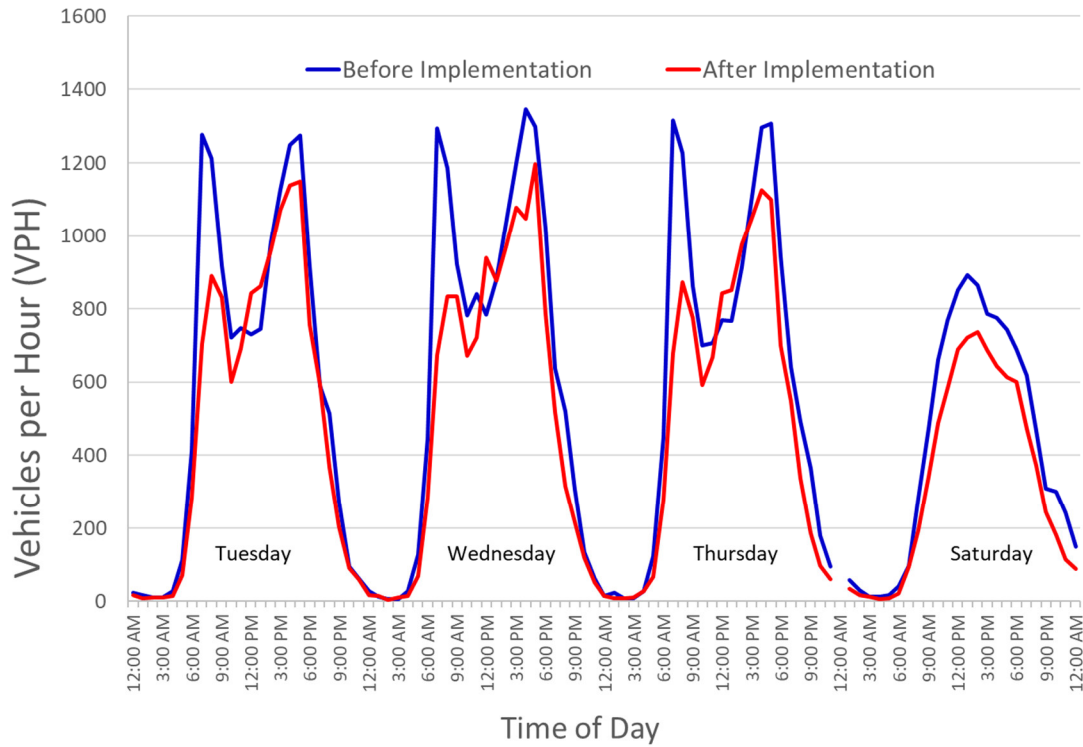
<u>2020 Day and Date</u>	<u>Volume (veh.)</u>	<u>2021 Day and Date</u>	<u>Volume (veh.)</u>	<u>Percent Difference</u>
<b>Tuesday February 11</b>	<b>14,049</b>	<b>Tuesday April 13</b>	<b>12,232</b>	<b>-12.93%</b>
<b>Wednesday February 12</b>	<b>14,903</b>	<b>Wednesday April 14</b>	<b>12,266</b>	<b>-17.7%</b>
<b>Thursday February 13</b>	<b>14,332</b>	<b>Thursday April 15</b>	<b>11,877</b>	<b>-17.1%</b>
<b>Saturday February 8</b>	<b>10,144</b>	<b>Saturday March 6</b>	<b>7,969</b>	<b>-21.4%</b>

The traffic volume data reveals that there is a difference in traffic volumes which are anywhere from 12% to 21% lower during post-project (2021) conditions when compared to pre-COVID conditions (2020). Weekday AM periods have considerably lower volumes in 2021 compared to 2020. This may be due to the reduced number of students attending in-person learning and individuals still working from home. Mid-day volumes after implementation are closer to or exceed the before implementation volumes. PM volumes are closer to pre-COVID conditions yet are still consistently lower in post-implementation conditions. Saturday volumes are still lower in 2021. The Saturday reduction in traffic may be attributed to the continued restrictions on religious gatherings and the presence of several Jewish Temples along the corridor. It should also be noted that the reconstruction of the Kresson Road Bridge over the New Jersey Turnpike also definitely influenced this section of Kresson Road as it is due west of the count location. The lower volumes should be considered when evaluating the “benefits” of this project.

**Figure 2**



**Comparison of Daily Traffic Volumes on Kresson Road (Springdale to Marlkness Roads)  
February 2020—April 2021**



**D. Travel Time Runs**

The TWT project team conducted travel time runs before and after optimized signal timings were implemented to determine stops and travel time along the corridor. Initial travel time runs were conducted Tuesday February 11, 2020 and Saturday February 8, 2020. After improvement travel time runs were conducted on Thursday, April 8, 2021 and Saturday March 13, 2021. The data was collected with GPS enabled laptops and recorded using TruTraffic Version 10.0 software. Runs were conducted during AM weekday, Mid-day weekday, PM weekday, and mid-day weekend time periods. The travel time runs were the primary data sets used to compare the improvements along the corridor; analysis of this data can be found in a later section.

**E. Traffic Signal Timing and Phasing Data**

Phasing and field inventories were collected during Phase I in July 2017. Traffic signal timings and phasing were uploaded from the controllers at each of the intersections (except for NJ Route 73 and Brace Road, NJDOT maintained signals) along Kresson Road in March 2020. As noted previously, the existing timing/signal documentation is presented in **Appendix A** of this report.

**F. Field Review of Existing Operations**

A field review was conducted to gather controller information and operational issues at each of the signals along Kresson Road. An initial intersection inventory in 2017 recorded corridor directions, major and minor streets, controller types, controller accessories, location of controller, issues with controller clocks and timing, pedestrian facilities, and signal phasing.

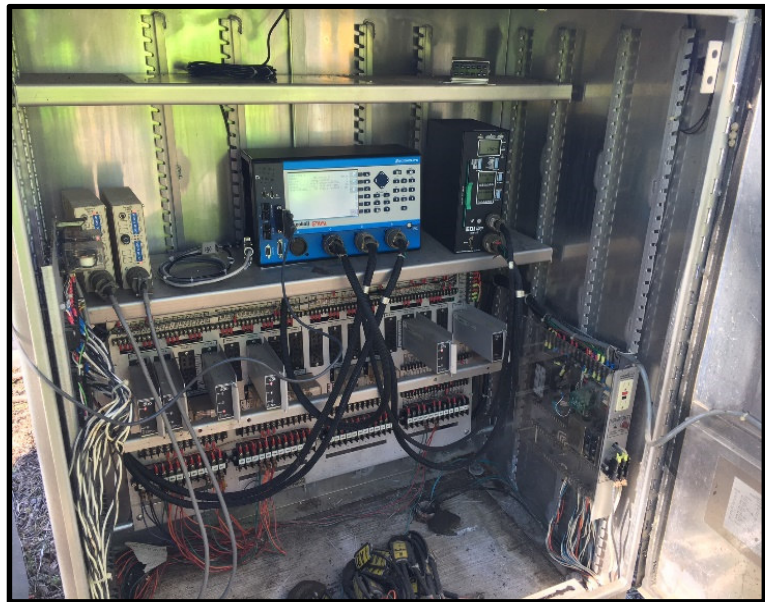
At the start of the timing work in 2020, the existing corridor controllers included the Econolite ASC/3, Econolite ASC/2, Transyt 1880 EL, and Multisonics 820a. The NJDOT signal at Brace Road had a Naztec 980 TS2; the NJ Route 73 signal cabinet was not opened. Six of the Camden County controllers along the corridor were found to be running in free operation and were not coordinated with the other signals on Kresson Road. In addition, several of the clocks in the controllers were found to be running ahead or behind of the actual time of day and/or had the wrong date. The variations in time/date recorded are to be expected with controllers of the age found on the street (ten to twenty years old). Table 4 documents the time/date drift observed in the existing controllers in 2021. To establish time, the consultant team utilized a smart phone and the <http://www.time.gov> web site.

**Table 4**  
**Time/Date Variances Recorded on Kresson Road Signal Controllers**  
**March 2020**

<u>Intersection Cross Road</u>	<u>Time Variation</u>	<u>Date Variation</u>
<b>Covered Bridge Road</b>	<b>N/A</b>	<b>N/A</b>
<b>Browning Lane</b>	<b>68 seconds fast</b>	<b>N/A</b>
<b>Marlkress Road</b>	<b>61 seconds fast</b>	<b>N/A</b>
<b>Heartwood Lane</b>	<b>41 seconds fast</b>	<b>N/A</b>
<b>Springdale Road</b>	<b>N/A</b>	<b>N/A</b>
<b>Oakley Drive-Cherry Hill High School</b>	<b>62 seconds slow</b>	<b>N/A</b>
<b>Cropwell Road</b>	<b>33 seconds slow</b>	<b>N/A</b>
<b>Evesham Road</b>	<b>4 hours and 6 minutes slow</b>	<b>Date read 08/18/1970</b>
<b>Centennial Boulevard</b>	<b>8 hours and 24 seconds slow</b>	<b>Date read 05/23/1987</b>

In addition to the time and date issues, operational issues were recorded in July 2017 during Phase I and again in March 2020 during Phase II. The following is a summary of the observed operational issues observed in March 2020:

- Kresson Road and Haddonfield-Berlin Road: Intersection was running in free operation and video detection faulting for all phases.
- Kresson Road and Covered Bridge Road: Southbound (phase 4) direction had constant call for phase, westbound pedestrian walk signal not illuminating on northeast corner.
- Kresson Road and Browning Lane: Northbound pedestrian call button for northeast signal is stuck, no detection for eastbound (phase 2) or westbound (phase 6) vehicular traffic.
- Kresson Road and Marlkness Road: No detection for westbound (phase 2) and eastbound (phase 6) vehicular traffic, northbound pedestrian call button on northeast corner did not place call.
- Kresson Road and Heartwood Lane: Constant call for northbound and southbound (phase 4) vehicular traffic, no detection for eastbound and westbound (phase 2) vehicular traffic, pedestrian countdown signal on southwest corner does not illuminate.
- Kresson Road and Springdale Road: Constant call for southbound (phase 2), westbound (phase 4), and northbound (phase 6) vehicular traffic. Pedestrian push buttons place calls on both parallel vehicular phases.
- Kresson Road and Oakley Drive/Cherry Hill High School Entrance: No detection for westbound (phase 2) or eastbound (phase 6) vehicular traffic.
- Kresson Road and Cropwell Road: Constant calls for northbound left turn (phase 3) and northbound thru (phase 8), no detection for westbound (phase 2) or eastbound (phase 6) direction for vehicular traffic. Pedestrian push button on southwest corner that does not place calls.
- Kresson Road and Evesham Road: Camera detection is in a constant call for eastbound (phase 2) and westbound (phase 6) vehicular traffic. No vehicular traffic detection for northbound and southbound directions (phase 1).
- Kresson Road and Centennial Boulevard: Constant call on phase 6 for vehicular traffic.



**Photo 2: Econolite Cobalt Controller, installed 2021, Kresson Road and Browning Lane**

Variations in both the controller times and dates led Voorhees Township and Cherry Hill Township to decide to install new Econolite Cobalt controllers at seven of the ten Camden County intersections. GPS pucks were installed at nine of the ten project intersections. Controllers such as the Transyt 1880 EL and Multisonics 820A are older models and were not equipped to directly connect to GPS units for time synchronization. Issues with detection were not addressed as part of equipment updates and remain an issue. Issues with detection impact intersection safety and efficiency. The original and new controller information can be seen in **Table 5**.

**Table 5**  
**Traffic Signal Controller Information | Kresson Road, Camden County Route 671**  
**March 2020**

<i>Intersection Cross Road</i>	<i>Maintaining Municipality</i>	<i>Original Controller 2/2021</i>	<i>Controller 3/2021</i>	<i>GPS Capability 3/2021</i>
<b>Haddonfield Road</b>	<b>Cherry Hill Township</b>	<b>Econolite ASC/3</b>	<b>Econolite ASC/3</b>	<b>Yes</b>
<b>Covered Bridge Road</b>	<b>Cherry Hill Township</b>	<b>Econolite ASC/2</b>	<b>Econolite Cobalt</b>	<b>Yes</b>
<b>Browning Lane</b>	<b>Cherry Hill Township</b>	<b>Transyt 1880 EL</b>	<b>Econolite Cobalt</b>	<b>Yes</b>
<b>Marlkress Road</b>	<b>Cherry Hill Township</b>	<b>Transyt 1880 EL</b>	<b>Econolite Cobalt</b>	<b>Yes</b>
<b>Heartwood Lane</b>	<b>Cherry Hill Township</b>	<b>Transyt 1880 EL</b>	<b>Econolite Cobalt</b>	<b>Yes</b>
<b>Springdale Road</b>	<b>Cherry Hill Township</b>	<b>Econolite ASC/3</b>	<b>Econolite ASC/3</b>	<b>Yes*</b>
<b>Oakley Drive-Cherry Hill Highschool Entrance</b>	<b>Cherry Hill Township</b>	<b>Econolite ASC/2</b>	<b>Econolite Cobalt</b>	<b>Yes</b>
<b>Cropwell Road</b>	<b>Cherry Hill Township</b>	<b>Econolite ASC/2</b>	<b>Econolite Cobalt</b>	<b>Yes</b>
<b>Evesham Road</b>	<b>Cherry Hill Township</b>	<b>Econolite ASC/3</b>	<b>Econolite ASC/3</b>	<b>Yes</b>
<b>Centennial Boulevard</b>	<b>Voorhees Township</b>	<b>Multisonics 820A</b>	<b>Econolite Cobalt</b>	<b>Yes</b>

\*Springdale Road was the only controller with a GPS puck prior to March 2021.

### **III. Analysis and Implementation**

#### **A. Modeling**

The Project Team developed a set of base Synchro™ Version 10 models for management of the new traffic data, initial analysis of the intersection with and without various timing 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

spillover, and the effects of origin-destination pairs. TruTraffic™ was used to assist in offset determination 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 were used to create base TruTraffic™ models for more in-depth optimization.

**B. Initial Results—Modeling**

Using the data collected to date and the modeled (i.e. theoretical) timing plans, several network-wide measures of effectiveness were presented for the then pre-existing conditions without retiming (Existing), and with the proposed signal retiming (Proposed). The results showed significant time savings, reductions in delays and reductions in fuel consumption throughout the project area. Weekday total delays decrease by approximately 16% during the AM peak hour, 9% during the Mid-Day peak hour and 18% during the PM peak hour. Weekend total delays decrease by approximately 11% during the Mid-Day. Table 7 presents the results of the modeling effort.

**Table 7**  
**Synchro Network Performance Measures**  
**(Weekday and Weekend- Modeled)**

<b>AM Peak</b>	<b>Existing</b>	<b>Implemented</b>	<b>Difference</b>
Total Delay (hr)	421	355	-15.7%
Total Stops	19,492	18,502	-5.1%
Total Travel Time (hr)	781	715	-8.5%
Fuel Consumed (gal)	1,03	976	-5.6%
<b>MD Peak</b>	<b>Existing</b>	<b>Implemented</b>	<b>Difference</b>
Total Delay (hr)	161	146	-9.3%
Total Stops	12,602	12,005	-4.7%
Total Travel Time (hr)	420	412	-1.9%
Fuel Consumed (gal)	630	621	-1.4%
<b>PM Peak</b>	<b>Existing</b>	<b>Implemented</b>	<b>Difference</b>
Total Delay (hr)	343	282	-17.8%
Total Stops	21,084	19,876	-5.7%
Total Travel Time (hr)	734	673	-8.3%
Fuel Consumed (gal)	1,03	983	-5.3%
<b>PM Off-peak</b>	<b>Existing</b>	<b>Implemented</b>	<b>Difference</b>
Total Delay (hr)	115	113	-1.7%
Total Stops	11,384	11,073	-2.7%



Total Travel Time (hr)	359	357	-0.6%
Fuel Consumed (gal)	558	557	-0.2%
<b>Weekend MD Peak</b>	<b>Existing</b>	<b>Implemented</b>	<b>Difference</b>
Total Delay (hr)	146	13	-11.0%
Total Stops	13,850	12,941	-6.6%
Total Travel Time (hr)	429	413	-3.7%
Fuel Consumed (gal)	670	651	-2.8%

**C. Implementation**

During the week of January 25, 2021, the consultant team implemented the optimized timing plans into each of the original township-maintained controllers. The consultant team entered the timings manually and/or uploaded the timings via laptop connection. Following this implementation, Cherry Hill and Voorhees Township decided to install new controllers at seven project intersections. GPS pucks were installed at nine project intersections.



**Photo 3: New Signal Timings Installed at Browning Lane**

Optimized timing plans were implemented for a second time in the new Econolite Cobalt controllers during the week of March 8, 2021. The consultant team verified that each project controller maintained a common time standard. The implemented coordination plan calls for the township-maintained signals to be in coordination during the week from 7:00 a.m. to 8:30 p.m., from 8:00 a.m. to 8:00 p.m. on Saturday and from 9:00 a.m. to 8:00 p.m. on Sunday. Exceptions to these plans include the Cherry Hill East High School intersection and Cropwell Road intersection which have the same morning start times but enter free mode at 7:00 p.m. on weekdays and Saturdays and 6:30 p.m. on Sundays. Evesham Road and Centennial Boulevard run in coordination on weekdays from 7:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m. and are run in free operation mode on the weekends. Cycle lengths were generally 90 seconds to 120 seconds during the weekdays and 80 seconds to 90 seconds on the weekend depending on the time of day and intersection. As noted previously, many of the intersections were running in free operation mode and the implementation of these cycle lengths and coordination was a significant change to existing conditions. The longer cycle lengths were typically used during AM and PM peaks to

better facilitate movement along the corridor. It should be noted that Evesham Road and Centennial Boulevard experience consistent side street demand which required free operation to service. The consultant team recommends that Evesham Road be evaluated under a separate project, as north-south Evesham Road coordination should benefit the intersection.

**D. Fine-Tuning of Signal Timings**

The Project 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 is over capacity, split adjustments were made to manage queue spillback and blockage. In addition to fine-tuning splits, offset adjustments often have a larger effect on the performance of the network. Offsets were adjusted at the coordinated intersections by conducting travel time runs along the corridor. Travel time runs were conducted using Tru-Traffic™ in conjunction with a Windows 10 computer outfitted with a USB GPS antenna. Tru-Traffic™ tracks the location of the probe vehicle within the traffic signal system. This provides the user dynamic information about the performance of the traffic signal system such as travel time and delay. Results of the travel time runs under existing timings (the “before” runs) and implemented signal timings (the “after” runs) are discussed in the next section of this report. The optimized timing directives are presented in **Appendix B** of this report.



**Photo 4: GPS Enabled Controller Cabinet**

**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, off-peak and the weekend morning, mid-day, an evening peak hour periods. Refer to Tables 8 and 9 which include the cumulative measures of effectiveness for the before and after conditions, as well as the percent differences between the two scenarios, per peak period based on actual field data, as opposed to the theoretical values highlighted in the previous section.

With implementation of the new timing plans and maintenance of a common time standard between project controllers, progression along Kresson Road improved significantly in both directions. For all four peak hour periods, there are significant savings in travel time, delay, the number of stops, and travel speed in both directions. Travel time plots/data are provided in **Appendix C**.

**Table 8**  
**Peak Hour Travel Time and Delay Improvements**  
**Tru-Traffic™ 10 Floating Car Studies**

		<u>AM Peak</u>		<u>Mid-day Peak</u>		<u>PM Peak</u>		<u>Weekend Mid-day Peak</u>	
		<u>Travel Time (s)</u>	<u>Delay (s)</u>	<u>Travel Time (s)</u>	<u>Delay (s)</u>	<u>Travel Time (s)</u>	<u>Delay (s)</u>	<u>Travel Time (s)</u>	<u>Delay (s)</u>
Eastbound	Existing	780	339	620	180	856	416	647	207
	Implemented	577	137	571	131	603	163	558	118
	Difference	-203		-49		-253		-89	
	% Difference	<b>-26.0%</b>	<b>-59.9%</b>	<b>-7.9%</b>	<b>-27.2%</b>	<b>-29.6%</b>	<b>-60.8%</b>	<b>-13.8%</b>	<b>-43.0%</b>
Westbound	Existing	915	464	633	183	794	343	653	202
	Implemented	603	152	613	162	616	165	575	124
	Difference	-312		-20		-178		-78	
	% Difference	<b>-34.1%</b>	<b>-67.2%</b>	<b>-3.2%</b>	<b>-10.9%</b>	<b>-22.4%</b>	<b>-51.9%</b>	<b>-11.9%</b>	<b>-38.6%</b>
Cumulative	Existing	852	406	627	181	825	379	650	205
	Implemented	590	144	594	148	609	164	567	121
	Difference	-262		-32		-216		-83	
	% Difference	<b>-30.8%</b>	<b>-64.5%</b>	<b>-5.1%</b>	<b>-17.7%</b>	<b>-26.2%</b>	<b>-57.0%</b>	<b>-12.8%</b>	<b>-40.5%</b>

**Table 9**  
**Peak Hour Stop and Fuel Consumption Improvements**  
**Tru-Traffic™ 10.0 Floating Car Studies**

		<u>AM Peak</u>		<u>Mid-day Peak</u>		<u>PM Peak</u>		<u>Weekend Mid-day Peak</u>	
		<u>Stops</u>	<u>Fuel Cons (gal/hr)</u>	<u>Stops</u>	<u>Fuel Cons (gal/hr)</u>	<u>Stops</u>	<u>Fuel Cons (gal/hr)</u>	<u>Stops</u>	<u>Fuel Cons (gal/hr)</u>
Eastbound	Existing	7.5	168.2	4.6	88.1	8.8	187.9	4.7	88.4
	Implemented	3.3	116.5	2.7	73.9	3.2	118	3	73
	Difference	-4.3	-51.6	-1.9	-14.2	-5.6	-69.9	-1.7	-15.5
	% Difference	<b>-56.7%</b>	<b>-30.7%</b>	<b>40.6%</b>	<b>-16.1%</b>	<b>63.7%</b>	<b>-37.2%</b>	<b>36.4%</b>	<b>-17.5%</b>
Westbound	Existing	9.1	201.9	4.4	75.9	6.4	156.8	5.5	97.6
	Implemented	3.5	120.7	3.9	74	3.6	122.6	2.2	75.3
	Difference	-5.6	-81.2	-0.5	-1.9	-2.8	-34.2	-3.3	-22.3
	% Difference	<b>-61.4%</b>	<b>-40.2%</b>	<b>12.2%</b>	<b>-2.5%</b>	<b>-43.6</b>	<b>-21.8%</b>	<b>59.6%</b>	<b>-22.8%</b>
Cumulative	Existing	8.3	186.3	4.5	82	7.6	172.3	5.1	92.7
	Implemented	3.4	118.6	3.4	74	3.4	120.1	2.6	74.1
	Difference	-5	-67.7	-1.1	-8	-4.2	-52.2	-2.5	-18.5
	% Difference	<b>-59.6%</b>	<b>-36.6%</b>	<b>25.0%</b>	<b>-9.8%</b>	<b>55.4%</b>	<b>-30.3%</b>	<b>48.6%</b>	<b>-20.0%</b>

**B. Opportunities for Improvement**

Kresson Road (CR 617) roadway is in Cherry Hill and Voorhees Townships, Camden County, New Jersey and serves largely residential, educational facility, and institutional traffic. In addition, Kresson Road intersects with State Route 73 and runs parallel to State Route 70 which provides extensive access to shopping centers, restaurants, and commercial facilities. At the onset of this

project, the traffic signals along Kresson Road were for the most part, operating in “free” mode with no attempt at coordination with adjacent signals.

This report has documented significant improvements in traffic flow associated with this project. Average delay, travel time and vehicle stops have all been positively impacted by new signal timing. The maintenance investment by Cherry Hill and Voorhees Townships, namely new controller units and GPS pucks, should help sustain the coordination settings for the foreseeable future. It is unclear what the actual benefits from this project are as traffic volumes are clearly down on Kresson Road, and most of the project intersections have detection failures.

There are numerous opportunities for improvement on this corridor, including the following general and specific recommendations:

**General Recommendations:**

1. The overall level of maintenance of the corridor traffic signals is well-below average. Ninety (90%) of the Camden County intersections have observed detection failures, which dramatically impacts the efficiency of these signals. There is limited evidence of preventive maintenance on the corridor. This may be due to Camden County’s policy of having municipalities maintain the County traffic signals. There are numerous examples of faulty pedestrian and vehicular indications on the corridor which impact the safety of both pedestrian and vehicular traffic on the corridor.
2. The corridor would benefit from standardized specifications for traffic signal installations. Non-invasive detection, utilizing video and/or radar should be considered. Emergency preemption and battery back-up systems should also be considered.

**Specific Recommendations:**

1. Kresson Road and Haddonfield-Berlin Road
  - a. Investigate video detection at intersection. Repair and/or replace as necessary. Video detection currently faulting on all actuated phases.
2. Kresson Road and Covered Bridge Road
  - a. Southbound Covered Bridge Road detection is showing constant call. This should be repaired.
  - b. Westbound pedestrian walk signal not illuminating on northeast corner.
3. Kresson Road and Browning Lane
  - a. Pedestrian push button on NE quadrant pole is stuck effectively placing the intersection in pedestrian recall.
4. Kresson Road and Marlkress Road
  - a. Northbound pedestrian detector on northeast corner of intersection is inoperative.
5. Kresson Road and Heartwood Lane:
  - a. Heartwood Lane approaches are on vehicular recall.
  - b. Pedestrians signal on southwest corner does not illuminate.



6. Kresson Road and Springdale Road
  - a. Southbound (Phase 2), Westbound (Phase 4) and Northbound (Phase 6) traffic are experiencing constant call.
  - b. Pedestrian push buttons place calls on both parallel vehicular phases.
7. Kresson Road and Cropwell Road
  - a. Northbound left-turn phase (Phase 3), as well as Northbound thru phase (Phase 8) are experiencing constant call.
  - b. Pedestrian detector on southwest corner is inoperative.
8. Kresson Road and Evesham Road
  - a. Video detection for Phases 2/6 (Eastbound-Westbound Kresson Road) are in constant call.
  - b. Side street detection does not appear to be working.
  - c. Evesham Road should be strongly considered for signal timing/coordination.
9. Kresson Road and Centennial Boulevard
  - a. Constant call observed on Phase 6 for vehicular traffic.

***G. Additional Resources/Project Data***

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

# Appendix A

## **Appendix B**

## **Appendix C**