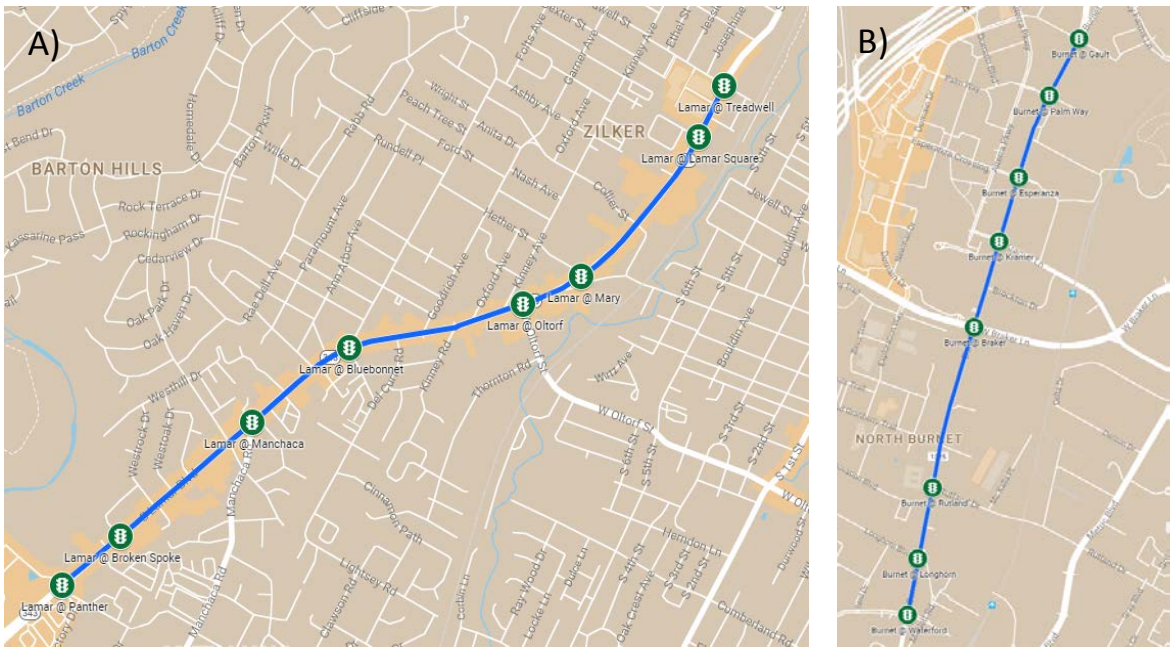
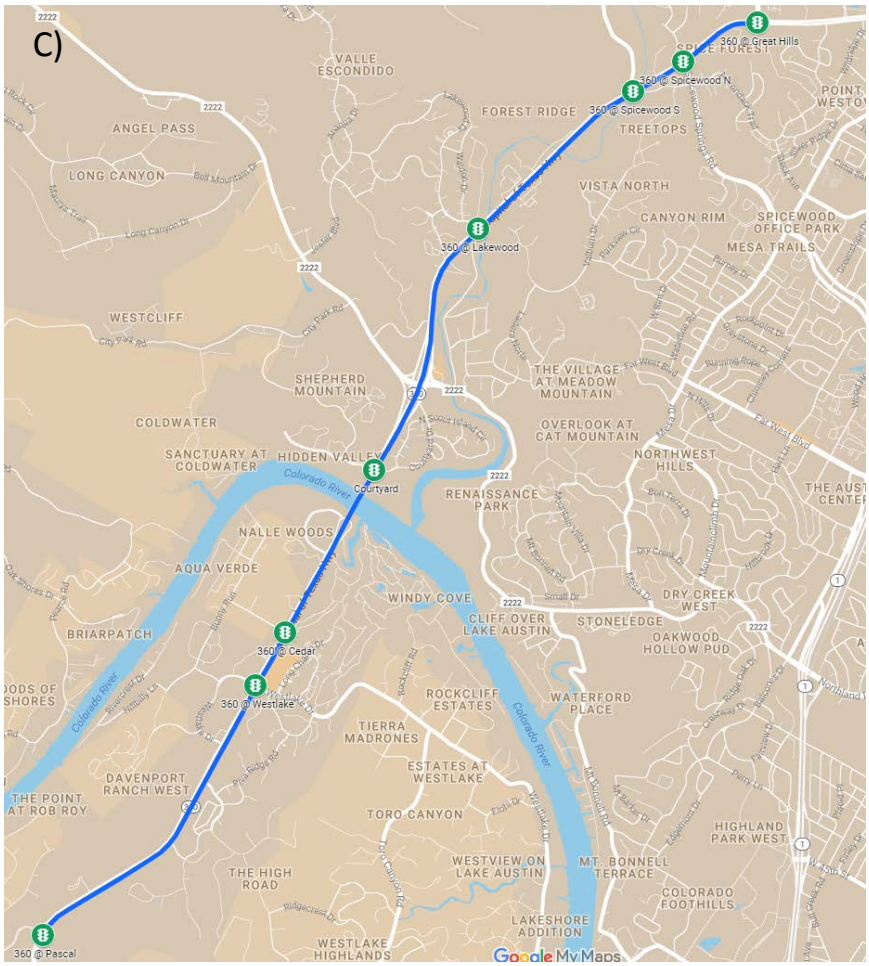
City of Austin Adaptive Traffic Signal Control Evaluation

Adaptive traffic signal control (ATSC) allows traffic signals to change or “adapt” timing based on real-time demand. This could potentially allow traffic signals to be more efficient and responsive to changes in traffic flow, thus reducing travel time and environmental impact. The Federal Highway Administration states that the technology has been used for 20 years, and estimates that less than 1% of traffic signals in the United States use adaptive technology.

ATSC was deployed along 2.1 miles of South Lamar Boulevard, 2.1 miles along Burnet Road, and 6.7 miles along Loop 360 (Figure 1), from November 2016 to June 2017. These produced a 5% reduction in peak period travel times, and a 15% average reduction in evening peak period travel times. Because of the better use of green time, the side streets benefited too, by an average of 25% during weekday peak periods.

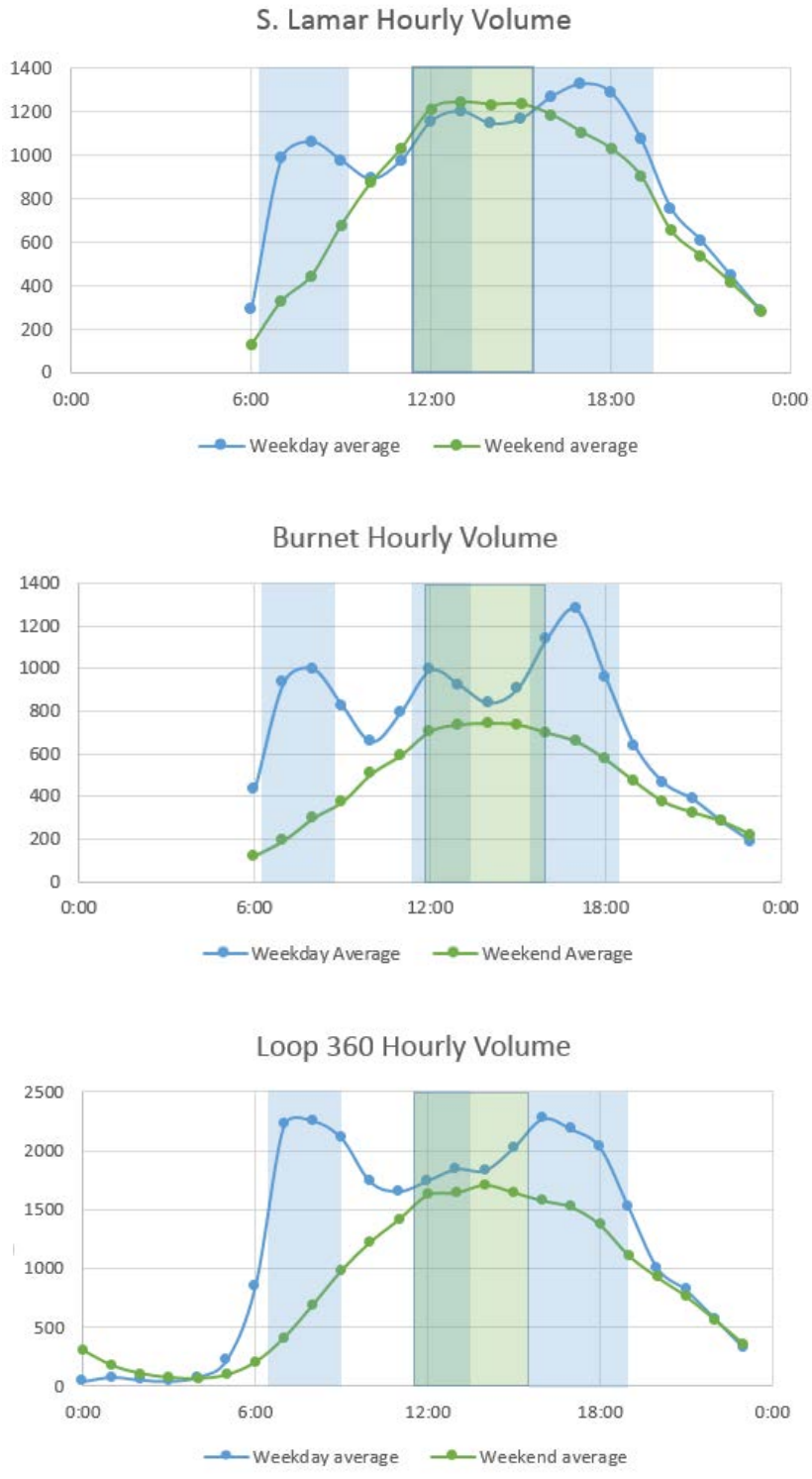
Figure 1: A) the South Lamar corridor, B) the Burnet corridor, C) the Loop 360 corridor with all intersections





Additional traffic sensors were deployed along each corridor to collect traffic counts and travel time data, which were used to assess the success of the deployment. Figure 2 illustrates the traffic count data along each corridor. The peak travel periods, during weekdays and weekends, are highlighted.

Figure 2: The average hourly volume along the three corridors, with weekday and weekend peaks highlighted.



Performance of the ATSC was assessed by doing before and after analyses of cross street (i.e., minor street) cycle failure and corridor travel times. Cross street failure occurs when vehicles wait more than one signal cycle to enter an intersection. Table 1 shows the results of the cross street analysis. In most cases, the cross streets were given more green time, which allowed more traffic to clear and also prevented long queues. Preventing long cross street queues is important for residents and businesses along each corridor. The ATSC allowed them to access the corridor without having to wait for multiple cycles.

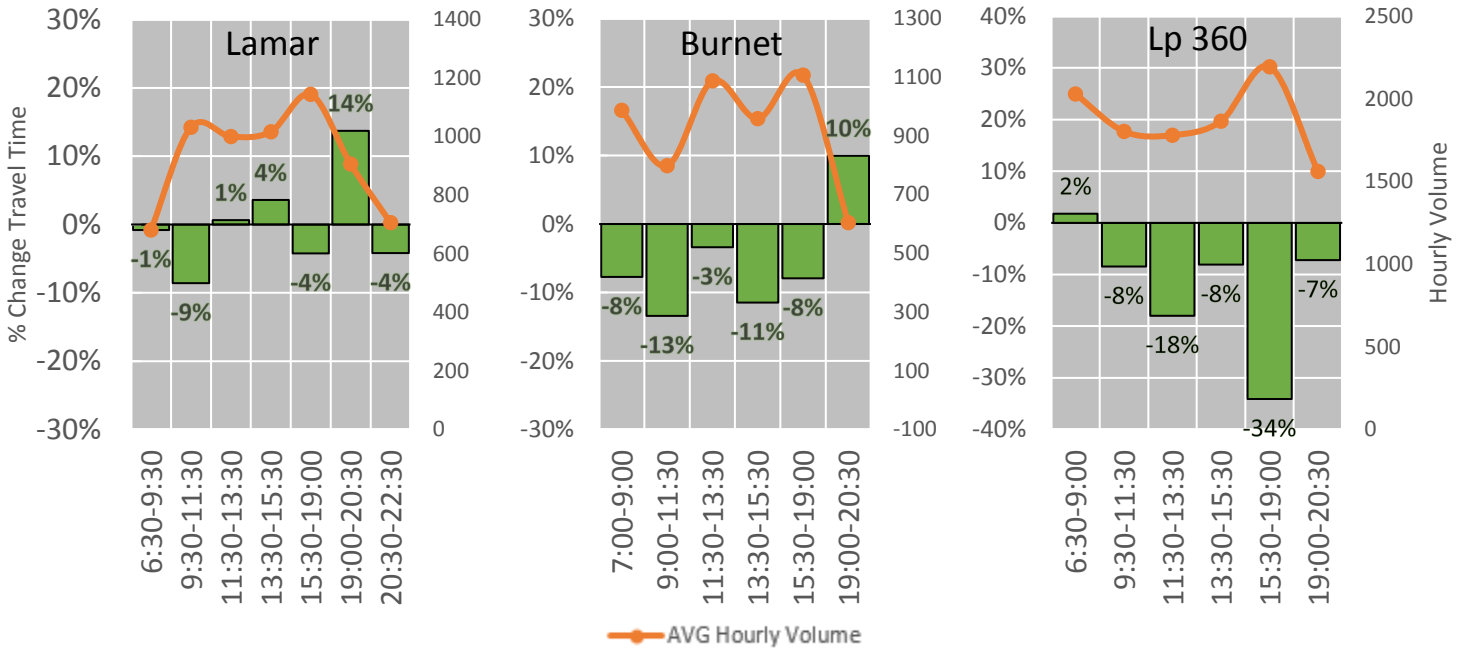
Table 1: % change in cross street performance averaged over the three corridors

	Weekday Peak	Weekday Off-Peak	Weekend Peak	Weekend Off-Peak
Green Time	+8%	+4%	+3%	-4%
Phase Utilization	-2%	-1%	-5%	-4%
Cycle Failure Frequency	-25%	-7%	-12%	-4%

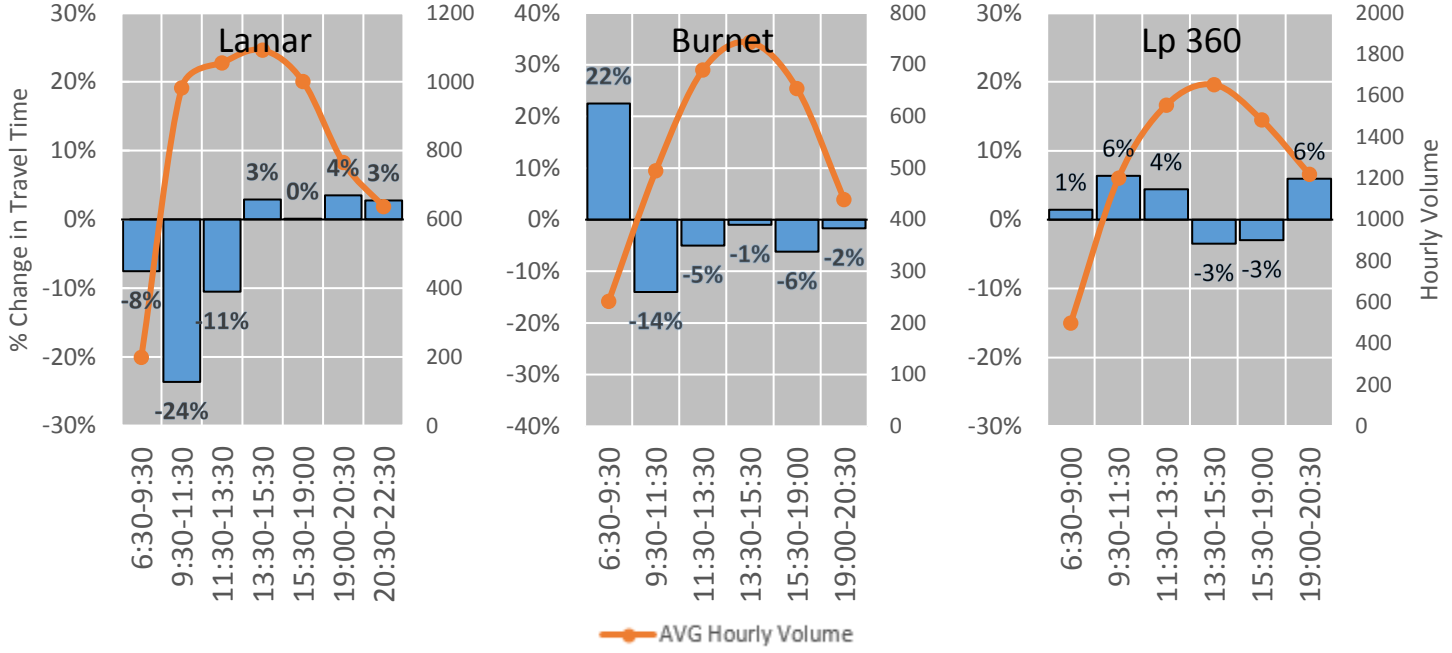
Travel times along each corridor were compared before and after ATSC deployment. In most cases, including most peak periods, the ATSC system decreased travel times (Figure 3). Some of the off-peak periods saw an increase in corridor travel time, which may be due to a focus on reducing cross street cycle failures during these times.

Figure 3: the % change in travel time along the three corridors along with hourly volumes during A) the weekdays and B) the weekend

A)



B)



Future ATSC deployments will focus on testing simplified processes for adaptive timing that require fewer City staff resources to maintain and monitor, and also upgrading the signal controller firmware. Continuous staff monitoring of ATSC was required because, if one vehicle detector malfunctioned, the entire corridor could see backups as the ATSC was making decisions based on bad data. Upgrading the firmware will allow better communication with controllers in the field and more options for deploying adaptive. The new firmware includes a form of “Local Adaptive” which can make timing decisions at the controller level. This more restricted form of adaptive signal controlling can reduce the reliance on good detection, and also reduce the need for constant monitoring and maintenance.