









Traffic Success: Greeley, Colorado



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Summary

To address increasing congestion and a rapidly growing population, Greeley optimized its traffic signals through an adaptive system and Acyclica's powerful analytics. Using advanced tools like Travel Times, Progression Diagrams, Weekly Analysis, Day of Week Analysis, and Delay By Phase, Greeley was able to feed their adaptive system with the most accurate information. As a result, travel times were reduced 10-20%, and Greeley is now well-prepared for future growth.

Population Growth, Increasing Congestion

Since the year 2000 Greeley's population has grown over 30%, from approximately 75,000 to more than 100,000 people¹. The city's burgeoning population began to put a strain on the city's infrastructure, threatening increased congestion and delay. To combat this problem, engineers were presented with two options—expand roadways using costly construction methods, or use technology to optimize their existing systems. Greeley chose to do the latter, installing an adaptive signal system along one of their most burdened corridors.

After the purchase of this new adaptive technology, Greeley needed to do two things. First, they needed to provide the adaptive system with the most accurate information possible so that it would be able to respond to traffic effectively. Second, they needed to validate the purchase of this technology by comparing baseline statistics for the corridor to new data showing the benefits of the system.

¹U.S. Census Bureau, Population Division, Annual Estimates of the Resident Population, May 2016

In order to establish baseline travel times for the corridor, Greeley could have chosen to use a floating car study. These studies have been the gold standard for obtaining travel time data for decades. However, as discussed in a recent US Department of Transportation report, floating car studies are often ineffective at determining the efficacy of adaptive systems because their exorbitant cost usually leads to insignificant sample rates². Instead of using this inefficient method, Greeley chose to use data and analytics provided by Acylica to improve and validate their adaptive system. Acylica devices cost a fraction of the price of a single floating car study, and yet provide an incomparably greater amount of information. They collect up to 250,000 records per hour at a sampling rate of 30-55%. This results in traffic information at over 95% accuracy, collected every hour of the day. These incredible capture rates are accomplished through Acylica's patented passive data collection technology that monitors passing cellular devices. This anonymous information is encrypted, analyzed, and fed into the Acylica *Go* online interface. After installation, Greeley then used several tools in *Go* to analyze information to improve their corridor.

² US DOT Federal Highway Administration. Measures of Effectiveness and Validation Guidance for Adaptive Signal Control Technologies. March 6, 2014. Accessed July 05, 2016. <http://www.ops.fhwa.dot.gov/publications/fhwahop13031/chap8.htm>.

Travel Times

Travel time measurement is the most commonly used analysis source for traffic studies³. While floating car studies often have an insignificant sample size, Acyclica's methods provide a wealth of information at each intersection. Acyclica's advanced detectors can monitor when a car enters the wifi detection zone, how long it lingers there, and when it leaves. When paired with information from other detectors on a corridor, algorithms are used to determine travel times on the route. This information can then be viewed in *Go*, Acyclica's online software. Travel times can be viewed by route, segment, in a graph or spreadsheet, and more. Greeley used travel times to provide their adaptive system with accurate information so it could respond accordingly. Then they used new travel time data to validate the technology, showing that average times were reduced by 10-20%.

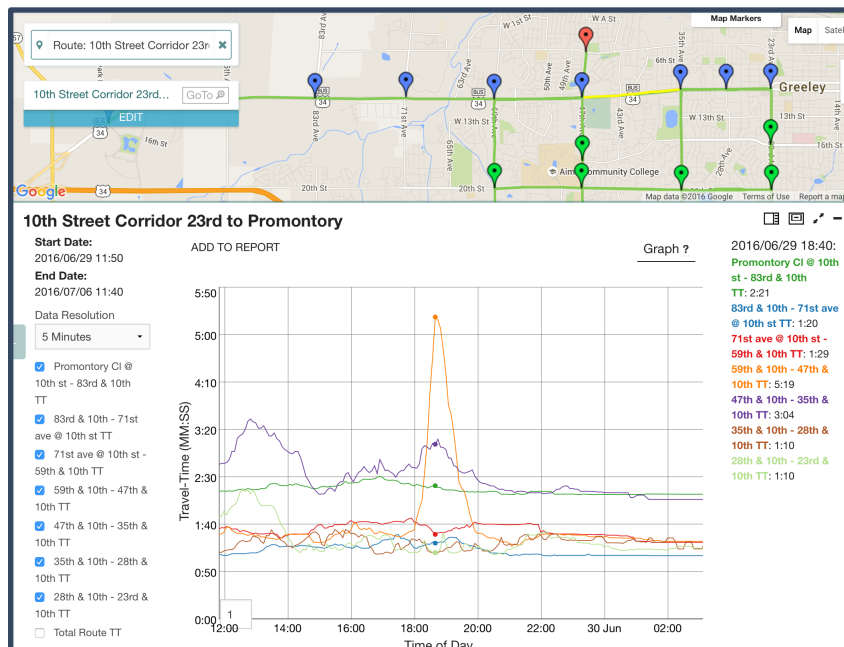


Figure 1: Travel Times Graph

³ US DOT Federal Highway Administration. Measures of Effectiveness and Validation Guidance for Adaptive Signal Control Technologies. March 6, 2014. Accessed July 05, 2016. <http://www.ops.fhwa.dot.gov/publications/fhwahop13031/chap8.htm>.

Progression Diagram

Another way to view travel information is in a progression diagram. This tool is powerful because it displays distance and travel time, thus showing a vehicle's speed along the route. The average speed for each segment is displayed visually so that it can easily be compared to others. This allows the user to see where delay is being experienced on a route. In Greeley's case, the route below shows a fairly smooth progression through the corridor, with none of the segments being significantly steeper than the others. If one of the sections was flat, Greeley would know that this area of the road was more congested, and could focus their efforts there.

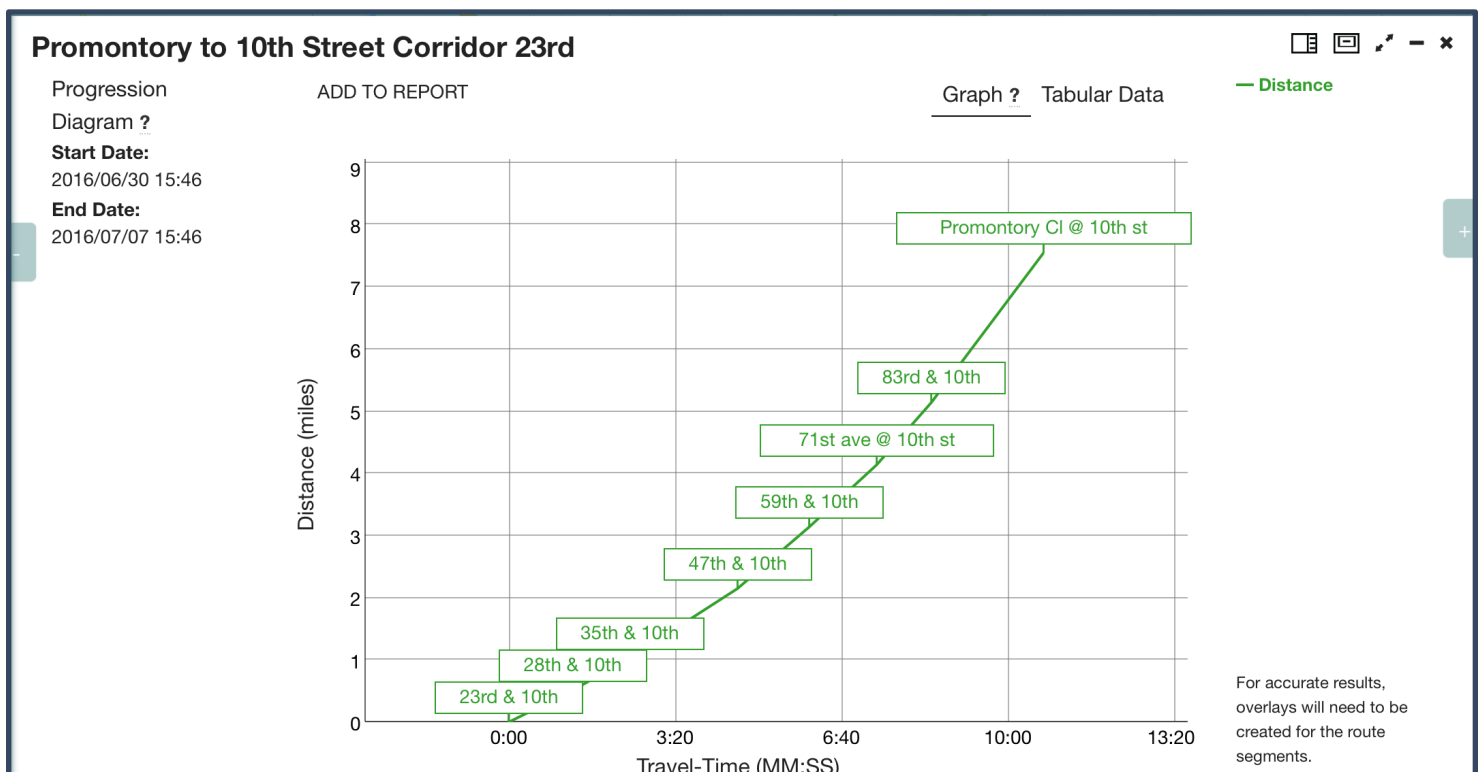


Figure 2: Progression Diagram

Weekly Analysis

The Weekly Analysis tool gives the user the ability to compare average travel times for a specific day by week over an extended period of time. The graph below shows the travel times for Wednesdays in June through early July, 2016. Greeley saw a significant increase in travel times on Wednesday evening on the week of June 29th from an average of about 12 minutes to almost 16 minutes. The problem was corrected the next week as Wednesday travel times returned to normal. Further investigation utilizing the progression diagram tool could allow the city to pin point where the delay originated.

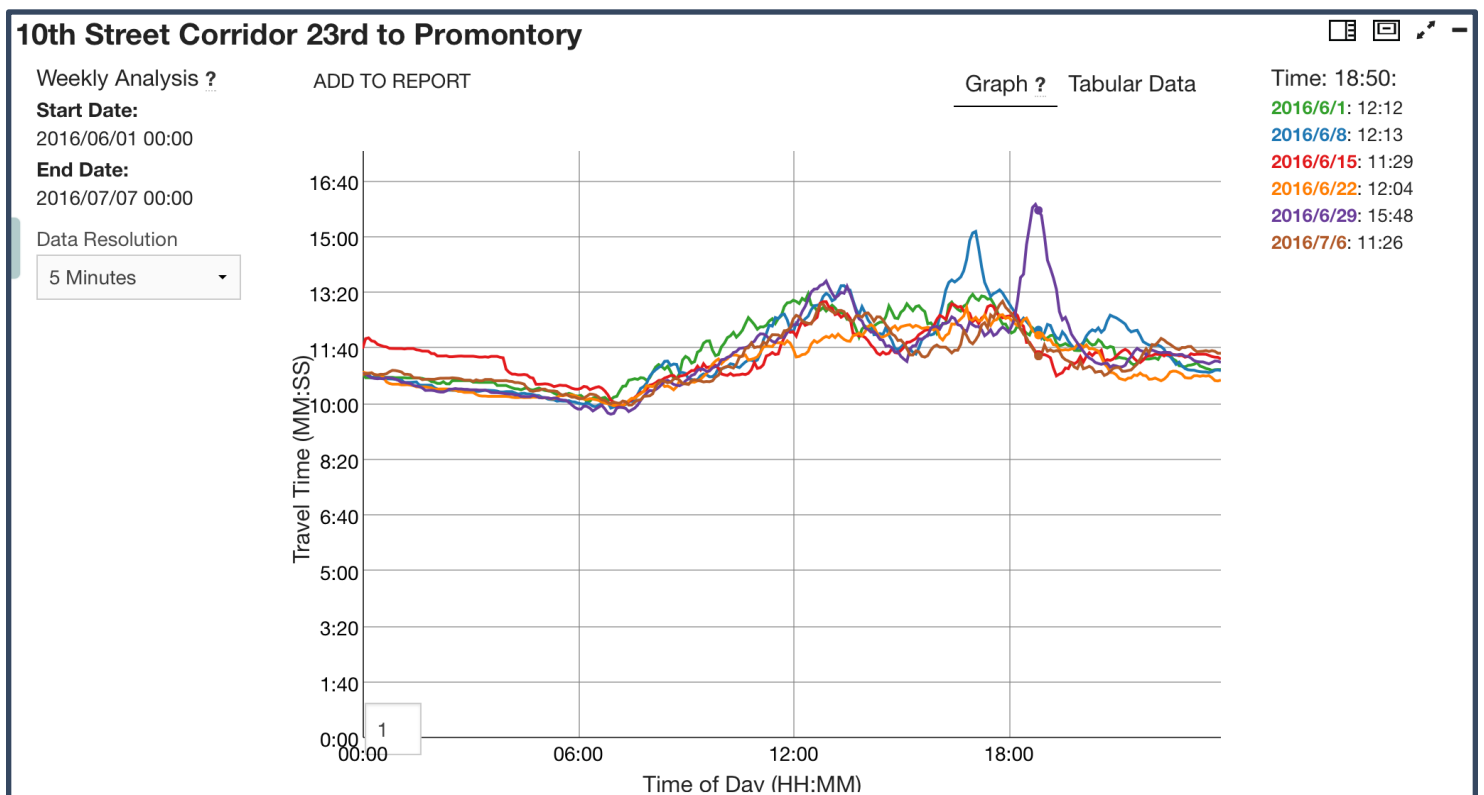


Figure 3: Weekly Analysis Graph

Day of Week Analysis

The Day of the Week Analysis allows the user to see the average travel times for each day in a week. For Greeley, this tool is a powerful way to further analyze the information discovered in the previous Weekly Analysis graph. The question to examine is whether the Wednesday spike observed is indicative of a larger problem that affected the more days in the week, or if it was an isolated incident. Examining the Day of Week Analysis graph below reveals that it was an anomaly that didn't affect surrounding days, and was quickly corrected.

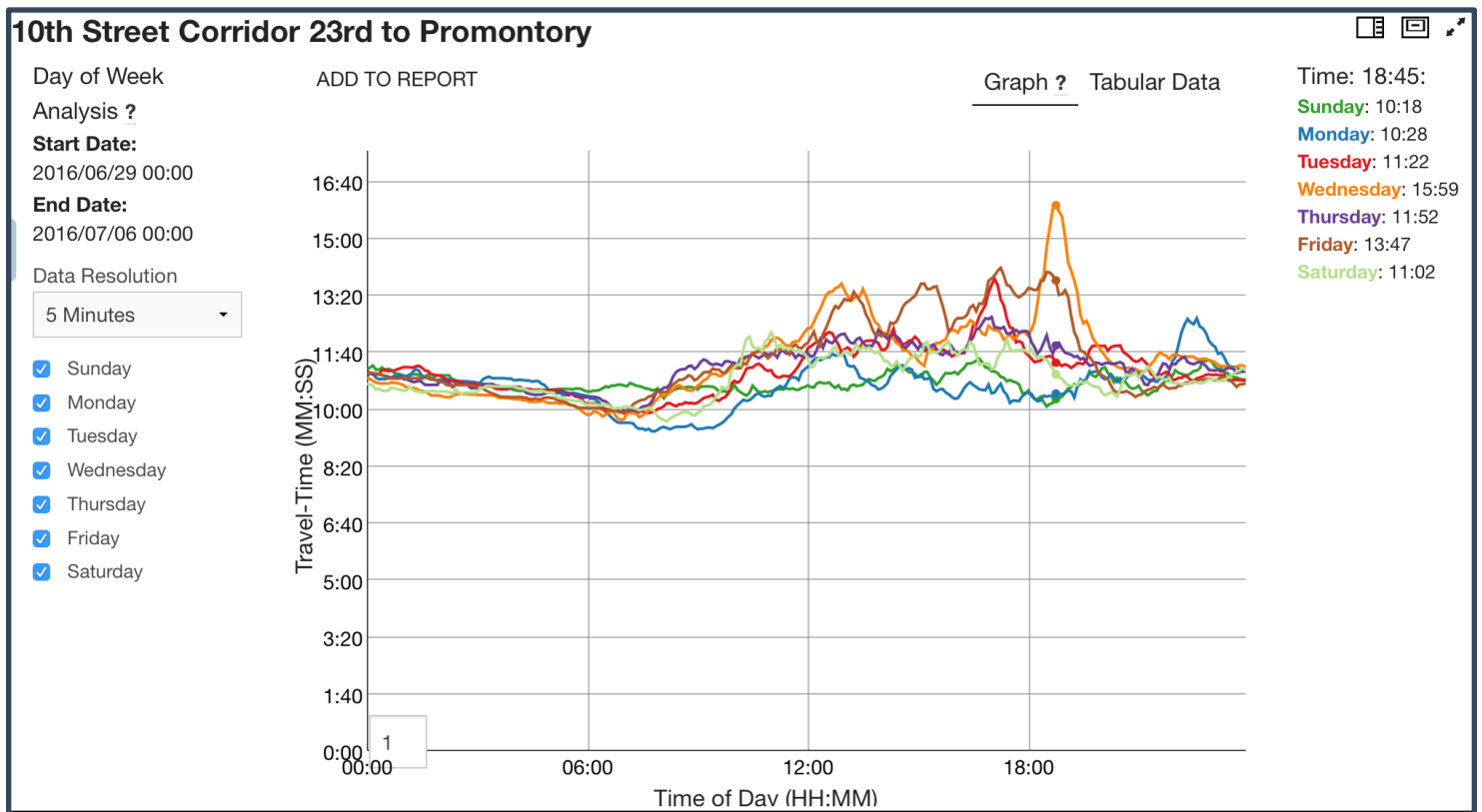


Figure 4: Day of Week Analysis Graph

Delay By Phase

Another useful tool is Delay By Phase, which allows Greeley to see how much delay a vehicle experiences at a given intersection depending on which direction the car is coming from and which way it is going. For example, in the graph below the highest delay time is a left turn coming from the south. This is not unusual, as left turns often present the most delay. However, the second-highest delay is for cars coming from the same direction, but making a right turn. Right turns usually have a comparatively low dwell time, so Greeley may want to look into why this particular intersection is experiencing so much right-turn delay.

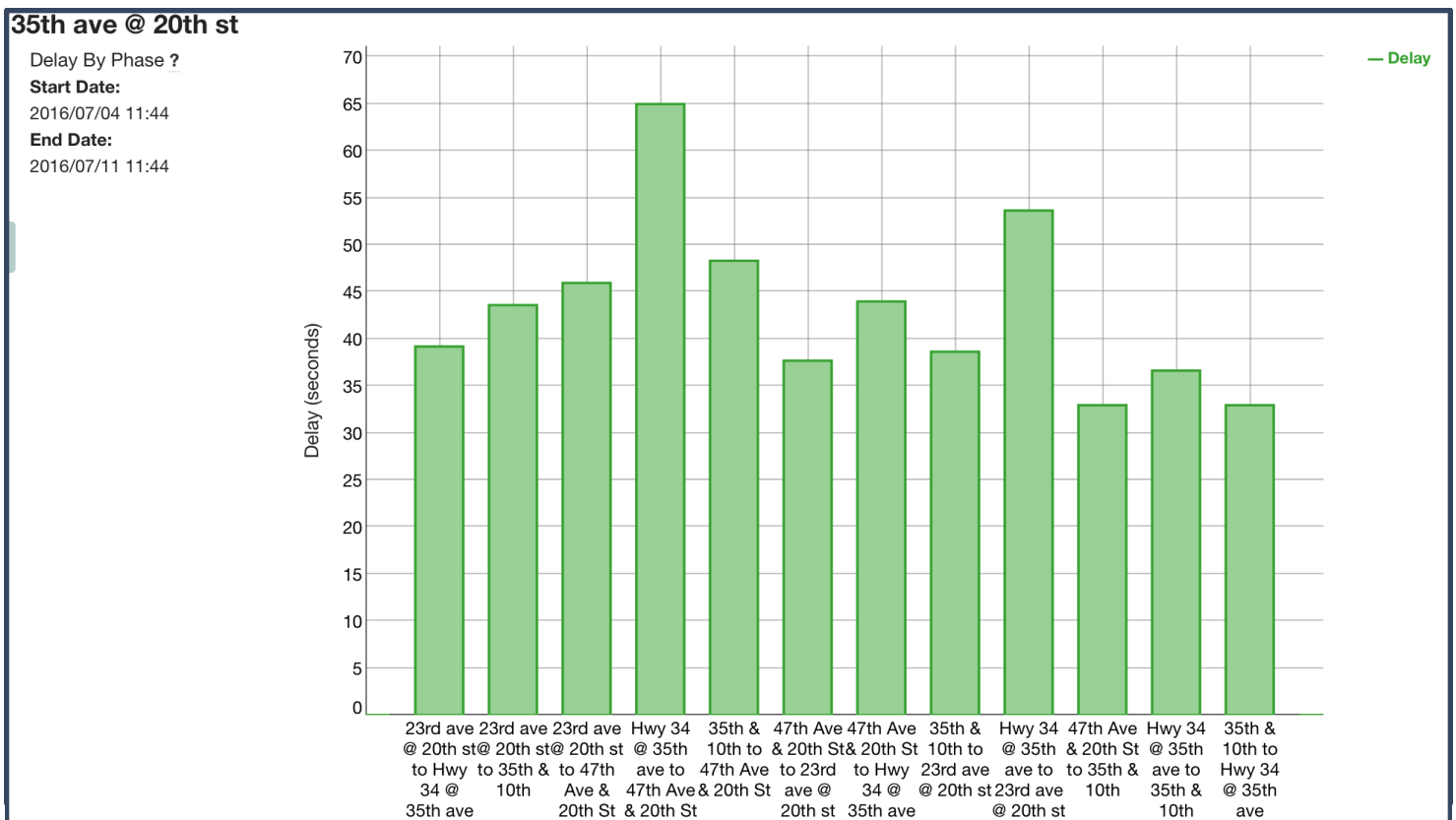


Figure 5: Delay By Phase Graph

Conclusion: Traffic Success

Greeley was able to accomplish their dual goals of feeding the adaptive system with the best information, and demonstrating the effectiveness of the new technology.

Acyclica's advanced travel time measurements were used to feed the adaptive system with the most up-to-date traffic data. This allowed the system to optimize signals to respond to the city's increasing congestion and reduce travel times. To prove the benefit of the adaptive system, Greeley used Acyclica's other tools like Progression Diagrams, Weekly Analysis, Day of Week Analysis, and Delay By Phase. Using these analytics, Greeley was able to show a 10-20% decrease in travel times along the route. All this was accomplished for the cost of a single floating car study.

Today, Greeley uses their system to monitor changes and prepare for the effects of further population growth. Acyclica's sensors collect information from Greeley's corridors 24 hours a day, 365 days a year. Armed with the best data, Greeley is ready to face the challenges of the future.