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Analysis and Recommendations to Improve Traffic Safety & Flow for Pedestrians Bicyclists and Motorists Along Franklin Street

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**ANALYSIS AND RECOMMENDATIONS TO IMPROVE
TRAFFIC SAFETY & FLOW FOR PEDESTRIANS
BICYCLISTS AND MOTORISTS ALONG
FRANKLIN STREET**

By

Matthew Pelletier

B.S. University of Maine 2014

A THESIS

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

(in Civil Engineering)

The Graduate School

The University of Maine

August 2016

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An Abstract of the Thesis Presented
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Franklin Street is a minor arterial servicing Portland, Maine that connects Commercial Street and Route 1 to I-295 and has been a target for redevelopment for some time. Franklin is the epitome of traffic congestion, and has unsafe conditions for pedestrians, bicyclists and motorists alike. Portland is the biggest city in Maine and is an important hub for employment, housing and tourism throughout the year. As the city grows, there is a greater demand to build more sustainable, multi-use streets to service all modes of transportation that supports business development, open space and growth. This new vision is being applied to all sectors of the city from pedestrian and bicycle considerations, to neighborhoods, housing, the waterfront and beyond. The key issue is how do you apply these concepts to improve pedestrian, bicycle and traffic safety and flow along Franklin Street in Portland, Maine.

The main goal of this research is to see if previous reports and analysis, done by outside consultants and city planners, fit the city's vision and effectively improve the corridor. One of the concerns being that the city may be focusing too much on the idea and not on how to implement the ideas in a practical way. Namely, will the designs and suggestions properly reduce traffic congestion while improving pedestrian and bicycle safety? The approach used in this thesis is to look at this problem by understanding the history and current conditions, what sectors of Portland affect Franklin Street the most and how they tie into the vision, analyzing future traffic models and data at a worst case scenario and making suggestions to improve pedestrian and bicycle safety based on that scenario.

Based on the research and analysis, the city does a good job of making suggestions to improve Franklin Street to coincide with their vision. However, it seems that the City planners have been more focused on the idea of creating a multi-use, sustainable corridor rather than making sure they effectively mitigate conditions for future traffic growth of all road-user categories. Their suggestions could help improve traffic now as well as support business growth, open space and safety improvements, but what will it do for the future? Would we be back to similar conditions with congestion and safety issues as we see today? This thesis looks to help answer these questions and make suggestions to properly improve Franklin Street. I propose and recommend improvements based on three geometric layouts for Franklin Street combined with analysis from this thesis to provide the best solution.

DEDICATION

To Douglas Small
A respected Engineer and loving Grandfather
you will be missed

ACKNOWLEDGMENTS

I would like to thank my thesis advisor Dr. Per Garder, who has been there every step of the way since the first time I stepped foot in CIE 225. His knowledge and expertise in transportation engineering has helped me a great deal in my studies, thesis and professional engineering career. I would also like to thank Dr. Roberto Lopez-Anido and Jeff Aceto for serving on my defense committee.

Finally I would like to thank my professors who helped me graduate and continued to support me throughout this process, my family who encouraged and pushed me to continue when times were tough, and my friends and classmates who provided the comic relief and breaks when they were needed.

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CHAPTER 1

INTRODUCTION

1.1. Problem Statement

Franklin Street is an arterial that serves as a major connection from I-295 to Commercial Street, the Maine State Pier and Collector Streets such as Congress and Cumberland Street that service one of Portland's largest neighborhoods to downtown. When the street was first built in the late 1960's, its primary purpose was to move traffic as quickly as possible but as the city grew and developed around Franklin, the city's focus shifted from moving traffic to building a sustainable city that accommodates all modes of transportation including pedestrians, and promotes businesses. But the layout of Franklin Street has still not been substantially upgraded since the 1960s and the street now serves as a poster child for congestion in the city, wasted space, and untapped opportunity. With over 10 years' worth of studies and proposals, a solution has yet to be found.

The problem is how do you change Franklin Street to coincide with the new vision of Portland, Maine, to provide a more sustainable and livable, pedestrian, bicycle, and business friendly corridor, while still addressing traffic congestion? As always, there are several "solutions" to the issues of congestion and safety, but most or all of the solutions address only some of the issues. It will be up to city officials and residents, and the people of Maine since Portland

serves all of the state, to decide which are the most important issues to address.

1.2. Objective

The objective of this research is to analyze Franklin Street and provide suggestions to improve traffic flow and safety for pedestrians, bicyclists and motorists. However, before providing suggestions for improvements, it's important to understand current and future project developments so that Franklin Street grows with the city instead of against it. Some things to consider:

- The surrounding neighborhoods.
- The development of the Waterfront and Maine State Pier.
- Pedestrian walkways, growth and improvements to the Bayside Trail network.
- Existing bicycle facilities and expansions and other improvements.
- Sustainability improvements throughout the city.
- Environmental impacts such as carbon emissions and sea level rise.
- Peninsula and other traffic studies that can provide conservative models for future congestion.
- Technological advancements and future potential

With all these policies, plans, and ideas considered, it is important to understand what's wrong with Franklin Street in order to properly implement them. The City of Portland has taken steps over the past ten years to study the Franklin corridor and surrounding areas to determine what is wrong with the area and how to fix it. Thus, the main objective of this research is not to do a completely new study, but rather analyze the potential solutions provided by the city and provide data and analysis agreeing, disagreeing or expanding upon their findings. This is important to keep in mind while reading this thesis.

There are no technical design plans presented in this thesis, but rather conceptual ideas and traffic models to help with understanding present and future conditions of the area based on proposed design changes. However, these models are not the most accurate representations of future conditions as the traffic data is based on projections, not fact. Also, some of the conditions can not be modeled because there is not enough data to accurately represent the change in design. Therefore, the results of running the models, presented in this thesis, should be used to give the reader an idea of what the conditions could be like using a conservative estimate on future traffic growth, but they are probably not completely accurate representations.

The focus will be how to improve and all modes of transportation equally but centered around pedestrians and bicyclists. The reason for this is based on the city's desire to move towards a more harmonized city, where pedestrians, bicyclists, and vehicles move together in a safe and cohesive manner. However, I believe, that to truly improve pedestrian and bicyclist conditions, the traffic

along Franklin Street needs to be addressed first and that is considered a focal point in this thesis. By providing suggestions to improve traffic, it in turn provides ideas for how to improve pedestrian and bicycle conditions which will support a more harmonized Franklin corridor.

1.3. Organization of Report

There are five chapters in this thesis described below.

Chapter One is the introduction to the thesis, which describes the problem, objective and organization of the report.

Chapter Two contains background information, which describes the location, information about the areas land use, demographics and physical condition. There is also information regarding other studies, analysis, what is wrong with Franklin Street and three initial concepts.

Chapter Three contains an analysis on existing pedestrian, bicycle and traffic conditions as well as information on level of service and delay supported by Synchro models.

Chapter Four contains future growth and design models representing different scenarios supported by Synchro models. This chapter focuses mostly on one section of the street that is considered a priority. There is also a brief look at other considered designs and solutions.

Chapter Five contains the conclusion, recommendations and considerations regarding the entire corridor.

There are also two appendices at the end of the thesis. Appendix A provides the Synchro analysis for the highlighted designs in this report. Appendix B provides the AADT (Average Annual Daily Traffic) volumes for Franklin Street and its connecting streets.

CHAPTER 2

BACKGROUND

2.1. Location

Franklin Street is a minor arterial located in Portland, Maine connecting I-295 and Commercial Street with a speed limit of 35 MPH. There are many major collector streets that connect to Franklin, including Cumberland and Congress, which direct the majority of the cities public transportation and connects surrounding neighborhoods and downtown. Franklin Street also connects to the Maine State Pier and is in direct proximity to the Back Cove



Figure 2.1. Location of Franklin Street (Portland Maine city map - Portland maine • mappery, 2009)

trail network which connects Baxter Boulevard, Bayside, and the Eastern Promenade. Figure 2.1 shows the City of Portland, and circled in red is the Location of Franklin Street (North is up). Figure 2.2 shows a Google Earth image of Franklin Street with some names of locations surrounding it.

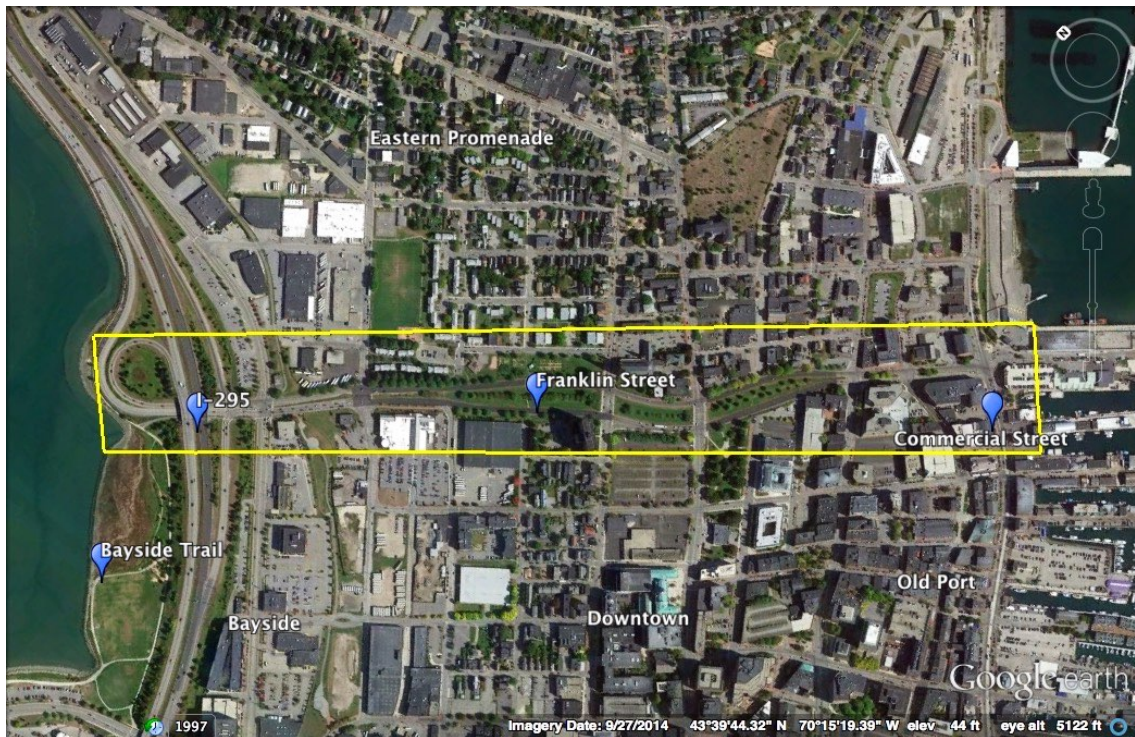


Figure 2.2. Google Earth image of Franklin Street (Google Earth)

Overall there are eight major intersections along Franklin Street: I-295 southbound and northbound off (southbound and northbound on are free flowing), Marginal Way, Somerset/Fox Street, Cumberland Street, Congress Street, Middle Street, Fore Street, and Commercial Street. There is also a one-way, right turn only Street in-between Somerset Street and Cumberland Street that can only be accessed by eastbound traffic. Figure 2.3 shows the locations of each intersection in Google Earth.

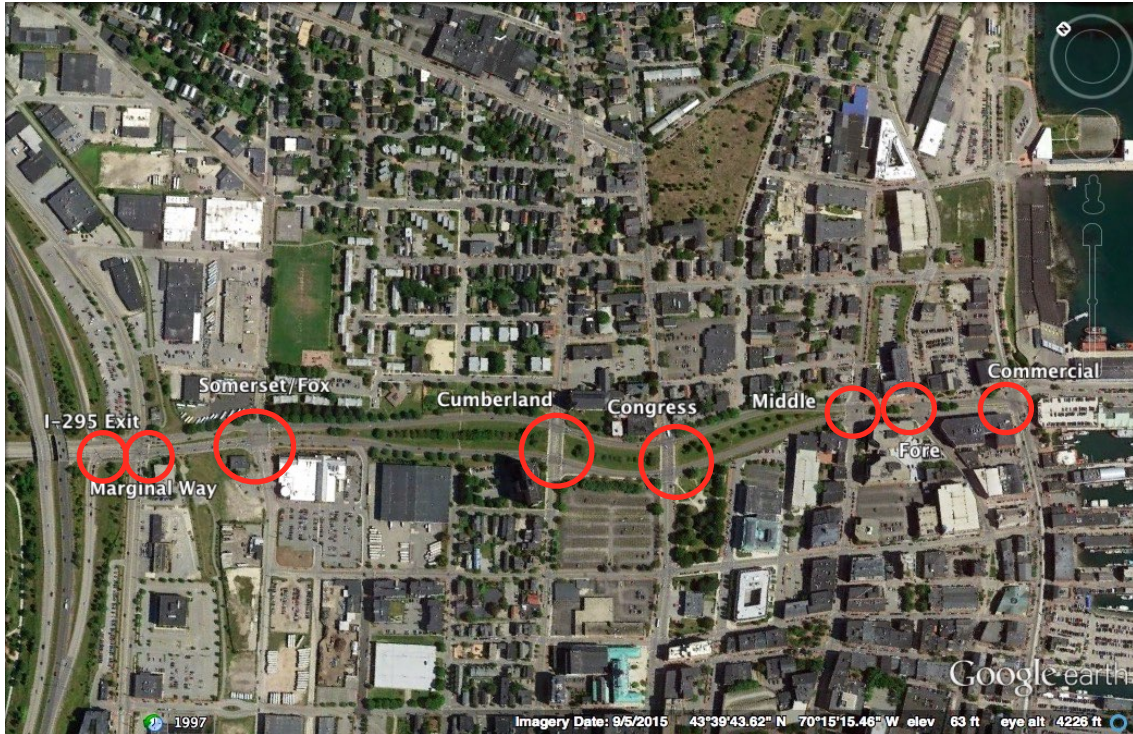


Figure 2.3. Location of each Intersection on Franklin Street (Google Earth)

2.1.1. Layout & Streetscape

This section gives a more detailed look at the streets connecting to Franklin Street. Figure 2.4 shows the busiest intersections of the Corridor, I-295 NB off, SB off and NB on, Marginal Way and Somerset Street (transitions to Fox Street north of Franklin) in Google Earth. Franklin is a four lane street with separate left hand turn lanes for westbound onto Marginal Way and eastbound onto Somerset Street. Eastbound traffic, coming from I-295, is four lanes on its own to accommodate traffic volumes coming off the highway. Marginal Way is a busy street as it connects to Forest Avenue going Southbound, lined with many businesses and a large student apartment complex. Going northbound on Marginal Way there is a park-and-ride and a street connection to Washington



Figure 2.4. View of intersections I-295, Marginal Way and Somerset Street (Google Earth)

Avenue, which connects to the East End neighborhoods, other collector streets, and the Highway. Somerset is not as busy but connects to the Whole Foods grocery store with a large area reserved for future development southbound, and northbound connects to the East Bayside neighborhoods and Washington Avenue.

Figure 2.5 shows Cumberland and Congress Street with a large median separating Franklin westbound and eastbound in Google Earth. Both of these Streets link the Eastern Promenade neighborhoods with downtown Portland and carry most of the public transportation. Important buildings and points of interest include a church to the north, a retirement apartment building in the



Figure 2.5. View of Intersections Cumberland Street and Congress Street (Google Earth)

southwest corner, a large parking lot that services a concert hall and other major events and Lincoln park in the south east corner.

Figure 2.6 shows the three easternmost streets intersecting with Franklin Street, Middle, Fore and Commercial Street in Google Earth. Middle Street connects to the lower half of downtown, Fore Street connects to the Old Port and a larger parking garage and Commercial Street connects to many businesses, the Old Port and the Main State Pier, which also has a large parking garage. This section of the Franklin Corridor is also subject to a higher volume of pedestrian traffic from the Maine State Pier's cruise ships docking in the summer months and other tourists visiting the Old Port.

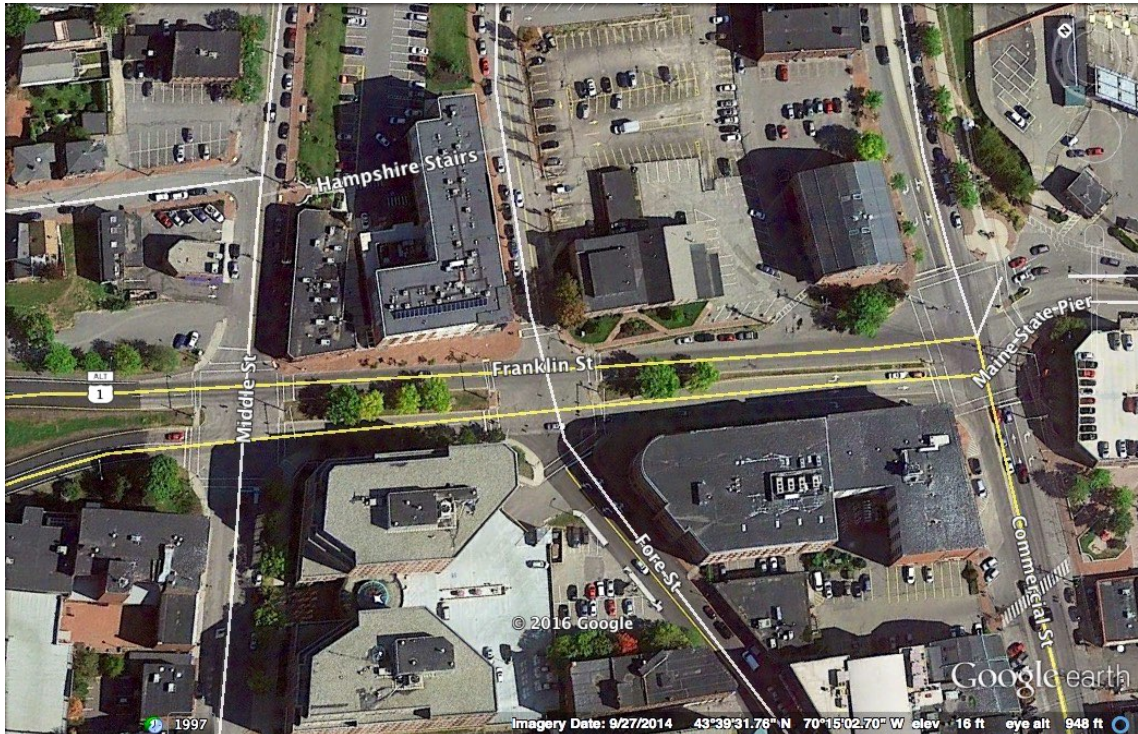


Figure 2.6. View of Intersections Middle, Fore, and Commercial Streets (Google Earth)

2.1.2. Physical Condition Overview

It's important to assess the physical condition of the corridor before recommending any significant changes. This will help decide if the street needs a complete overhaul or just surface treatment. Therefore this section will provide a brief overview of the conditions of Franklin Street relating to pavement, signage and markings.

Overall the corridor seems to be suffering from normal wear and tear with no major deficiencies. There are several areas where crosswalk paint is fading away, some areas with no ADA ramps, a few pot holes and cracked pavement along the Street. The worst conditions appear at Commercial Street where there are ruts in the northbound traffic lanes and inconsistent pedestrian



Figure 2.7. Cumberland Street Crosswalk



Figure 2.8. Congress Street Crosswalk



Figure 2.9. Middle Street Crosswalk

crossing signal technologies at the Middle and Fore Street intersections, some that don't even work properly. This is a concerning sign since that end of Franklin Street has the most pedestrian traffic. Figures 2.7, 2.8, and 2.9 highlight some of the issues along the corridor.

Recently, as of 2015, there has been some re-striping, paint and pavement touchups to improve crosswalk and lane visibility as well as to alleviate pot holes and minor rutting along the Street. However these are only temporary fixes as the greater concern is intersection design, flow of traffic and integration with other forms of transportation rather than physical condition. The next section will look at the local demographics.

2.1.3. Demographics

This section takes a look at the demographics around the area, which is important in determining who lives in the area and who the corridor serves the most. Based on the Franklin Street initial Conditions Report part 1, this is what the demographics around Franklin Street look like:

- Most of the population lives between Somerset and Congress Street north of Franklin and in between Fox and Middle Street.
- The housing density ranges from 1000 to 13000 housing units per square mile around Franklin Street, Portland's average population density is 3000 persons per square mile

- 70% of the population around Franklin Street lives in poverty, the city wide average is 14%. A large number of Households make less than \$10,000,
- Most people living around Franklin drive to work but there is also a considerable number of people who walk to work. This is shown in Figure 2.10.

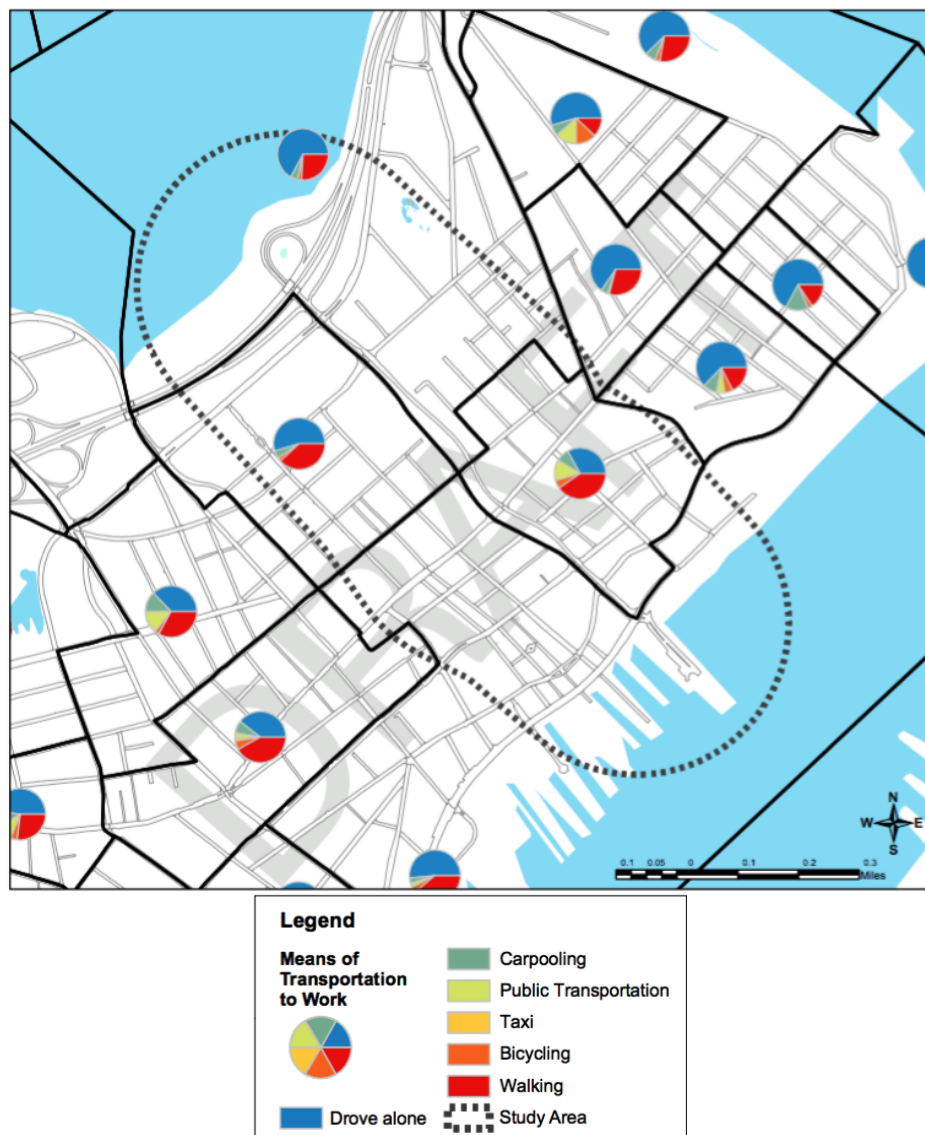


Figure 2.10. Means of Transportation to Work (Franklin Street feasibility study - phase II, 2013)

- Portions of the area are not well serviced by public transportation but remain an important mode for those living between Congress and Commercial Street.
- There is some bicycle usage throughout the area even with the lack of bicycle facilities.

While traveling by car dominates the area, there are still a considerable number of people who walk, bike or use public transportation to get to work. This indicates that there is already a strong demand for walking and biking facilities and better walking and bicycling facilities as well as an expanded public transit network would lead to a smaller percentage of people using their own automobile for commuting. An analysis of the demographics also shows that there is a need for commercial development to provide better paying jobs to help the people living in the area get out of poverty. These things are important to keep in mind when developing a more sustainable, multi-use corridor to accommodate all modes of transportation and all people who live in the area.

2.1.4.Land Use

This section gives a general overview of the land use around Franklin Street. This is important to understand where the commercial, residential, and industrial areas are located, how the neighborhoods are separated and what the potential is for future development. Figure 2.11 gives a breakdown of the different districts of Portland with a red circle indicating the location of



Figure 2.11. Districts of Portland Map (Future Conditions Report, 2014)

Franklin Street. As you can see it extends from I-295 all the way down to the waterfront and cuts off the East End from the rest of Portland.

As you can see from Figure 2.12, much of the residential area is located between Congress and Somerset/Fox Street with more commercial towards the waterfront and I-295. There is also a bit of industrial and Institution land use in between but the area is mostly dominated by residential and commercial development. What's noticeable is there isn't a whole lot of green space downtown and the median in between Franklin Street, while green space, is not useful space. Figure 2.12 shows the mixed use development and large median in the middle of Franklin Street. What's noticeable about Franklin Street is that it has a rather large travel-way footprint that if redesigned could

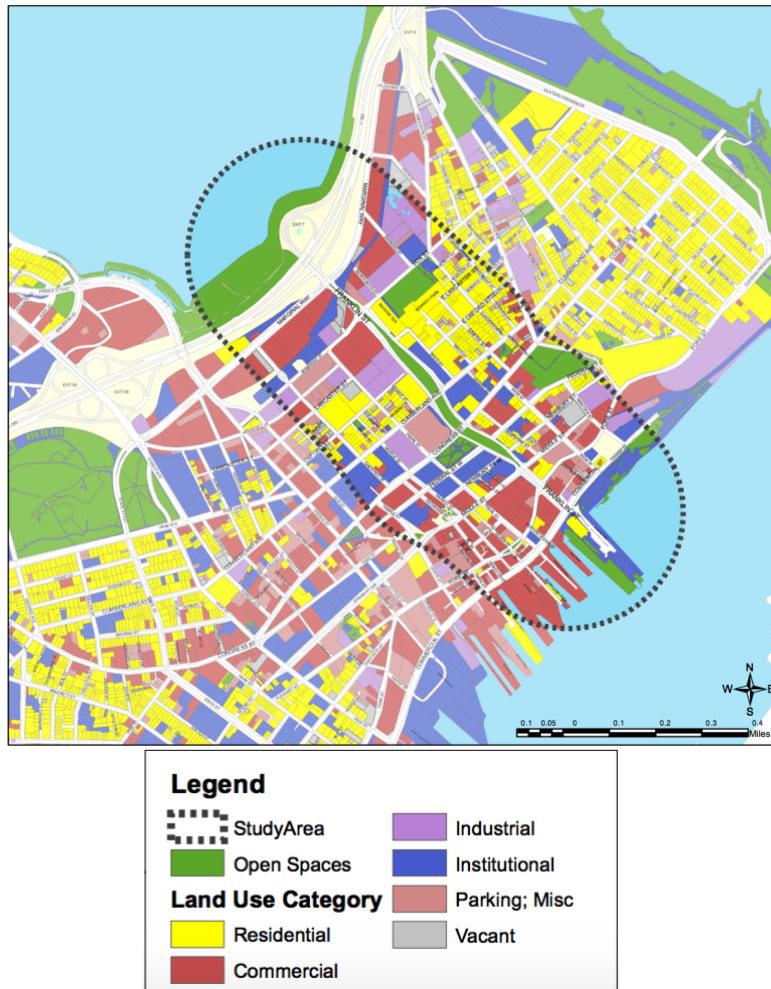


Figure 2.12. Land Use Development Map (Franklin Street feasibility study - phase II, 2013)

lead to the development of new businesses, more residential housing, possible redevelopment, and increase of useful green space for the public to enjoy.

2.2. What's Wrong with Franklin Street

Franklin Street is an arterial class road that was designed to move vehicles as quickly as possible from one side of Portland to the other. However, as the city grew around it, Franklin Street started developing problems with its design both technically and regarding safety. While many older roads have

technical issues and safety concerns, there are four key issues that lend to Franklin Street's major problems (What's Wrong with Franklin?, 2013):

- Traffic Flow & Street Classification
- Use of Space and Development
- Pedestrian Safety
- Bicycle Safety

Each of these points lend their own unique problem to the corridor and each will have to be addressed in order to “fix” Franklin Street for the future. The next six sections will address each point in more detail.

2.2.1. Traffic Flow & Street Classification

Traffic flow is a little easier to quantify than street classification, which seems like a less glaring problem than it actually is. However, in order to improve traffic flow, Franklin's Street classification must be fixed. Before we can go in more detail, it's important to gain a brief understanding of the Federal Highway Administration's Classification of Streets and how they are used for Roadway Design (FHWA, 2013).

2.2.1.1. Street Types, Definitions and Characteristics

There are four main types of urban streets as classified by the federal highway administration: Highways (interstate's, expressway's, freeway's, etc.), other arterials, collectors and local roads. Each of these Street classifications

can be broken down even further based on other qualify factors, which will be highlighted in this section

Highways are technically a subcategory of arterials at the highest level. They are built to handle the most traffic at high speeds to move traffic efficiently over longer distances. Highways offer higher levels of mobility while linking larger urban areas and have on and off ramps or very few intersections depending on the type of highway linking to other roadways.

Subcategories of highways; interstates, freeways, expressways, etc. are very similar to one another and vary depending on a region's definition but can be distinguished based on the presence of a physical barrier separating opposing lanes, and the type of access or exit points. Just like the main highway, these Street classifications are designed to maximize mobility and handle larger amounts of traffic.

Arterials can be separated into two subcategories, principle and minor arterials. Principal arterials are a step down from highways but can provide a high level of mobility to rural and urban areas and include intersections and driveway access. The main difference between a highway and an arterial however, is that there is generally more than one arterial serving an urban area to provide access to the surrounding community. Minor arterials provide connectivity to the principal arterials, are shorter in length and serve a smaller area. Figure 2.13 is Franklin Street, which is classified as a minor arterial.



Figure 2.13. Franklin Street Arterial Aerial View (Souza, 2016)

Collectors can be separated into two sub categories, major and minor. Collectors may be the most important road classifications in transportation but they are also difficult to distinguish between whether a road is a major collector or a minor one. Specifically they serve as the bridge between local roads and arterials to help transition from a slow, urban area with less traffic volume to much faster, high traffic volume road to connect to the surrounding area. The difference between major and minor collectors depends on the speed of the road, length, traffic volumes and number of travel lanes, etc. Essentially the determining factor is mobility vs. access and these factors should be taken in careful consideration before designating a road as either a major or minor collector.



Principal Arterial



Minor Arterial



Collector



Local Street

Figure 2.14. Types of Roadways (Cecchini, 2013)

Local roads make up the largest percentage of roadways in the United States and are designed to discourage through traffic. They are used mainly to access neighborhoods and communities as public roads and therefore should have access all year round. There is no specific criteria that determines whether a road is a local road or not, only that arterials and collectors are designated first and anything left is considered a local road. Figure 2.14 shows the visual differences between roads.

What is the connection between the classification of Franklin Street and traffic flow? First, this is one of the major problems plaguing the corridor, as it was designed to handle large amounts of traffic with a higher speed limit. According to the Maine DOT (MaineDOT, 2016), which is shown in Table B.1 in Appendix B, from their 2015 report the highest AADT (Average Annual Daily

Traffic) recorded in 2011 along Franklin Street is 13990 going westbound from the I-295 off ramps approaching Marginal Way. The lowest AADT was 2290 going eastbound from Commercial Street approaching Fore Street. The speed limit is 35 mph along the entire corridor. According to the Federal Highway Administration (FHWA,2013), an arterial can have anywhere from 7000 to 27000 AADT for a principal and 3000 to 14000 AADT for a minor. Technically, Franklin Street is classified as a minor arterial, but as you can see, these numbers suggest that Franklin Street could be considered either a principle or minor arterial as it is flirting with that line. Parts of Franklin Street could also be considered a collector road due to lower volumes, which creates more issues when trying to classify it.

It is clear that the volumes going westbound are significantly reduced from Marginal Way to Commercial Street, but what about the other volumes connecting to Franklin Street? There is a significant amount of traffic coming from the collector streets turning onto Franklin closer to I-295: Marginal Way, South of Franklin, has an AADT of 7300 and 7550 going to and from respectively, and Somerset has an AADT of 7110 going to and from (MaineDOT, 2016). The other major streets such as Cumberland, and Congress, which connect to downtown, and Middle and Fore Street have an AADT of around 5,000 (MaineDOT, 2016). The outlier is Commercial Street, which has an AADT of 10,130 south of Franklin Street (MaineDOT, 2016). This is due to Commercial Street being an extension of Route 1 which handles tourist traffic.

The significance of these volumes is that it shows where the issues reside along the corridor in terms of traffic congestion. There is significant congestion at the I-295 on and off ramps, Marginal Way, and Somerset, less congestion westbound going from Cumberland Street to Fore Street but a significant increase at Commercial Street. Of course, there are other factors to consider, the important thing to take away from this is that if Portland wants to create a more urbanized area that reduces traffic, Franklin Street needs to be better classified as a road that can handle an appropriate amount of traffic. In addition speeds need to be reduced to make Franklin Street a more pedestrian, bicycle and commercial development friendly corridor.

2.2.2. Pedestrian Safety

pedestrian safety is another major factor to consider when revitalizing Franklin Street. Creating viable crossings, updating equipment, creating proper signage, having clear line of sight, and incorporating ADA compliance are all important factors for improving pedestrian safety along Franklin Street. After performing a walkthrough and a small signal crossing study, which will be discussed later in the thesis, here are some of the main points with regards to safety:

- Paint conditions for crossings are wearing out and needed to be repainted, although some intersections were better than others.
- Signals and/or signs are well placed, and for the most part, worked well throughout Franklin Street but there was an inconsistent use of



Figure 2.15. Handicap Person Crossing Franklin Street



Figure 2.16. Between Somerset & Cumberland Unmarked Path



Figure 2.17. Between Middle and Congress Middle Unmarked Path

technology from one end to the other.

- Signal timing is mostly fine throughout the corridor except a malfunction by the I-295 exit and Commercial Street where signal times were inadequate.
- While signal timing was fine for the average person and most intersections are ADA compliant, they are not fine for the disabled or elderly as you can see from Figure 2.15.
- There are specific crossing areas that pedestrians tended to favor even though they weren't actual crossings. In order to improve this, these areas either have to be made safer or the new design has to do a better job of directing pedestrians to the right areas. These crossings are highlighted in Figures 2.16 and 2.17.

Slower Speeds Safer for Pedestrians

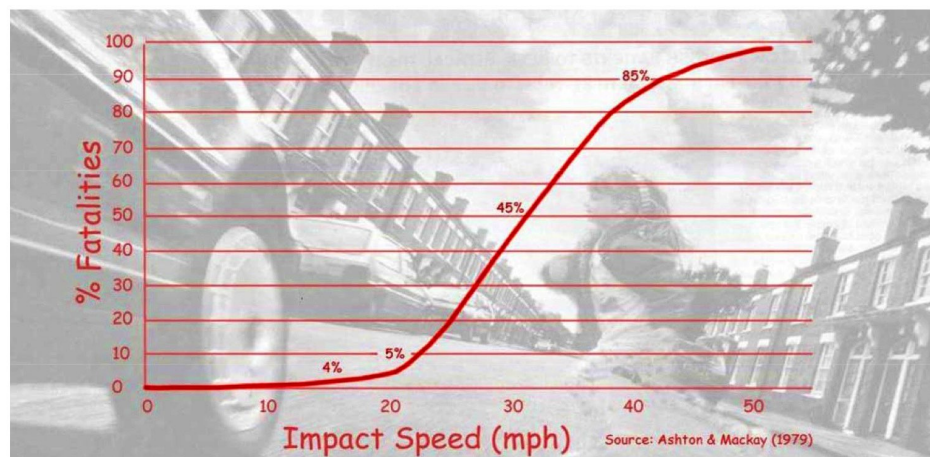


Figure 2.18. Percent Fatalities vs. Impact Speed (Franklin Street Redesign: Phase 2 Feasibility Study, 2013)

Overall, one way to help increase pedestrian safety is to decrease the speed limit of the road. As you can see from Figure 2.18, the slower the speeds the less risk for a pedestrian fatality. In a collision at an actual speed coinciding with the current posted speed of 35 mph, there is a 65% risk for a fatality as compared to a 20% chance at 25 mph (Franklin Street Redesign: Phase 2 Feasibility Study, 2013).

2.2.3. Bicycle Safety

Bicycle safety goes hand in hand with pedestrian safety and needs to be addressed in order to revitalize Franklin Street. The difference is that bicycles flow with traffic either in the same lane or in a separate bike lane. Franklin



Figure 2.19. Bicycle Lane

Street makes very few accommodations for bicyclists and where there are accommodations, the conditions are unsafe and need to be addressed. Figure 2.19 shows a bicycle lane in between two vehicle lanes.

While Phase 2 of a Franklin Street feasibility study and peninsula study found that bicycle traffic was minimal (Franklin Street feasibility study -phase II, 2013), steps can and should be taken to improve safety. Figure 20 shows that there is neither a bicycle lane or shoulder for a bicyclists to travel safely along the road. The goal for the new Franklin corridor would be to create a safe environment for bicyclists to travel with separated bike lanes, and proper crossings when approaching an intersection.



Figure 2.20. Westbound Shoulder

2.2.4. Use of Space

One of the most identifiable characteristics of Franklin Street is that it splits after Somerset Street into separate east and west bound lanes with a wide green space median until Middle Street, about 2,500 feet of roadway. This median is an obvious problem with Franklin Street even though it would seem that more green space is good, in reality it's mostly wasted space that hinders growth and commercial development. The start of the median from Somerset Street is shown in Figure 2.21.

Not only is wasted space is an issue with Franklin Street, it also creates a barrier between downtown and the neighborhoods of the Eastern Promenade.



Figure 2.21. Green Space Median

This concept not only ties into how much space the street takes up but also the traffic volume and the road classification. Since crossing is unsafe for pedestrians because it cuts off walking routes, more and more people choose other means to get to where they're going downtown rather than walking. In order to revitalize Franklin Street, it can no longer act as a barrier to downtown and the surrounding neighborhoods; instead, it needs to seamlessly meld them together through an urbanized, complete street corridor.

In conclusion, in order to improve Franklin Street, several steps need to be taken:

- The street needs to be reclassified and traffic flow improved which can be done with redesigned intersections, and lower top speeds.

Figure 2.22 shows the speed-flow relationship graph.

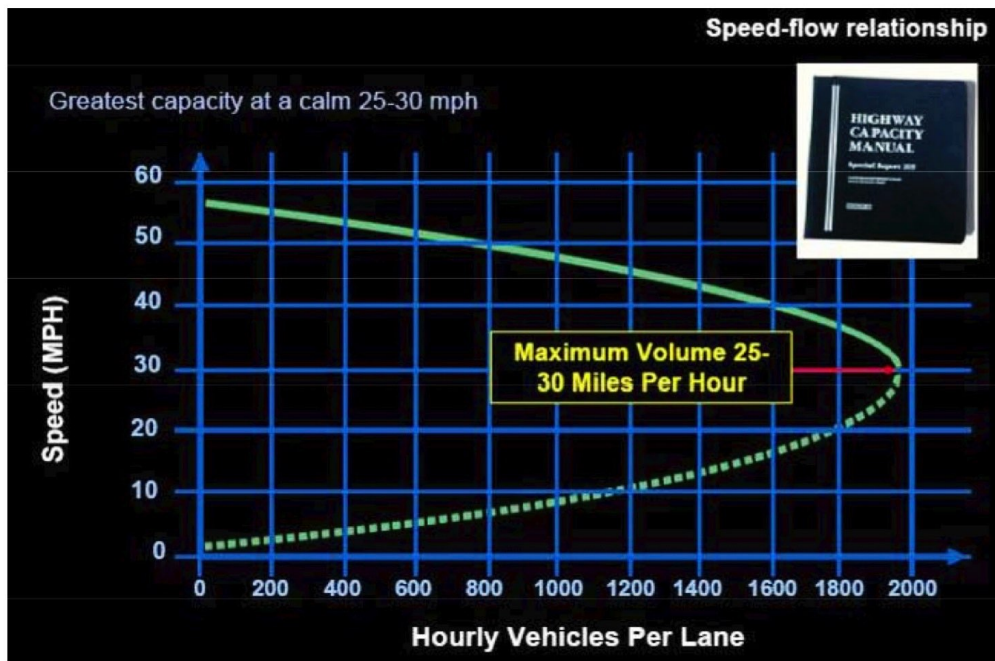


Figure 2.22. Speed-Flow Relationship (Franklin Street Redesign: Phase 2 Feasibility Study, 2013)

- Land has to be used more efficiently which can be done by realigning Franklin Street and creating usable green space and new development areas.
- Pedestrians have to be safe, which can be done through investment in better pedestrian facilities and infrastructure.
- Bicyclists have to be safer which can be done through designated bike lanes and investment in better bicycle facilities and infrastructure.
- The environment is also a concern, but with improved traffic flow and a more multi-use, mix transport, urbanized corridor, concerns such as CO2 emissions will be less of a problem.

2.3. Franklin Reclamation Authority

The Franklin Reclamation Authority (Franklin Street Redesign: Phase 2 Feasibility Study, 2013) is a citizen based action group that took on the role of transportation planning and land use development in Portland. The goal of this group is to transform and revitalize the Portland Peninsula to create a more welcoming environment for all modes of transportation, maximize economic growth and develop a balanced mixed-use urbanized area that enhances safety, viability and sustainability. Their vision includes (Vision Statement, 2013):

- Creating a multi-way boulevard with lower speeds that connects the waterfront to the Back Cove with balanced, mixed-use transportation.

- Creating a positive gateway experience with a focus on pedestrian facilities, and reconnecting streets to eliminate the “barrier” between downtown and historic neighborhoods.
- Maximizing use of space, developing and connecting trails and parks to create a more vibrant, environmentally friendly corridor.

This thesis focuses on the work done by the FRA to make suggestions to improve pedestrian, bicycle and traffic safety and flow. Some of the topics that will be discussed in this section include the history of Franklin Street and how it developed into its present day form, a Peninsula Traffic study addressed by the FRA but not presented by them that has since been rejected by the City of Portland, and three conceptual ideas to improve the corridor. The conceptual plans have since been modified by the City but were used as inspiration for this thesis to come up with improvements for a more sustainable corridor.

2.3.1. History of Franklin Street

In order to plan for the future it’s important to understand how Franklin Street evolved into its present day form and to give a better idea of existing conditions. This will give better context to how Franklin Street changed the way Portland was designed and the things that were taken away in order to make it happen. Figure 2.23 shows the then and now picture from when Franklin Street was first built.

Franklin Street began as Essex Street in the early 18th century and by 1850 had aligned and connected to the newly created Commercial Street and

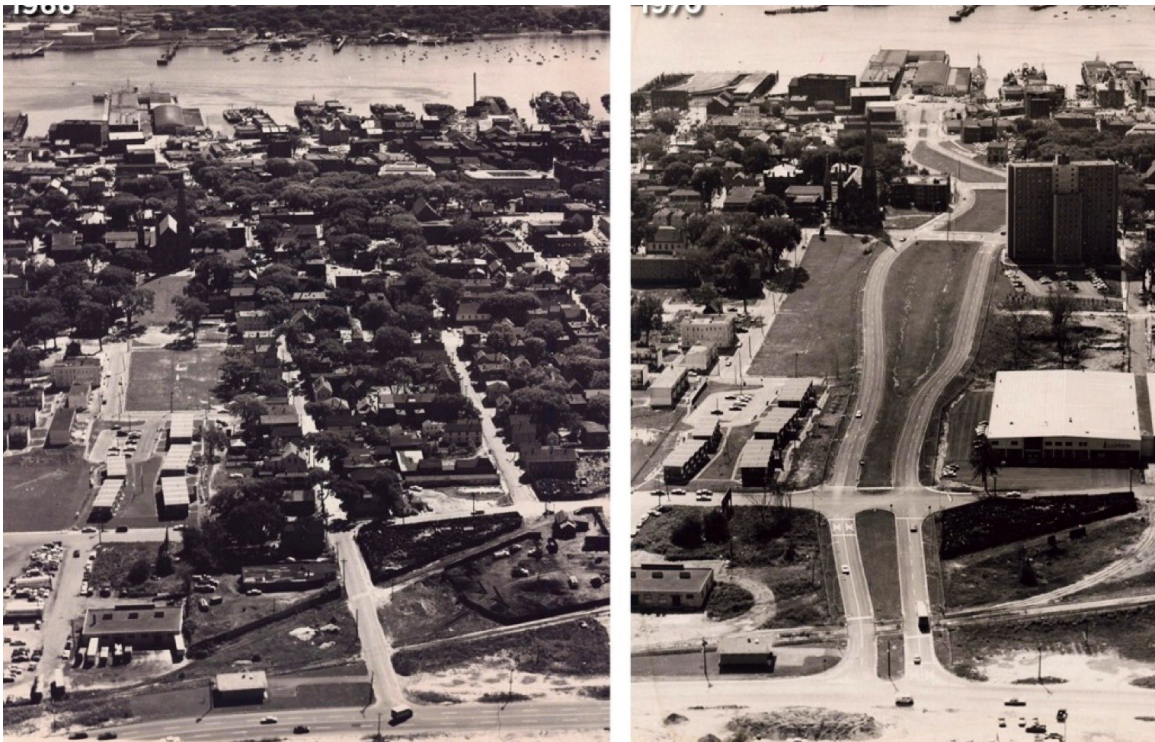


Figure 2.23. Franklin Street in 1960 (left) and then 1970 (right). (Portland Press Herald, 2009)

the wharf on the south eastern end and connected to the Back Cove on the North Western end. At that time, Back Cove neighborhood had not filled its shores and only extended to about where Oxford Street is today. Franklin at the time was filled with historic, mixed-use development that included small businesses and single family housing with connector streets such as Oxford and Lancaster Streets that served as important east-west connections through the city. By 1866, most of the city was destroyed due to the Great Portland fire but boomed back into economic growth in the late 18th century and early 19th century as a thriving seaport. That quickly ended by the 1950's when the city spun into economic decline and beautiful single family homes were retrofitted with "Maintenance Free" siding and converted into apartment buildings to

house the growing number of Italian, Jewish, Lithuanian and Armenian immigrants. By doing so, this increased the population density and traffic congestion around Franklin Street and the presence of slums around the area provided consistent headlines. (Franklin Street feasibility study - phase II, 2013)

Portland needed a strategy to relieve traffic congestion and eliminate the slums and that's essentially how the modern day Franklin Street was born. Between 1954 and 1956, Portland began its redevelopment initiative by clearing out slums in order to accommodate the new roadway. During that time, the buildings of Vine, Deer and Chatham Streets, which were deemed substandard were razed (excluding the Hub Street furniture building on Fore Street), and the mixed use area around Lancaster, Pearl, Somerset and Franklin Street was razed (History of Franklin Street, 2013). The demolition of these historic neighborhoods led to new housing projects such as the Bayside Park Urban Renewal Project to help accommodate the displaced families. The bulk of the slum clearance around Franklin Street happened in 1967 where 100 additional structures were destroyed and an unknown number of families were relocated. Only three buildings remain; the W.L. Blake complex between Fore and Commercial, Hugo's restaurant building at the corner of Franklin in Middle, and a brick apartment house near the cathedral by Commercial Street. Lincoln Park also remained but was partially destroyed to make way for the roadway. Figure 2.24 and 2.25 show Hugo's restaurant and W.L Blake that still stand today. (Franklin Street feasibility study - phase II, 2013)



Figure 2.24. Hugo's Restaurant (romaneladiaz, 2013)



Figure 2.25. W.L. Blake & Company Building (Commercial Street, 2015)

Before the Arterial was completed in the 1970's, Portland began the early development phase by hiring Victor Gruen Associates in 1965 to plan for

the increased demand for automobiles. As a historic port that was built around railroads and a harbor, the influx of automobiles and new interstate system was both a challenge and an economic revival for the City of Portland. On one hand it represented economic growth, as the connection between the interstate and the port along an appropriate roadway would allow more money into the city. On the other hand it would destroy many neighborhoods and uproot many families as indicated by the early slum clearance in the 1950's. Ultimately, Victor Gruen Associates devised a Pattern for Progress Plan (History of Franklin Street, 2013) that envisioned a neighborhood renewal for the entire Peninsula and sought to create a ring road system around the city center. Unfortunately only a small portion of the plan was enacted and Franklin Street was ultimately chosen to move automobiles from the interstate to downtown. This led to a major urban revitalization from 1967 to 1970 that saw adverse affects on the circulation of the city as a whole, and divided Munjoy hill, and East Bayside from downtown and cut off many side street, which is still a major problem today (Franklin Street feasibility study - phase II, 2013). The Franklin Reclamation Authority looks to rewrite the mistakes made in the late 1960's and reconnect the city to become a better urban center to accommodate all forms of transportation and development.

2.3.2. Peninsula Traffic Study

The Portland Peninsula Traffic Study was presented to the city in 2006 by Gorrill Palmer as highlighted on the Franklin Reclamation Authority website, predicted that the traffic congestion would grow significantly by 2025 ◦

(“The Peninsula Traffic Study: Widening Franklin,” 2009). Now it’s important to note that the study was not produced by the FRA; it was however addressed by them. The study was rejected by the City of Portland citing that it predicted “an unrealistic number of vehicles” and didn’t address any of the neighborhood concerns, only a worse case scenario traffic congestion using questionable assumptions. However, it’s still an important resource when predicting the increase in traffic as well as to show other concepts and ideas that could fix traffic congestion but not fix the other underlying problems with the corridor. The biggest takeaway would be that just fixing traffic isn’t the answer. A complete revitalization is needed to address sustainability, transportation and urban growth and development.

2.3.3.Three Concepts

Figures 2.26, 2.27 and 2.28 show three potential concepts for the new Franklin Street and were used as a basis for analysis to design a better corridor to handle future traffic, provide a safe area for pedestrians and bicyclists, and become the new vision of Portland. Provided are the three designs with highlights of each design with emphasis on the roadway/intersections, pedestrian and bicycle accommodations and development.

Figure 2.26 is an Urban Street design that supports mixed use land development, two travel lanes in each direction between Marginal Way and Congress Street and one lane of traffic between Congress and Commercial Streets. Streets are reconnected and added to help divert traffic from Franklin

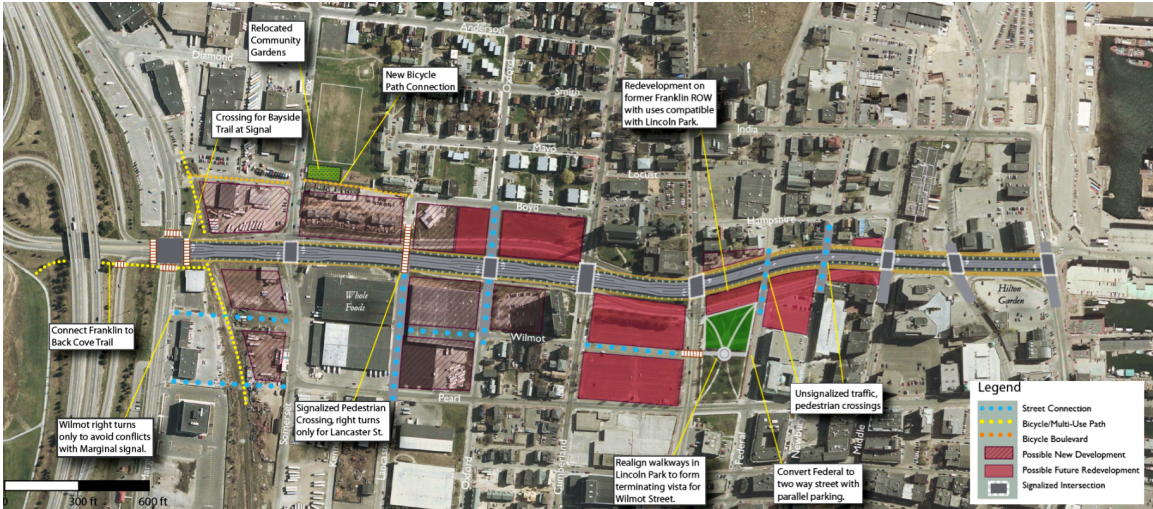


Figure 2.26. Urban Street Design (Franklin Street Arterial Study Committee, 2009)

Street and a new intersection is added between Cumberland and Somerset Street to support a slower speed corridor. There is an increased network of pedestrian paths and bicycle lanes that run along the length of the corridor and along a new bicycle corridor running parallel to Franklin. There are also pedestrian crossings, signalized and un-signalized along the corridor, crosswalks, parallel parking, and the potential for curbside bus stops if transit service is introduced. The Urban Street design has the smallest foot print for vehicle right of way, which puts more emphasis on the other modes of transportation and increases development opportunities. (Franklin Street Arterial Study Committee, 2009)

Figure 2.27 is an Urban Parkway design that emphasizes green space and parks with redevelopment opportunities all along the corridor. Like the Urban Street, there are two travel lanes in each direction between Marginal Way and Congress Street with one travel lanes in each direction between Congress and

Commercial. There is also a new signal in between Cumberland and Somerset and new connecting streets but not as many as with the Urban Street design.

There is also a new roundabout intersection at Marginal Way (two lane) and

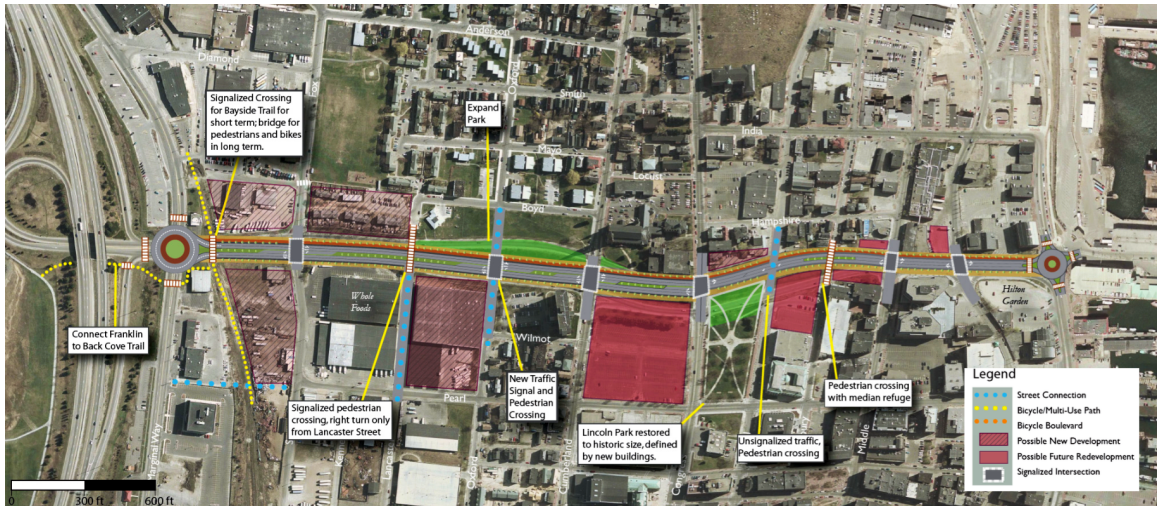


Figure 2.27. Urban Parkway Design (Franklin Street Arterial Study Committee, 2009)

Commercial Street (one lane). There is an increased network of pedestrian and bicycle paths and crossings. Parallel parking is limited around future development sites but a median provides the opportunity for light rail or a designated transit lane. (Franklin Street Arterial Study Committee, 2009)

This last design, shown in Figure 2.28, is a Multiway Boulevard that provides a high quality of service for all modes of transportation and supports development all along the corridor. Like the two previous designs, there are two travel lanes in each direction between Marginal Way and Congress Street and one travel lane in each direction between Congress and Commercial. There is a new signalized intersection between Cumberland and Somerset, newly connected Streets to provide better access, and on street parking. There is an

increased network of pedestrian and bicycle paths along the corridor, signaled and un-signalized intersections, and green space. Although there is less green space than the Urban Parkway and fewer connector streets than the Urban Street, this design seems to try to combine the best of the two designs with more pedestrian crossings. (Franklin Street Arterial Study Committee, 2009)

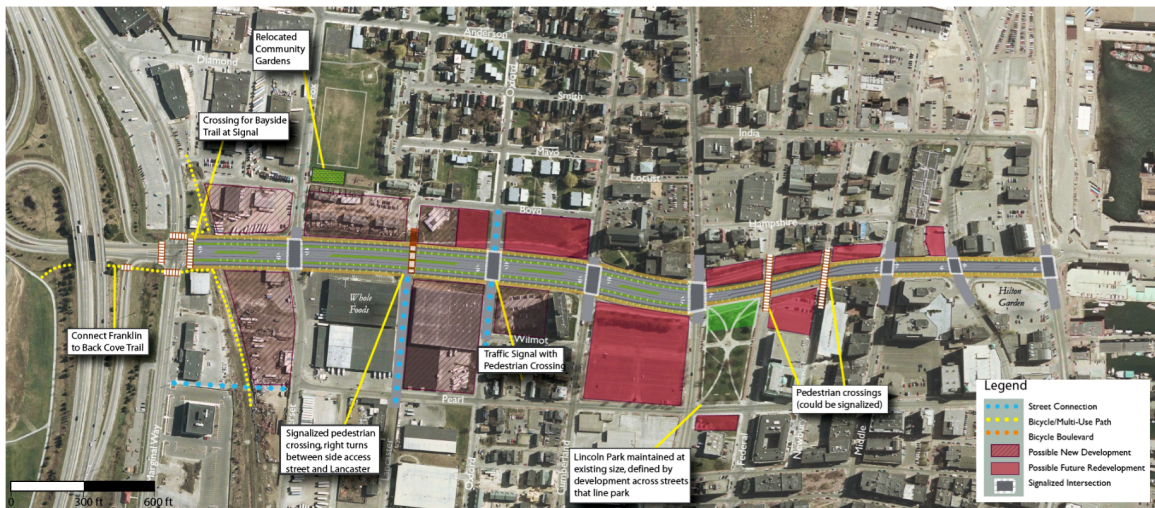


Figure 2.28. Multiway Boulevard Design (Franklin Street Arterial Study Committee, 2009)

In general, these three designs were developed for lower speeds with an emphasis on addressing all modes of transportation equally and supporting mixed use development and an increased travel network to help disperse congestion and make it safer for everyone. While each design provides a little something different whether its an increase in green space, development areas or pedestrian crossings, it will be up to the city and the public to determine which best fits their vision. Ideas from these concepts were used in the design portion of this thesis to help determine the best course of action based on my own engineering knowledge and analysis. The next section gives a brief

overview of Portland 2005 Comprehensive Plan and updates made in their 2015 revision

2.3.4. Portland's Comprehensive Plan Highlights

This section provides an overview of sections in Portland's comprehensive plan that best relate to the Franklin Street redesign. The focus is to gain a brief understanding of what other sectors of the city (waterfront, housing, sustainability, etc.) tie into Portland's vision and how Franklin Street can best fit into that vision.

According to the Franklin Reclamation Authority, there are five planning documents implemented by the City of Portland that relate to Franklin Street through the Comprehensive Plan ("Comprehensive Planning and Franklin Street," 2009):

- Portland's Transportation Plan
- A New Vision for Bayside
- The Waterfront Master Plan
- The Peninsula Traffic Study (as discussed previously)
- The Peninsula Transit Study

Portland's Transportation plan, which was implemented back in 1993, focused on exactly what we are talking about today - Improving multi-use connected streets, transit, biking, walking, land use, etc. Most have been implemented today but more needs to be done now that Portland has expanded

and grown. As expected, the plan highlighted Franklin Street as a major divider between transportation districts. Both downtown and the East End support mixed use transportation and pedestrians but are divided by Franklin Street, which is designed as a vehicle mover. (“Comprehensive Planning and Franklin Street,” 2009)

The New Vision for Bayside, as shown in Figure 2.29, looked to develop into an urbanized, open space and recreation based district, with plenty of



Figure 2.29. New Vision for Bayside Cover (“Comprehensive Planning and Franklin Street,” 2009)

development and economic opportunity. The Bayside trail network is also a key part of this plan and works fairly well with one exception: Franklin Street.

Overall, the plan calls for 950k square feet of office space, 230k square feet of retail space, a 3000 space parking garage, and 940 housing units, totaling 230k, 75k, 1100, and 200 respectively as of 2009. Clearly the goal is to improve walkability with a connecting trail network and allow for better access to businesses, and Franklin Street acts as a wedge right in between.

(“Comprehensive Planning and Franklin Street,” 2009)

The Waterfront Masterplan, which is located close to where Franklin Street connects to Commercial Street, has proposed an increase in large residential development and an expansion of the Maine Street Pier. The Maine State Pier is perhaps the biggest proponent of Franklin Street as vehicle mover rather than a people mover as there will be large masses of vehicles and pedestrians moving through the area, especially during the summer for cruise ships and other attractions. (“Comprehensive Planning and Franklin Street,” 2009)

The Portland Traffic Study used an outdated traffic model and 20th century trends in car growth to predict future traffic conditions. That with some questionable assumptions (Train through bay, no reduction in single occupancy vehicles) and some reasonable ones (Potential development, bayside and waterfront redevelopment) caused the plan to be rejected by the City of Portland. While the plan had similar goals as the City of Portland has; such as: improving safety, reducing traffic flow, creating a better connected street to



Figure 2.30. Portland's Transit Priority Corridor ("Comprehensive Planning and Franklin Street," 2009)

the city, and strengthening access to open space, the plan focused more on moving vehicles than it did moving people. However, The Peninsula Traffic Study was an important document for this thesis, not as a accurate prediction model for future traffic growth but as a worse case scenario tool for Synchro analysis purposes. The goal was to see what potentially could happen to traffic in the future, see what the models would do and then make recommendations based on a mixed transit and urbanized idea rather than what the models tell us. ("Comprehensive Planning and Franklin Street," 2009)

The Peninsula Transit study (2008), as one of the more recent studies that relate to Franklin Street, provides some of the more useful data to help redesign the corridor. The goals of the study include improving public

transportation, bicycle and pedestrian facilities, and transportation management. From the study, along with public feedback, Franklin Street was identified as a major corridor that needed improvement in all areas of the study. Therefore, it was recommended to provide sweeping improvements to Franklin Street to make bicycling and walking safer and more efficient. The study also identified Priority corridors for transit development. Figure 2.30 highlights some of them through the peninsula. As you can see Franklin Street is not a priority for the moment, but could be in the future, which is something to consider for potential redesign (hence the light rail assumption made by the Peninsula Traffic Study). (“Comprehensive Planning and Franklin Street,” 2009)

2.3.4.1. Portland’s Comprehensive Plan 2015 Update

Recently, a public forum was held to discuss the recent survey that was conducted over the last year to figure out what the public wants to happen to Portland in the near future and for generations to come. Common themes included sense of community, open space, architecture, beauty, art and culture and there was a high satisfaction among the respondents with public services, access to open space and neighborhood amenities. However there were concerns about housing, affordability, supply, design, displacement and diversity. To provide a few numbers presented at the meeting:

- 91% support protection of the waterfront
- 60% believe they have adequate access to outdoor amenities in neighborhoods

- 70% support transit oriented development

There is also support for energy efficiency, climate change considerations, sea level rise planning, density around transit and key corridors with bicycle improvements along those corridors. Overall, this 2015 update and subsequent public forum was more about aspiration than it was about real change. There were some legitimate concerns and ideas expressed such as the aging demographic and how people feel about different aspects of the city but there was less talk about how to best implement them.

CHAPTER 3

EXISTING CONDITIONS AND TRANSPORTATION ANALYSIS

3.1. Existing Conditions Overview

This section will provide existing traffic and transportation conditions and analysis. The traffic counts are provided by the Maine DOT and the turning movements, pedestrian and bicycle analysis are provided by Gorrill Palmer in conjunction with the IBI group, both local engineering firms, to the City of Portland. The traffic counts, movements and other assumptions, formed the basis for modeling done in this thesis, which will be explained later in this section. The Level of Service criteria is used to measure the level of traffic in each intersection and is the basis for developing improved designs in this thesis. First, there will be discussion on pedestrian and bicycle movements and conditions throughout Franklin Street to create a precedent that this thesis is not just about moving traffic, as it is heavily focused on in the analysis, but also about multi-use transportation.

3.2. Pedestrian and Bicycle Analysis

Before getting into the traffic analysis, it's important to understand pedestrian and bicycle safety and movements through the corridor in order to development a safe, more efficient urbanized Franklin Street. There is a lot of focus on vehicle movements in the analysis portion of this thesis. However, I believe that to truly improve Franklin Street to support multi use transit, the City will need to improve how cars move in and out, intersections,

and the fundamental idea of creating a people mover rather than a vehicle mover.

3.2.1. Pedestrian Analysis

As highlighted in the Background section of this thesis, the condition of the pavement is adequate, which includes sidewalks suffering from normal wear and tear. However, there are problems with safety, inconsistent crossing

	Ave Wait Time	Ave Time Left
I-295 NB Off	133.50	20.00
Marginal Way	45.13	8.00
Fox/Somerset	55.75	6.75
Cumberland S	31.67	5.75
Cumberland N	32.83	6.83
Congress S	48.83	5.83
Congress N	38.67	5.83
Middle	38.13	0.00
Fore	37.13	7.83
Commercial	52.25	5.14
	Ave Wait Time	Ave Time Left
Total Average	50.90	7.25
Average w/o I-295	40.58	5.65

Table 3.1. pedestrian Crossing Wait Times & Time Left to Cross

technologies, timing issues and design. There was a limited amount of crash data involving pedestrians and therefore is considered outside the scope of this thesis. The Franklin Street Feasibility study - phase II (“Franklin Street

feasibility study -phase II,” 2013) also listed lack of pedestrian crossings as a major issue around Marginal Way but that has since been fixed.

It was found from an independent study for this thesis that due to the volume of traffic and inconsistencies of crossing technology throughout the corridor that the average wait times and average time left to cross varied depending on those factors. Table 3.1 shows the average wait times and average time left from one pass, at each crossing for each intersection. According to the results, there was a major outlier in the data. The first intersection, I-295 NB off, had a signal that didn't work well. In response, the total averages are split between with and without I-295. The average highest wait time (not including I-295) was Fox/Somerset (s) at 55.75 seconds and the shortest average wait time was Cumberland (s) at 31.67 seconds. The largest average time left (not including I-295) was Marginal Way at 8 seconds and the lowest average time left was Commercial Street at 5.14 seconds. With I-295 included, the average delay for the entire corridor was 50.90 seconds with an average time left of 7.25 seconds. Without I-295, the average wait time for the entire corridor was 40.58 seconds with an average wait time of 5.65 seconds. Commercial Street was the worst of all the intersections because of the conditions of the pavement and the average wait time and average time left. There just wasn't enough time left to cross on some of the movements, which is a major problem for a higher pedestrian traffic intersection.

To quantify how many trips are taken by pedestrians on a daily basis, Table 3.2 shows the total daily crossing volumes for all four movements, across

Junction	Total Daily Crossing Volume (4-ways)	Total Daily Crossing Volume- (Across Franklin Street)	Total Daily Crossing Volume (Along Franklin Street)	Pedestrian Peak hour	Pedestrian Peak hour crossing volume (4-ways)
I-295	n/a	n/a	n/a	n/a	n/a
Marginal Way	143	124	19	5:00-6:00pm	24
Somerset/ Fox Streets	161	131	30	3:00-4:00pm	25
Cumberland Avenue	387	326	61	1:00-2:00pm	65
Congress Street	735	685	50	11:00-12:00 pm	101
Middle Street	910	805	105	1:00-2:00pm	132
Fore Street	1140	707	433	12:00-1:00pm	185
Commercial Street	1345	1152	193	12:00-1:00pm	243

Table 3.2. Franklin Street Crossing Volumes (“Franklin Street feasibility study -phase II,” 2013)

Franklin, along Franklin and peak hour. As you can see, Congress, Middle, Fore and Commercial Streets have by far the most pedestrian crossings, with the volume increasing from 735 Total Daily volume (4-way) to 1345. Since this area is closest to downtown, the Old Port and the Maine State Pier, these numbers aren't surprising. Commercial Street also has the most daily volume crossing Franklin, peak hour flow and 2nd most crossing along Franklin. Unfortunately, the longest wait times and average time left to cross were experienced trying to cross Franklin Street, which is a huge issue for the area.

The last big issue associated with pedestrian safety and flow are the “fake Crossings”, which was also discussed in the background section. There were several locations along Franklin Street where people, without a proper crosswalk or sidewalk, would just cross because it was convenient for where they were going. This is an unsafe practice and causes damage to the green areas, fences and barriers trying to keep people out.

In order to create a safer corridor for pedestrians, the signal timings, quality of the crossing infrastructure, consistency in technology and design improvements need to be taken into account. Developing an area where people want to walk, can feel safe and don't have to rely on “fake crossings” should be one of the main goals of the Franklin Street redesign.

3.2.2. Pedestrian Considerations

With any new Franklin Street design, pedestrian considerations should be one of the top priorities for city planners and engineers. While previous sections of this thesis have looked at the current conditions of the pedestrian network, both at the infrastructure level and analytical level, this section will serve to provide a few suggestions for improvements along the corridor.

The main concerns for the current design include signal times, lack of continuity with signals, high traffic volumes and high speeds, and low quality of flow. The new design should focus on these aspects to provide a safe and efficient environment for pedestrians; specifically for the corridor:

- Reducing the travel way bounds to add more green space and walkability



Figure 3.1. Signalized pedestrian Crossing (“Hillsborough county, FL -



Figure 3.2. Un-signalized pedestrian Crossing (“Midblock Crosswalks - national association of city transportation officials,” n.d.)



Figure 3.3. Un-signalized pedestrian Crossing (“pedestrian bridges - Veritas steel project portfolio,” n.d.)

- Adding pedestrian only crossings throughout the corridor, signalized and un-signalized shown in Figures 3.1 and 3.2.
- Adding pedestrian bridges in heavily traveled areas shown in Figure 3.3.
- Concentrating on Synchronizing traffic signals with pedestrian signals to properly move pedestrians and vehicles efficiently.
- Investing in updating crossing signals so that every intersection has the same technology.
- Adding speed humps at crossings to reduce speed and raise awareness shown in Figure 3.4.

In order for Franklin Street to fully embrace the people mover mentality, pedestrians over other modes of transportation should be considered a priority over vehicles. Even improving a few of these techniques could help in the present and the future.



Figure 3.4. Speed Table at Crosswalk (“Western Line Marking,” 1995)

3.2.3. Bicycle Analysis

According to the MDOT’s counts, there is not a significant amount of bicycle traffic along Franklin Street. There was only one bike traveling on Franklin during a 12 hour period in April when the counts were conducted between Marginal Way and Somerset (“Franklin Street feasibility study -phase II,” 2013). This is not surprising, as there are limited bicycle amenities, high speeds, and high traffic volumes along the corridor. There is also a steep grade between Somerset and Cumberland and between Congress and Middle Street. This is less desirable for cyclists, and since there are no bike lanes except for on a few perpendicular streets, such as Marginal Way, most cyclists seek alternate routes. However, if Franklin is transformed into a multi-use corridor

that welcomes cyclists, then steps should be taken to improve bicycle conditions such as a separate bike path, protected bike lanes, and painted lanes to name a few. Forest Avenue has already implemented painted bike



Figure 3.5. Forest Avenue Bike Lane

lanes, located near the I-295 exits, to improve visibility and safety, which is highlighted in Figure 3.5. This will be discussed more in Chapter 4 of this thesis.

3.2.4. Bicycle Considerations

While there isn't substantial bicycle traffic along Franklin Street as stated in the previous section, it's important to make the proper accommodations for bicyclist to provide a safe environment. Some of the techniques that could be implemented include:

- Providing bike lanes along the corridor as there are currently none.
- Adding proper signage and markings for bicyclist and motorists.
- Adding a separate bike path along a lesser traveled streets, specifically closer to areas where higher traffic volumes are expected.



Figure 3.6. Protected Bike Lane (“Bicycle facilities,” 2016)

- Providing barriers along sections where bicyclists travel on Franklin Street. Figure 3.6.
- Providing separate bike signals for more heavily traveled areas. Figure 3.7.



Figure 3.7. Bike Signals at Intersection (LADOT Bike Blog, 2011)

3.3. Traffic Analysis

Table b.1, Appendix B, shows the AADT for Franklin Street and all of its connector Streets and Figure 3.8 gives a graphical representation of the corridor (“Franklin Street feasibility study -phase II Appendix,” 2013). The 2011 AADT was used in analysis for this thesis as it is the most complete. As explained in a previous section, most of the traffic occurs around Marginal Way

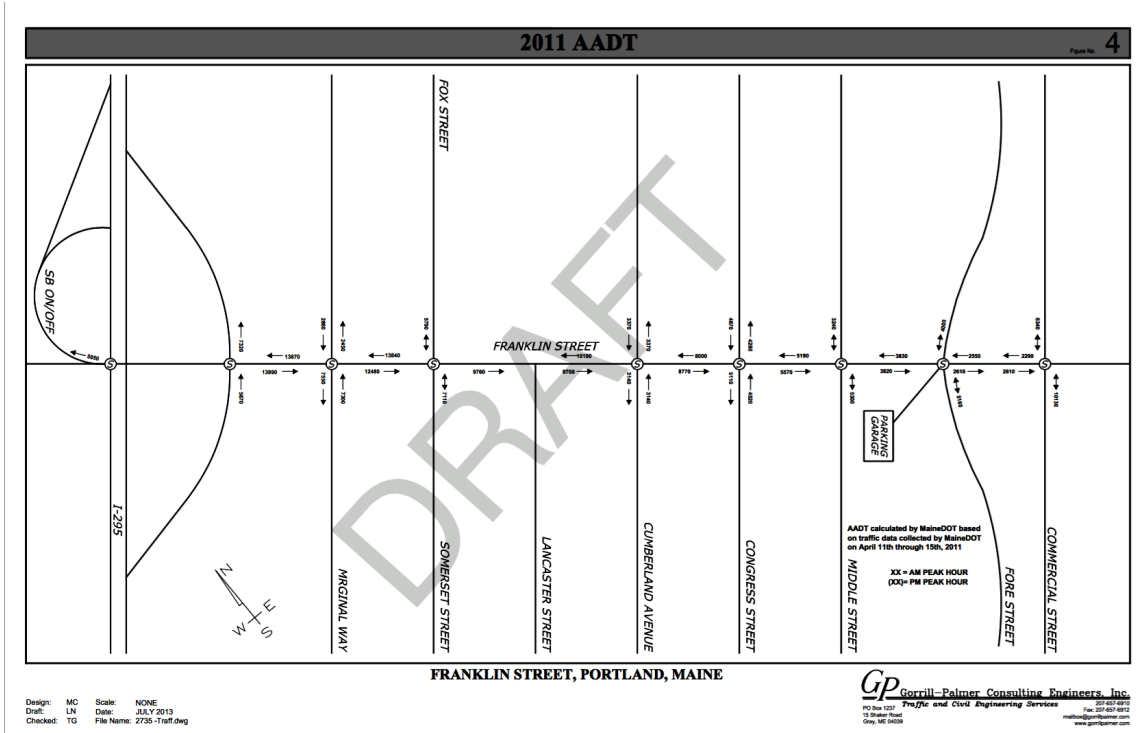


Figure 3.8. 2011 AADT Volumes (“Franklin Street feasibility study -phase II Appendix,” 2013)

and the I-295 off and on ramps and Commercial Street, with Middle and Fore Street having the least amount of traffic. Figure 3.9 shows the turning movements, which was collected by Gorrill Palmer for both afternoon peak and morning peak hours. These raw volumes were used to create Synchro models to better understand existing traffic conditions in order to make appropriate changes to improve traffic flow. (“Franklin Street feasibility study -phase II Appendix,” 2013)

As you can see, there is a significant number of vehicles going straight through Franklin Street from the I-295 southbound off ramp in the morning and then significantly dissipating by Congress heading to Commercial Street. Movements hover around 1100 straight for peak flow (1 hour duration) from

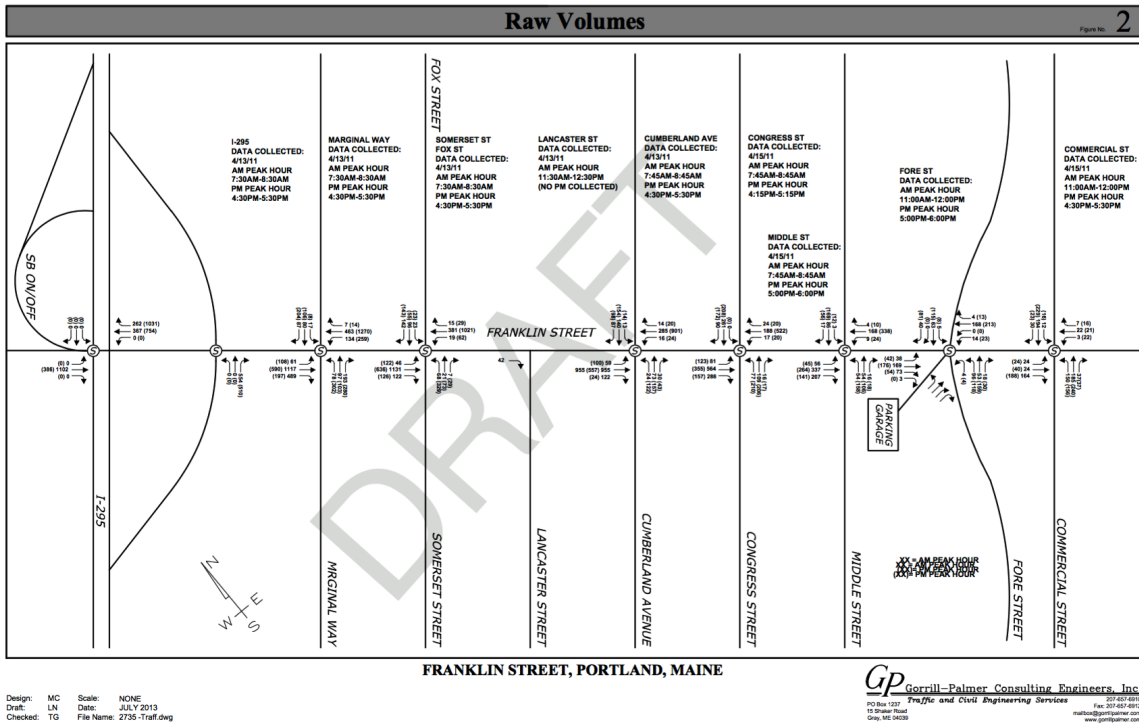


Figure 3.9. Turning Movement Raw Volumes (“Franklin Street feasibility study -phase II Appendix,” 2013)

I-295 Southbound to Somerset, below 1000 at Cumberland, around 550 for Congress and then negligible flow from Middle to Commercial Street. The afternoon sees the same effect but in the opposite direction. Flow starts to increase from Commercial Street peak to 500 by Congress Street, 900 by Cumberland Street and almost 1330 by Marginal Way before the flow splits between NB on and SB on. However the main difference between the two peak flows is that there is a more significant turning movement from Marginal Way northbound left and Somerset northbound left onto Franklin Street. While there are slight variations all along the corridor in terms of number of vehicles, there is almost a 400% increase at Marginal Way and almost a 500% increase at Somerset. Coupled with the fact that Marginal Way and Somerset are two of the busiest

intersections on Franklin, this leads me to believe that most of the Traffic congestion occurs during the afternoon peak flow.

3.3.1. Methodology/Assumptions

This section provides methodology and assumptions for the Synchro models used to assess the initial traffic conditions of Franklin Street. Below is a list of assumptions and initial conditions used in this analysis:

- All factors and coefficients that were preassigned by Synchro were used in this analysis.
- Cycle lengths and splits for signal timing were optimized and not preset based on each individual intersection.
- Cumberland and Congress Street, while presented as having two separate intersections, were modeled as one intersection. Data collected by Gorrill Palmer was also modeled as such.
- Lancaster Street, which is a right turn only, one way, lightly used street was omitted from this analysis as it only had 42 movements during the data collection period and Synchro had a hard time modeling the intersection.
- Only the general layout and geometry was used and are not to the exact specifications of the corridor.

- The Synchro Models were made to match as close as possible to the real world conditions, which include; lanes and direction, control type, right turn on red, etc.
- I-295 Exit, Marginal Way, Somerset Street, Cumberland & Congress Street were modeled with a control type of Actuated Coordinated and Middle Street, Fore Street, and Commercial Street were modeled as Actuated Uncoordinated. (“Franklin Street feasibility study -phase II,” 2013)
- The models do not take into account recent changes, if any, or changes due to the time of year (whether cycle length change based on peak tourist season/summer traffic), if any.
- Not all traffic counts were taken on the same date and each intersection was taken at peak morning & afternoon times which were all not at the same time.

3.3.2.Synchro Models

This section shows still photos of Synchro simulations at peak morning and afternoon traffic movements. A full synchro analysis is provided in Appendix A, figures A.1 and A.2 for the morning and afternoon conditions respectively. Figure 3.10 shows the morning traffic simulation by I-295 and Marginal Way. As you can see, there is significant congestion from I-295 southbound off, which with the proximity of the two intersections, causes even more delay as the day goes on for the morning commute. The traffic counts

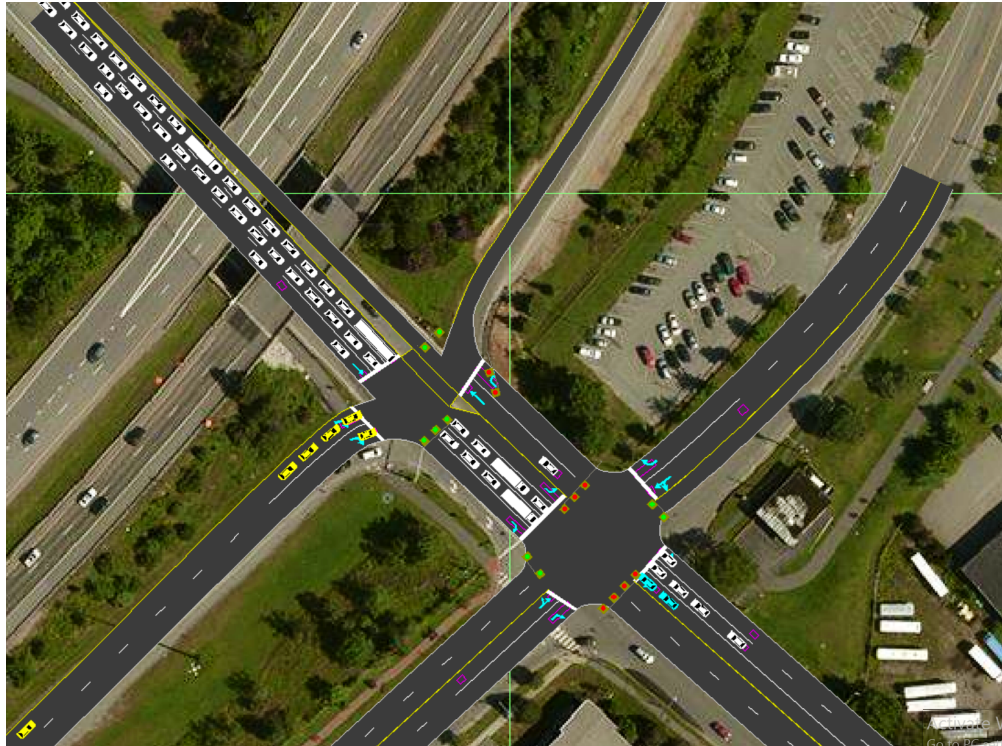


Figure 3.10. Morning Existing Conditions Synchro Simulation for I-295, Marginal Way and Somerset Street

used in this simulation were from a peak morning hour of 7:30 am - 8:30 am on 4/13/11. While these volumes were counted 5 years ago, it's reasonable to assume these counts as the present conditions. Figure 3.11 shows the afternoon traffic simulation by I-295, Marginal Way, and Somerset Street. As you can see significant congestion is building at the through movement intersections going westbound from Cumberland Street, and eastbound at I-295 and Marginal Way. The simulation, which is not shown in this still photo, also shows congestion at the Marginal Way, northbound lefthand turn onto Franklin Street towards I-295 and the Somerset northbound lefthand turn onto Franklin Street. The traffic counts used for this simulation were taken from 4:30 pm to 5:30 pm on 4/13/11. ("Franklin Street feasibility study -phase II Appendix," 2013)

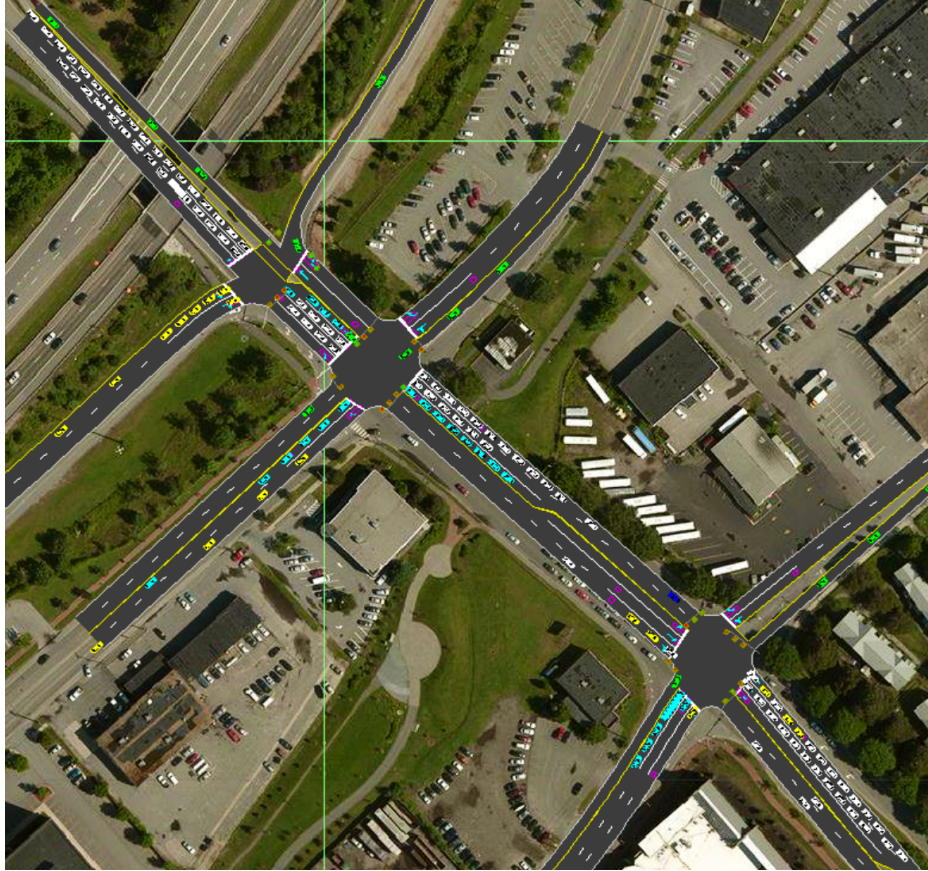


Figure 3.11. Afternoon Existing Conditions Synchro Simulation for I-295, Marginal Way and Somerset Street

Figures 3.12 and 3.13 show the morning and afternoon simulations respectively for Cumberland and Congress Street. As you can see from the two figures, the afternoon peak traffic movements show more congestion and delay based on the number of cars in the system. As previously explained in this thesis, the two intersections for each street were modeled as one intersection to make analysis simpler and to match with how traffic data was collected and presented. The traffic counts for morning flow were taken between 7:45 am and 8:45 am on 4/13/11 and the traffic counts for afternoon flow were taken between 4:30 pm and 5:30 pm for Cumberland on 4/13/11 and between 4:15 pm and 5:15 pm on 4/15/11. (“Franklin Street feasibility study -phase II

Appendix,” 2013)

Figures 3.14 and 3.15 show the morning and afternoon simulations respectively for Middle Street, Fore Street and Commercial Street. As you can



Figure 3.14. Morning Existing Conditions Synchro Simulation for Middle, Fore, and Commercial Street

see, there is not a significant amount of traffic congestion because this end of Franklin Street experiences lower traffic volumes than the other side of Franklin Street. Commercial Street, however does experience quite a bit of traffic according to the MDOT with roughly 10,000 AADT. What is not shown in the simulation is the movement counts during the summer or counts from the Maine State Pier when there is a greater influx of traffic due to tourism. This is

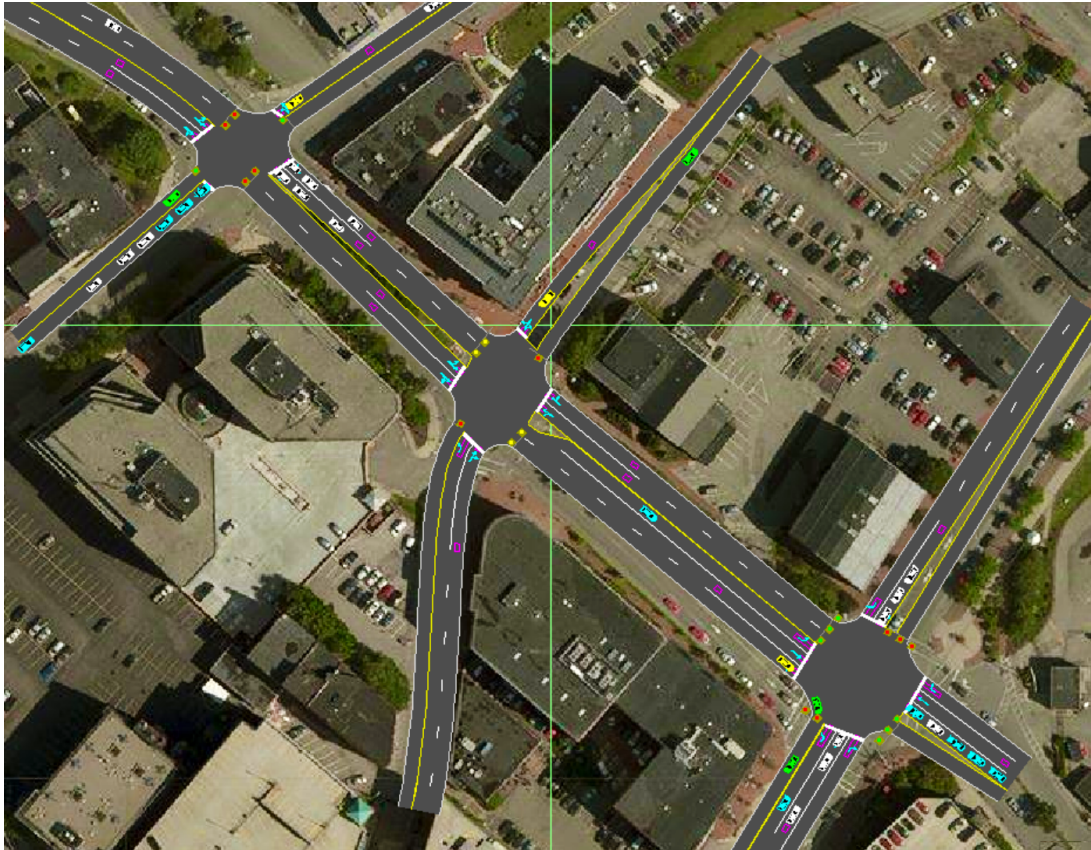


Figure 3.15. Afternoon Existing Conditions Synchro Simulation for Middle, Fore, and Commercial Street

something that can't be modeled with the data I currently have but is an important issue to consider to improve future conditions. The traffic counts for morning and afternoon times varied between the three Streets. Middle Street flows were taken at a peak morning hour between 7:45 am and 8:45 am and a peak afternoon hour between 5:00 pm and 6:00 pm on 4/15/11. Fore Street flows were taken at a peak morning hour between 11:00 am and 12:00 pm and a peak afternoon hour between 5:00 pm and 6:00 pm on 4/15/11. Commercial Street flows were taken at a peak morning hour between 11:00 am and 12:00 pm and a peak afternoon hour between 4:30 pm and 5:30 pm on 4/15/11

(“Franklin Street feasibility study -phase II Appendix,” 2013). A full set of the Synchro model analysis is located in Table A.1 in Appendix A.

3.3.3. Level of Service & Delay

This section provides an overview of Level of Service as it pertains to this project as well as other factors that coincide with it including Intersection LOS, v/c ratio, delay, ICU and ICU LOS. Plus, this section will provide the values of each factor for each intersection, what it means and how it was used to determine future designs.

Level of Service is an indicator of the quality of the road traveled established by the Highway Capacity Manual. This has been expanded to intersections, including roundabouts, bicycles and pedestrians over time and describes the level of quality in different traffic conditions. LOS is rated between A and F with A being the best quality and F being the worst quality (Trafficware, LLC, 2014). Table 3.3 below shows the Intersection Level of Service criteria used in the Synchro analysis for a signal controlled intersection.

The delay is an important factor for calculating the level of service. It is calculated using the volume weighted averages of total delays for intersection delay and is the average of the movement delays for a roundabout, measured in seconds. The max v/c ratio is the maximum volume to capacity ratio of a particular intersection and it measures how close the volumes are to the capacity. The maximum v/c ratio is just another way to evaluate the quality of

Control Delay Per Vehicle (s)	LOS
<= 10	A
>10 and <=20	B
>20 and <=35	C
>35 and <=55	D
>55 and <=80	E
>80	F

Table 3.3. Intersection Level of Service (Trafficware, LLC, 2014)

the intersection. The higher the ratio the closer the intersection is to being too congested and needs to be redesigned or traffic needs to be mitigated (Trafficware, LLC, 2014).

The ICU and ICU LOS is described as the intersection Capacity Utilization and is used to provide insight as to how much extra capacity the intersection

ICU	LOS
0 to 55%	A
>55% to 64%	B
>64% to 73%	C
>73% to 82%	D
>82% to 91%	E
>91% to 100%	F
>100% to 109%	G
>109%	H

Table 3.4. ICU Level of Service (Trafficware, LLC, 2014)

can handle if there is an event or incident. Generally, it used to provide an indication of how well the intersection is functioning and what conditions that can be expected (Trafficware, LLC, 2014). Table 3.4 shows the ICU LOS criteria used in Synchro analysis.

All of these factors are used to determine the health of an intersection and were used in the analysis of Franklin Street to show which areas need to be addressed the most when it comes to traffic congestion. Table 3.5 and 3.6 show the LOS values of each intersection along Franklin Street as well as the cycle

Morning						
Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
I-295	80	0.73	12.1	B	0.48	A
Marginal Way	80	0.93	45.3	D	0.66	C
Somerset	80	0.75	18.3	B	0.59	B
Cumberland	70	0.85	19.1	B	0.73	C
Congress	75	0.79	17.3	B	0.68	C
Middle	70	0.62	10.7	B	0.47	A
Fore	55	0.42	8.6	A	0.37	A
Commercial	80	0.47	15.1	B	0.4	A

Table 3.5. Morning Existing Intersection Characteristics

lengths, delays, max v/c ratios and ICU values for the morning and the afternoon. As you can see, the greatest delays and worst intersection LOS were

Afternoon						
Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
I-295	110	0.79	6.3	A	0.43	A
Marginal Way	110	0.91	45.5	D	0.75	D
Somerset	110	0.81	39.1	D	0.63	B
Cumberland	65	0.9	21.5	C	0.84	E
Congress	65	0.87	20.5	C	0.72	C
Middle	55	0.65	10.8	B	0.72	C
Fore	55	0.41	8.5	A	0.51	A
Commercial	80	0.54	14.5	B	0.45	A

Table 3.6. Afternoon Existing Intersection Characteristics

at Marginal Way, no surprises there, with a delay of 45.5 seconds and an LOS of D. The LOS generally decreases in delay and increases in LOS as you get closer to Commercial Street. Since LOS and delays were generally worse for the peak afternoon hour, I based my new intersection designs on the afternoon turning movements with the assumption that if the corridor could handle the afternoon traffic then it could handle the morning traffic, with the only concern being the I-295 southbound off ramp.

The outlier in this analysis was I-295 off intersection, which ended up having the shortest delay, ICU and LOS rating of A. In reality, there is a lot of congestion at this intersection. Some reasons for this include the assumptions I've made based on the data that was available to me and I chose to optimize

my cycle lengths and splits, which may not be the case in real life. Also, this version of Synchro may not have the capacity to properly analyze the intersection as it is only the student version and not the full version. Based on this analysis, real life experience and engineering knowledge, it is safe to assume that the I-295 intersection and it's proximity to Marginal Way needs to be improved for future use.

CHAPTER 4

FUTURE GROWTH AND DEVELOPMENT

4.1. Future Growth & Design Overview

This section will discuss future growth, potential designs and best practices that could be used to improve Franklin Street to create a more sustainable, multi-transportation and business friendly corridor. First, a look at future growth models is discussed as well as how much traffic is supposed to grow by 2035. There are some discrepancies between several different models that are used to predict traffic growth but that will be discussed in more detail later on in this section. Then, there will be discussion on what Franklin Street will look like using a conservative model in regards to traffic conditions, which will include methodology, potential designs, variations and other things to consider.

4.2. City Growth

According to the Franklin Feasibility Study Phase 2, employment is expected to grow as much as 38% and housing units are expected to increase by as much as 232% depending on the area. As you can see from Table 4.1 and 4.2, which is from the feasibility study, there is significant growth city wide as there is a current housing crisis and a demand for more development and jobs. Overall, there is an expected average increase of 17.6% for employment and 75.4% for housing units by 2035 (“2035 Future Baseline (No-Build) Conditions,” 2014).

Area	Employment		
	Fall 2011	Growth by 2035	% Growth
Region	182,680	27,146	15%
Portland Total	63,758	7,858	12%
Portland Peninsula	35,024	4,361	12%
Bayside (between Elm & Franklin)	1,399	500	36%
Bayside (between Elm and Forest)	2,177	170	8%
Government District	1,576	150	10%
Arts District	2,404	-	0%
India Street Neighborhood	977	375	38%
Old Port District	6,014	510	8%
Waterfront	2,817	1,045	37%
		<u>AVE</u>	<u>0.176</u>

Table 4.1. 2035 Franklin Street Traffic Projections (“2035 Future Baseline (No-Build) Conditions,” 2014)

It is important to note that percent growth was calculated using PACTS travel demand model that looks at trip generation, trip distribution, mode split and traffic assignment. The PACTS travel model has been in use for over 25 years and it was assumed in this thesis that the information provided through the Feasibility Study using this model was adequate to show that there is growth and that providing a more transportation-friendly corridor would be an important step for future growth. The next section looks specifically at traffic

growth and addresses some discrepancies with some of the traffic models.
 (“2035 Future Baseline (No-Build) Conditions,” 2014).

Area	Housing Units		
	2010 Census	Growth by 2035	% Growth
Region	146,104	33,528	23%
Portland Total	32,538	3,870	12%
Portland Peninsula	13,271	2,438	18%
Bayside (between Elm & Franklin)	715	800	112%
Bayside (between Elm and Forest)	408	360	88%
Government District	149	100	67%
Arts District	722	-	0%
India Street Neighborhood	259	600	232%
Old Port District	275	-	0%
Waterfront	99	200	202%
		<u>AVE</u>	<u>75.4%</u>

Table 4.2. Housing Unit Growth (“2035 Future Baseline (No-Build) Conditions,” 2014)

4.3. Traffic Growth

The future traffic data used in the analysis for this thesis was taken from the Franklin Street Feasibility Study Phase 2, which was calculated using a PACTS regional travel demand model. Figure 4.1 shows the 2035 Turning Movement calculations. What’s important about these projections is that there is no straight percentage difference used to determine how much growth there would be. Some of the turning movements varied by a little and some of them

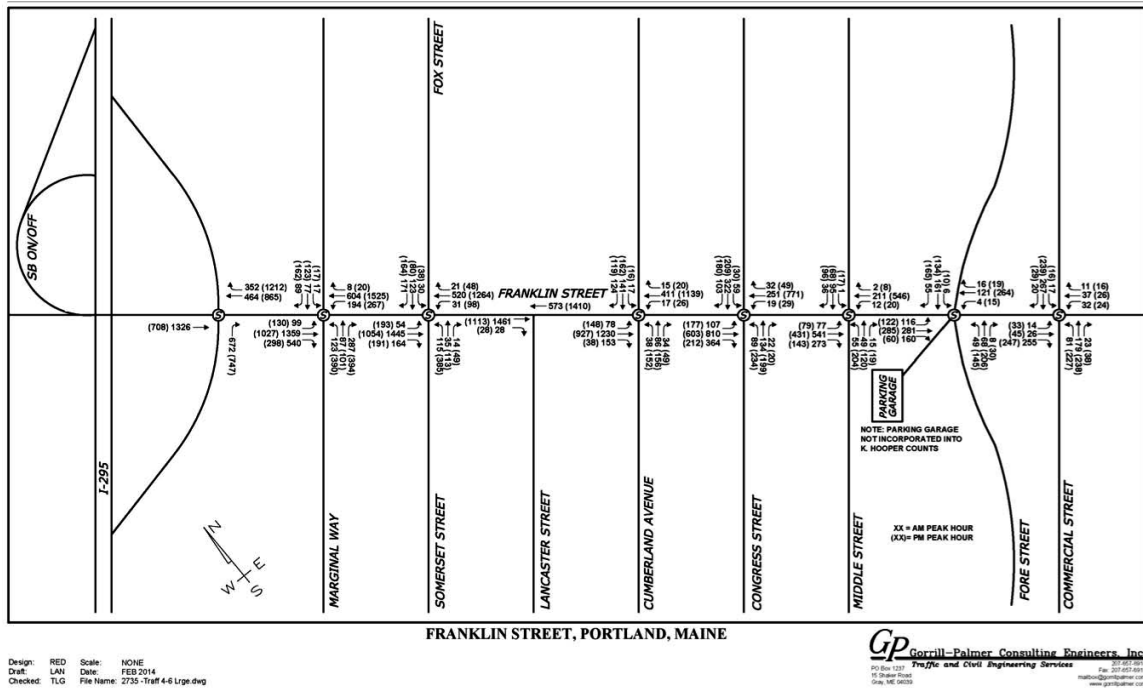


Figure 4.1. 2035 Turning Movements (“2035 Future Baseline (No-Build) Conditions,” 2014)

varied significantly. Based on this data and Figure 4.2, which shows traffic data from the last 25 years, I assumed an over conservative model as traffic forecasts have not changed significantly over that time period. It was also concluded through the Franklin Reclamation Authorities efforts that a 10 percent growth model of traffic was more likely, with 20% being a more conservative estimate (“Franklin Street Redesign: Phase 2 Feasibility Study,” 2013). The Figure below shows the projections compared to a Portland Traffic Study in collaboration with Gorrill Palmer using their traffic forecasts. While the Figure shows only up to 2025, it follows a linear projection and it should be safe to assume it will do so until 2035.

Traffic Forecasts

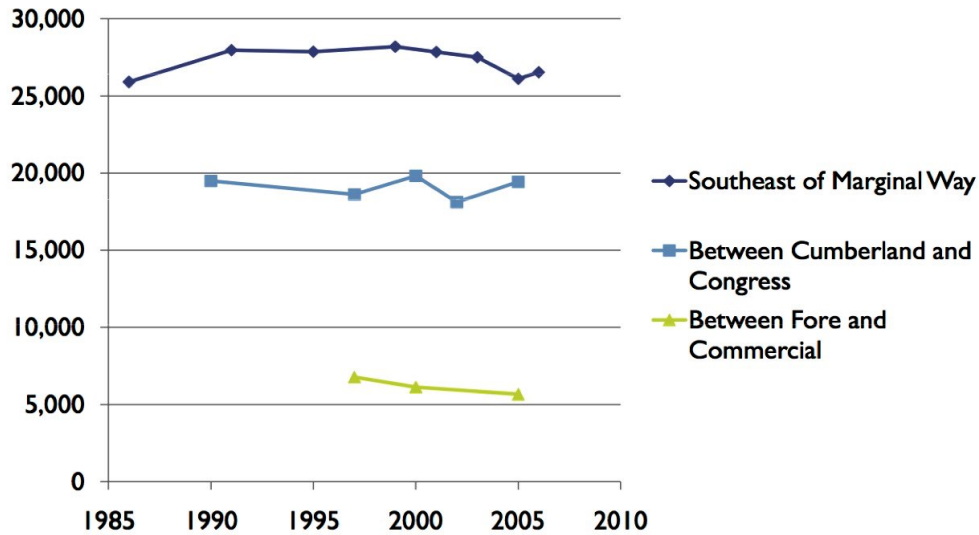


Figure 4.2. Traffic Forecasts Figure (“Franklin Street Redesign: Phase 2 Feasibility Study,” 2013)

After much consideration, it was decided to use the more conservative values provided by Gorrill Palmer for the analysis in this Thesis. The reason being, based on my research so far, Portland has taken an approach of designing for the vision rather than designing for the condition. There are pros and cons to both approaches, however, it was felt that it would be more beneficial to run models based on the worst case scenario, especially if they expect the new design to last far beyond 2035 and if the current design has been in place for over 45 years with minimal changes. The next section will look at the traffic models and analysis used to make recommendations to improve Franklin Street.

4.4. Traffic Models & Analysis

This section analyzes the no build condition with the 2035 traffic data for the afternoon Peak flow. As explained earlier in this thesis, most of the analysis after that will look only at the afternoon peak flow as it produced the worst traffic conditions. Then, a few designs will be introduced that combine ideas from the Urban Street, Urban parkway, and Multi-way boulevard in different capacities based on my own engineering knowledge and design limits using Synchro software. Lastly, a few other design variations are introduced along with some other considerations that could be made.

4.4.1. No Build Condition

The set up for the no build models follow the exact same methodology as the initial condition models but with the 2035 traffic projections. A full Synchro analysis is provided in Appendix A, figure A.3 for the 2035 afternoon condition. As you can see from Figure 4.3, which shows I-295, Marginal Way and Somerset Street, there is traffic congestion all along the corridor from both I-295 exits, and westbound to a point where there is potential for traffic to overflow in the intersection. Eventually, you would see traffic back up in the left hand turn lanes from Marginal Way and Somerset Street going onto Franklin Street westbound. Figure 4.4 shows Cumberland and Congress Street and as you can see, there is also major traffic congestion centered around East and West bound movements with traffic that extends into almost the next two intersections.

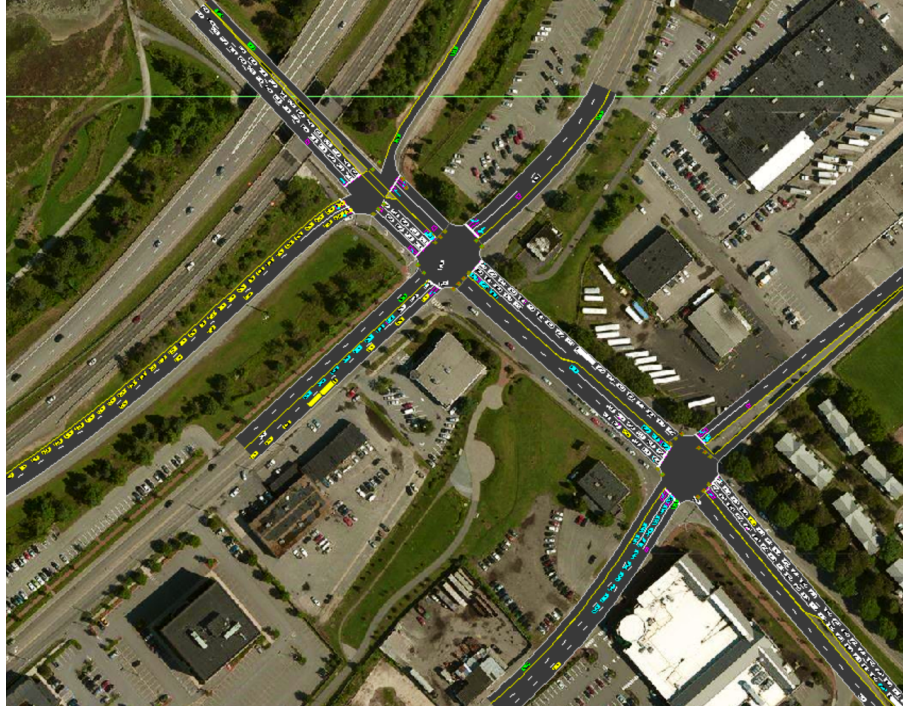


Figure 4.3. 2035 Traffic Conditions for I-295, Marginal Way and Somerset Street Synchro Model

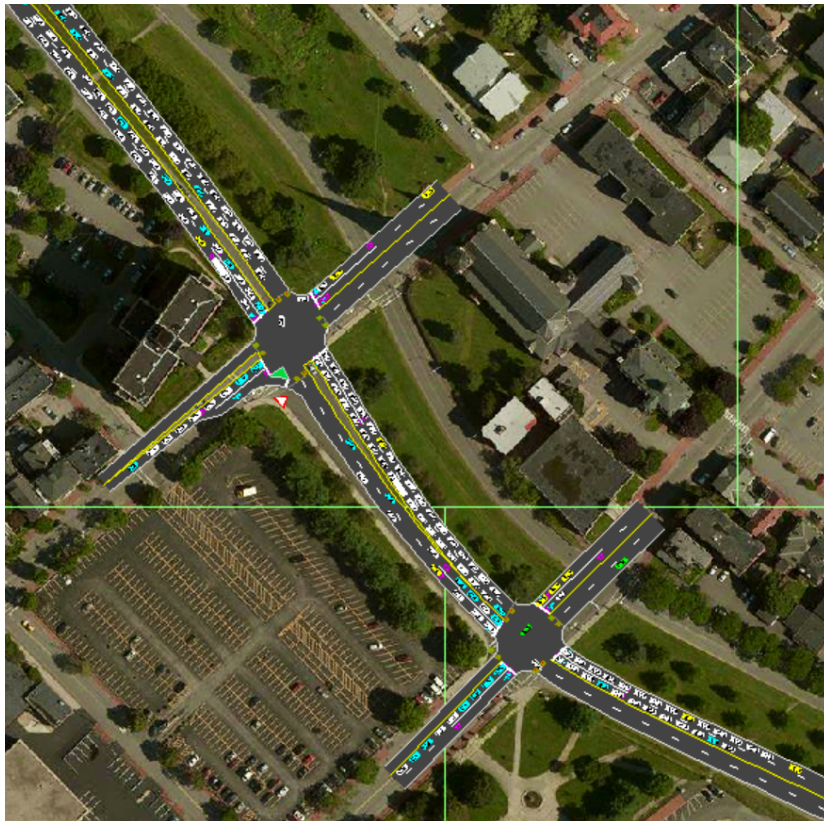


Figure 4.4. 2035 Traffic Conditions for I-295, Marginal Way and Somerset Street Synchro Model

Afternoon						
Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
I-295	110	0.79	13.7	B	0.49	A
Marginal Way	110	1.32	114.2	F	0.99	F
Somerset	110	1.05	75.2	E	0.79	D
Cumberland	65	1.54	120	F	1.05	G
Congress	65	1.23	56.8	E	0.93	F
Middle	55	0.71	12.5	B	0.79	D
Fore	55	0.59	10.4	B	0.67	C
Commercial	80	0.64	15.4	B	0.46	A

Table 4.3. 2035 Intersection Characteristics

Table 4.3 shows the new Level of Service ratings as well as the max v/c ratios, delay and ICU. As you can see, Marginal Way, Somerset, Cumberland, and Congress Street all have an intersection level of service of E or worse meaning that at times of peak flow, there will be significant congestion. All four of those intersections also had a max volume to capacity ratio over 1.00 and delays that lasted a minute or longer. The modeling results confirm that by a worst case scenario, the current configuration of Franklin Street would not be able to handle the traffic flow through the area.

It's important to note that like the initial condition model, Synchro is not able to properly model the I-295 intersection either based on lack of data or due to the limit of the software and the close proximity of Marginal Way. Also, Commercial Street seems to have a good LOS and delay but fails to take into

account worse conditions during the summer due to tourism traffic. Conditions such as an influx of pedestrians crossing, vehicles exiting and entering the Maine State Pier, an inaccurate future traffic projection due to Old Port traffic or the initial assumptions made in this Thesis. Overall, it's safe to say from experience, that Commercial Street will need to be included in intersection redesign to handle the flux of traffic and pedestrians.

4.4.2. Franklin Street Widening

In order to handle the projected traffic flow along Franklin Street, the Peninsula Traffic Study came up with a potential solution that has been modeled in Synchro for this analysis. Appendix A, figure A.4 shows the full Synchro analysis of the widening. Figure 4.5 is the new widened Franklin needed to handle traffic projections. The study suggested to widen Franklin

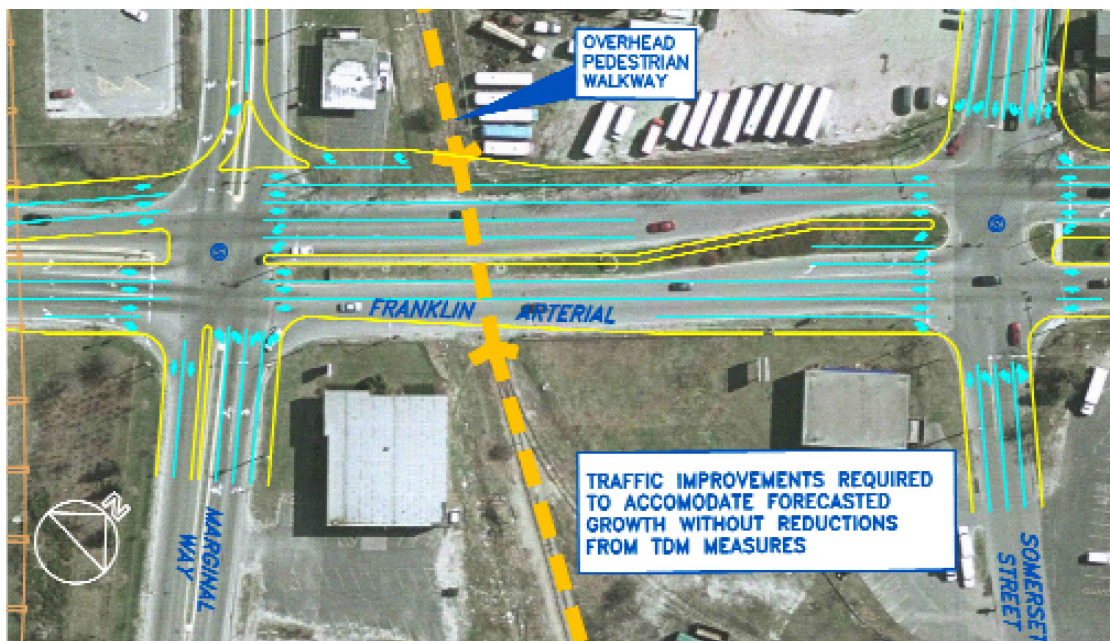


Figure 4.5. Franklin Street Widening Illustration

Street from 6 lanes to 9 lanes, adding an extra left and right turn lane, northbound on Marginal Way entering Franklin Street and three on Somerset Street (Fox Street) north of Franklin Street. Interestingly, Marginal Way north of Franklin Street is reduced to one lane in each direction and prohibits left turn turning traffic and thru traffic from Marginal Way. This concept will be addressed later on in this section as a potential solution to help alleviate traffic congestion.

Figure 4.6 below shows the Synchro model used to best represent the Franklin Widening. As you can see, the model moves traffic well but there is barely enough room, if any to accommodate the widening. Table 4.4 shows the

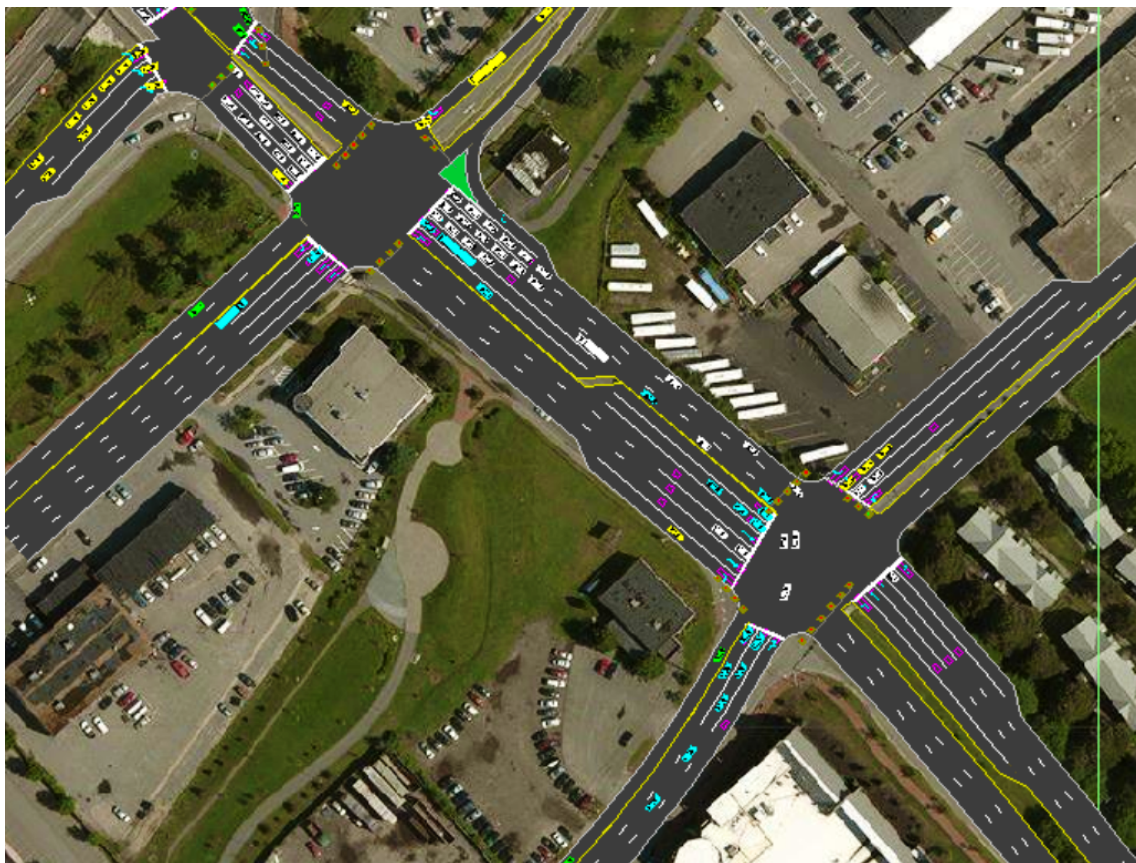


Figure 4.6. Franklin Street Widening Synchro Model

cycle lengths, Max v/c ratio, delay, ICU and LOS values for Marginal Way and Somerset Street for peak afternoon flow. While the intersection LOS and delay's aren't ideal (target LOS of C), they are vastly improved from the no build condition. With that being said, this solution was widely rejected by the

Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
Marginal Way	80	0.92	43.9	D	0.61	B
Somerset	80	0.96	32.8	C	0.63	B

Table 4.4. Franklin Street Widening Intersection Characteristics

City of Portland as it countered their desire to create a more urbanized and multi-transit corridor and therefore not on the table for future development.

The next section will look at potential designs of the corridor.

4.4.3. Potential Designs

While there were many designs created to evaluate Franklin Street, only a few designs were highlighted for the purposes of this analysis. They are:

- Marginal Way roundabout
- Marginal Way Conversion to a T intersection

I did not take into account geometric design but rather looked at the conceptual aspect. Some of the designs did require widening in some areas to accommodate channelized right hand turns or flow. But the models were as close as possible to a two lane concept unless there was a greater benefit to add another lane. This section focuses mainly on traffic and intersection design

and less on bicyclist and pedestrian design. However, there will be a discussion on the accommodations that should be considered when looking at these designs.

There will also be brief discussions on other design consideration for the purposes of analysis but these were not chosen to be highlighted in this thesis, which include:

- Other locations for roundabouts
- Other Intersection locations
- The “Mini Big Dig”

Ultimately, converting the intersection with Marginal Way into a roundabout and converting that intersection into a T intersection were two of the more appealing options based on the analysis.

4.4.3.1. Marginal Way Roundabout

The Marginal Way roundabout has been a popular solution to help with traffic flow but after running models through Synchro with conservative traffic projections it became clear that it might not work out the way the planners hoped. Appendix A, figure A.5 shows the full analysis of the Marginal Way roundabout in Synchro. Figure 4.7 shows the I-295 and Marginal Way intersections, and as the reader can see the traffic congestion doesn't look as bad but there is some backing up towards Somerset Street. However, the east and westbound lanes thru Franklin Street have to be increased to 9 lanes in

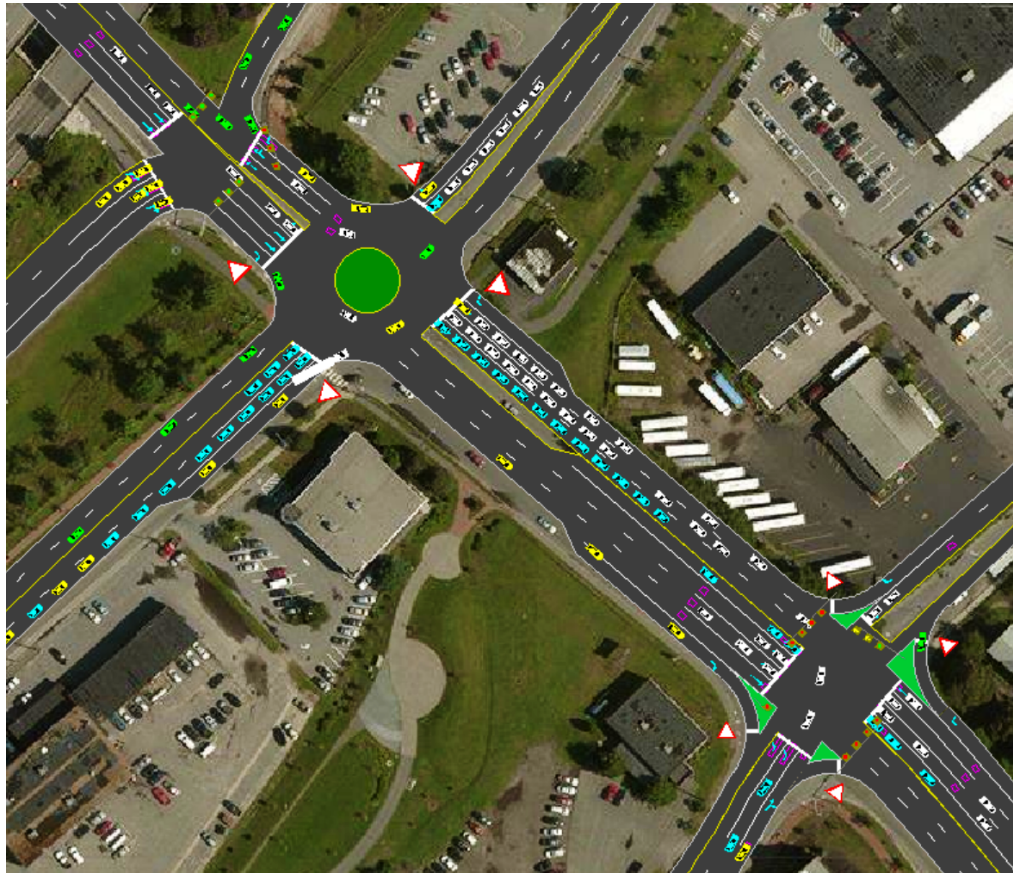


Figure 4.7. Marginal Way Roundabout Synchro Model

order to achieve a decent LOS. Table 4.4 shows the LOS, max v/c ratio, delay, and ICU values for the new design.

As you can see, since Marginal Way is a roundabout there was no cycle length, delay, or intersection level of service but had a 2.4 volume to capacity

Afternoon						
Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
Marginal Way	-	2.4	-	-	0.92	F
Somerset	90	0.91	34.6	C	0.67	C

Table 4.5. Marginal Way Roundabout Intersection Characteristics

ratio and ICU of 0.92 which led to a LOS of F. This is not a good sign, especially if the roundabout needs to be three lanes and requiring a widening to 9 lanes, which is exactly what city officials and the public don't want. Somerset seems to have improved with a reduced cycle length, adequate max v/c ratio, delay of 34.6 s and LOS of C for both the ICU and intersection. Again, this still requires adding an extra lane each way from Cumberland Street and still maintaining nine lanes between Marginal Way and Somerset Street. While there is enough room to add extra lanes in between Somerset and Cumberland Street, it still goes against the Main vision for the city.

4.4.3.2. Marginal Way T-intersection/Hybrid

The Marginal Way T intersection is an interesting prospect, since there aren't many indications from city planners and engineers that this is a direction they would consider. Since there are such low traffic volumes coming from and going to Marginal Way, northbound of Franklin Street, what would happen if Marginal Way became a T intersection? This would help reduce traffic congestion and improve cycle times since one approach would be taken away and thus theoretically would reduce delay and help improve traffic flow. Traffic that used to go to and from that leg would be redirected to Diamond Street which reconnects to Somerset/Fox Street, which is shown in Figure 4.8. This way, the I-295 intersection can be dedicated as thru lanes and a right turn instead of having a dedicated left hand turn lane that bogs down the cycle.

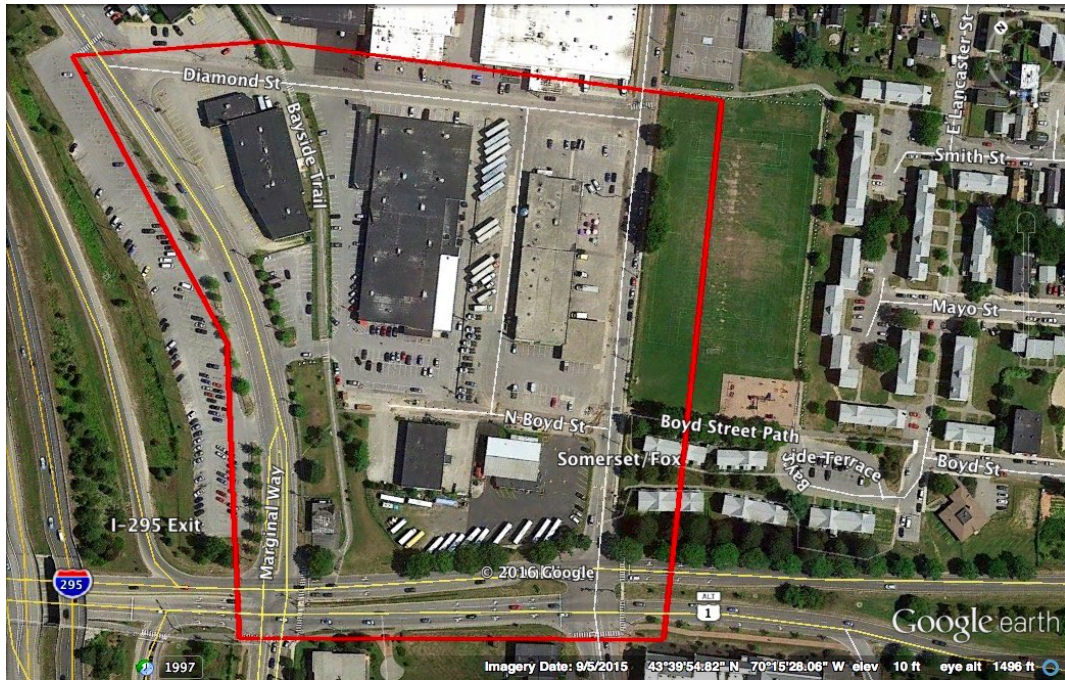


Figure 4.8. Diamond Street Access Point (Google Earth)

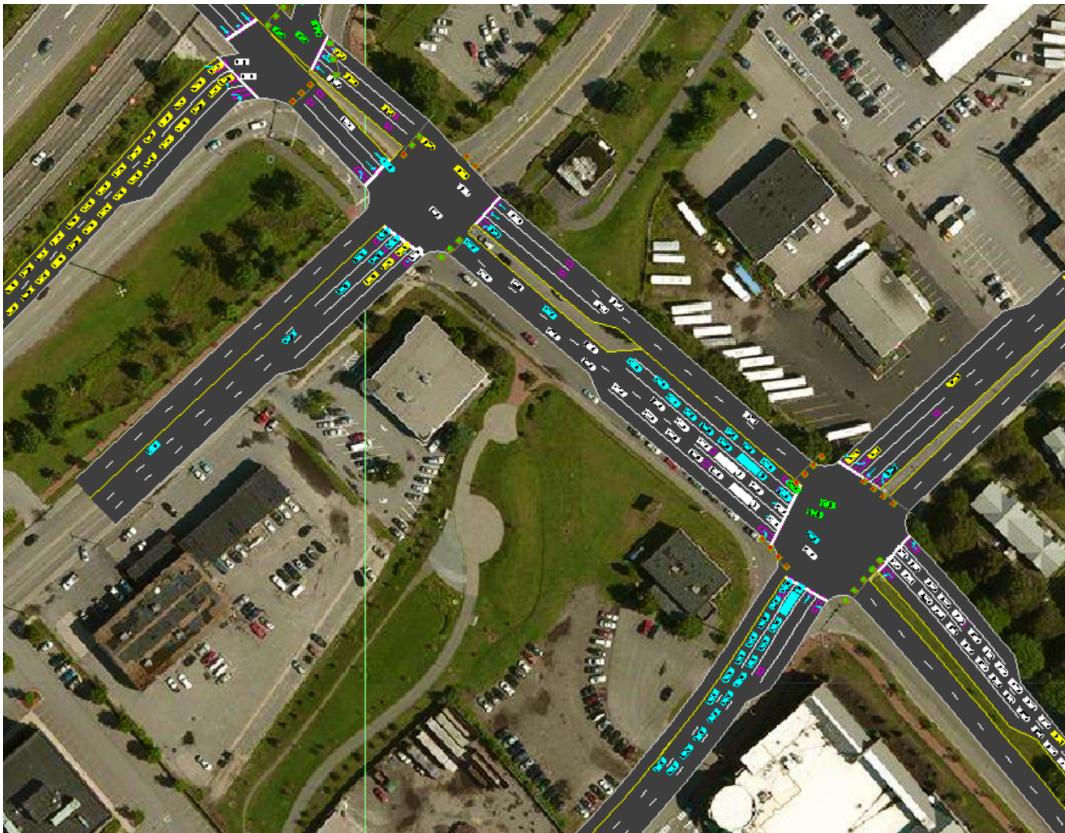


Figure 4.9: T-Intersection Synchro Model

Afternoon						
Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
Marginal Way	80	0.91	34.5	C	0.69	C
Somerset	110	1.01	47	D	0.76	D

Table 4.6. T-intersection Intersection Characteristics

Figure 4.9 shows the T-intersection modeled in Synchro and as the reader can see, Marginal Way seems to be performing a lot better but there is significant backup on I-295 NB off ramp and at Somerset Street, especially from Cumberland Street. Even with extra left hand turn lanes from Franklin onto Somerset/Fox Street and extra turn lanes from Somerset onto Franklin to account for the redirected volume, there is still not enough capacity to handle only two lanes coming from Cumberland. Table 4.6 shows the LOS and other traffic data for Marginal Way and Somerset. As you can see from the numbers, Marginal Way is indeed improved from other previous designs. However there is still a problem with I-295 NB off ramp and Somerset has gotten worse, but is not directly due to the increased volumes from the lost lane at Marginal Way, but rather from Franklin only having two thru lanes. There are only two lanes in between Marginal Way and Somerset and only two thru lanes between Somerset and Cumberland and with the increased traffic volume three thru lanes in each direction would be better.

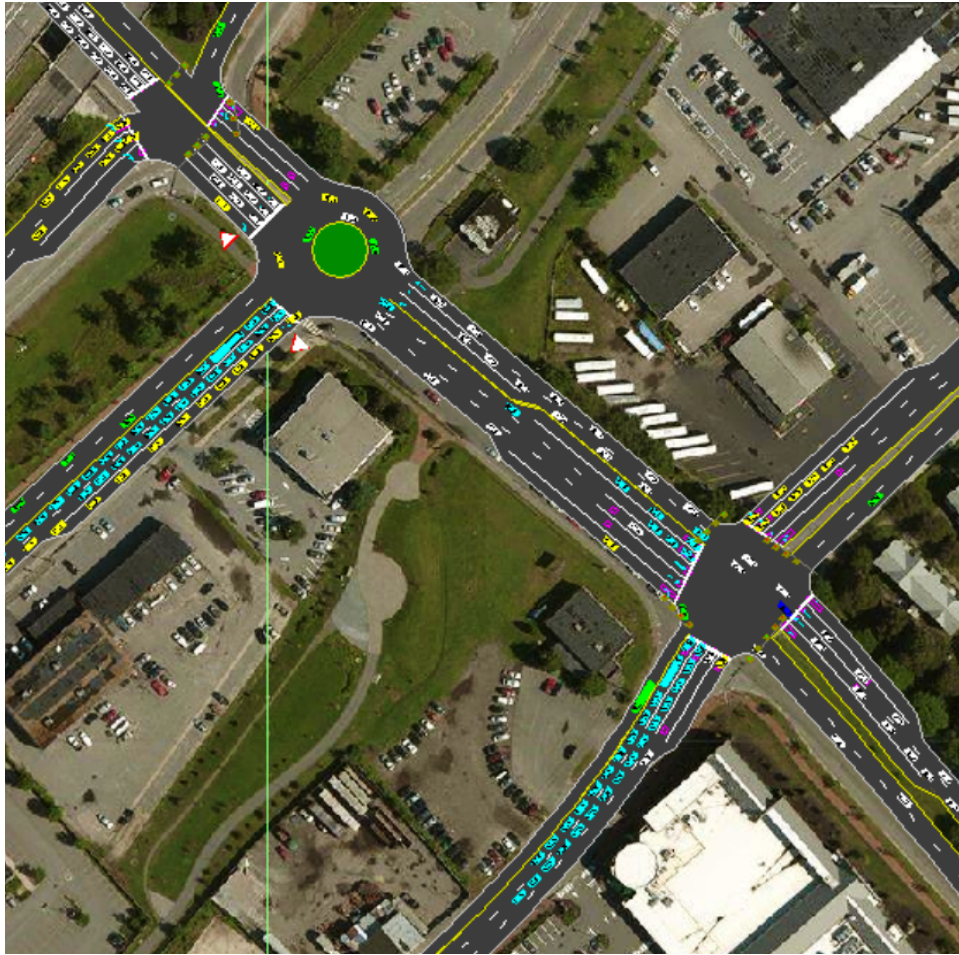


Figure 4.10. T-Roundabout Synchro Model

I also looked at a hybrid of both a Marginal Way roundabout and Marginal Way T-intersection, a T-roundabout. Figure 4.10 shows the T roundabout. As you can see, there is smoother movement along Franklin Street, with minimum back up coming from the I-295 exits, but there is more back up coming from Marginal Way and Somerset Street turning onto Franklin. Table 4.7 shows The traffic characteristics from Marginal Way and Somerset Street. While the max v/c ratio is significantly higher for the Marginal Way intersection the ICU and LOS are lower and Somerset Street has essentially identical numbers with the exception of having a slightly better delay.

Afternoon						
Intersection	Cycle Length	Max v/c Ratio	Delay	Intersection LOS	ICU	ICU LOS
Marginal Way	-	1.96	-	-	0.6	B
Somerset	110	1.01	46.5	D	0.76	D

Table 4.7. T-Roundabout Intersection Characteristics

It is clear from these models that with the higher traffic volumes, the road needs to add lanes in order to handle the volume, especially on Franklin Street. Changes such as making Marginal Way a T-intersection, making Marginal Way a roundabout and adding specific turning lanes to handle turning or redirected flow are options to create a more efficient intersection. Again, these models were designed for a worst case scenario traffic condition and may not accurately reflect what would actually happen by the year 2035 but they do show that some of these techniques could be implemented to build a better Franklin Street. Appendix A, figures A.6 and A.7 show the full synchro analysis of the T-intersection and T-intersection roundabout at Marginal Way.

4.4.3.3. Other Design Considerations

This section will give an overview of some other designs that were considered but were chosen not to be highlighted in this thesis, they include:

- I-295 Roundabout
- Somerset Street Roundabout



Figure 4.11. Augusta Roundabouts (“I-95 at exit 113/Hwy 3,” 2012)

- The “Mini-Big Dig”

I-295 roundabout sounded like a potential design change Portland could take advantage of. One example of a roundabout that has been implemented at a turnpike/interstate exit is the Augusta Exit 113 with roundabouts shown in Figure 4.11. However, there are three big difference that wouldn’t allow such a design to work for Portland. First, there isn’t really enough space to put in a two lane roundabout with channelized right hand turns of that size, especially since the models require three lanes in order to handle the traffic volume. The second is traffic volume since the AADT at I-295 connecting to Marginal Way has volumes ranging from 5850 to 7320, where as Augusta has volumes no greater than 4870 (Maine DOT, 2016). Now this doesn’t seem like a big difference but one is channeling into an arterial connecting to the biggest city in Maine and

the other, while also an arterial, connects to a rural setting. Finally, the proximity to the Marginal Way intersection makes putting in a roundabout difficult, especially if Marginal Way stays signalized. This could cause greater delays since a roundabout promotes continuous traffic flow and a signal relies on cycles. Because of these reasons, the I-295 Roundabout was not considered.

The Somerset Street roundabout was a design that was analyzed in multiple different models, more so than the other designs that were chosen not to be highlighted. The issues associated with the roundabout were minor, but ultimately it was chosen not to be included because:

- Marginal Way was deemed more of a priority because of its traffic volumes and proximity to the Back Bay Trail network and I-295 exits
- Improvements, on a strictly traffic basis, could require adding additional lanes between Cumberland and Somerset Streets and having 8-9 lanes between Marginal Way and Somerset

Figure 4.12 shows a roundabout at Somerset and Marginal Way and Figure 4.13 shows just Somerset Street with a roundabout. While flow seems to move fairly well, the ICU Level of service is F for the Marginal Way roundabout and D for the Somerset roundabout. The single roundabout scenario fairs slightly better with an intersection LOS of D and ICU LOS of C with a delay of 44s at Marginal Way and an ICU LOS of D for Somerset. However it came down to space and location. The idea of having two, high traffic, three lane roundabouts so close with heavy traffic coming from I-295 and the proximity to

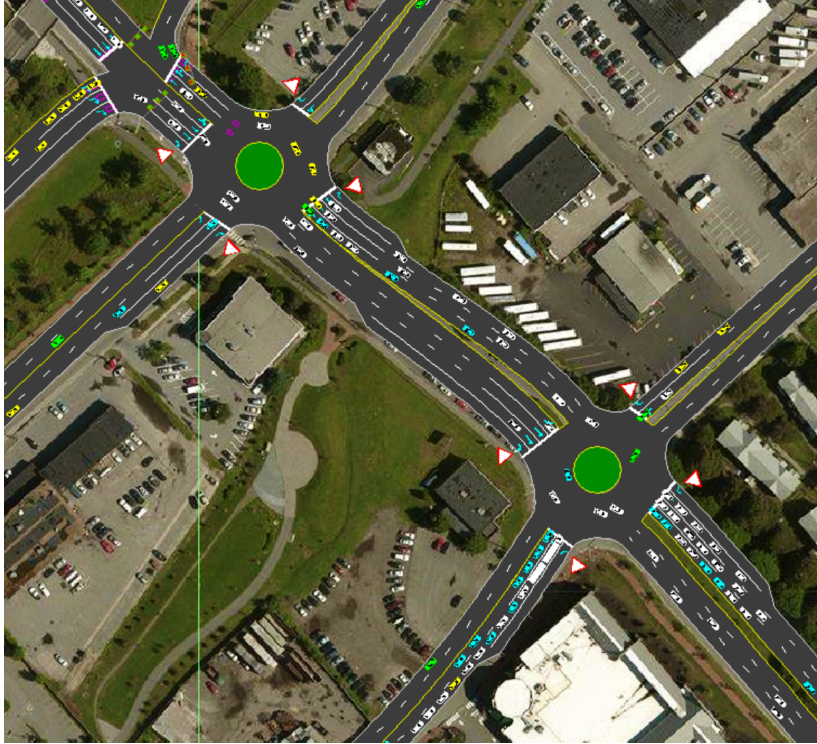


Figure 4.12. Marginal Way and Somerset Street Roundabout

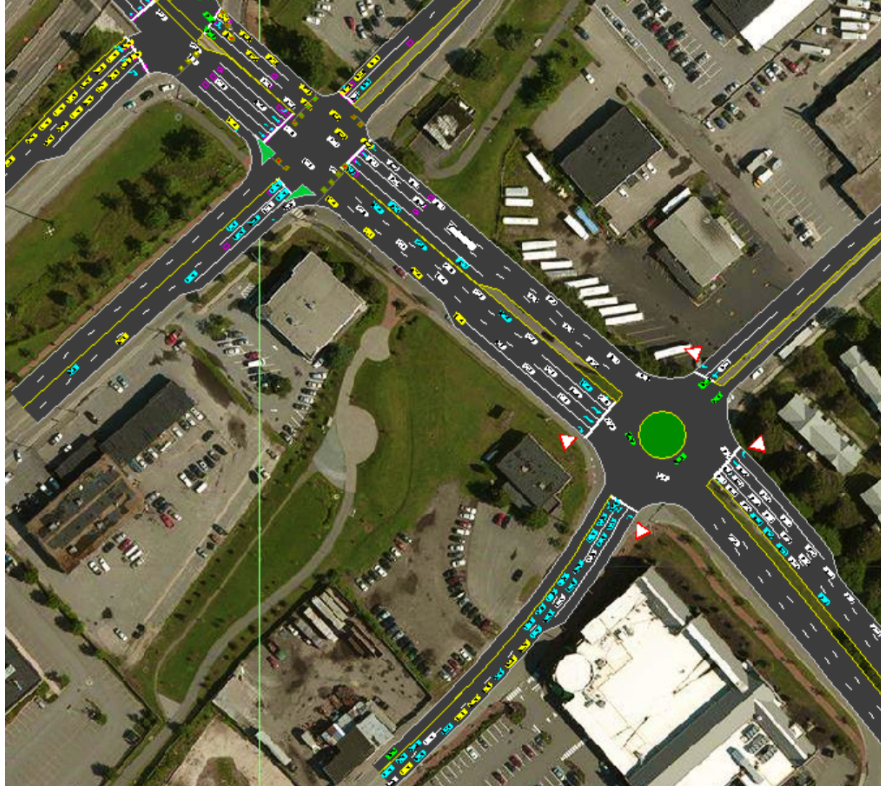


Figure 4.13. Somerset Street Roundabout

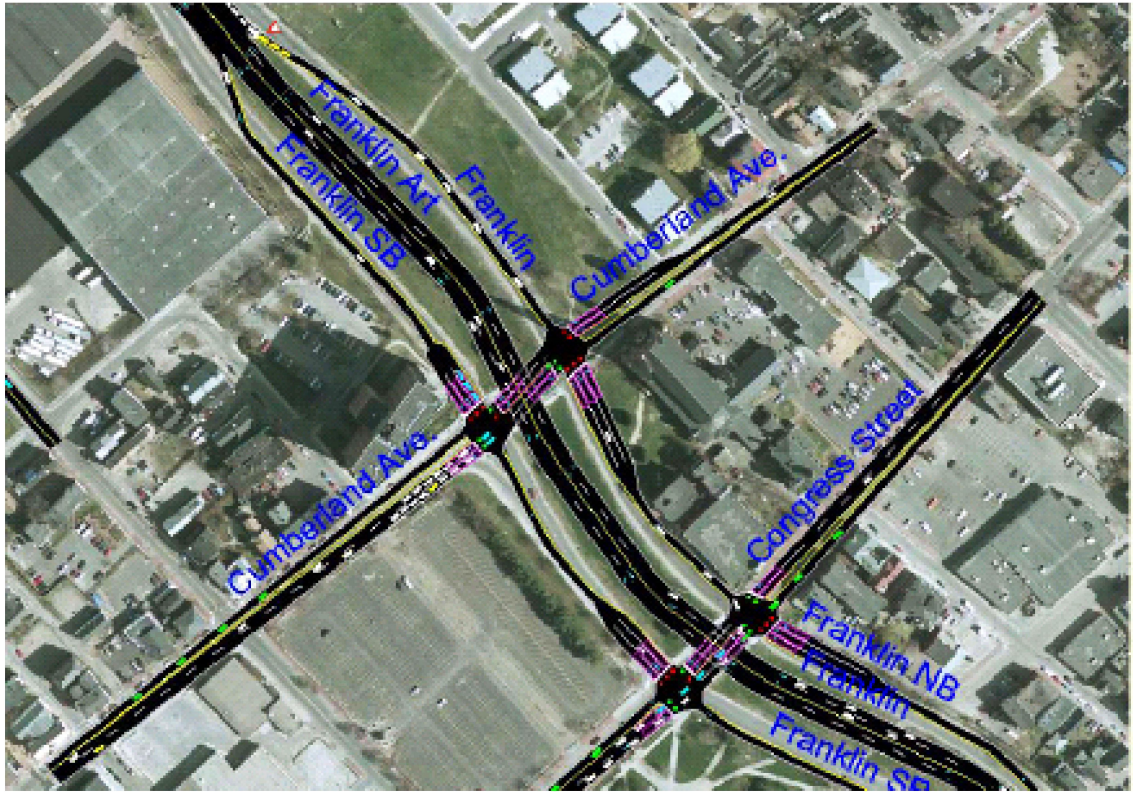


Figure 4.14. Franklin Street “Mini-Big Dig” (“The Peninsula Traffic Study: Widening Franklin,” 2009)

the Back Bay trail network seemed like it was going against the vision the city has for Franklin Street.

Finally, this last intersection design dealt more with Congress and Cumberland Street than it did Marginal Way and Somerset. This plan was revisited by the Reclamation Authority, but decided it went against the multi-transit vision of Portland. Figure 4.14 shows the “Mini-Big Dig” concept which involves tunneling in between Somerset and Middle Street as the thru lane and then having separate intersections at street level to access Cumberland and Congress Street (“The Peninsula Traffic Study: Widening Franklin,” 2009). Ultimately, it would be an expensive venture and would be more of a high speed arterial that goes against what the City of Portland wants: a highly

attractive, open space, multi-transportation, business friendly corridor. Now that there has been discussion throughout this thesis about what's wrong with Franklin Street, and what the city and its citizens want for the future, the final chapter will provide a conclusion and recommendations based on the analysis of the unique design I came up with.

CHAPTER 5

CONCLUSION & RECOMENDATIONS

5.1. Conclusion

Based on the research and analysis conducted in this thesis, it is clear there has been a lot of research performed both technically and through community outreach to come up with the best solution for Franklin Street. Most of the city planners, officials and engineers are on the same page with the community in that they have the same vision to development a multi-transportation corridor that values open space and free movement while creating access to new job opportunities and local businesses.

Current conditions are consistent with outside analysis and reports in that the traffic conditions are unsustainable. Pedestrian safety and design is adequate but should be improved to fit the new design concepts. Bicycle safety and design is completely lacking and should be a focus for improvement. Policies and plans that affect Franklin Street, coincide with suggested design concepts, which will help Portland continue to develop into a sustainable city.

Future conditions show a spike in housing and employment, which translate into more people and potentially more vehicles. While it is more customary to use a more modest traffic growth projection, this thesis used a more conservative approach to provide a worse case scenario traffic model. This provides valuable data to not necessarily over design but to review in the

context of, this is what potentially could happen and are we doing enough to prevent that?

While the city and its planners have done a good job of making suggestions to improve the corridor, they focus too much on how to adopt Franklin Street to the city's vision and less about effectively mitigating traffic. Worst-case scenario future traffic models show that some of concept designs may not be able to handle future traffic flow. Therefore, several other design concepts were implemented for this thesis to better understand ways to mitigate congestion while still considering pedestrian and bicycle movements and safety. The next section will provide the recommendation based on this analysis.

5.2. Recommendations/Considerations

There are many ways to design a street corridor to improve pedestrian, bicycle, traffic safety and flow but based on this analysis. Here are some recommendations that the city should consider for each mode of transportation.

For pedestrian safety and flow:

- There should be clear marking, signs, and crosswalks with proper ADA compliance and consistent crossing technology with improved signal times to cater to elderly or handicap individuals.

- Pedestrian only crossing (signalized or un-signalized) should be added in between Somerset Street and Cumberland Street and in between Congress Street and Middle Street where there is more foot traffic in unmarked areas.
- A pedestrian bridge or tunnel should be considered between Marginal Way and Somerset Street where there is creator traffic flow and it connects to the Back Bay trail network.
- Raised crosswalks/speed bumps should be considered between Middle Street and Commercial Street where there is more foot traffic

For bicycle safety and flow:

- Bike lanes should be added to the outside traffic lanes, rather than in the middle, with a barrier to help protect from vehicles (posts, parked cars, curb, etc.)
- Use colored lanes to help distinguish what is a bicycle lane and what isn't, similar to Forest Avenue, with proper signage and markings.
- Consider having a separate bike path on a side street in between Marginal Way and Somerset, where there is more traffic,
- Provide access to the trail network either with the pedestrian bridge or separate bike signal at the Marginal Way or Somerset Street intersection. Consider bike signals for the whole corridor.

For traffic safety and flow:

- Reduce the travel way footprint and reduce the speed to 25 mph improve safety throughout the whole corridor.
- Consider adding or maintaining the same number of lanes near Marginal Way and Somerset Street to mitigate traffic congestion.
- Add connecting side Streets to help mitigate traffic on the main drag.
- Add another intersection along Franklin Street to connect the side Streets to Franklin Street and help reduce the distance between Somerset Street and Cumberland Street in order to help with speed.
- Eliminate the NB access point of Marginal Way to Franklin Street to create a T-intersection to reduce congestion around I-295 and Marginal Way.
- Add a roundabout to Commercial Street to improve safety flow near the Maine State Pier and Old Port.

Other recommendations and considerations:

- Develop more usable open space and greenery to help with both scenery, pedestrian, bicycle and traffic safety.
- Consider the development of smart cars and the implications it could have on roads for the future.

- Consider Environmental changes, such as sea level rise that could affect Bayside and travel around that area.

Overall, there should be more analysis and research on how to mitigate traffic in the area, especially near I-295, Marginal Way and Somerset Street. It might be helpful to consider completely overhauling the I-295 exits and entrances at Franklin Street and possibly adding another exit. As explained in the background section of this thesis, if the corridor is improved to help mitigate traffic, reduce speeds and improve safety. It will also help to improve pedestrian and bicycle flow and safety - they go hand in hand. It should be a priority of the city to better understand this concept and consider the recommendation and consideration provided in this thesis in order create a safer and more sustainable Franklin Street for the future.

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APPENDIX A: Synchro Analysis

This Appendix contains the full Synchro analysis for the morning and afternoon initial conditions (figures A.1 and A.2), the afternoon 2035 condition (figure A.3), the Franklin Street widening (figure A.4), the Marginal Way roundabout design (figure A.5) and both the T-intersection and T-intersection roundabout designs (figures A.6 and A.7).

Figure A.1. Franklin Street Morning Initial Conditions

Franklin Street Morning Initial Cond.syn
1: I-295

7/26/2016

Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑				↑↑↑			↑	↑
Traffic Volume (vph)	0	554	0	0	0	1102	0	0	367	262
Future Volume (vph)	0	554	0	0	0	1102	0	0	367	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	16	16	16
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	0.91	1.00	1.00	1.00	1.00
Frts		0.850								0.850
Flt Protected										
Satd. Flow (prot)	0	3158	0	0	0	5085	0	0	2111	1794
Flt Permitted										
Satd. Flow (perm)	0	3158	0	0	0	5085	0	0	2111	1794
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		50								285
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	535		533			410			178	
Travel Time (s)	12.2		12.1			8.0			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	602	0	0	0	1198	0	0	399	285
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	602	0	0	0	1198	0	0	399	285
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			12			12	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	0.85	0.85	0.85
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		CI+Ex				CI+Ex			CI+Ex	CI+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						CI+Ex			CI+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	
Permitted Phases										Free
Detector Phase		7				2				
Switch Phase										

Baseline

Synchro 9 Classroom Report
Page 1



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Initial (s)		5.0				5.0				
Minimum Split (s)		22.5				22.5				
Total Split (s)		40.0				40.0				
Total Split (%)		50.0%				50.0%				
Maximum Green (s)		35.5				35.5				
Yellow Time (s)		3.5				3.5				
All-Red Time (s)		1.0				1.0				
Lost Time Adjust (s)		0.0				0.0				
Total Lost Time (s)		4.5				4.5				
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)		3.0				3.0				
Recall Mode		None				C-Max				
Walk Time (s)		7.0				7.0				
Flash Dont Walk (s)		11.0				11.0				
Pedestrian Calls (#/hr)		0				0				
Act Effct Green (s)		20.0				51.0		80.0	80.0	
Actuated g/C Ratio		0.25				0.64		1.00	1.00	
v/c Ratio		0.73				0.37		0.19	0.16	
Control Delay		30.1				7.9		0.2	0.2	
Queue Delay		0.1				1.9		0.0	0.0	
Total Delay		30.2				9.8		0.2	0.2	
LOS		C				A		A	A	
Approach Delay	30.2					9.8		0.2		
Approach LOS	C					A		A		
90th %ile Green (s)		26.2				44.8				
90th %ile Term Code		Gap				Coord				
70th %ile Green (s)		22.2				48.8				
70th %ile Term Code		Gap				Coord				
50th %ile Green (s)		19.9				51.1				
50th %ile Term Code		Gap				Coord				
30th %ile Green (s)		17.6				53.4				
30th %ile Term Code		Gap				Coord				
10th %ile Green (s)		14.2				56.8				
10th %ile Term Code		Gap				Coord				
Stops (vph)		444				492		1	0	
Fuel Used(gal)		8				9		0	0	
CO Emissions (g/hr)		570				610		35	24	
NOx Emissions (g/hr)		111				119		7	5	
VOC Emissions (g/hr)		132				141		8	6	
Dilemma Vehicles (#)		0				69		0	0	
Queue Length 50th (ft)		144				91		0	0	
Queue Length 95th (ft)		182				146		0	0	
Internal Link Dist (ft)	455		453			330		98		
Turn Bay Length (ft)										
Base Capacity (vph)		1429				3240		2111	1794	
Starvation Cap Reductn		0				0		0	0	
Spillback Cap Reductn		103				829		0	0	
Storage Cap Reductn		0				0		0	0	

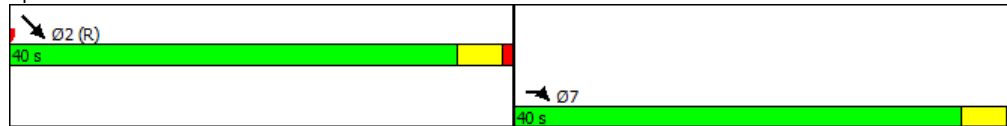


Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Reduced v/c Ratio		0.45				0.84			0.19	0.16

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:SET and 6:, Start of Green
 Natural Cycle: 45
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 12.1 Intersection LOS: B
 Intersection Capacity Utilization 48.2% ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 1: I-295



Educational Use Only

Franklin Street Morning Initial Cond.syn
2: Marginal Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↙	↕	↘	↙	↕	↘	↙	↕	↘	↙	↕	↘
Traffic Volume (vph)	61	1117	489	134	463	8	78	97	193	17	80	87
Future Volume (vph)	61	1117	489	134	463	8	78	97	193	17	80	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	14	12	14	12	16	16
Storage Length (ft)	90		0	205		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.997				0.850			0.850
Flt Protected	0.950			0.950				0.978			0.992	
Satd. Flow (prot)	1770	3539	1583	1770	3529	0	0	1822	1689	0	2094	1794
Flt Permitted	0.950			0.950				0.828			0.943	
Satd. Flow (perm)	1770	3539	1583	1770	3529	0	0	1542	1689	0	1991	1794
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			532		3				210			143
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		178			516			464			379	
Travel Time (s)		3.5			11.7			10.5			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	1214	532	146	503	9	85	105	210	18	87	95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	66	1214	532	146	512	0	0	190	210	0	105	95
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	0.92	1.00	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
2: Marglin Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4				2		2	6		6
Detector Phase	7	4	4	3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5	9.5	22.5	22.5
Total Split (s)	11.7	34.0	34.0	13.0	35.3		9.5	23.5	23.5	9.5	23.5	23.5
Total Split (%)	14.6%	42.5%	42.5%	16.3%	44.1%		11.9%	29.4%	29.4%	11.9%	29.4%	29.4%
Maximum Green (s)	7.2	29.5	29.5	8.5	30.8		5.0	19.0	19.0	5.0	19.0	19.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	6.8	29.6	29.6	8.4	33.2		28.5	28.5		28.5	28.5	
Actuated g/C Ratio	0.08	0.37	0.37	0.10	0.42		0.36	0.36		0.36	0.36	
v/c Ratio	0.44	0.93	0.58	0.78	0.35		0.35	0.29		0.15	0.13	
Control Delay	43.6	40.7	9.4	72.6	12.7		21.2	4.0		18.3	1.7	
Queue Delay	1.2	46.8	1.7	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	44.8	87.5	11.0	72.6	12.7		21.2	4.0		18.3	1.7	
LOS	D	F	B	E	B		C	A		B	A	
Approach Delay		63.5			26.0		12.1			10.4		
Approach LOS		E			C		B			B		
90th %ile Green (s)	7.2	29.5	29.5	8.5	30.8		0.0	28.5	28.5	0.0	28.5	28.5
90th %ile Term Code	Max	Max	Max	Max	Hold		Skip	Coord	Coord	Skip	Coord	Coord
70th %ile Green (s)	7.2	29.5	29.5	8.5	30.8		0.0	28.5	28.5	0.0	28.5	28.5
70th %ile Term Code	Max	Max	Max	Max	Hold		Skip	Coord	Coord	Skip	Coord	Coord
50th %ile Green (s)	7.2	29.5	29.5	8.5	30.8		0.0	28.5	28.5	0.0	28.5	28.5
50th %ile Term Code	Max	Max	Max	Max	Hold		Skip	Coord	Coord	Skip	Coord	Coord
30th %ile Green (s)	7.1	29.5	29.5	8.5	30.9		0.0	28.5	28.5	0.0	28.5	28.5
30th %ile Term Code	Gap	Max	Max	Max	Hold		Skip	Coord	Coord	Skip	Coord	Coord
10th %ile Green (s)	0.0	29.8	29.8	8.2	42.5		0.0	28.5	28.5	0.0	28.5	28.5
10th %ile Term Code	Skip	Max	Max	Gap	Hold		Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	58	996	118	123	193		124	22		63	5	
Fuel Used(gal)	1	18	2	3	4		2	1		1	0	
CO Emissions (g/hr)	74	1271	171	224	292		145	68		70	22	
NOx Emissions (g/hr)	14	247	33	44	57		28	13		14	4	
VOC Emissions (g/hr)	17	295	40	52	68		34	16		16	5	
Dilemma Vehicles (#)	0	71	0	0	0		0	0		0	0	
Queue Length 50th (ft)	33	345	53	79	53		69	0		35	0	
Queue Length 95th (ft)	74	#452	130	#173	80		122	42		69	13	
Internal Link Dist (ft)		98			436		384			299		
Turn Bay Length (ft)	96			205								
Base Capacity (vph)	159	1308	920	188	1464		549	736		709	731	

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
 2: Marginal Way

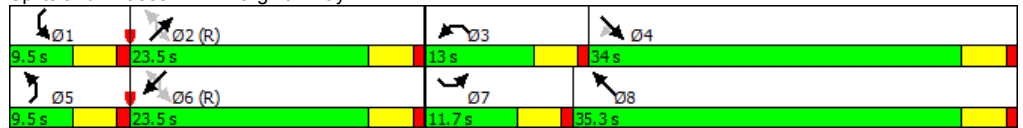
7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	22	497	224	0	0			0	0		0	0
Spillback Cap Reductn	0	70	0	0	0			0	4		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	0.48	1.50	0.76	0.78	0.35			0.35	0.29		0.15	0.13

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 45.3 Intersection LOS: D
 Intersection Capacity Utilization 65.6% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: Marginal Way



Educational Use Only

Franklin Street Morning Initial Cond.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	↶
Traffic Volume (vph)	46	1131	122	19	381	15	68	21	7	23	96	142
Future Volume (vph)	46	1131	122	19	381	15	68	21	7	23	96	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	205		0	250		0	0		0	0		0
Storage Lanes	1		0	1		0	2		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frnt		0.985			0.994			0.961				0.850
Flt Protected	0.950			0.950			0.950				0.990	
Satd. Flow (prot)	1770	3719	0	1770	3518	0	3433	1790	0	0	1844	1583
Flt Permitted	0.950			0.950			0.950				0.946	
Satd. Flow (perm)	1770	3719	0	1770	3518	0	3433	1790	0	0	1762	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			6			8				154
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		516			1269			509			540	
Travel Time (s)		11.7			24.7			11.6			12.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	1229	133	21	414	16	74	23	8	25	104	154
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	1362	0	21	430	0	74	31	0	0	129	154
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases										6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	22.5
Total Split (s)	11.1	37.4		9.6	35.9		9.6	23.5		9.5	23.4	23.4
Total Split (%)	13.9%	46.8%		12.0%	44.9%		12.0%	29.4%		11.9%	29.3%	29.3%
Maximum Green (s)	6.6	32.9		5.1	31.4		5.1	19.0		5.0	18.9	18.9
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	None		None	None		None	C-Max	C-Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	6.4	38.7		5.1	35.8		5.1	28.5		20.8	20.8	20.8
Actuated g/C Ratio	0.08	0.48		0.06	0.45		0.06	0.36		0.26	0.26	0.26
v/c Ratio	0.36	0.75		0.19	0.27		0.34	0.05		0.28	0.29	0.29
Control Delay	44.8	17.3		39.6	15.4		40.4	14.0		26.9	6.3	6.3
Queue Delay	0.0	0.1		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	44.8	17.4		39.6	15.4		40.4	14.0		26.9	6.3	6.3
LOS	D	B		D	B		D	B		C	A	A
Approach Delay		18.3			16.5			32.6			15.7	
Approach LOS		B			B			C			B	
90th %ile Green (s)	6.6	32.9		5.1	31.4		5.1	28.5		0.0	18.9	18.9
90th %ile Term Code	Max	MaxR		Max	Hold		Max	Coord		Skip	Coord	Coord
70th %ile Green (s)	6.6	32.9		5.1	31.4		5.1	28.5		0.0	18.9	18.9
70th %ile Term Code	Max	MaxR		Max	Hold		Max	Coord		Skip	Coord	Coord
50th %ile Green (s)	6.6	42.5		0.0	31.4		5.1	28.5		0.0	18.9	18.9
50th %ile Term Code	Max	MaxR		Skip	Hold		Max	Coord		Skip	Coord	Coord
30th %ile Green (s)	0.0	42.5		0.0	42.5		5.1	28.5		0.0	18.9	18.9
30th %ile Term Code	Skip	MaxR		Skip	Hold		Max	Coord		Skip	Coord	Coord
10th %ile Green (s)	0.0	42.5		0.0	42.5		0.0	28.5		0.0	28.5	28.5
10th %ile Term Code	Skip	MaxR		Skip	Hold		Skip	Coord		Skip	Coord	Coord
Stops (vph)	48	489		21	240		63	16		95	23	23
Fuel Used(gal)	1	12		0	7		1	0		2	1	1
CO Emissions (g/hr)	61	850		34	466		82	20		117	63	63
NOx Emissions (g/hr)	12	165		7	91		16	4		23	12	12
VOC Emissions (g/hr)	14	197		8	108		19	5		27	15	15
Dilemma Vehicles (#)	0	0		0	18		0	0		0	0	0
Queue Length 50th (ft)	27	152		10	75		18	7		53	0	0
Queue Length 95th (ft)	m34	m199		32	110		39	25		101	44	44
Internal Link Dist (ft)		436			1189			429			460	
Turn Bay Length (ft)	205			250								
Base Capacity (vph)	146	1805		112	1570		218	642		458	525	525

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	21		0	0		0	0			0	0
Spillback Cap Reductn	0	0		0	0		0	0			0	0
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	0.34	0.76		0.19	0.27		0.34	0.05			0.28	0.29

Intersection Summary

Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	80
Offset:	0 (0%), Referenced to phase 6:SWTL, Start of Green
Natural Cycle:	75
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.75
Intersection Signal Delay:	18.3
Intersection Capacity Utilization:	58.7%
Analysis Period (min):	15
m	Volume for 95th percentile queue is metered by upstream signal.
	Intersection LOS: B
	ICU Level of Service B

Splits and Phases: 5: Somerset Street

Ø1	Ø2	Ø3	Ø4
9.5 s	23.5 s	9.6 s	37.4 s
Ø5	Ø6 (R)	Ø7	Ø8
9.6 s	23.4 s	11.1 s	35.9 s

Educational Use Only

Franklin Street Morning Initial Cond.syn
10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔			↔		↕	↕	
Traffic Volume (vph)	16	285	14	59	955	122	24	73	30	13	140	87
Future Volume (vph)	16	285	14	59	955	122	24	73	30	13	140	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		80	0		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Frnt		0.993			0.984			0.964			0.942	
Flt Protected		0.998			0.997			0.991		0.950		
Satd. Flow (prot)	0	3507	0	0	3472	0	0	3381	0	1770	1755	0
Flt Permitted		0.880			0.912			0.883		0.558		
Satd. Flow (perm)	0	3093	0	0	3176	0	0	3013	0	1039	1755	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			22			33			44	
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		481			1269			295			262	
Travel Time (s)		9.4			24.7			6.7			7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	310	15	64	1038	133	26	79	33	14	152	95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	342	0	0	1235	0	0	138	0	14	247	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	8			7			5			2		6
Permitted Phases	8			4			2			6		

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	9.5	28.0		9.5	28.0		9.5	23.0		9.5	23.0	
Total Split (%)	13.6%	40.0%		13.6%	40.0%		13.6%	32.9%		13.6%	32.9%	
Maximum Green (s)	5.0	23.5		5.0	23.5		5.0	18.5		5.0	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		4.5			4.5			4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)		31.9			31.9			27.2		29.1	29.1	
Actuated g/C Ratio		0.46			0.46			0.39		0.42	0.42	
v/c Ratio		0.24			0.85			0.12		0.03	0.33	
Control Delay		11.6			23.1			12.5		13.0	13.2	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		11.6			23.1			12.5		13.0	13.2	
LOS		B			C			B		B	B	
Approach Delay		11.6			23.1			12.5			13.2	
Approach LOS		B			C			B			B	
90th %ile Green (s)	0.0	33.0		0.0	33.0		0.0	18.5		5.0	28.0	
90th %ile Term Code	Skip	Hold		Skip	Max		Skip	Coord		Max	Coord	
70th %ile Green (s)	0.0	33.0		0.0	33.0		0.0	28.0		0.0	28.0	
70th %ile Term Code	Skip	Hold		Skip	Max		Skip	Coord		Skip	Coord	
50th %ile Green (s)	0.0	33.0		0.0	33.0		0.0	28.0		0.0	28.0	
50th %ile Term Code	Skip	Hold		Skip	Max		Skip	Coord		Skip	Coord	
30th %ile Green (s)	0.0	33.0		0.0	33.0		0.0	28.0		0.0	28.0	
30th %ile Term Code	Skip	Hold		Skip	Max		Skip	Coord		Skip	Coord	
10th %ile Green (s)	0.0	27.7		0.0	27.7		0.0	33.3		0.0	33.3	
10th %ile Term Code	Skip	Hold		Skip	Gap		Skip	Coord		Skip	Coord	
Stops (vph)		172			924			64		10	123	
Fuel Used(gal)		3			23			1		0	2	
CO Emissions (g/hr)		219			1587			68		7	111	
NOx Emissions (g/hr)		43			309			13		1	22	
VOC Emissions (g/hr)		51			368			16		2	26	
Dilemma Vehicles (#)		16			77			0		0	0	
Queue Length 50th (ft)		42			224			14		4	57	
Queue Length 95th (ft)		66			311			38		13	109	
Internal Link Dist (ft)		401			1189			215			182	
Turn Bay Length (ft)												
Base Capacity (vph)		1415			1469			1189		484	754	
Starvation Cap Reductn		0			0			0		0	0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
 10: Cumberland Street

7/26/2016

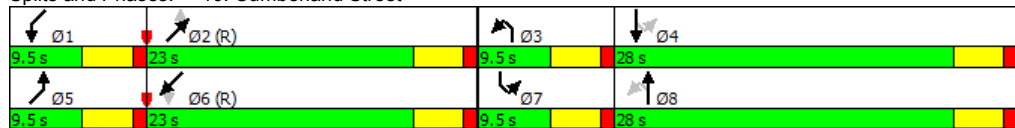


Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.24			0.85			0.12		0.03	0.33	

Intersection Summary

Area Type:	Other
Cycle Length:	70
Actuated Cycle Length:	70
Offset:	0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
Natural Cycle:	70
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.85
Intersection Signal Delay:	19.1
Intersection LOS:	B
Intersection Capacity Utilization:	72.6%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 10: Cumberland Street



Educational Use Only

Franklin Street Morning Initial Cond.syn
12: Congress Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔			↔			↔			↔	↔
Traffic Volume (vph)	81	564	288	17	188	24	77	109	16	0	261	90
Future Volume (vph)	81	564	288	17	188	24	77	109	16	0	261	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Frt		0.954			0.984			0.988				0.850
Flt Protected		0.996			0.996			0.981				
Satd. Flow (prot)	0	3363	0	0	3469	0	0	3430	0	0	1863	1583
Flt Permitted		0.892			0.871			0.768				
Satd. Flow (perm)	0	3012	0	0	3033	0	0	2686	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		123			21			13				153
Link Speed (mph)		35			35			30				25
Link Distance (ft)		481			832			235				220
Travel Time (s)		9.4			16.2			5.3				6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	613	313	18	204	26	84	118	17	0	284	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1014	0	0	248	0	0	219	0	0	284	98
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA			NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
12: Congress Street

7/26/2016



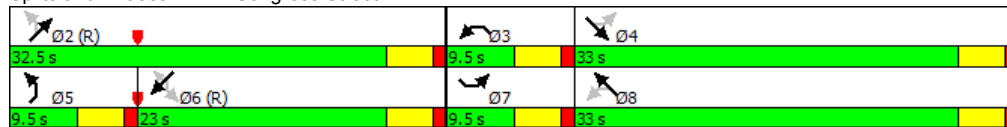
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		22.5	22.5	22.5
Total Split (s)	9.5	33.0		9.5	33.0		9.5	32.5		23.0	23.0	23.0
Total Split (%)	12.7%	44.0%		12.7%	44.0%		12.7%	43.3%		30.7%	30.7%	30.7%
Maximum Green (s)	5.0	28.5		5.0	28.5		5.0	28.0		18.5	18.5	18.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)		4.5			4.5			4.5			4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	C-Max
Walk Time (s)		7.0			7.0			7.0		7.0	7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0			0			0		0	0	0
Act Effct Green (s)		30.0			30.0			36.0			36.0	36.0
Actuated g/C Ratio		0.40			0.40			0.48			0.48	0.48
v/c Ratio		0.79			0.20			0.17			0.32	0.12
Control Delay		21.8			12.7			12.3			14.8	1.3
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		21.8			12.7			12.3			14.8	1.3
LOS		C			B			B			B	A
Approach Delay		21.8			12.7			12.3			11.3	
Approach LOS		C			B			B			B	
90th %ile Green (s)	0.0	38.0		0.0	38.0		0.0	28.0		28.0	28.0	28.0
90th %ile Term Code	Skip	Max		Skip	Hold		Skip	Coord		Coord	Coord	Coord
70th %ile Green (s)	0.0	32.3		0.0	32.3		0.0	33.7		33.7	33.7	33.7
70th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
50th %ile Green (s)	0.0	30.0		0.0	30.0		0.0	36.0		36.0	36.0	36.0
50th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
30th %ile Green (s)	0.0	27.1		0.0	27.1		0.0	38.9		38.9	38.9	38.9
30th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
10th %ile Green (s)	0.0	22.6		0.0	22.6		0.0	43.4		43.4	43.4	43.4
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
Stops (vph)		684			122			106			160	4
Fuel Used(gal)		13			3			1			2	0
CO Emissions (g/hr)		875			201			102			132	15
NOx Emissions (g/hr)		170			39			20			26	3
VOC Emissions (g/hr)		203			47			24			31	3
Dilemma Vehicles (#)		49			11			0			0	0
Queue Length 50th (ft)		187			35			26			77	0
Queue Length 95th (ft)		210			46			57			158	11
Internal Link Dist (ft)		401			752			155			140	
Turn Bay Length (ft)												
Base Capacity (vph)		1334			1284			1296			894	839
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.76			0.19			0.17			0.32	0.12

Baseline

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Intersection Summary	
Area Type:	Other
Cycle Length:	75
Actuated Cycle Length:	75
Offset:	0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.79
Intersection Signal Delay:	17.3
Intersection LOS:	B
Intersection Capacity Utilization:	68.1%
ICU Level of Service:	C
Analysis Period (min):	15

Splits and Phases: 12: Congress Street



Educational Use Only

Franklin Street Morning Initial Cond.syn
16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕			↕↕			↕↕				↕↕
Traffic Volume (vph)	56	337	207	9	168	4	54	54	16	3	86	17
Future Volume (vph)	56	337	207	9	168	4	54	54	16	3	86	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.948			0.997			0.983			0.979	
Flt Protected		0.995			0.997			0.979			0.999	
Satd. Flow (prot)	0	3338	0	0	3518	0	0	1793	0	0	1822	0
Flt Permitted		0.905			0.916			0.860			0.995	
Satd. Flow (perm)	0	3036	0	0	3232	0	0	1575	0	0	1815	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		148			4			10			14	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		832			303			251			371	
Travel Time (s)		16.2			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	366	225	10	183	4	59	59	17	3	93	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	652	0	0	197	0	0	135	0	0	114	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Morning Initial Cond.syn
16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Minimum Split (s)	9.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	23.0		22.5	36.0		24.5	24.5		24.5	24.5	
Total Split (%)	13.6%	32.9%		32.1%	51.4%		35.0%	35.0%		35.0%	35.0%	
Maximum Green (s)	5.0	18.5		18.0	31.5		20.0	20.0		20.0	20.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effect Green (s)		13.3			13.3			20.1			20.1	
Actuated g/C Ratio		0.31			0.31			0.47			0.47	
v/c Ratio		0.62			0.19			0.18			0.13	
Control Delay		12.0			10.5			8.0			7.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		12.0			10.5			8.0			7.2	
LOS		B			B			A			A	
Approach Delay		12.0			10.5			8.0			7.2	
Approach LOS		B			B			A			A	
90th %ile Green (s)	0.0	18.5		0.0	18.5		20.0	20.0		20.0	20.0	
90th %ile Term Code	Skip	Max		Skip	Hold		MaxR	MaxR		MaxR	MaxR	
70th %ile Green (s)	0.0	15.7		0.0	15.7		20.0	20.0		20.0	20.0	
70th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		MaxR	MaxR	
50th %ile Green (s)	0.0	13.1		0.0	13.1		20.0	20.0		20.0	20.0	
50th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		MaxR	MaxR	
30th %ile Green (s)	0.0	11.6		0.0	11.6		20.0	20.0		20.0	20.0	
30th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		MaxR	MaxR	
10th %ile Green (s)	0.0	8.7		0.0	8.7		20.0	20.0		20.0	20.0	
10th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		MaxR	MaxR	
Stops (vph)		352			111			64			52	
Fuel Used(gal)		8			2			1			1	
CO Emissions (g/hr)		540			113			50			48	
NOx Emissions (g/hr)		105			22			10			9	
VOC Emissions (g/hr)		125			26			12			11	
Dilemma Vehicles (#)		55			15			0			0	
Queue Length 50th (ft)		51			17			15			12	
Queue Length 95th (ft)		87			33			47			39	
Internal Link Dist (ft)		752			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1412			2410			750			866	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.46			0.03			0.18			0.13	

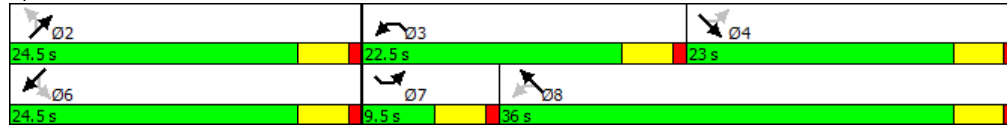
Baseline

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Intersection Summary

Area Type:	Other
Cycle Length:	70
Actuated Cycle Length:	42.5
Natural Cycle:	70
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.62
Intersection Signal Delay:	10.7
Intersection LOS:	B
Intersection Capacity Utilization:	47.3%
ICU Level of Service:	A
Analysis Period (min):	15
90th %ile Actuated Cycle:	47.5
70th %ile Actuated Cycle:	44.7
50th %ile Actuated Cycle:	42.1
30th %ile Actuated Cycle:	40.6
10th %ile Actuated Cycle:	37.7



















Splits and Phases: 16: Middle Street



Educational Use Only

Franklin Street Morning Initial Cond.syn
19: Fore Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	96	53	18	5	63	40	38	169	73	14	168	4
Future Volume (vph)	96	53	18	5	63	40	38	169	73	14	168	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.962			0.950			0.961			0.997	
Flt Protected	0.950				0.998			0.993			0.996	
Satd. Flow (prot)	1770	1792	0	0	1766	0	0	3377	0	0	3514	0
Flt Permitted	0.682				0.992			0.883			0.912	
Satd. Flow (perm)	1270	1792	0	0	1755	0	0	3003	0	0	3218	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			43			79			4	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	104	58	20	5	68	43	41	184	79	15	183	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	78	0	0	116	0	0	304	0	0	202	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

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Franklin Street Morning Initial Cond.syn
19: Fore Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effect Green (s)	18.6	18.6			18.6			7.9			7.9	
Actuated g/C Ratio	0.52	0.52			0.52			0.22			0.22	
v/c Ratio	0.16	0.08			0.12			0.42			0.28	
Control Delay	5.6	4.1			3.8			10.4			12.1	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	5.6	4.1			3.8			10.4			12.1	
LOS	A	A			A			B			B	
Approach Delay		5.0			3.8			10.4			12.1	
Approach LOS		A			A			B			B	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	10.1		0.0	10.1	
90th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
70th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	8.8		0.0	8.8	
70th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	7.9		0.0	7.9	
50th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
30th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	7.0		0.0	7.0	
30th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
10th %ile Green (s)	19.0	19.0		19.0	19.0		0.0	5.9		0.0	5.9	
10th %ile Term Code	Dwell	Dwell		Dwell	Dwell		Skip	Gap		Skip	Hold	
Stops (vph)	47	29			35			160			135	
Fuel Used(gal)	1	0			1			2			2	
CO Emissions (g/hr)	41	28			38			168			140	
NOx Emissions (g/hr)	8	5			7			33			27	
VOC Emissions (g/hr)	10	6			9			39			32	
Dilemma Vehicles (#)	0	0			0			28			19	
Queue Length 50th (ft)	9	5			6			18			16	
Queue Length 95th (ft)	27	18			22			40			33	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	665	949			940			1561			1633	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.16	0.08			0.12			0.19			0.12	

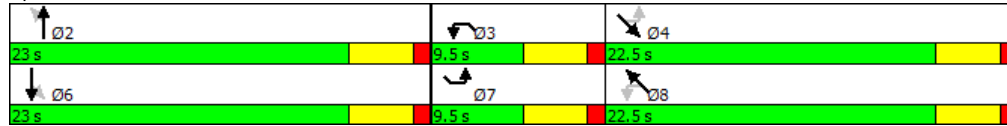
Baseline

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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	35.5
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.42
Intersection Signal Delay:	8.6
Intersection LOS:	A
Intersection Capacity Utilization:	36.5%
ICU Level of Service:	A
Analysis Period (min):	15
90th %ile Actuated Cycle:	37.6
70th %ile Actuated Cycle:	36.3
50th %ile Actuated Cycle:	35.4
30th %ile Actuated Cycle:	34.5
10th %ile Actuated Cycle:	33.9

Splits and Phases: 19: Fore Street



Educational Use Only

Franklin Street Morning Initial Cond.syn
22: Commercial Street

7/26/2016













Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	150	185	37	12	194	30	24	24	164	3	22	7
Future Volume (vph)	150	185	37	12	194	30	24	24	164	3	22	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	1		1	0		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.997		0.950				0.994	
Satd. Flow (prot)	1770	1863	1583	0	1857	1583	1770	1863	1583	0	3518	1583
Flt Permitted	0.406				0.978		0.645				0.944	
Satd. Flow (perm)	756	1863	1583	0	1822	1583	1201	1863	1583	0	3341	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			205			205			205			143
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			194	
Travel Time (s)		10.6			10.3			10.7			4.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	201	40	13	211	33	26	26	178	3	24	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	163	201	40	0	224	33	26	26	178	0	27	8
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4			8

Baseline

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Franklin Street Morning Initial Cond.syn
22: Commercial Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	11.2	25.5	25.5	9.5	23.8	23.8	9.5	22.5	22.5	22.5	35.5	35.5
Total Split (%)	14.0%	31.9%	31.9%	11.9%	29.8%	29.8%	11.9%	28.1%	28.1%	28.1%	44.4%	44.4%
Maximum Green (s)	6.7	21.0	21.0	5.0	19.3	19.3	5.0	18.0	18.0	18.0	31.0	31.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	None	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	30.6	30.6	30.6		19.4	19.4	34.6	34.6	34.6		31.1	31.1
Actuated g/C Ratio	0.41	0.41	0.41		0.26	0.26	0.47	0.47	0.47		0.42	0.42
v/c Ratio	0.40	0.26	0.05		0.47	0.06	0.04	0.03	0.21		0.04	0.01
Control Delay	18.7	16.6	0.1		28.1	0.2	10.5	10.4	1.8		14.7	0.0
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	18.7	16.6	0.1		28.1	0.2	10.5	10.4	1.8		14.7	0.0
LOS	B	B	A		C	A	B	B	A		B	A
Approach Delay		15.8			24.5			3.8			11.4	
Approach LOS		B			C			A			B	
90th %ile Green (s)	6.7	30.5	30.5	0.0	19.3	19.3	5.0	40.5	40.5	0.0	31.0	31.0
90th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Max	Hold	Hold	Skip	MaxR	MaxR
70th %ile Green (s)	6.7	30.5	30.5	0.0	19.3	19.3	5.0	40.5	40.5	0.0	31.0	31.0
70th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Max	Hold	Hold	Skip	MaxR	MaxR
50th %ile Green (s)	6.7	30.5	30.5	0.0	19.3	19.3	0.0	31.0	31.0	0.0	31.0	31.0
50th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	Hold	Hold	Skip	MaxR	MaxR
30th %ile Green (s)	6.7	30.5	30.5	0.0	19.3	19.3	0.0	31.0	31.0	0.0	31.0	31.0
30th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	Hold	Hold	Skip	MaxR	MaxR
10th %ile Green (s)	6.7	30.5	30.5	0.0	19.3	19.3	0.0	31.0	31.0	0.0	31.0	31.0
10th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	Hold	Hold	Skip	MaxR	MaxR
Stops (vph)	94	118	0		168	0	14	14	10		17	0
Fuel Used(gal)	1	2	0		2	0	0	0	1		0	0
CO Emissions (g/hr)	100	118	9		174	7	13	13	45		14	1
NOx Emissions (g/hr)	19	23	2		34	1	3	3	9		3	0
VOC Emissions (g/hr)	23	27	2		40	2	3	3	11		3	0
Dilemma Vehicles (#)	0	0	0		0	0	0	0	0		0	0
Queue Length 50th (ft)	42	53	0		80	0	6	6	0		3	0
Queue Length 95th (ft)	98	117	0		165	0	18	18	22		12	0
Internal Link Dist (ft)		308			298			314			114	
Turn Bay Length (ft)			160				270					
Base Capacity (vph)	405	767	772		471	564	598	869	847		645	746
Starvation Cap Reductn	0	0	0		0	0	0	0	0		0	0

Baseline

Synchro 9 Classroom Report
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Figure A.2. Franklin Street Afternoon Initial Conditions

Franklin Street Afternoon Initial Cond.syn
1: I-295

7/26/2016

Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑				↑↑↑			↑	↑
Traffic Volume (vph)	0	510	0	0	0	386	0	0	758	1031
Future Volume (vph)	0	510	0	0	0	386	0	0	758	1031
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	16	16	16
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	0.91	1.00	1.00	1.00	1.00
Ped Bike Factor										
Frt		0.850								0.850
Flt Protected										
Satd. Flow (prot)	0	3158	0	0	0	5085	0	0	2111	1794
Flt Permitted										
Satd. Flow (perm)	0	3158	0	0	0	5085	0	0	2111	1794
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		417								490
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	1006		533			410			174	
Travel Time (s)	22.9		12.1			8.0			3.4	
Confl. Peds. (#/hr)								754		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	554	0	0	0	420	0	0	824	1121
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	554	0	0	0	420	0	0	824	1121
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			12			12	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	0.85	0.85	0.85
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		Cl+Ex				Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						Cl+Ex			Cl+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	Free
Permitted Phases										

Baseline

Synchro 9 Classroom Report
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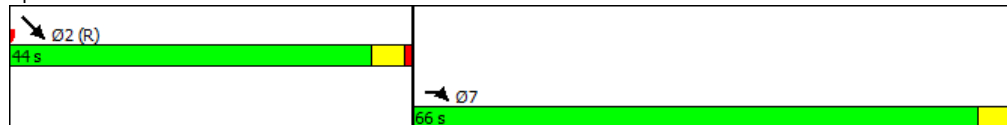


Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase		7				2				
Switch Phase										
Minimum Initial (s)		5.0				5.0				
Minimum Split (s)		9.5				9.5				
Total Split (s)		66.0				44.0				
Total Split (%)		60.0%				40.0%				
Maximum Green (s)		61.5				39.5				
Yellow Time (s)		3.5				3.5				
All-Red Time (s)		1.0				1.0				
Lost Time Adjust (s)		0.0				0.0				
Total Lost Time (s)		4.5				4.5				
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)		3.0				3.0				
Recall Mode		None				C-Max				
Act Effect Green (s)		11.5				89.5		110.0	110.0	
Actuated g/C Ratio		0.10				0.81		1.00	1.00	
v/c Ratio		0.79				0.10		0.39	0.62	
Control Delay		20.3				2.5		0.4	5.0	
Queue Delay		0.2				0.0		0.0	0.0	
Total Delay		20.5				2.5		0.4	5.0	
LOS		C				A		A	A	
Approach Delay	20.5					2.5		3.0		
Approach LOS	C					A		A		
90th %ile Green (s)		19.1				81.9				
90th %ile Term Code		Gap				Coord				
70th %ile Green (s)		13.9				87.1				
70th %ile Term Code		Gap				Coord				
50th %ile Green (s)		10.9				90.1				
50th %ile Term Code		Gap				Coord				
30th %ile Green (s)		8.1				92.9				
30th %ile Term Code		Gap				Coord				
10th %ile Green (s)		5.5				95.5				
10th %ile Term Code		Gap				Coord				
Stops (vph)		133				72		0	221	
Fuel Used(gal)		7				2		1	4	
CO Emissions (g/hr)		479				132		71	279	
NOx Emissions (g/hr)		93				26		14	54	
VOC Emissions (g/hr)		111				30		16	65	
Dilemma Vehicles (#)		0				17		0	0	
Queue Length 50th (ft)		52				16		0	143	
Queue Length 95th (ft)		107				34		m0	m197	
Internal Link Dist (ft)	926		453			330		94		
Turn Bay Length (ft)										
Base Capacity (vph)		1949				4137		2111	1794	
Starvation Cap Reductn		0				0		0	0	
Spillback Cap Reductn		603				916		0	0	
Storage Cap Reductn		0				0		0	0	
Reduced v/c Ratio		0.41				0.3		0.39	0.62	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:SET and 6:, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 6.3 Intersection LOS: A
Intersection Capacity Utilization 43.2% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: I-295



Educational Use Only

Franklin Street Afternoon Initial Cond.syn
2: Marginal Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↘	↗	↘	↘	↗			↗	↘		↗	↘
Traffic Volume (vph)	108	590	197	259	1021	29	302	103	280	8	106	204
Future Volume (vph)	108	590	197	259	1021	29	302	103	280	8	106	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	14	12	14	12	16	16
Storage Length (ft)	90		0	205		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996				0.850			0.850
Flt Protected	0.950			0.950				0.964			0.996	
Satd. Flow (prot)	1770	3539	1583	1770	3525	0	0	1796	1689	0	2103	1794
Flt Permitted	0.950			0.950				0.701			0.968	
Satd. Flow (perm)	1770	3539	1583	1770	3525	0	0	1306	1689	0	2044	1794
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			214		3				304			222
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		174			520			464			379	
Travel Time (s)		3.4			11.8			10.5			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	117	641	214	282	1110	32	328	112	304	9	115	222
Shared Lane Traffic (%)												
Lane Group Flow (vph)	117	641	214	282	1142	0	0	440	304	0	124	222
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	0.92	1.00	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
2: Marglin Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4				2		2	6		6
Detector Phase	7	4	4	3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5	9.5	22.5	22.5
Total Split (s)	14.0	30.8	30.8	27.2	44.0		9.5	42.5	42.5	9.5	42.5	42.5
Total Split (%)	12.7%	28.0%	28.0%	24.7%	40.0%		8.6%	38.6%	38.6%	8.6%	38.6%	38.6%
Maximum Green (s)	9.5	26.3	26.3	22.7	39.5		5.0	38.0	38.0	5.0	38.0	38.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	9.3	27.5	27.5	20.8	39.0		48.2	48.2		48.2	48.2	
Actuated g/C Ratio	0.08	0.25	0.25	0.19	0.35		0.44	0.44		0.44	0.44	
v/c Ratio	0.79	0.73	0.38	0.84	0.91		0.77	0.33		0.14	0.24	
Control Delay	84.3	41.0	5.2	71.3	32.1		37.3	3.3		19.4	3.2	
Queue Delay	54.1	54.9	2.5	0.0	1.7		0.0	0.0		0.0	0.0	
Total Delay	138.4	95.9	7.6	71.3	33.8		37.3	3.3		19.4	3.2	
LOS	F	F	A	E	C		D	A		B	A	
Approach Delay		81.6			41.2		23.4			9.0		
Approach LOS		F			D		C			A		
90th %ile Green (s)	9.5	26.3	26.3	22.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
90th %ile Term Code	Max	Max	Max	Max	Max		Skip	Coord	Coord	Skip	Coord	Coord
70th %ile Green (s)	9.5	26.3	26.3	22.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
70th %ile Term Code	Max	Max	Max	Max	Max		Skip	Coord	Coord	Skip	Coord	Coord
50th %ile Green (s)	9.5	26.3	26.3	22.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
50th %ile Term Code	Max	Max	Max	Max	Max		Skip	Coord	Coord	Skip	Coord	Coord
30th %ile Green (s)	9.5	28.8	28.8	20.2	39.5		0.0	47.5	47.5	0.0	47.5	47.5
30th %ile Term Code	Max	Hold	Hold	Gap	Max		Skip	Coord	Coord	Skip	Coord	Coord
10th %ile Green (s)	8.6	29.7	29.7	15.8	36.9		0.0	51.0	51.0	0.0	51.0	51.0
10th %ile Term Code	Gap	Hold	Hold	Gap	Gap		Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	91	538	34	215	914		335	21		65	17	
Fuel Used(gal)	3	10	1	6	16		6	1		1	1	
CO Emissions (g/hr)	187	679	50	419	1131		447	92		80	58	
NOx Emissions (g/hr)	36	132	10	82	220		87	18		16	11	
VOC Emissions (g/hr)	43	157	12	97	262		104	21		19	13	
Dilemma Vehicles (#)	0	21	0	0	0		0	0		0	0	
Queue Length 50th (ft)	76	228	0	170	327		261	0		52	0	
Queue Length 95th (ft)	#171	297	44	m230	#512		#413	49		90	43	
Internal Link Dist (ft)		94			440		384			299		
Turn Bay Length (ft)	96			205								
Base Capacity (vph)	132	314	556	365	1267		571	911		895	910	

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
 2: Marginal Way









7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	42	473	229	0	45			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	0		0	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	1.06	1.56	0.65	0.77	0.93			0.77	0.33		0.14	0.24

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 45.5 Intersection LOS: D
 Intersection Capacity Utilization 75.2% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Marginal Way

 Ø1	 Ø2 (R)	 Ø3	 Ø4
9.5 s	42.5 s	27.2 s	30.8 s
 Ø5	 Ø6 (R)	 Ø7	 Ø8
9.5 s	42.5 s	14 s	44 s

Educational Use Only

Franklin Street Afternoon Initial Cond.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↵	↕		↵	↕		↕	↕			↕	↕
Traffic Volume (vph)	122	636	126	62	1021	29	329	73	29	23	55	143
Future Volume (vph)	122	636	126	62	1021	29	329	73	29	23	55	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	205		0	250		0	0		0	0		0
Storage Lanes	1		0	1		0	2		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frnt		0.975			0.996			0.957				0.850
Flt Protected	0.950			0.950			0.950				0.986	
Satd. Flow (prot)	1770	3681	0	1770	3525	0	3433	1783	0	0	1837	1583
Flt Permitted	0.950			0.950			0.950				0.898	
Satd. Flow (perm)	1770	3681	0	1770	3525	0	3433	1783	0	0	1673	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			3			18				155
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		520			1269			509			540	
Travel Time (s)		11.8			24.7			11.6			12.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	691	137	67	1110	32	358	79	32	25	60	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	133	828	0	67	1142	0	358	111	0	0	85	155
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		Prot	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases										6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	22.5
Total Split (s)	18.0	50.7		14.3	47.0		20.0	35.5		9.5	25.0	25.0
Total Split (%)	16.4%	46.1%		13.0%	42.7%		18.2%	32.3%		8.6%	22.7%	22.7%
Maximum Green (s)	13.5	46.2		9.8	42.5		15.5	31.0		5.0	20.5	20.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	None		None	None		None	C-Max	C-Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	12.1	49.5		8.6	43.9		14.8	40.5		21.2	21.2	21.2
Actuated g/C Ratio	0.11	0.45		0.08	0.40		0.13	0.37		0.19	0.19	0.19
v/c Ratio	0.69	0.50		0.49	0.81		0.78	0.17		0.26	0.36	0.36
Control Delay	62.2	37.9		60.3	35.2		58.3	20.3		40.8	8.7	8.7
Queue Delay	0.0	0.0		0.0	0.7		0.0	0.0		0.0	0.0	0.0
Total Delay	62.2	37.9		60.3	35.9		58.3	20.3		40.8	8.7	8.7
LOS	E	D		E	D		E	C		D	A	A
Approach Delay		41.3			37.3			49.3			20.1	
Approach LOS		D			D			D			C	
90th %ile Green (s)	13.5	46.2		9.8	42.5		15.5	40.5		0.0	20.5	20.5
90th %ile Term Code	Max	MaxR		Max	Max		Max	Coord		Skip	Coord	Coord
70th %ile Green (s)	13.5	46.2		9.8	42.5		15.5	40.5		0.0	20.5	20.5
70th %ile Term Code	Max	MaxR		Max	Max		Max	Coord		Skip	Coord	Coord
50th %ile Green (s)	13.5	46.5		9.5	42.5		15.5	40.5		0.0	20.5	20.5
50th %ile Term Code	Max	MaxR		Gap	Max		Max	Coord		Skip	Coord	Coord
30th %ile Green (s)	11.4	48.0		8.0	44.6		15.0	40.5		0.0	21.0	21.0
30th %ile Term Code	Gap	MaxR		Gap	Hold		Gap	Coord		Skip	Coord	Coord
10th %ile Green (s)	8.4	60.5		0.0	47.6		12.4	40.5		0.0	23.6	23.6
10th %ile Term Code	Gap	MaxR		Skip	Hold		Gap	Coord		Skip	Coord	Coord
Stops (vph)	120	525		57	903		310	56		66	20	20
Fuel Used(gal)	3	12		2	24		7	1		1	1	1
CO Emissions (g/hr)	189	830		123	1674		484	79		94	67	67
NOx Emissions (g/hr)	37	162		24	326		94	15		18	13	13
VOC Emissions (g/hr)	44	192		28	388		112	18		22	16	16
Dilemma Vehicles (#)	0	0		0	43		0	0		0	0	0
Queue Length 50th (ft)	98	248		46	378		126	43		52	0	0
Queue Length 95th (ft)	m146	326		92	470		177	84		99	55	55
Internal Link Dist (ft)		440			1189			429			460	
Turn Bay Length (ft)	205			250								
Base Capacity (vph)	217	1670		157	1409		483	667		322	430	430

Baseline

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Franklin Street Afternoon Initial Cond.syn
 5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	0		0	0		0	0			0	0
Spillback Cap Reductn	0	0		0	76		0	0			0	3
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	0.61	0.50		0.43	0.86		0.74	0.17			0.26	0.36

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 6:SWTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 39.1 Intersection LOS: D
 Intersection Capacity Utilization 63.2% ICU Level of Service B
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Somerset Street

Ø1	Ø2	Ø3	Ø4
9.5 s	35.5 s	14.3 s	50.7 s
Ø5	Ø6 (R)	Ø7	Ø8
20 s	25 s	18 s	47 s

Educational Use Only

Franklin Street Afternoon Initial Cond.syn
10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↔			↕↔			↕↔		↕	↔	
Traffic Volume (vph)	24	901	20	100	557	24	122	157	43	14	154	98
Future Volume (vph)	24	901	20	100	557	24	122	157	43	14	154	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		80	0		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Frt		0.997			0.995			0.980			0.941	
Flt Protected		0.999			0.993			0.981		0.950		
Satd. Flow (prot)	0	3525	0	0	3497	0	0	3403	0	1770	1753	0
Flt Permitted		0.925			0.585			0.742		0.455		
Satd. Flow (perm)	0	3264	0	0	2060	0	0	2574	0	848	1753	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			6			30			50	
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		481			1269			295			262	
Travel Time (s)		9.4			24.7			6.7			7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	979	22	109	605	26	133	171	47	15	167	107
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1027	0	0	740	0	0	351	0	15	274	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	8			7			5			2		6
Permitted Phases	8			4			2			6		

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	9.5	23.0		9.5	23.0		9.5	23.0		9.5	23.0	
Total Split (%)	14.6%	35.4%		14.6%	35.4%		14.6%	35.4%		14.6%	35.4%	
Maximum Green (s)	5.0	18.5		5.0	18.5		5.0	18.5		5.0	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)		25.9			25.9			28.2			30.1	30.1
Actuated g/C Ratio		0.40			0.40			0.43			0.46	0.46
v/c Ratio		0.79			0.92dl			0.31			0.03	0.33
Control Delay		18.4			33.9			13.5			10.9	10.9
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		18.4			33.9			13.5			10.9	10.9
LOS		B			C			B			B	B
Approach Delay		18.4			33.9			13.5			10.9	
Approach LOS		B			C			B			B	B
90th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	18.5		5.0	28.0	
90th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Max	Coord	
70th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		0.0	28.0	
70th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Skip	Coord	
50th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		0.0	28.0	
50th %ile Term Code	Skip	Max		Skip	Hold		Skip	Coord		Skip	Coord	
30th %ile Green (s)	0.0	24.3		0.0	24.3		0.0	31.7		0.0	31.7	
30th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Skip	Coord	
10th %ile Green (s)	0.0	21.0		0.0	21.0		0.0	35.0		0.0	35.0	
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Skip	Coord	
Stops (vph)		820			574			194		10	129	
Fuel Used(gal)		13			15			3		0	2	
CO Emissions (g/hr)		908			1066			189		7	113	
NOx Emissions (g/hr)		177			207			37		1	22	
VOC Emissions (g/hr)		210			247			44		2	26	
Dilemma Vehicles (#)		66			43			0		0	0	
Queue Length 50th (ft)		198			129			41		3	55	
Queue Length 95th (ft)		264			#232			90		12	105	
Internal Link Dist (ft)		401			1189			215			182	
Turn Bay Length (ft)												
Base Capacity (vph)		1301			822			1135		467	839	
Starvation Cap Reductn		0			0			0		0	0	

Baseline

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Franklin Street Afternoon Initial Cond.syn
12: Congress Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕			↕↕			↕↕			↕	↕
Traffic Volume (vph)	123	355	157	20	522	20	210	206	17	0	208	172
Future Volume (vph)	123	355	157	20	522	20	210	206	17	0	208	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Frt		0.963			0.995			0.994				0.850
Flt Protected		0.990			0.998			0.976				
Satd. Flow (prot)	0	3374	0	0	3514	0	0	3434	0	0	1863	1583
Flt Permitted		0.651			0.918			0.721				
Satd. Flow (perm)	0	2219	0	0	3233	0	0	2536	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		77			6			8				187
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		481			832			235			220	
Travel Time (s)		9.4			16.2			5.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	134	386	171	22	567	22	228	224	18	0	226	187
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	691	0	0	611	0	0	470	0	0	226	187
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA			NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0

Baseline

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Franklin Street Afternoon Initial Cond.syn
12: Congress Street

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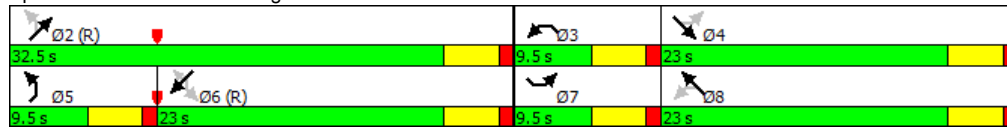
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		22.5	22.5	22.5
Total Split (s)	9.5	23.0		9.5	23.0		9.5	32.5		23.0	23.0	23.0
Total Split (%)	14.6%	35.4%		14.6%	35.4%		14.6%	50.0%		35.4%	35.4%	35.4%
Maximum Green (s)	5.0	18.5		5.0	18.5		5.0	28.0		18.5	18.5	18.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)		4.5			4.5			4.5			4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	C-Max
Walk Time (s)		7.0			7.0			7.0		7.0	7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0			0			0		0	0	0
Act Effct Green (s)		21.8			21.8			34.2			34.2	34.2
Actuated g/C Ratio		0.34			0.34			0.53			0.53	0.53
v/c Ratio		0.87			0.56			0.35			0.23	0.20
Control Delay		36.6			18.9			10.8			10.4	2.6
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		36.6			18.9			10.8			10.4	2.6
LOS		D			B			B			B	A
Approach Delay		36.6			18.9			10.8			6.9	
Approach LOS		D			B			B			A	
90th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		28.0	28.0	28.0
90th %ile Term Code	Skip	Max		Skip	Hold		Skip	Coord		Coord	Coord	Coord
70th %ile Green (s)	0.0	24.3		0.0	24.3		0.0	31.7		31.7	31.7	31.7
70th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
50th %ile Green (s)	0.0	22.3		0.0	22.3		0.0	33.7		33.7	33.7	33.7
50th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
30th %ile Green (s)	0.0	19.4		0.0	19.4		0.0	36.6		36.6	36.6	36.6
30th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
10th %ile Green (s)	0.0	15.0		0.0	15.0		0.0	41.0		41.0	41.0	41.0
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	Coord		Coord	Coord	Coord
Stops (vph)		898			418			242			111	19
Fuel Used(gal)		14			9			3			1	0
CO Emissions (g/hr)		958			607			215			88	34
NOx Emissions (g/hr)		186			118			42			17	7
VOC Emissions (g/hr)		222			141			50			20	8
Dilemma Vehicles (#)		80			31			0			0	0
Queue Length 50th (ft)		128			100			52			45	0
Queue Length 95th (ft)		m120			124			100			99	31
Internal Link Dist (ft)		401			752			155			140	
Turn Bay Length (ft)												
Base Capacity (vph)		818			1123			1337			980	921
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.84			0.51			0.35			0.23	0.20

Baseline

Synchro 9 Classroom Report
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Intersection Summary	
Area Type:	Other
Cycle Length:	65
Actuated Cycle Length:	65
Offset:	0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.87
Intersection Signal Delay:	20.5
Intersection LOS:	C
Intersection Capacity Utilization	72.3%
ICU Level of Service	C
Analysis Period (min)	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 12: Congress Street



Educational Use Only

Franklin Street Afternoon Initial Cond.syn
16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕			↕↕			↕↕				↕↕
Traffic Volume (vph)	45	264	141	20	522	20	158	106	18	12	169	56
Future Volume (vph)	45	264	141	20	522	20	158	106	18	12	169	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.953			0.995			0.991			0.968	
Flt Protected		0.995			0.998			0.973			0.997	
Satd. Flow (prot)	0	3356	0	0	3514	0	0	1796	0	0	1798	0
Flt Permitted		0.861			0.931			0.717			0.977	
Satd. Flow (perm)	0	2904	0	0	3279	0	0	1324	0	0	1762	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		153			8			7			30	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		832			303			251			371	
Travel Time (s)		16.2			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	287	153	22	567	22	172	115	20	13	184	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	489	0	0	611	0	0	307	0	0	258	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	22.6		9.5	22.6		22.9	22.9		22.9	22.9	
Total Split (%)	17.3%	41.1%		17.3%	41.1%		41.6%	41.6%		41.6%	41.6%	
Maximum Green (s)	5.0	18.1		5.0	18.1		18.4	18.4		18.4	18.4	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	Max		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)		18.2			18.2			14.9			14.9	
Actuated g/C Ratio		0.43			0.43			0.35			0.35	
v/c Ratio		0.37			0.43			0.65			0.40	
Control Delay		7.0			10.2			18.2			10.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		7.0			10.2			18.2			10.8	
LOS		A			B			B			B	
Approach Delay		7.0			10.2			18.2			10.8	
Approach LOS		A			B			B			B	
90th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
90th %ile Term Code	Skip	Hold		Skip	MaxR		Max	Max		Hold	Hold	
70th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
70th %ile Term Code	Skip	Hold		Skip	MaxR		Max	Max		Hold	Hold	
50th %ile Green (s)	0.0	18.1		0.0	18.1		16.2	16.2		16.2	16.2	
50th %ile Term Code	Skip	Hold		Skip	MaxR		Gap	Gap		Hold	Hold	
30th %ile Green (s)	0.0	18.1		0.0	18.1		13.2	13.2		13.2	13.2	
30th %ile Term Code	Skip	Hold		Skip	MaxR		Gap	Gap		Hold	Hold	
10th %ile Green (s)	0.0	18.1		0.0	18.1		9.5	9.5		9.5	9.5	
10th %ile Term Code	Skip	Hold		Skip	MaxR		Gap	Gap		Hold	Hold	
Stops (vph)		193			358			212			140	
Fuel Used(gal)		5			5			2			2	
CO Emissions (g/hr)		335			356			172			126	
NOx Emissions (g/hr)		65			69			33			25	
VOC Emissions (g/hr)		78			82			40			29	
Dilemma Vehicles (#)		38			65			0			0	
Queue Length 50th (ft)		26			52			57			38	
Queue Length 95th (ft)		56			92			118			80	
Internal Link Dist (ft)		752			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1339			1419			584			789	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.37			0.43			0.53			0.33	







Baseline

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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	42.2
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.65
Intersection Signal Delay:	10.8
Intersection LOS:	B
Intersection Capacity Utilization:	72.1%
ICU Level of Service:	C
Analysis Period (min):	15
90th %ile Actuated Cycle:	45.5
70th %ile Actuated Cycle:	45.5
50th %ile Actuated Cycle:	43.3
30th %ile Actuated Cycle:	40.3
10th %ile Actuated Cycle:	36.6

Splits and Phases: 16: Middle Street

 02 22.9 s	 03 9.5 s	 04 22.6 s
 06 22.9 s	 07 9.5 s	 08 22.6 s

Educational Use Only

Franklin Street Afternoon Initial Cond.syn
19: Fore Street

7/26/2016













Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	118	159	30	8	115	81	42	176	54	23	213	13
Future Volume (vph)	118	159	30	8	115	81	42	176	54	23	213	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.976			0.946			0.970			0.992	
Flt Protected	0.950				0.998			0.992			0.995	
Satd. Flow (prot)	1770	1818	0	0	1759	0	0	3406	0	0	3493	0
Flt Permitted	0.620				0.988			0.859			0.898	
Satd. Flow (perm)	1155	1818	0	0	1741	0	0	2949	0	0	3153	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19			65			59			12	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	128	173	33	9	125	88	46	191	59	25	232	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	128	206	0	0	222	0	0	296	0	0	271	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
19: Fore Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	18.5	18.5			18.5			8.1			8.1	
Actuated g/C Ratio	0.52	0.52			0.52			0.23			0.23	
v/c Ratio	0.21	0.22			0.24			0.41			0.37	
Control Delay	6.3	5.3			4.5			11.1			12.6	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	6.3	5.3			4.5			11.1			12.6	
LOS	A	A			A			B			B	
Approach Delay		5.7			4.5			11.1			12.6	
Approach LOS		A			A			B			B	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	10.3		0.0	10.3	
90th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
70th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	8.9		0.0	8.9	
70th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	8.1		0.0	8.1	
50th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Hold		Skip	Gap	
30th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	7.3		0.0	7.3	
30th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Hold		Skip	Gap	
10th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	6.3		0.0	6.3	
10th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Hold		Skip	Gap	
Stops (vph)	60	85			74			167			181	
Fuel Used(gal)	1	1			1			2			3	
CO Emissions (g/hr)	52	79			77			172			189	
NOx Emissions (g/hr)	10	15			15			34			37	
VOC Emissions (g/hr)	12	18			18			40			44	
Dilemma Vehicles (#)	0	0			0			27			25	
Queue Length 50th (ft)	11	16			13			20			22	
Queue Length 95th (ft)	33	43			40			41			42	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	600	953			935			1519			1598	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.21	0.22			0.24			0.19			0.17	

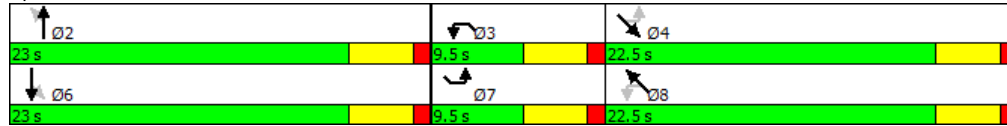
Baseline

Synchro 9 Classroom Report
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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	35.7
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.41
Intersection Signal Delay:	8.5
Intersection LOS:	A
Intersection Capacity Utilization:	51.4%
ICU Level of Service:	A
Analysis Period (min):	15
90th %ile Actuated Cycle:	37.8
70th %ile Actuated Cycle:	36.4
50th %ile Actuated Cycle:	35.6
30th %ile Actuated Cycle:	34.8
10th %ile Actuated Cycle:	33.8

Splits and Phases: 19: Fore Street



Educational Use Only

Franklin Street Afternoon Initial Cond.syn
 22: Commercial Street

7/26/2016













Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↘	↗	↘		↗	↘	↘	↗	↘		↗↘	↘
Traffic Volume (vph)	156	240	37	16	229	23	24	40	188	22	21	16
Future Volume (vph)	156	240	37	16	229	23	24	40	188	22	21	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	1		1	0		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.997		0.950				0.975	
Satd. Flow (prot)	1770	1863	1583	0	1857	1583	1770	1863	1583	0	3451	1583
Flt Permitted	0.359				0.971		0.620				0.865	
Satd. Flow (perm)	669	1863	1583	0	1809	1583	1155	1863	1583	0	3061	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			205			205			204			205
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			156	
Travel Time (s)		10.6			10.3			10.7			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	170	261	40	17	249	25	26	43	204	24	23	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	261	40	0	266	25	26	43	204	0	47	17
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4			8

Baseline

Synchro 9 Classroom Report
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Franklin Street Afternoon Initial Cond.syn
 22: Commercial Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5	9.5	22.5	22.5
Total Split (s)	11.4	25.5	25.5	9.5	23.6	23.6	22.5	35.5	35.5	9.5	22.5	22.5
Total Split (%)	14.3%	31.9%	31.9%	11.9%	29.5%	29.5%	28.1%	44.4%	44.4%	11.9%	28.1%	28.1%
Maximum Green (s)	6.9	21.0	21.0	5.0	19.1	19.1	18.0	31.0	31.0	5.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	None	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	30.5	30.5	30.5		19.1	19.1	31.0	31.0	31.0		26.5	26.5
Actuated g/C Ratio	0.43	0.43	0.43		0.27	0.27	0.44	0.44	0.44		0.38	0.38
v/c Ratio	0.43	0.32	0.05		0.54	0.04	0.05	0.05	0.25		0.10	0.02
Control Delay	16.3	14.6	0.1		26.9	0.1	11.5	11.7	2.9		18.0	0.1
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	16.3	14.6	0.1		26.9	0.1	11.5	11.7	2.9		18.0	0.1
LOS	B	B	A		C	A	B	B	A		B	A
Approach Delay		14.0			24.6			5.1			13.2	
Approach LOS		B			C			A			B	
90th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	7.1	31.0	31.0	0.0	19.4	19.4
90th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Gap	MaxR	MaxR	Skip	Hold	Hold
70th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	6.5	31.0	31.0	0.0	20.0	20.0
70th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Gap	MaxR	MaxR	Skip	Hold	Hold
50th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	0.0	31.0	31.0	0.0	31.0	31.0
50th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	MaxR	MaxR	Skip	Hold	Hold
30th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	0.0	31.0	31.0	0.0	31.0	31.0
30th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	MaxR	MaxR	Skip	Hold	Hold
10th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	0.0	31.0	31.0	0.0	31.0	31.0
10th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	MaxR	MaxR	Skip	Hold	Hold
Stops (vph)	94	152	0		204	0	16	23	20		30	0
Fuel Used(gal)	1	2	0		3	0	0	0	1		0	0
CO Emissions (g/hr)	97	146	9		204	5	14	22	57		26	1
NOx Emissions (g/hr)	19	28	2		40	1	3	4	11		5	0
VOC Emissions (g/hr)	23	34	2		47	1	3	5	13		6	0
Dilemma Vehicles (#)	0	0	0		0	0	0	0	0		0	0
Queue Length 50th (ft)	44	72	0		98	0	6	10	0		5	0
Queue Length 95th (ft)	82	123	0		168	0	19	27	33		21	0
Internal Link Dist (ft)		308			298			314			76	
Turn Bay Length (ft)			160				270					
Base Capacity (vph)	397	805	801		499	578	664	819	810		473	722
Starvation Cap Reductn	0	0	0		0	0	0	0	0		0	0

Baseline

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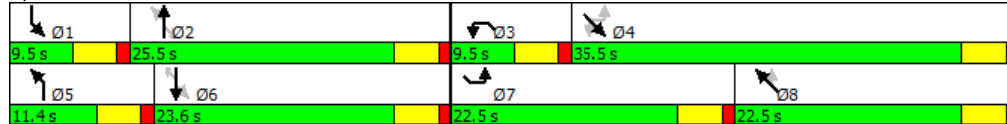
Franklin Street Afternoon Initial Cond.syn
 22: Commercial Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Spillback Cap Reductn	0	0	0		0	0	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0	0	0	0		0	0
Reduced v/c Ratio	0.43	0.32	0.05		0.54	0.04	0.04	0.05	0.25		0.10	0.02

Intersection Summary	
Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	70.5
Natural Cycle:	80
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.54
Intersection Signal Delay:	14.5
Intersection LOS:	B
Intersection Capacity Utilization:	44.8%
ICU Level of Service:	A
Analysis Period (min):	15
90th %ile Actuated Cycle:	70.5
70th %ile Actuated Cycle:	70.5
50th %ile Actuated Cycle:	70.5
30th %ile Actuated Cycle:	70.5
10th %ile Actuated Cycle:	70.5

Splits and Phases: 22: Commercial Street



Educational Use Only

Figure A.3. Franklin Street 2035 Afternoon Conditions

Franklin Street 2035 Afternoon Initial Cond.syn
1: I-295

7/26/2016

Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑				↑↑↑			↑	↑
Traffic Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Future Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	16	16	16
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	0.91	1.00	1.00	1.00	1.00
Ped Bike Factor										
Frt		0.850								0.850
Flt Protected										
Satd. Flow (prot)	0	3158	0	0	0	5085	0	0	2111	1794
Flt Permitted										
Satd. Flow (perm)	0	3158	0	0	0	5085	0	0	2111	1794
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		109								504
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	1006		533			410			174	
Travel Time (s)	22.9		12.1			8.0			3.4	
Confl. Peds. (#/hr)								754		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	812	0	0	0	770	0	0	940	1317
Shared Lane Traffic (%)										
Lane Group Flow (vph)	0	812	0	0	0	770	0	0	940	1317
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			12			12	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	0.85	0.85	0.85
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		Cl+Ex				Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						Cl+Ex			Cl+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	
Permitted Phases										Free

Baseline

Synchro 9 Classroom Report
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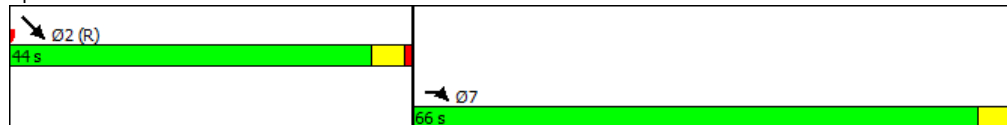


Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase		7				2				
Switch Phase										
Minimum Initial (s)		5.0				5.0				
Minimum Split (s)		9.5				9.5				
Total Split (s)		66.0				44.0				
Total Split (%)		60.0%				40.0%				
Maximum Green (s)		61.5				39.5				
Yellow Time (s)		3.5				3.5				
All-Red Time (s)		1.0				1.0				
Lost Time Adjust (s)		0.0				0.0				
Total Lost Time (s)		4.5				4.5				
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)		3.0				3.0				
Recall Mode		None				C-Max				
Act Effct Green (s)		33.6				67.4		110.0	110.0	
Actuated g/C Ratio		0.31				0.61		1.00	1.00	
v/c Ratio		0.78				0.25		0.45	0.73	
Control Delay		35.0				10.8		0.8	10.9	
Queue Delay		0.7				0.1		0.0	0.0	
Total Delay		35.7				10.9		0.8	10.9	
LOS		D				B		A	B	
Approach Delay	35.7					10.9		6.7		
Approach LOS	D					B		A		
90th %ile Green (s)		43.0				58.0				
90th %ile Term Code		Gap				Coord				
70th %ile Green (s)		37.2				63.8				
70th %ile Term Code		Gap				Coord				
50th %ile Green (s)		33.7				67.3				
50th %ile Term Code		Gap				Coord				
30th %ile Green (s)		30.1				70.9				
30th %ile Term Code		Gap				Coord				
10th %ile Green (s)		24.2				76.8				
10th %ile Term Code		Gap				Coord				
Stops (vph)		574				314		28	494	
Fuel Used(gal)		14				6		1	8	
CO Emissions (g/hr)		1003				421		100	555	
NOx Emissions (g/hr)		195				82		19	108	
VOC Emissions (g/hr)		232				98		23	129	
Dilemma Vehicles (#)		0				32		0	0	
Queue Length 50th (ft)		259				84		0	368	
Queue Length 95th (ft)		296				132		m0	m144	
Internal Link Dist (ft)	926		453			330		94		
Turn Bay Length (ft)										
Base Capacity (vph)		1813				3114		2111	1794	
Starvation Cap Reductn		0				0		0	0	
Spillback Cap Reductn		609				975		0	0	
Storage Cap Reductn		0				0		0	0	
Reduced v/c Ratio		0.67				0.56		0.45	0.73	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:SET and 6:, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 13.7 Intersection LOS: B
Intersection Capacity Utilization 48.9% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: I-295



Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
2: Marginal Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗	↘	↙	↕	↖	↗	↘	↙	↕	↖	↗
Traffic Volume (vph)	130	1027	298	267	1525	20	390	101	394	17	123	162
Future Volume (vph)	130	1027	298	267	1525	20	390	101	394	17	123	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	14	12	14	12	16	16
Storage Length (ft)	90		0	205		0	0		0	0		0
Storage Lanes	1		1	1		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950				0.962			0.994	
Satd. Flow (prot)	1770	3539	1583	1770	3532	0	0	1792	1689	0	2098	1794
Flt Permitted	0.950			0.950				0.654			0.923	
Satd. Flow (perm)	1770	3539	1583	1770	3532	0	0	1218	1689	0	1949	1794
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			261		1				428			176
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		174			520			464			379	
Travel Time (s)		3.4			11.8			10.5			8.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	1116	324	290	1658	22	424	110	428	18	134	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	141	1116	324	290	1680	0	0	534	428	0	152	176
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	0.92	1.00	0.85	0.85
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street 2035 Afternoon Initial Cond.syn
2: Marginal Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4				2		2	6		6
Detector Phase	7	4	4	3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5	9.5	22.5	22.5
Total Split (s)	14.0	30.8	30.8	27.2	44.0		9.5	42.5	42.5	9.5	42.5	42.5
Total Split (%)	12.7%	28.0%	28.0%	24.7%	40.0%		8.6%	38.6%	38.6%	8.6%	38.6%	38.6%
Maximum Green (s)	9.5	26.3	26.3	22.7	39.5		5.0	38.0	38.0	5.0	38.0	38.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	
Act Effct Green (s)	9.5	28.0	28.0	21.0	39.5		47.5	47.5		47.5	47.5	
Actuated g/C Ratio	0.09	0.25	0.25	0.19	0.36		0.43	0.43		0.43	0.43	
v/c Ratio	0.93	1.24	0.54	0.86	1.32		1.02	0.44		0.18	0.20	
Control Delay	115.0	148.4	11.6	67.6	172.0		75.9	3.4		20.0	3.4	
Queue Delay	51.8	3.2	5.0	0.0	0.1		0.0	0.9		0.2	0.0	
Total Delay	166.8	151.6	16.7	67.6	172.0		75.9	4.3		20.2	3.4	
LOS	F	F	B	E	F		E	A		C	A	
Approach Delay		125.3			156.7		44.1			11.2		
Approach LOS		F			F		D			B		
90th %ile Green (s)	9.5	26.3	26.3	22.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
90th %ile Term Code	Max	Max	Max	Max	Max		Skip	Coord	Coord	Skip	Coord	Coord
70th %ile Green (s)	9.5	26.3	26.3	22.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
70th %ile Term Code	Max	Max	Max	Max	Max		Skip	Coord	Coord	Skip	Coord	Coord
50th %ile Green (s)	9.5	26.3	26.3	22.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
50th %ile Term Code	Max	Max	Max	Max	Max		Skip	Coord	Coord	Skip	Coord	Coord
30th %ile Green (s)	9.5	28.3	28.3	20.7	39.5		0.0	47.5	47.5	0.0	47.5	47.5
30th %ile Term Code	Max	Max	Max	Gap	Max		Skip	Coord	Coord	Skip	Coord	Coord
10th %ile Green (s)	9.5	32.7	32.7	16.3	39.5		0.0	47.5	47.5	0.0	47.5	47.5
10th %ile Term Code	Max	Max	Max	Gap	Max		Skip	Coord	Coord	Skip	Coord	Coord
Stops (vph)	106	789	115	229	1114		411	28		84	15	
Fuel Used(gal)	4	38	2	6	67		12	2		1	1	
CO Emissions (g/hr)	280	2674	136	421	4652		813	130		101	47	
NOx Emissions (g/hr)	54	520	26	82	905		158	25		20	9	
VOC Emissions (g/hr)	65	620	32	98	1078		189	30		23	11	
Dilemma Vehicles (#)	0	46	0	0	0		0	0		0	0	
Queue Length 50th (ft)	99	~535	58	181	~795		~383	0		65	0	
Queue Length 95th (ft)	#222	#681	158	m190	m#797		#608	57		108	39	
Internal Link Dist (ft)		94			440		384			299		
Turn Bay Length (ft)	96			205								
Base Capacity (vph)	132	300	597	365	1263		525	972		841	874	

Baseline

Synchro 9 Classroom Report
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Franklin Street 2035 Afternoon Initial Cond.syn
 2: Marginal Way

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	45	355	205	0	23			0	0		0	0
Spillback Cap Reductn	0	0	0	0	0			0	292		247	0
Storage Cap Reductn	0	0	0	0	0			0	0		0	0
Reduced v/c Ratio	1.32	2.05	0.83	0.79	1.35			1.02	0.63		0.26	0.20

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.32
 Intersection Signal Delay: 114.2 Intersection LOS: F
 Intersection Capacity Utilization 99.3% ICU Level of Service F
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Marginal Way

9.5 s	42.5 s	27.2 s	30.8 s
9.5 s	42.5 s	14 s	44 s

Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↕		↖	↕		↖	↕			↕	↖
Traffic Volume (vph)	193	1054	191	98	1264	48	385	113	49	38	80	164
Future Volume (vph)	193	1054	191	98	1264	48	385	113	49	38	80	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	205		0	250		0	0		0	0		0
Storage Lanes	1		0	1		0	2		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frnt		0.977			0.995			0.955				0.850
Flt Protected	0.950			0.950			0.950				0.984	
Satd. Flow (prot)	1770	3688	0	1770	3522	0	3433	1779	0	0	1833	1583
Flt Permitted	0.950			0.950			0.950				0.853	
Satd. Flow (perm)	1770	3688	0	1770	3522	0	3433	1779	0	0	1589	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			4			20				178
Link Speed (mph)		30			35			30				30
Link Distance (ft)		520			1269			509				540
Travel Time (s)		11.8			24.7			11.6				12.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	210	1146	208	107	1374	52	418	123	53	41	87	178
Shared Lane Traffic (%)												
Lane Group Flow (vph)	210	1354	0	107	1426	0	418	176	0	0	128	178
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24				24
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94				94
Detector 2 Size(ft)		6			6			6				6
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				Cl+Ex
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				0.0
Turn Type	Prot	NA		Prot	NA		Prot	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street 2035 Afternoon Initial Cond.syn
5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases										6		6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	22.5
Total Split (s)	18.0	50.7		14.3	47.0		20.0	35.5		9.5	25.0	25.0
Total Split (%)	16.4%	46.1%		13.0%	42.7%		18.2%	32.3%		8.6%	22.7%	22.7%
Maximum Green (s)	13.5	46.2		9.8	42.5		15.5	31.0		5.0	20.5	20.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5			4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	None		None	None		None	C-Max	C-Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	13.5	46.6		9.4	42.5		15.3	40.5			20.7	20.7
Actuated g/C Ratio	0.12	0.42		0.09	0.39		0.14	0.37			0.19	0.19
v/c Ratio	0.97	0.86		0.71	1.05		0.87	0.26			0.43	0.40
Control Delay	60.6	50.4		74.5	71.0		66.4	22.7			44.7	8.7
Queue Delay	0.0	27.7		0.0	23.8		0.0	0.0			0.0	0.1
Total Delay	60.6	78.1		74.5	94.8		66.4	22.7			44.7	8.9
LOS	E	E		E	F		E	C			D	A
Approach Delay		75.7			93.3			53.4				23.9
Approach LOS		E			F			D				C
90th %ile Green (s)	13.5	46.2		9.8	42.5		15.5	40.5		0.0	20.5	20.5
90th %ile Term Code	Max	MaxR		Max	Max		Max	Coord		Skip	Coord	Coord
70th %ile Green (s)	13.5	46.2		9.8	42.5		15.5	40.5		0.0	20.5	20.5
70th %ile Term Code	Max	MaxR		Max	Max		Max	Coord		Skip	Coord	Coord
50th %ile Green (s)	13.5	46.2		9.8	42.5		15.5	40.5		0.0	20.5	20.5
50th %ile Term Code	Max	MaxR		Max	Max		Max	Coord		Skip	Coord	Coord
30th %ile Green (s)	13.5	46.2		9.8	42.5		15.5	40.5		0.0	20.5	20.5
30th %ile Term Code	Max	MaxR		Max	Max		Max	Coord		Skip	Coord	Coord
10th %ile Green (s)	13.5	48.3		7.7	42.5		14.7	40.5		0.0	21.3	21.3
10th %ile Term Code	Max	MaxR		Gap	Max		Gap	Coord		Skip	Coord	Coord
Stops (vph)	166	1022		90	1147		354	98			102	23
Fuel Used(gal)	4	23		3	40		9	2			2	1
CO Emissions (g/hr)	285	1642		214	2769		607	135			149	78
NOx Emissions (g/hr)	55	319		42	539		118	26			29	15
VOC Emissions (g/hr)	66	380		50	642		141	31			35	18
Dilemma Vehicles (#)	0	0		0	55		0	0			0	0
Queue Length 50th (ft)	157	466		75	~576		151	75			81	0
Queue Length 95th (ft)	m157	m414		#155	#716		#232	130			141	59
Internal Link Dist (ft)		440			1189			429			460	
Turn Bay Length (ft)	205			250								
Base Capacity (vph)	217	1516		157	1363		483	667			298	441

Baseline

Synchro 9 Classroom Report
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Franklin Street 2035 Afternoon Initial Cond.syn
 5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	288		0	0		0	0			0	0
Spillback Cap Reductn	0	0		0	540		0	0			0	26
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	0.97	1.05		0.68	1.73		0.87	0.26			0.43	0.43

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 6:SWTL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.05
 Intersection Signal Delay: 75.2 Intersection LOS: E
 Intersection Capacity Utilization 79.5% ICU Level of Service D
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Somerset Street

Ø1	Ø2	Ø3	Ø4
9.5 s	35.5 s	14.3 s	50.7 s
Ø5	Ø6 (R)	Ø7	Ø8
20 s	25 s	18 s	47 s

Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↔			↕↔			↕↔		↕	↔	
Traffic Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Future Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		80	0		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Frt		0.997			0.995			0.980			0.937	
Flt Protected		0.999			0.993			0.979		0.950		
Satd. Flow (prot)	0	3525	0	0	3497	0	0	3396	0	1770	1745	0
Flt Permitted		0.847			0.517			0.717		0.417		
Satd. Flow (perm)	0	2989	0	0	1821	0	0	2487	0	777	1745	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			6			30			57	
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		481			1269			295			262	
Travel Time (s)		9.4			24.7			6.7			7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1238	22	161	1008	41	165	170	53	17	176	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1288	0	0	1210	0	0	388	0	17	305	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	8		7	1		5	2		1	6	
Permitted Phases	8			4			2			6		

Baseline

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Franklin Street 2035 Afternoon Initial Cond.syn
 10: Cumberland Street

7/26/2016

	↶		↑		↷		↓		↶		↷	
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8		7	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	9.5	23.0		9.5	23.0		9.5	23.0		9.5	23.0	
Total Split (%)	14.6%	35.4%		14.6%	35.4%		14.6%	35.4%		14.6%	35.4%	
Maximum Green (s)	5.0	18.5		5.0	18.5		5.0	18.5		5.0	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		7.0			7.0			7.0			7.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)		28.0			28.0			26.1			28.0	
Actuated g/C Ratio		0.43			0.43			0.40			0.43	
v/c Ratio		1.00			1.54			0.38			0.04	0.39
Control Delay		38.2			269.6			14.9			11.0	11.9
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		38.2			269.6			14.9			11.0	11.9
LOS		D			F			B			B	B
Approach Delay		38.2			269.6			14.9				11.9
Approach LOS		D			F			B				B
90th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	18.5		5.0	28.0	
90th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Max	Coord	
70th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		0.0	28.0	
70th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Skip	Coord	
50th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		0.0	28.0	
50th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Skip	Coord	
30th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		0.0	28.0	
30th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Skip	Coord	
10th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		0.0	28.0	
10th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Skip	Coord	
Stops (vph)		982			860			227			11	149
Fuel Used(gal)		21			78			3			0	2
CO Emissions (g/hr)		1448			5436			221			8	131
NOx Emissions (g/hr)		282			1058			43			2	26
VOC Emissions (g/hr)		336			1260			51			2	30
Dilemma Vehicles (#)		32			56			0			0	0
Queue Length 50th (ft)		~273			~369			47			4	62
Queue Length 95th (ft)		#414			#490			102			13	117
Internal Link Dist (ft)		401			1189			215				182
Turn Bay Length (ft)												
Base Capacity (vph)		1289			787			1016			411	784
Starvation Cap Reductn		0			0			0			0	0

Baseline

Synchro 9 Classroom Report
 Page 11

Franklin Street 2035 Afternoon Initial Cond.syn
 10: Cumberland Street

7/26/2016



Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		1.00			1.54			0.38		0.04	0.39	

Intersection Summary

Area Type: Other
 Cycle Length: 65
 Actuated Cycle Length: 65
 Offset: 9.5 (15%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.54
 Intersection Signal Delay: 120.0 Intersection LOS: F
 Intersection Capacity Utilization 105.1% ICU Level of Service G
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 10: Cumberland Street

Ø1 9.5 s	Ø2 (R) 23 s	Ø3 9.5 s	Ø4 23 s
Ø5 9.5 s	Ø6 (R) 23 s	Ø7 9.5 s	Ø8 23 s

Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
12: Congress Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕			↕↕			↕↕			↕	↕
Traffic Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Future Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Frt		0.968			0.991			0.993				0.850
Flt Protected		0.991			0.998			0.975			0.994	
Satd. Flow (prot)	0	3395	0	0	3500	0	0	3427	0	0	1852	1583
Flt Permitted		0.572			0.867			0.685			0.909	
Satd. Flow (perm)	0	1960	0	0	3041	0	0	2407	0	0	1693	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		59			11			9				176
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		481			832			235			220	
Travel Time (s)		9.4			16.2			5.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	655	230	32	838	53	254	216	22	33	227	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1077	0	0	923	0	0	492	0	0	260	196
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	7	4		3	8		5	2		6	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0

Baseline

Synchro 9 Classroom Report
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Franklin Street 2035 Afternoon Initial Cond.syn
 12: Congress Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		22.5	22.5	22.5
Total Split (s)	9.5	23.0		9.5	23.0		9.5	32.5		23.0	23.0	23.0
Total Split (%)	14.6%	35.4%		14.6%	35.4%		14.6%	50.0%		35.4%	35.4%	35.4%
Maximum Green (s)	5.0	18.5		5.0	18.5		5.0	28.0		18.5	18.5	18.5
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	0.0
Total Lost Time (s)		4.5			4.5			4.5			4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	C-Max
Walk Time (s)		7.0			7.0			7.0		7.0	7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0			0			0		0	0	0
Act Effct Green (s)		28.0			28.0			28.0			28.0	28.0
Actuated g/C Ratio		0.43			0.43			0.43			0.43	0.43
v/c Ratio		1.23			0.70			0.47			0.36	0.25
Control Delay		128.6			18.5			14.8			14.2	3.7
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		128.6			18.5			14.8			14.2	3.7
LOS		F			B			B			B	A
Approach Delay		128.6			18.5			14.8			9.7	
Approach LOS		F			B			B			A	
90th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		28.0	28.0	28.0
90th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Coord	Coord	Coord
70th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		28.0	28.0	28.0
70th %ile Term Code	Skip	Max		Skip	Max		Skip	Coord		Coord	Coord	Coord
50th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		28.0	28.0	28.0
50th %ile Term Code	Skip	Max		Skip	Hold		Skip	Coord		Coord	Coord	Coord
30th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		28.0	28.0	28.0
30th %ile Term Code	Skip	Max		Skip	Hold		Skip	Coord		Coord	Coord	Coord
10th %ile Green (s)	0.0	28.0		0.0	28.0		0.0	28.0		28.0	28.0	28.0
10th %ile Term Code	Skip	Max		Skip	Hold		Skip	Coord		Coord	Coord	Coord
Stops (vph)		584			651			303			153	27
Fuel Used(gal)		34			13			4			2	1
CO Emissions (g/hr)		2362			922			271			121	40
NOx Emissions (g/hr)		460			179			53			23	8
VOC Emissions (g/hr)		547			214			63			28	9
Dilemma Vehicles (#)		131			56			0			0	0
Queue Length 50th (ft)		~220			147			68			66	4
Queue Length 95th (ft)		m114			211			107			117	37
Internal Link Dist (ft)		401			752			155			140	
Turn Bay Length (ft)												
Base Capacity (vph)		877			1316			1041			729	782
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.23			0.70			0.47			0.36	0.25








Baseline

Synchro 9 Classroom Report
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Intersection Summary

Area Type:	Other
Cycle Length:	65
Actuated Cycle Length:	65
Offset:	0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
Natural Cycle:	80
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.23
Intersection Signal Delay:	56.8
Intersection LOS:	E
Intersection Capacity Utilization:	92.9%
ICU Level of Service:	F
Analysis Period (min)	15
~	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Congress Street

 Ø2 (R) 32.5 s	 Ø3 9.5 s	 Ø4 23 s
 Ø5 9.5 s	 Ø6 (R) 23 s	 Ø7 9.5 s
 Ø8 23 s		

Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕			↕↕			↕↕				↕↕
Traffic Volume (vph)	79	431	143	20	546	8	204	120	19	17	68	96
Future Volume (vph)	79	431	143	20	546	8	204	120	19	17	68	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967			0.998			0.992			0.928	
Flt Protected		0.994			0.998			0.971			0.995	
Satd. Flow (prot)	0	3402	0	0	3525	0	0	1794	0	0	1720	0
Flt Permitted		0.815			0.921			0.752			0.952	
Satd. Flow (perm)	0	2789	0	0	3253	0	0	1390	0	0	1646	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		80			3			6			104	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		832			303			251			371	
Travel Time (s)		16.2			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	468	155	22	593	9	222	130	21	18	74	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	709	0	0	624	0	0	373	0	0	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
 Page 16

Franklin Street 2035 Afternoon Initial Cond.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	22.6		9.5	22.6		22.9	22.9		22.9	22.9	
Total Split (%)	17.3%	41.1%		17.3%	41.1%		41.6%	41.6%		41.6%	41.6%	
Maximum Green (s)	5.0	18.1		5.0	18.1		18.4	18.4		18.4	18.4	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	Max		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)		18.2			18.2			16.4			16.4	
Actuated g/C Ratio		0.42			0.42			0.38			0.38	
v/c Ratio		0.59			0.46			0.71			0.29	
Control Delay		11.6			11.0			20.3			6.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		11.6			11.0			20.3			6.0	
LOS		B			B			C			A	
Approach Delay		11.6			11.0			20.3			6.0	
Approach LOS		B			B			C			A	
90th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
90th %ile Term Code	Skip	Max		Skip	MaxR		Max	Max		Hold	Hold	
70th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
70th %ile Term Code	Skip	Max		Skip	MaxR		Max	Max		Hold	Hold	
50th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
50th %ile Term Code	Skip	Hold		Skip	MaxR		Max	Max		Hold	Hold	
30th %ile Green (s)	0.0	18.1		0.0	18.1		15.8	15.8		15.8	15.8	
30th %ile Term Code	Skip	Hold		Skip	MaxR		Gap	Gap		Hold	Hold	
10th %ile Green (s)	0.0	18.1		0.0	18.1		11.7	11.7		11.7	11.7	
10th %ile Term Code	Skip	Hold		Skip	MaxR		Gap	Gap		Hold	Hold	
Stops (vph)		419			381			263			60	
Fuel Used(gal)		9			5			3			1	
CO Emissions (g/hr)		601			378			221			71	
NOx Emissions (g/hr)		117			74			43			14	
VOC Emissions (g/hr)		139			88			51			17	
Dilemma Vehicles (#)		64			65			0			0	
Queue Length 50th (ft)		63			60			73			14	
Queue Length 95th (ft)		107			95			#162			45	
Internal Link Dist (ft)		752			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1207			1356			591			756	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.59			0.45			0.63			0.26	

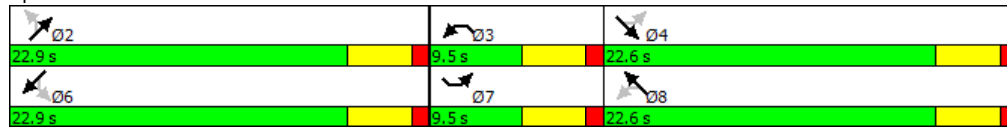
Baseline

Synchro 9 Classroom Report
 Page 17

Intersection Summary

Area Type:	Other	
Cycle Length:	55	
Actuated Cycle Length:	43.6	
Natural Cycle:	55	
Control Type:	Actuated-Uncoordinated	
Maximum v/c Ratio:	0.71	
Intersection Signal Delay:	12.5	Intersection LOS: B
Intersection Capacity Utilization	78.9%	ICU Level of Service D
Analysis Period (min)	15	
90th %ile Actuated Cycle:	45.5	
70th %ile Actuated Cycle:	45.5	
50th %ile Actuated Cycle:	45.5	
30th %ile Actuated Cycle:	42.9	
10th %ile Actuated Cycle:	38.8	
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.		

Splits and Phases: 16: Middle Street



Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
19: Fore Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	145	206	30	10	134	165	122	285	54	15	264	19
Future Volume (vph)	145	206	30	10	134	165	122	285	54	15	264	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.981			0.928			0.982			0.990	
Flt Protected	0.950				0.998			0.987			0.998	
Satd. Flow (prot)	1770	1827	0	0	1725	0	0	3430	0	0	3497	0
Flt Permitted	0.593				0.989			0.777			0.920	
Satd. Flow (perm)	1105	1827	0	0	1710	0	0	2700	0	0	3224	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			112			32			16	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	224	33	11	146	179	133	310	59	16	287	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	257	0	0	336	0	0	502	0	0	324	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

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Franklin Street 2035 Afternoon Initial Cond.syn
 19: Fore Street

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Max	Max		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	18.6	18.6			18.6			12.4			12.4	
Actuated g/C Ratio	0.46	0.46			0.46			0.31			0.31	
v/c Ratio	0.31	0.30			0.39			0.59			0.32	
Control Delay	10.1	8.5			7.1			13.7			10.6	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	10.1	8.5			7.1			13.7			10.6	
LOS	B	A			A			B			B	
Approach Delay		9.1			7.1			13.7			10.6	
Approach LOS		A			A			B			B	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	18.0		0.0	18.0	
90th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Max		Skip	Hold	
70th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	14.5		0.0	14.5	
70th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	11.9		0.0	11.9	
50th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
30th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	10.3		0.0	10.3	
30th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
10th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	8.4		0.0	8.4	
10th %ile Term Code	MaxR	MaxR		Hold	Hold		Skip	Gap		Skip	Hold	
Stops (vph)	89	130			131			323			189	
Fuel Used(gal)	1	2			2			5			3	
CO Emissions (g/hr)	77	115			133			330			204	
NOx Emissions (g/hr)	15	22			26			64			40	
VOC Emissions (g/hr)	18	27			31			77			47	
Dilemma Vehicles (#)	0	0			0			45			26	
Queue Length 50th (ft)	19	29			27			44			26	
Queue Length 95th (ft)	62	82			86			76			47	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	512	856			853			1237			1465	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.31	0.30			0.39			0.41			0.22	

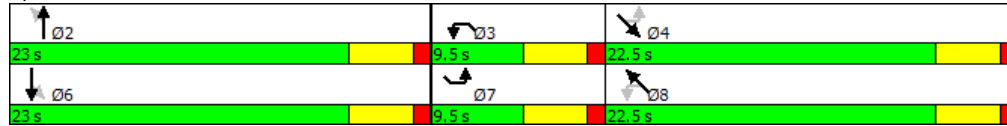
Baseline

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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	40.1
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.59
Intersection Signal Delay:	10.4
Intersection LOS:	B
Intersection Capacity Utilization:	66.9%
ICU Level of Service:	C
Analysis Period (min):	15
90th %ile Actuated Cycle:	45.5
70th %ile Actuated Cycle:	42
50th %ile Actuated Cycle:	39.4
30th %ile Actuated Cycle:	37.8
10th %ile Actuated Cycle:	35.9

Splits and Phases: 19: Fore Street



Educational Use Only

Franklin Street 2035 Afternoon Initial Cond.syn
 22: Commercial Street

7/26/2016













Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↘	↑	↗		↑	↗	↘	↑	↗		↗	↗
Traffic Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Future Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	1		1	0		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.997		0.950				0.976	
Satd. Flow (prot)	1770	1863	1583	0	1857	1583	1770	1863	1583	0	3454	1583
Flt Permitted	0.344				0.972		0.615				0.864	
Satd. Flow (perm)	641	1863	1583	0	1811	1583	1146	1863	1583	0	3058	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			205			205			268			205
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			156	
Travel Time (s)		10.6			10.3			10.7			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	247	259	41	17	260	32	36	49	268	26	28	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	247	259	41	0	277	32	36	49	268	0	54	17
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4			8

Baseline

Synchro 9 Classroom Report
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Franklin Street 2035 Afternoon Initial Cond.syn
 22: Commercial Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5	9.5	22.5	22.5
Total Split (s)	11.4	25.5	25.5	9.5	23.6	23.6	22.5	35.5	35.5	9.5	22.5	22.5
Total Split (%)	14.3%	31.9%	31.9%	11.9%	29.5%	29.5%	28.1%	44.4%	44.4%	11.9%	28.1%	28.1%
Maximum Green (s)	6.9	21.0	21.0	5.0	19.1	19.1	18.0	31.0	31.0	5.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max	Max	None	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	30.5	30.5	30.5		19.1	19.1	31.0	31.0	31.0		26.3	26.3
Actuated g/C Ratio	0.43	0.43	0.43		0.27	0.27	0.44	0.44	0.44		0.37	0.37
v/c Ratio	0.64	0.32	0.05		0.57	0.06	0.06	0.06	0.32		0.11	0.02
Control Delay	22.2	14.6	0.1		27.4	0.2	11.7	11.7	2.9		18.3	0.1
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	22.2	14.6	0.1		27.4	0.2	11.7	11.7	2.9		18.3	0.1
LOS	C	B	A		C	A	B	B	A		B	A
Approach Delay		17.0			24.6			5.0			13.9	
Approach LOS		B			C			A			B	
90th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	7.5	31.0	31.0	0.0	19.0	19.0
90th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Gap	MaxR	MaxR	Skip	Hold	Hold
70th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	6.8	31.0	31.0	0.0	19.7	19.7
70th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Gap	MaxR	MaxR	Skip	Hold	Hold
50th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	0.0	31.0	31.0	0.0	31.0	31.0
50th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	MaxR	MaxR	Skip	Hold	Hold
30th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	0.0	31.0	31.0	0.0	31.0	31.0
30th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	MaxR	MaxR	Skip	Hold	Hold
10th %ile Green (s)	6.9	30.5	30.5	0.0	19.1	19.1	0.0	31.0	31.0	0.0	31.0	31.0
10th %ile Term Code	Max	Hold	Hold	Skip	MaxR	MaxR	Skip	MaxR	MaxR	Skip	Hold	Hold
Stops (vph)	142	150	0		214	0	19	25	24		36	0
Fuel Used(gal)	2	2	0		3	0	0	0	1		0	0
CO Emissions (g/hr)	162	145	9		214	7	18	25	75		31	1
NOx Emissions (g/hr)	32	28	2		42	1	4	5	15		6	0
VOC Emissions (g/hr)	38	34	2		50	2	4	6	17		7	0
Dilemma Vehicles (#)	0	0	0		0	0	0	0	0		0	0
Queue Length 50th (ft)	68	71	0		103	0	9	12	0		6	0
Queue Length 95th (ft)	#118	122	0		176	0	24	29	37		23	0
Internal Link Dist (ft)		308			298			314			76	
Turn Bay Length (ft)			160				270					
Base Capacity (vph)	397	805	801		499	578	663	819	846		470	719
Starvation Cap Reductn	0	0	0		0	0	0	0	0		0	0


Baseline

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Figure A.4. Franklin Street Widening

Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
1: I-295

7/26/2016



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑				↑↑↑			↑↑	↑
Traffic Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Future Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	12	12	12
Storage Length (ft)	0	150	0	0	0		0	0		0
Storage Lanes	0	1	0	0	0		0	0		1
Taper Length (ft)	25		25		25			25		
Lane Util. Factor	1.00	0.76	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Fr		0.850							0.941	0.850
Flt Protected										
Satd. Flow (prot)	0	4091	0	0	0	5085	0	0	3190	1441
Flt Permitted										
Satd. Flow (perm)	0	4091	0	0	0	5085	0	0	3190	1441
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		310							224	711
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	798		534			410			212	
Travel Time (s)	18.1		12.1			8.0			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	812	0	0	0	770	0	0	940	1317
Shared Lane Traffic (%)										46%
Lane Group Flow (vph)	0	812	0	0	0	770	0	0	1546	711
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			0			0	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		Cl+Ex				Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						Cl+Ex			Cl+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	

Baseline

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Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Permitted Phases										Free
Detector Phase		7				2				
Switch Phase										
Minimum Initial (s)		5.0				5.0				
Minimum Split (s)		9.5				22.5				
Total Split (s)		16.0				24.0				
Total Split (%)		40.0%				60.0%				
Maximum Green (s)		11.5				19.5				
Yellow Time (s)		3.5				3.5				
All-Red Time (s)		1.0				1.0				
Lost Time Adjust (s)		0.0				0.0				
Total Lost Time (s)		4.5				4.5				
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)		3.0				3.0				
Recall Mode		None				C-Max				
Walk Time (s)						7.0				
Flash Dont Walk (s)						11.0				
Pedestrian Calls (#/hr)						0				
Act Effect Green (s)		10.0				21.0		40.0	40.0	
Actuated g/C Ratio		0.25				0.52		1.00	1.00	
v/c Ratio		0.64				0.29		0.48	0.49	
Control Delay		10.4				6.1		1.2	2.1	
Queue Delay		4.1				0.0		0.0	0.0	
Total Delay		14.6				6.1		1.2	2.1	
LOS		B				A		A	A	
Approach Delay	14.6					6.1		1.5		
Approach LOS	B					A		A		
90th %ile Green (s)		11.5				19.5				
90th %ile Term Code		Max				Coord				
70th %ile Green (s)		11.5				19.5				
70th %ile Term Code		Max				Coord				
50th %ile Green (s)		11.2				19.8				
50th %ile Term Code		Gap				Coord				
30th %ile Green (s)		9.0				22.0				
30th %ile Term Code		Gap				Coord				
10th %ile Green (s)		7.0				24.0				
10th %ile Term Code		Gap				Coord				
Stops (vph)		376				355		236	155	
Fuel Used(gal)		8				6		4	2	
CO Emissions (g/hr)		581				394		301	171	
NOx Emissions (g/hr)		113				77		59	33	
VOC Emissions (g/hr)		135				91		70	40	
Dilemma Vehicles (#)		0				88		0	0	
Queue Length 50th (ft)		39				32		6	6	
Queue Length 95th (ft)		70				50		2	m7	
Internal Link Dist (ft)	718		454			330		132		
Turn Bay Length (ft)		150								
Base Capacity (vph)		1337				2634		3190	1441	



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Starvation Cap Reductn		0				0			0	0
Spillback Cap Reductn		491				426			0	0
Storage Cap Reductn		0				0			0	0
Reduced v/c Ratio		0.90				0.34			0.48	0.49

Intersection Summary

Area Type: Other
 Cycle Length: 40
 Actuated Cycle Length: 40
 Offset: 0 (0%), Referenced to phase 2:SET and 6:, Start of Green, Master Intersection
 Natural Cycle: 40
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 5.2 Intersection LOS: A
 Intersection Capacity Utilization 40.2% ICU Level of Service A
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: I-295



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2: Marginal Way

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑	↑	↑↑	↑↑↑	↑	↑↑		↑↑			↑
Traffic Volume (vph)	0	1157	298	317	1525	20	390	0	495	0	0	162
Future Volume (vph)	0	1157	298	317	1525	20	390	0	495	0	0	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	200		100	0		0	0		0
Storage Lanes	0		1	2		1	2		2	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	1.00	0.88	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.865
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	5085	1583	3433	5085	1583	3433	0	2787	0	0	1611
Flt Permitted				0.950			0.950					
Satd. Flow (perm)	0	5085	1583	3433	5085	1583	3433	0	2787	0	0	1611
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			324			82			538			143
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		212			514			458			387	
Travel Time (s)		4.1			11.7			10.4			8.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1258	324	345	1658	22	424	0	538	0	0	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1258	324	345	1658	22	424	0	538	0	0	176
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2	1	1	2	1	1		1			1
Detector Template		Thru	Right	Left	Thru	Right	Left		Right			Right
Leading Detector (ft)		100	20	20	100	20	20		20			20
Trailing Detector (ft)		0	0	0	0	0	0		0			0
Detector 1 Position(ft)		0	0	0	0	0	0		0			0
Detector 1 Size(ft)		6	20	20	6	20	20		20			20
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex			Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type		NA	Perm	Prot	NA	Perm	Prot		Perm			Perm
Protected Phases		4		3	2		5					
Permitted Phases			4			8			2			6

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
2: Marginal Way

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase		4	4	3	8	8	5		2			6
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0
Minimum Split (s)		22.5	22.5	9.5	22.5	22.5	9.5		22.5			22.5
Total Split (s)		26.0	26.0	14.0	40.0	40.0	16.0		40.0			24.0
Total Split (%)		32.5%	32.5%	17.5%	50.0%	50.0%	20.0%		50.0%			30.0%
Maximum Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
Yellow Time (s)		3.5	3.5	3.5	3.5	3.5	3.5		3.5			3.5
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0	1.0		1.0			1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0
Total Lost Time (s)		4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5
Lead/Lag		Lag	Lag	Lead			Lead					Lag
Lead-Lag Optimize?		Yes	Yes	Yes			Yes					Yes
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0
Recall Mode		None	None	None	None	None	None		C-Max			C-Max
Walk Time (s)		7.0	7.0		7.0	7.0			7.0			7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0			11.0			11.0
Pedestrian Calls (#/hr)		0	0		0	0			0			0
Act Effct Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
Actuated g/C Ratio		0.27	0.27	0.12	0.44	0.44	0.14		0.44			0.24
v/c Ratio		0.92	0.49	0.85	0.73	0.03	0.86		0.35			0.35
Control Delay		39.9	7.3	48.5	33.6	3.6	52.4		2.0			9.3
Queue Delay		46.0	1.0	0.0	0.0	0.0	0.0		0.0			0.0
Total Delay		85.9	8.3	48.5	33.6	3.6	52.4		2.0			9.3
LOS		F	A	D	C	A	D		A			A
Approach Delay		70.0			35.8			24.2			9.3	
Approach LOS		E			D			C			A	
90th %ile Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
90th %ile Term Code		Max	Max	Max	Max	Max	Max		Coord			Coord
70th %ile Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
70th %ile Term Code		Max	Max	Max	Max	Max	Max		Coord			Coord
50th %ile Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
50th %ile Term Code		Max	Max	Max	Max	Max	Max		Coord			Coord
30th %ile Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
30th %ile Term Code		Max	Max	Max	Max	Max	Max		Coord			Coord
10th %ile Green (s)		21.5	21.5	9.5	35.5	35.5	11.5		35.5			19.5
10th %ile Term Code		Max	Max	Max	Hold	Hold	Max		Coord			Coord
Stops (vph)		1060	92	297	1268	5	350		30			39
Fuel Used(gal)		19	2	6	24	0	7		2			1
CO Emissions (g/hr)		1338	111	422	1647	9	523		149			71
NOx Emissions (g/hr)		260	22	82	320	2	102		29			14
VOC Emissions (g/hr)		310	26	98	382	2	121		35			16
Dilemma Vehicles (#)		49	0	0	0	0	0		0			0
Queue Length 50th (ft)		235	0	97	279	0	108		0			13
Queue Length 95th (ft)		#316	72	m108	m306	m0	#184		28			61
Internal Link Dist (ft)		132			434			378			307	
Turn Bay Length (ft)				200		100						
Base Capacity (vph)		1906	632	407	2259	748	493		1535			500
Starvation Cap Reductn		326	150	0	0	0	0		0			0

Baseline

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 2: Marginal Way

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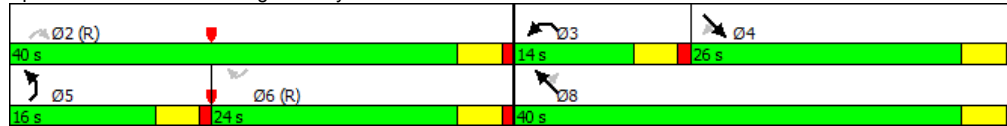


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn		0	0	0	0	0	0		0			0
Storage Cap Reductn		0	0	0	0	0	0		0			0
Reduced v/c Ratio		1.21	0.63	0.85	0.73	0.03	0.86		0.35			0.35

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:NER and 6:SWR, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 43.9 Intersection LOS: D
 Intersection Capacity Utilization 61.5% ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Marginal Way



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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↔↔	↕↕↕	↔	↔	↕↕↕	↔	↔↔	↔	↔	↔	↕	↕↕
Traffic Volume (vph)	294	1054	191	98	1264	48	385	113	49	55	80	287
Future Volume (vph)	294	1054	191	98	1264	48	385	113	49	55	80	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	175		150	200		150	0		150	0		250
Storage Lanes	2		1	1		1	2		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	1.00	1.00	1.00	1.00	0.88
Frt			0.850			0.850		0.955				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	5424	1583	1770	5085	1583	3433	1779	0	1770	1863	2787
Flt Permitted	0.950			0.950			0.950			0.646		
Satd. Flow (perm)	3433	5424	1583	1770	5085	1583	3433	1779	0	1203	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			208			205		29				312
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		514			1268			509			593	
Travel Time (s)		11.7			24.7			11.6			13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	320	1146	208	107	1374	52	418	123	53	60	87	312
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	1146	208	107	1374	52	418	176	0	60	87	312
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		pm+pt	NA	Perm
Protected Phases	7	4		3		5	2			1	6	

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
5: Somerset Street

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4			8				6		6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	9.5		9.5	22.5	22.5
Total Split (s)	13.0	28.0	28.0	12.1	27.1	27.1	15.2	30.3		9.6	24.7	24.7
Total Split (%)	16.3%	35.0%	35.0%	15.1%	33.9%	33.9%	19.0%	37.9%		12.0%	30.9%	30.9%
Maximum Green (s)	8.5	23.5	23.5	7.6	22.6	22.6	10.7	25.8		5.1	20.2	20.2
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max		None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0					7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0					11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0					0	0
Act Effect Green (s)	8.5	25.9	25.9	7.4	22.6	22.6	10.7	27.7		25.3	20.2	20.2
Actuated g/C Ratio	0.11	0.32	0.32	0.09	0.28	0.28	0.13	0.35		0.32	0.25	0.25
v/c Ratio	0.88	0.65	0.32	0.65	0.96	0.09	0.91	0.28		0.14	0.19	0.33
Control Delay	66.8	15.2	2.9	55.2	44.9	0.3	60.8	18.1		14.5	24.8	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	66.8	15.2	2.9	55.2	44.9	0.3	60.8	18.1		14.5	24.8	4.2
LOS	E	B	A	E	D	A	E	B		B	C	A
Approach Delay		23.5			44.1			48.1			9.4	
Approach LOS		C			D			D			A	
90th %ile Green (s)	8.5	23.5	23.5	7.6	22.6	22.6	10.7	25.8		5.1	20.2	20.2
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord		Max	Coord	Coord
70th %ile Green (s)	8.5	23.5	23.5	7.6	22.6	22.6	10.7	25.8		5.1	20.2	20.2
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord		Max	Coord	Coord
50th %ile Green (s)	8.5	23.5	23.5	7.6	22.6	22.6	10.7	25.8		5.1	20.2	20.2
50th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord		Max	Coord	Coord
30th %ile Green (s)	8.5	23.5	23.5	7.6	22.6	22.6	10.7	25.8		5.1	20.2	20.2
30th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord		Max	Coord	Coord
10th %ile Green (s)	8.5	35.6	35.6	0.0	22.6	22.6	10.7	35.4		0.0	20.2	20.2
10th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Max	Coord		Skip	Coord	Coord
Stops (vph)	268	378	19	88	1121	0	339	98		37	61	30
Fuel Used(gal)	7	10	1	3	32	0	8	2		1	1	2
CO Emissions (g/hr)	465	669	69	186	2205	31	571	124		43	78	121
NOx Emissions (g/hr)	91	130	13	36	429	6	111	24		8	15	24
VOC Emissions (g/hr)	108	155	16	43	511	7	132	29		10	18	28
Dilemma Vehicles (#)	0	0	0	0	75	0	0	0		0	0	0
Queue Length 50th (ft)	89	78	0	53	246	0	107	54		17	34	0
Queue Length 95th (ft)	m#113	m107	m0	#121	#343	0	#190	103		38	70	32
Internal Link Dist (ft)		434			1188			429			513	
Turn Bay Length (ft)	175		150	200		50						250
Base Capacity (vph)	364	477	653	468	1435	574	459	635		416	470	936

Baseline

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 5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.65	0.32	0.64	0.96	0.09	0.91	0.28		0.14	0.19	0.33

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 2:NET, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 32.8 Intersection LOS: C
 Intersection Capacity Utilization 63.0% ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Somerset Street

Ø1 9.6 s	Ø2 (R) 30.3 s	Ø3 12.1 s	Ø4 28 s
Ø5 15.2 s	Ø6 24.7 s	Ø7 13 s	Ø8 27.1 s

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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Future Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		100	0		100	0		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	0.95	0.95	0.95	1.00	1.00	1.00
Frnt		0.997			0.994			0.980				0.850
Flt Protected	0.950			0.950				0.979		0.950		
Satd. Flow (prot)	1770	5070	0	1770	5055	0	0	3396	0	1770	1863	1583
Flt Permitted	0.950			0.950				0.759		0.424		
Satd. Flow (perm)	1770	5070	0	1770	5055	0	0	2633	0	790	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			9			27				164
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			1268			295			268	
Travel Time (s)		9.4			24.7			6.7			7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1238	22	161	1008	41	165	170	53	17	176	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1260	0	161	1049	0	0	388	0	17	176	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	8		7	1		5	2		1	6	
Permitted Phases							2			6		6

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 10: Cumberland Street

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8		7	4		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	22.5
Total Split (s)	11.8	25.0		13.0	26.2		9.5	22.5		9.5	22.5	22.5
Total Split (%)	16.9%	35.7%		18.6%	37.4%		13.6%	32.1%		13.6%	32.1%	32.1%
Maximum Green (s)	7.3	20.5		8.5	21.7		5.0	18.0		5.0	18.0	18.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	7.3	20.6		8.4	21.7		0.0	25.6		27.5	27.5	27.5
Actuated g/C Ratio	0.10	0.29		0.12	0.31		0.37	0.37		0.39	0.39	0.39
v/c Ratio	0.15	0.84		0.76	0.67		0.40	0.40		0.04	0.24	0.18
Control Delay	20.4	24.8		55.1	23.3		17.7	17.7		13.4	15.4	2.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	20.4	24.8		55.1	23.3		17.7	17.7		13.4	15.4	2.2
LOS	C	C		E	C		B	B		B	B	A
Approach Delay		24.7			27.5		17.7	17.7			10.0	
Approach LOS		C			C		B	B			A	
90th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	18.0		5.0	27.5	27.5
90th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	27.5		0.0	27.5	27.5
70th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Skip	MaxR	MaxR
50th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	27.5		0.0	27.5	27.5
50th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Skip	MaxR	MaxR
30th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	27.5		0.0	27.5	27.5
30th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Skip	MaxR	MaxR
10th %ile Green (s)	7.3	21.1		7.9	21.7		0.0	27.5		0.0	27.5	27.5
10th %ile Term Code	Coord	Coord		Gap	MaxR		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	20	1099		130	794		242	242		11	103	8
Fuel Used(gal)	0	18		4	19		3	3		0	1	0
CO Emissions (g/hr)	24	1268		279	1355		241	241		9	89	25
NOx Emissions (g/hr)	5	247		54	264		47	47		2	17	5
VOC Emissions (g/hr)	6	294		65	314		56	56		2	21	6
Dilemma Vehicles (#)	0	29		0	69		0	0		0	0	0
Queue Length 50th (ft)	7	212		68	141		55	55		4	49	0
Queue Length 95th (ft)	m12	m238		#158	184		112	112		15	91	19
Internal Link Dist (ft)		400			1188		215	215			188	
Turn Bay Length (ft)	100			200								100
Base Capacity (vph)	194	1496		214	1579		979	979		380	731	721
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0

Baseline

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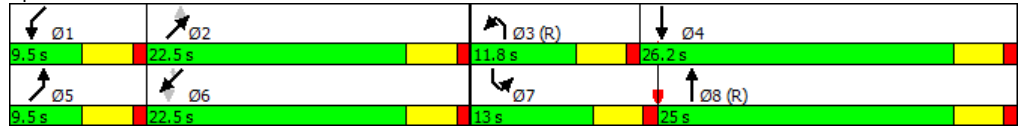
7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.15	0.84		0.75	0.67			0.40		0.04	0.24	0.18

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 0 (0%), Referenced to phase 3:NBL and 8:NBT, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 23.5 Intersection LOS: C
 Intersection Capacity Utilization 64.5% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Cumberland Street



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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 12: Congress Street

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↘	↗	↘	↘	↗	↗		↗	↗		↗	↗
Traffic Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Future Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	100		150	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.993				0.850
Flt Protected	0.950			0.950				0.975			0.994	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	3427	0	0	1852	1583
Flt Permitted	0.950			0.950				0.671			0.905	
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	2358	0	0	1686	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			230			164		7				196
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			828			235			220	
Travel Time (s)		9.4			16.1			5.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	655	230	32	838	53	254	216	22	33	227	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	192	655	230	32	838	53	0	492	0	0	260	196
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	2		5	2		1	6	
Permitted Phases			4			8		2		6		6

Baseline

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 12: Congress Street

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5
Total Split (s)	14.0	27.0	27.0	10.0	23.0	23.0	9.5	23.5		9.5	23.5	23.5
Total Split (%)	20.0%	38.6%	38.6%	14.3%	32.9%	32.9%	13.6%	33.6%		13.6%	33.6%	33.6%
Maximum Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	5.0	19.0		5.0	19.0	19.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0			11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0			0	0
Act Effct Green (s)	9.4	28.4	28.4	5.5	18.5	18.5		28.6			28.6	28.6
Actuated g/C Ratio	0.13	0.41	0.41	0.08	0.26	0.26		0.41			0.41	0.41
v/c Ratio	0.81	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26
Control Delay	37.8	19.0	12.7	34.6	39.5	0.4		17.5			16.5	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	37.8	19.0	12.7	34.6	39.5	0.4		17.5			16.5	3.3
LOS	D	B	B	C	D	A		B			B	A
Approach Delay		21.0			37.1			17.5			10.8	
Approach LOS		C			D			B			B	
90th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
70th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
50th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
50th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
30th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
30th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
10th %ile Green (s)	9.0	31.8	31.8	0.0	18.3	18.3	0.0	29.2		0.0	29.2	29.2
10th %ile Term Code	Gap	Hold	Hold	Skip	Gap	Gap	Skip	Coord		Skip	Coord	Coord
Stops (vph)	159	577	141	31	675	0		319			161	20
Fuel Used(gal)	3	9	2	1	16	0		4			2	1
CO Emissions (g/hr)	222	612	164	43	1110	21		294			131	37
NOx Emissions (g/hr)	43	119	32	8	216	4		57			25	7
VOC Emissions (g/hr)	51	142	38	10	257	5		68			30	9
Dilemma Vehicles (#)	0	4	0	0	51	0		0			0	0
Queue Length 50th (ft)	87	156	71	13	182	0		79			76	0
Queue Length 95th (ft) m#164	210	m124	38	#286	0			122			132	35
Internal Link Dist (ft)		400			748			155			140	
Turn Bay Length (ft)	200			100		150						
Base Capacity (vph)	246	1413	778	139	935	539		969			689	763
Starvation Cap Reductn	0	0	0	0	0	0		0			0	0

Baseline

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 12: Congress Street

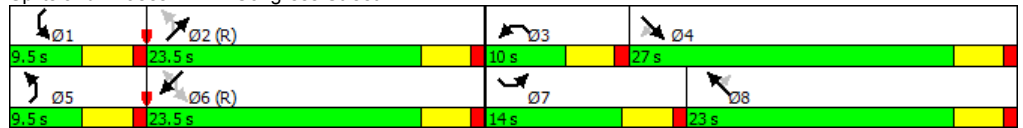
7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn	0	0	0	0	0	0		0			0	0
Storage Cap Reductn	0	0	0	0	0	0		0			0	0
Reduced v/c Ratio	0.80	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 23.9 Intersection LOS: C
 Intersection Capacity Utilization 71.7% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Congress Street



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 16: Middle Street

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Future Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		100	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967			0.998			0.992			0.928	
Flt Protected		0.994			0.999			0.971			0.995	
Satd. Flow (prot)	0	3402	0	0	3529	0	0	1794	0	0	1720	0
Flt Permitted		0.811			0.939			0.741			0.955	
Satd. Flow (perm)	0	2776	0	0	3317	0	0	1369	0	0	1651	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		69			3			6			104	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		828			303			251			371	
Travel Time (s)		16.1			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	468	155	11	596	9	222	130	21	18	74	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	709	0	0	616	0	0	373	0	0	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	2			2			6	
Permitted Phases	4			8			2			6		

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 16: Middle Street

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	22.6		9.5	22.6		22.9	22.9		22.9	22.9	
Total Split (%)	17.3%	41.1%		17.3%	41.1%		41.6%	41.6%		41.6%	41.6%	
Maximum Green (s)	5.0	18.1		5.0	18.1		18.4	18.4		18.4	18.4	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead	Lead							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)		15.1			15.1			18.5			18.5	
Actuated g/C Ratio		0.35			0.35			0.43			0.43	
v/c Ratio		0.69			0.52			0.63			0.25	
Control Delay		14.4			12.4			16.7			5.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.4			12.4			16.7			5.7	
LOS		B			B			B			A	
Approach Delay		14.4			12.4			16.7			5.7	
Approach LOS		B			B			B			A	
90th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
90th %ile Term Code	Skip	Max		Skip	Max		MaxR	MaxR		Hold	Hold	
70th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
70th %ile Term Code	Skip	Max		Skip	Hold		MaxR	MaxR		Hold	Hold	
50th %ile Green (s)	0.0	16.6		0.0	16.6		18.4	18.4		18.4	18.4	
50th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
30th %ile Green (s)	0.0	13.6		0.0	13.6		18.4	18.4		18.4	18.4	
30th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
10th %ile Green (s)	0.0	10.0		0.0	10.0		18.4	18.4		18.4	18.4	
10th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
Stops (vph)		455			398			250			59	
Fuel Used(gal)		9			6			3			1	
CO Emissions (g/hr)		645			396			200			70	
NOx Emissions (g/hr)		125			77			39			14	
VOC Emissions (g/hr)		149			92			46			16	
Dilemma Vehicles (#)		65			52			0			0	
Queue Length 50th (ft)		65			58			69			13	
Queue Length 95th (ft)		109			93			#179			45	
Internal Link Dist (ft)		748			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1223			1418			596			774	
Starvation Cap Reductn		0			0			0			0	

Baseline

Synchro 9 Classroom Report
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 16: Middle Street

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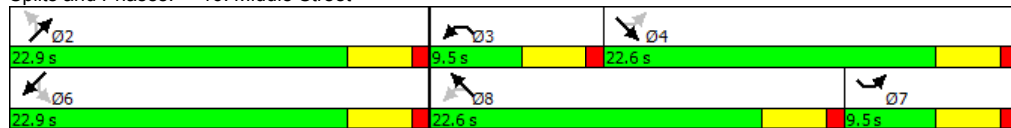


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.58			0.44			0.63			0.25	

Intersection Summary

Area Type: Other
 Cycle Length: 55
 Actuated Cycle Length: 42.7
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 13.3 Intersection LOS: B
 Intersection Capacity Utilization 78.6% ICU Level of Service D
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 45.5
 70th %ile Actuated Cycle: 45.5
 50th %ile Actuated Cycle: 44
 30th %ile Actuated Cycle: 41
 10th %ile Actuated Cycle: 37.4
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 16: Middle Street



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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 19: Fore Street

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Future Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.981			0.928			0.981			0.990	
Flt Protected	0.950				0.998			0.987			0.998	
Satd. Flow (prot)	1770	1827	0	0	1725	0	0	3427	0	0	3497	0
Flt Permitted	0.600				0.986			0.779			0.921	
Satd. Flow (perm)	1118	1827	0	0	1704	0	0	2705	0	0	3227	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			112			36			16	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	224	33	11	146	179	133	310	65	16	287	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	257	0	0	336	0	0	508	0	0	324	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 19: Fore Street

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.7	11.7			11.7			11.9			11.9	
Actuated g/C Ratio	0.35	0.35			0.35			0.36			0.36	
v/c Ratio	0.40	0.39			0.50			0.51			0.28	
Control Delay	12.2	10.0			8.8			10.3			8.4	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	12.2	10.0			8.8			10.3			8.4	
LOS	B	B			A			B			A	
Approach Delay		10.8			8.8			10.3			8.4	
Approach LOS		B			A			B			A	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	18.0		0.0	18.0	
90th %ile Term Code	Max	Max		Hold	Hold		Skip	Max		Skip	Hold	
70th %ile Green (s)	15.5	15.5		15.5	15.5		0.0	14.5		0.0	14.5	
70th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	11.3	11.3		11.3	11.3		0.0	11.9		0.0	11.9	
50th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
30th %ile Green (s)	8.6	8.6		8.6	8.6		0.0	9.1		0.0	9.1	
30th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
10th %ile Green (s)	6.4	6.4		6.4	6.4		0.0	7.3		0.0	7.3	
10th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
Stops (vph)	96	141			141			289			169	
Fuel Used(gal)	1	2			2			4			3	
CO Emissions (g/hr)	83	123			143			292			184	
NOx Emissions (g/hr)	16	24			28			57			36	
VOC Emissions (g/hr)	19	29			33			68			43	
Dilemma Vehicles (#)	0	0			0			53			31	
Queue Length 50th (ft)	19	29			27			30			17	
Queue Length 95th (ft)	62	82			86			77			47	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	662	1088			1055			1574			1867	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.24	0.24			0.32			0.32			0.17	

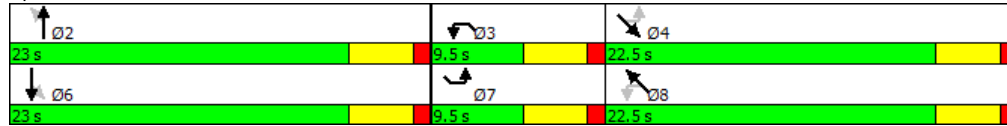
Baseline

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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	33.2
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.51
Intersection Signal Delay:	9.7
Intersection LOS:	A
Intersection Capacity Utilization:	67.0%
ICU Level of Service:	C
Analysis Period (min):	15
90th %ile Actuated Cycle:	45.5
70th %ile Actuated Cycle:	39
50th %ile Actuated Cycle:	32.2
30th %ile Actuated Cycle:	26.7
10th %ile Actuated Cycle:	22.7
























Splits and Phases: 19: Fore Street



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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 22: Commercial Street

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Future Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	1		1	0		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.997		0.950			0.950	0.995	
Satd. Flow (prot)	1770	1863	1583	0	1857	1583	1770	1863	1583	1681	1761	1583
Flt Permitted	0.406				0.971		0.440			0.725	0.968	
Satd. Flow (perm)	756	1863	1583	0	1809	1583	820	1863	1583	1283	1713	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			176			176			268			176
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			218	
Travel Time (s)		10.6			10.3			10.7			5.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	247	259	41	17	260	32	36	49	268	26	28	17
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	247	259	41	0	277	32	36	49	268	23	31	17
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	custom	NA	custom
Protected Phases	5	2		1	6		7	4				
Permitted Phases	2		2	6		6	4		4	8	8	8

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street with widening.syn
 22: Commercial Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase	5	2	2	1	6	6	7	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	10.0	23.5	23.5	9.5	23.0	23.0	9.5	32.0	32.0	22.5	22.5	22.5
Total Split (%)	15.4%	36.2%	36.2%	14.6%	35.4%	35.4%	14.6%	49.2%	49.2%	34.6%	34.6%	34.6%
Maximum Green (s)	5.5	19.0	19.0	5.0	18.5	18.5	5.0	27.5	27.5	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0	0	0	0
Act Effct Green (s)	20.5	20.5	20.5		12.8	12.8	8.1	8.1	8.1	6.7	6.7	6.7
Actuated g/C Ratio	0.54	0.54	0.54		0.34	0.34	0.21	0.21	0.21	0.18	0.18	0.18
v/c Ratio	0.44	0.26	0.04		0.45	0.05	0.12	0.12	0.49	0.10	0.10	0.04
Control Delay	8.1	6.0	0.1		14.4	0.1	14.2	14.2	5.9	18.4	17.9	0.2
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	6.0	0.1		14.4	0.1	14.2	14.2	5.9	18.4	17.9	0.2
LOS	A	A	A		B	A	B	B	A	B	B	A
Approach Delay		6.5			13.0			7.9			13.8	
Approach LOS		A			B			A			B	
90th %ile Green (s)	5.5	28.5	28.5	0.0	18.5	18.5	5.0	17.6	17.6	8.1	8.1	8.1
90th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Max	Hold	Hold	Gap	Gap	Gap
70th %ile Green (s)	5.5	24.2	24.2	0.0	14.2	14.2	0.0	7.1	7.1	7.1	7.1	7.1
70th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
50th %ile Green (s)	5.5	20.5	20.5	0.0	10.5	10.5	0.0	6.3	6.3	6.3	6.3	6.3
50th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
30th %ile Green (s)	5.5	19.0	19.0	0.0	9.0	9.0	0.0	5.8	5.8	5.8	5.8	5.8
30th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
10th %ile Green (s)	0.0	11.2	11.2	0.0	11.2	11.2	0.0	5.5	5.5	5.5	5.5	5.5
10th %ile Term Code	Skip	Dwell	Dwell	Skip	Dwell	Dwell	Skip	Gap	Gap	Hold	Hold	Hold
Stops (vph)	101	105	0		185	0	27	35	37	20	27	0
Fuel Used(gal)	2	1	0		2	0	0	0	1	0	0	0
CO Emissions (g/hr)	106	103	9		159	7	22	29	89	16	21	2
NOx Emissions (g/hr)	21	20	2		31	1	4	6	17	3	4	0
VOC Emissions (g/hr)	24	24	2		37	2	5	7	21	4	5	0
Dilemma Vehicles (#)	0	0	0		0	0	0	0	0	0	0	0
Queue Length 50th (ft)	19	20	0		44	0	6	8	0	4	5	0
Queue Length 95th (ft)	76	79	0		126	0	24	30	42	25	30	0
Internal Link Dist (ft)		308			298			314			138	
Turn Bay Length (ft)			160				270					
Base Capacity (vph)	561	1114	1017		932	304	305	1402	1257	644	859	882
Starvation Cap Reductn	0	0	0		0	0	0	0	0	0	0	0


Baseline

Synchro 9 Classroom Report
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Figure A.5. Marginal Way Roundabout

Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
1: I-295

7/26/2016



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑				↑↑↑			↑↑	↑
Traffic Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Future Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	12	12	12
Storage Length (ft)	0	250	0	0	0		0	0		0
Storage Lanes	0	1	0	0	0		0	0		1
Taper Length (ft)	25		25		25			25		
Lane Util. Factor	1.00	0.76	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Flt Protected		0.850							0.941	0.850
Satd. Flow (prot)	0	4091	0	0	0	5085	0	0	3190	1441
Flt Permitted										
Satd. Flow (perm)	0	4091	0	0	0	5085	0	0	3190	1441
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		310							224	711
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	535		533			410			182	
Travel Time (s)	12.2		12.1			8.0			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	812	0	0	0	770	0	0	940	1317
Shared Lane Traffic (%)										46%
Lane Group Flow (vph)	0	812	0	0	0	770	0	0	1546	711
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			0			0	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		Cl+Ex				Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						Cl+Ex			Cl+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	

Baseline

Synchro 9 Classroom Report
Page 1



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	
Permitted Phases										Free	
Detector Phase	7				2						
Switch Phase											
Minimum Initial (s)	5.0				5.0						
Minimum Split (s)	9.5				22.5						
Total Split (s)	16.0				24.0						
Total Split (%)	40.0%				60.0%						
Maximum Green (s)	11.5				19.5						
Yellow Time (s)	3.5				3.5						
All-Red Time (s)	1.0				1.0						
Lost Time Adjust (s)	0.0				0.0						
Total Lost Time (s)	4.5				4.5						
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0				3.0						
Recall Mode	None				C-Max						
Walk Time (s)	7.0										
Flash Dont Walk (s)	11.0										
Pedestrian Calls (#/hr)	0										
Act Effect Green (s)	10.0				21.0			40.0		40.0	
Actuated g/C Ratio	0.25				0.52			1.00		1.00	
v/c Ratio	0.64				0.29			0.48		0.49	
Control Delay	10.4				6.1			0.5		1.2	
Queue Delay	0.0				0.0			0.0		0.0	
Total Delay	10.4				6.1			0.5		1.2	
LOS	B				A			A		A	
Approach Delay	10.4				6.1			0.7			
Approach LOS	B				A			A			
90th %ile Green (s)	11.5				19.5						
90th %ile Term Code	Max				Coord						
70th %ile Green (s)	11.5				19.5						
70th %ile Term Code	Max				Coord						
50th %ile Green (s)	11.2				19.8						
50th %ile Term Code	Gap				Coord						
30th %ile Green (s)	9.0				22.0						
30th %ile Term Code	Gap				Coord						
10th %ile Green (s)	7.0				24.0						
10th %ile Term Code	Gap				Coord						
Stops (vph)	376				355			1		1	
Fuel Used(gal)	7				6			2		1	
CO Emissions (g/hr)	474				394			142		72	
NOx Emissions (g/hr)	92				77			28		14	
VOC Emissions (g/hr)	110				91			33		17	
Dilemma Vehicles (#)	0				88			0		0	
Queue Length 50th (ft)	39				32			0		0	
Queue Length 95th (ft)	70				50			0		0	
Internal Link Dist (ft)	455		453		330			102			
Turn Bay Length (ft)	240				264						
Base Capacity (vph)	1337				2634			3190		1441	

Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
2: Marginal Way

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑	↑		↑↑↑	↑	↓	↑	↓		↑	↓
Traffic Volume (vph)	130	1027	298	267	1525	20	390	101	394	17	123	162
Future Volume (vph)	130	1027	298	267	1525	20	390	101	394	17	123	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		100	0		150	0		0
Storage Lanes	0		1	0		1	1		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.994			0.993		0.950	0.971			0.994	
Satd. Flow (prot)	0	5055	1583	0	5050	1583	1681	1718	1583	0	1852	1583
Flt Permitted		0.994			0.993		0.950	0.971			0.994	
Satd. Flow (perm)	0	5055	1583	0	5050	1583	1681	1718	1583	0	1852	1583
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		182			520			464			385	
Travel Time (s)		3.5			11.8			10.5			8.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	1116	324	290	1658	22	424	110	428	18	134	176
Shared Lane Traffic (%)							38%					
Lane Group Flow (vph)	0	1257	324	0	1948	22	263	271	428	0	152	176
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type:	Other
Control Type:	Roundabout
Intersection Capacity Utilization	91.6%
ICU Level of Service	F
Analysis Period (min)	15

Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↖	↗↗↗	↖	↖	↗↗↗	↖	↖↖	↖				↖
Traffic Volume (vph)	193	1054	191	98	1264	48	385	113	49	38	80	164
Future Volume (vph)	193	1054	191	98	1264	48	385	113	49	38	80	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	250		200	200		150	0		150	0		0
Storage Lanes	1		1	1		1	2		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.955				0.850
Flt Protected	0.950			0.950			0.950				0.984	
Satd. Flow (prot)	1770	5424	1583	1770	5085	1583	3433	1779	0	0	1833	1583
Flt Permitted	0.950			0.950			0.950				0.857	
Satd. Flow (perm)	1770	5424	1583	1770	5085	1583	3433	1779	0	0	1596	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			208			182		25				182
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		520			1268			509			565	
Travel Time (s)		11.8			24.7			11.6			12.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	210	1146	208	107	1374	52	418	123	53	41	87	178
Shared Lane Traffic (%)												
Lane Group Flow (vph)	210	1146	208	107	1374	52	418	176	0	0	128	178
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4			8				6		6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	9.5		9.5	22.5	22.5
Total Split (s)	18.0	32.5	32.5	16.5	31.0	31.0	17.0	31.5		9.5	24.0	24.0
Total Split (%)	20.0%	36.1%	36.1%	18.3%	34.4%	34.4%	18.9%	35.0%		10.6%	26.7%	26.7%
Maximum Green (s)	13.5	28.0	28.0	12.0	26.5	26.5	12.5	27.0		5.0	19.5	19.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5			4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max		None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0					7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0					11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0					0	0
Act Effect Green (s)	13.0	31.9	31.9	10.1	26.8	26.8	12.6	36.7			19.6	19.6
Actuated g/C Ratio	0.14	0.35	0.35	0.11	0.30	0.30	0.14	0.41			0.22	0.22
v/c Ratio	0.82	0.60	0.30	0.54	0.91	0.09	0.87	0.24			0.37	0.37
Control Delay	63.6	26.3	4.7	47.7	40.7	0.3	58.4	16.0			33.6	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay	63.6	26.3	4.7	47.7	40.7	0.3	58.4	16.0			33.6	6.9
LOS	E	C	A	D	D	A	E	B			C	A
Approach Delay		28.5			39.8			45.8			18.1	
Approach LOS		C			D			D			B	
90th %ile Green (s)	13.5	28.0	28.0	12.0	26.5	26.5	12.5	36.5		0.0	19.5	19.5
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord		Skip	Coord	Coord
70th %ile Green (s)	13.5	28.0	28.0	12.0	26.5	26.5	12.5	36.5		0.0	19.5	19.5
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord		Skip	Coord	Coord
50th %ile Green (s)	13.5	29.3	29.3	10.7	26.5	26.5	12.5	36.5		0.0	19.5	19.5
50th %ile Term Code	Max	Max	Max	Gap	Max	Max	Max	Coord		Skip	Coord	Coord
30th %ile Green (s)	13.5	31.0	31.0	9.0	26.5	26.5	12.5	36.5		0.0	19.5	19.5
30th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord		Skip	Coord	Coord
10th %ile Green (s)	11.0	43.4	43.4	0.0	27.9	27.9	12.9	37.6		0.0	20.2	20.2
10th %ile Term Code	Gap	Hold	Hold	Skip	Gap	Gap	Gap	Coord		Skip	Coord	Coord
Stops (vph)	173	842	23	91	1135	0	347	88			98	22
Fuel Used(gal)	4	15	1	3	31	0	8	2			2	1
CO Emissions (g/hr)	296	1019	76	177	2138	31	561	116			131	75
NOx Emissions (g/hr)	58	198	15	34	416	6	109	23			25	15
VOC Emissions (g/hr)	69	236	18	41	496	7	130	27			30	17
Dilemma Vehicles (#)	0	0	0	0	65	0	0	0			0	0
Queue Length 50th (ft)	117	202	0	58	275	0	121	54			62	0
Queue Length 95th (ft)	#230	255	48	109	#365	0	#203	100			115	49
Internal Link Dist (ft)		440			1188			429			485	
Turn Bay Length (ft)	250		200		50							
Base Capacity (vph)	265	1014	695	236	1513	508	479	740			348	487

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 5: Somerset Street

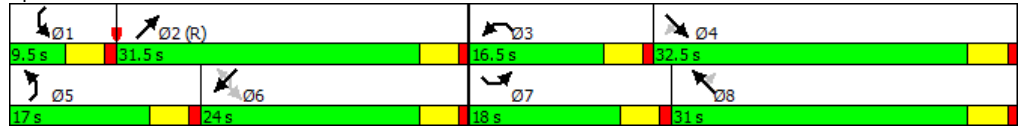
7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	0	0	0	0	0	0	0			0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0			0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0			0	0
Reduced v/c Ratio	0.79	0.60	0.30	0.45	0.91	0.09	0.87	0.24			0.37	0.37

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NET, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 34.6 Intersection LOS: C
 Intersection Capacity Utilization 67.4% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 5: Somerset Street



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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Future Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	100		100	0		100	0		100
Storage Lanes	1		0	1		0	0		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	0.95	0.95	0.95	1.00	1.00	1.00
Frnt		0.997			0.994			0.980				0.850
Flt Protected	0.950			0.950				0.979		0.950		
Satd. Flow (prot)	1770	5070	0	1770	5055	0	0	3396	0	1770	1863	1583
Flt Permitted	0.950			0.950				0.759		0.424		
Satd. Flow (perm)	1770	5070	0	1770	5055	0	0	2633	0	790	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			9			27				164
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			1268			295			268	
Travel Time (s)		9.4			24.7			6.7			7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1238	22	161	1008	41	165	170	53	17	176	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1260	0	161	1049	0	0	388	0	17	176	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	8		7	1		5	2		1	6	
Permitted Phases							2			6		6

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8		7	4		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	22.5
Total Split (s)	11.8	25.0		13.0	26.2		9.5	22.5		9.5	22.5	22.5
Total Split (%)	16.9%	35.7%		18.6%	37.4%		13.6%	32.1%		13.6%	32.1%	32.1%
Maximum Green (s)	7.3	20.5		8.5	21.7		5.0	18.0		5.0	18.0	18.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		None	Max		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	7.3	20.6		8.4	21.7		0.0	25.6		27.5	27.5	27.5
Actuated g/C Ratio	0.10	0.29		0.12	0.31		0.37	0.37		0.39	0.39	0.39
v/c Ratio	0.15	0.84		0.76	0.67		0.40	0.40		0.04	0.24	0.18
Control Delay	20.4	24.8		55.1	23.3		17.7	17.7		13.4	15.4	2.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	20.4	24.8		55.1	23.3		17.7	17.7		13.4	15.4	2.2
LOS	C	C		E	C		B	B		B	B	A
Approach Delay		24.7			27.5			17.7			10.0	
Approach LOS		C			C			B			A	
90th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	18.0		5.0	27.5	27.5
90th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	27.5		0.0	27.5	27.5
70th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Skip	MaxR	MaxR
50th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	27.5		0.0	27.5	27.5
50th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Skip	MaxR	MaxR
30th %ile Green (s)	7.3	20.5		8.5	21.7		0.0	27.5		0.0	27.5	27.5
30th %ile Term Code	Coord	Coord		Max	MaxR		Skip	MaxR		Skip	MaxR	MaxR
10th %ile Green (s)	7.3	21.1		7.9	21.7		0.0	27.5		0.0	27.5	27.5
10th %ile Term Code	Coord	Coord		Gap	MaxR		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	20	1099		130	794		242	242		11	103	8
Fuel Used(gal)	0	18		4	19		3	3		0	1	0
CO Emissions (g/hr)	24	1268		279	1355		241	241		9	89	25
NOx Emissions (g/hr)	5	247		54	264		47	47		2	17	5
VOC Emissions (g/hr)	6	294		65	314		56	56		2	21	6
Dilemma Vehicles (#)	0	29		0	69		0	0		0	0	0
Queue Length 50th (ft)	7	212		68	141		55	55		4	49	0
Queue Length 95th (ft)	m12	m238		#158	184		112	112		15	91	19
Internal Link Dist (ft)		400			1188			215			188	
Turn Bay Length (ft)	100			100								100
Base Capacity (vph)	194	1496		214	1579		979	979		380	731	721
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 10: Cumberland Street

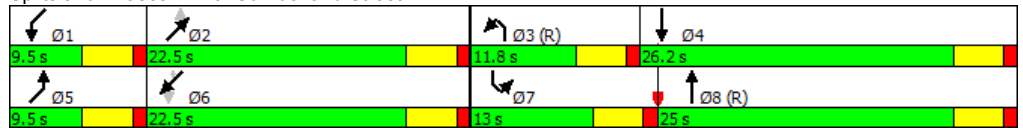
7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.15	0.84		0.75	0.67			0.40		0.04	0.24	0.18

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 0 (0%), Referenced to phase 3:NBL and 8:NBT, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 23.5 Intersection LOS: C
 Intersection Capacity Utilization 64.5% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Cumberland Street



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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 12: Congress Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↘	↗	↘	↘	↗	↗		↗	↘		↗	↘
Traffic Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Future Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	100		150	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.993				0.850
Flt Protected	0.950			0.950				0.975			0.994	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	3427	0	0	1852	1583
Flt Permitted	0.950			0.950				0.671			0.905	
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	2358	0	0	1686	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			230			164		7				196
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			828			235			220	
Travel Time (s)		9.4			16.1			5.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	655	230	32	838	53	254	216	22	33	227	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	192	655	230	32	838	53	0	492	0	0	260	196
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	2		5	2		1	6	
Permitted Phases			4			8	2			6		6

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 12: Congress Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5
Total Split (s)	14.0	27.0	27.0	10.0	23.0	23.0	9.5	23.5		9.5	23.5	23.5
Total Split (%)	20.0%	38.6%	38.6%	14.3%	32.9%	32.9%	13.6%	33.6%		13.6%	33.6%	33.6%
Maximum Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	5.0	19.0		5.0	19.0	19.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0			11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0			0	0
Act Effct Green (s)	9.4	28.4	28.4	5.5	18.5	18.5		28.6			28.6	28.6
Actuated g/C Ratio	0.13	0.41	0.41	0.08	0.26	0.26		0.41			0.41	0.41
v/c Ratio	0.81	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26
Control Delay	37.8	19.0	12.7	34.6	39.5	0.4		17.5			16.5	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	37.8	19.0	12.7	34.6	39.5	0.4		17.5			16.5	3.3
LOS	D	B	B	C	D	A		B			B	A
Approach Delay		21.0			37.1			17.5			10.8	
Approach LOS		C			D			B			B	
90th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
70th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
50th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
50th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
30th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
30th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
10th %ile Green (s)	9.0	31.8	31.8	0.0	18.3	18.3	0.0	29.2		0.0	29.2	29.2
10th %ile Term Code	Gap	Hold	Hold	Skip	Gap	Gap	Skip	Coord		Skip	Coord	Coord
Stops (vph)	159	577	141	31	675	0		319			161	20
Fuel Used(gal)	3	9	2	1	16	0		4			2	1
CO Emissions (g/hr)	222	612	164	43	1110	21		294			131	37
NOx Emissions (g/hr)	43	119	32	8	216	4		57			25	7
VOC Emissions (g/hr)	51	142	38	10	257	5		68			30	9
Dilemma Vehicles (#)	0	4	0	0	51	0		0			0	0
Queue Length 50th (ft)	87	156	71	13	182	0		79			76	0
Queue Length 95th (ft) m#164	210	m124	38	#286	0			122			132	35
Internal Link Dist (ft)		400			748			155			140	
Turn Bay Length (ft)	200			100		150						
Base Capacity (vph)	246	1413	778	139	935	539		969			689	763
Starvation Cap Reductn	0	0	0	0	0	0		0			0	0

Baseline

Synchro 9 Classroom Report
Page 12

Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 12: Congress Street

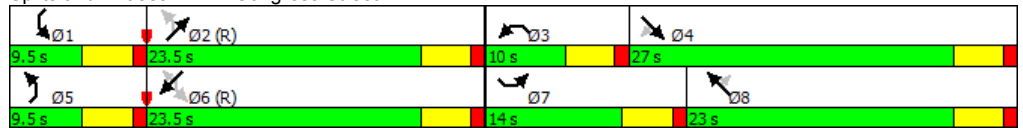
7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn	0	0	0	0	0	0		0			0	0
Storage Cap Reductn	0	0	0	0	0	0		0			0	0
Reduced v/c Ratio	0.80	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 23.9 Intersection LOS: C
 Intersection Capacity Utilization 71.7% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Congress Street



Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Future Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		100	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967			0.998			0.992			0.928	
Flt Protected		0.994			0.999			0.971			0.995	
Satd. Flow (prot)	0	3402	0	0	3529	0	0	1794	0	0	1720	0
Flt Permitted		0.811			0.939			0.741			0.955	
Satd. Flow (perm)	0	2776	0	0	3317	0	0	1369	0	0	1651	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		69			3			6			104	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		828			303			251			371	
Travel Time (s)		16.1			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	468	155	11	596	9	222	130	21	18	74	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	709	0	0	616	0	0	373	0	0	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	2			2			6	
Permitted Phases	4			8			2			6		

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	22.6		9.5	22.6		22.9	22.9		22.9	22.9	
Total Split (%)	17.3%	41.1%		17.3%	41.1%		41.6%	41.6%		41.6%	41.6%	
Maximum Green (s)	5.0	18.1		5.0	18.1		18.4	18.4		18.4	18.4	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead	Lead							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)		15.1			15.1			18.5			18.5	
Actuated g/C Ratio		0.35			0.35			0.43			0.43	
v/c Ratio		0.69			0.52			0.63			0.25	
Control Delay		14.4			12.4			16.7			5.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.4			12.4			16.7			5.7	
LOS		B			B			B			A	
Approach Delay		14.4			12.4			16.7			5.7	
Approach LOS		B			B			B			A	
90th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
90th %ile Term Code	Skip	Max		Skip	Max		MaxR	MaxR		Hold	Hold	
70th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
70th %ile Term Code	Skip	Max		Skip	Hold		MaxR	MaxR		Hold	Hold	
50th %ile Green (s)	0.0	16.6		0.0	16.6		18.4	18.4		18.4	18.4	
50th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
30th %ile Green (s)	0.0	13.6		0.0	13.6		18.4	18.4		18.4	18.4	
30th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
10th %ile Green (s)	0.0	10.0		0.0	10.0		18.4	18.4		18.4	18.4	
10th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
Stops (vph)		455			398			250			59	
Fuel Used(gal)		9			6			3			1	
CO Emissions (g/hr)		645			396			200			70	
NOx Emissions (g/hr)		125			77			39			14	
VOC Emissions (g/hr)		149			92			46			16	
Dilemma Vehicles (#)		65			52			0			0	
Queue Length 50th (ft)		65			58			69			13	
Queue Length 95th (ft)		109			93			#179			45	
Internal Link Dist (ft)		748			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1213			1418			596			774	
Starvation Cap Reductn		0			0			0			0	

Baseline

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 19: Fore Street

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Future Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.981			0.928			0.981			0.990	
Flt Protected	0.950				0.998			0.987			0.998	
Satd. Flow (prot)	1770	1827	0	0	1725	0	0	3427	0	0	3497	0
Flt Permitted	0.600				0.986			0.779			0.921	
Satd. Flow (perm)	1118	1827	0	0	1704	0	0	2705	0	0	3227	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			112			36			16	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	224	33	11	146	179	133	310	65	16	287	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	257	0	0	336	0	0	508	0	0	324	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 19: Fore Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.7	11.7			11.7			11.9			11.9	
Actuated g/C Ratio	0.35	0.35			0.35			0.36			0.36	
v/c Ratio	0.40	0.39			0.50			0.51			0.28	
Control Delay	12.2	10.0			8.8			10.3			8.4	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	12.2	10.0			8.8			10.3			8.4	
LOS	B	B			A			B			A	
Approach Delay		10.8			8.8			10.3			8.4	
Approach LOS		B			A			B			A	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	18.0		0.0	18.0	
90th %ile Term Code	Max	Max		Hold	Hold		Skip	Max		Skip	Hold	
70th %ile Green (s)	15.5	15.5		15.5	15.5		0.0	14.5		0.0	14.5	
70th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	11.3	11.3		11.3	11.3		0.0	11.9		0.0	11.9	
50th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
30th %ile Green (s)	8.6	8.6		8.6	8.6		0.0	9.1		0.0	9.1	
30th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
10th %ile Green (s)	6.4	6.4		6.4	6.4		0.0	7.3		0.0	7.3	
10th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
Stops (vph)	96	141			141			289			169	
Fuel Used(gal)	1	2			2			4			3	
CO Emissions (g/hr)	83	123			143			292			184	
NOx Emissions (g/hr)	16	24			28			57			36	
VOC Emissions (g/hr)	19	29			33			68			43	
Dilemma Vehicles (#)	0	0			0			53			31	
Queue Length 50th (ft)	19	29			27			30			17	
Queue Length 95th (ft)	62	82			86			77			47	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	662	1088			1055			1574			1867	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.24	0.24			0.32			0.32			0.17	

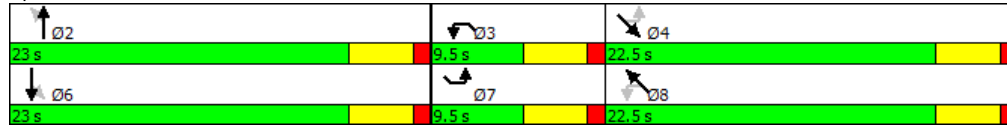
Baseline

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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	33.2
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.51
Intersection Signal Delay:	9.7
Intersection LOS:	A
Intersection Capacity Utilization:	67.0%
ICU Level of Service:	C
Analysis Period (min):	15
90th %ile Actuated Cycle:	45.5
70th %ile Actuated Cycle:	39
50th %ile Actuated Cycle:	32.2
30th %ile Actuated Cycle:	26.7
10th %ile Actuated Cycle:	22.7





















Splits and Phases: 19: Fore Street



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Franklin Street Alternate Afternoon 2035 Urban Parkway.syn
 22: Commercial Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Future Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	0		1	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.968	
Flt Protected		0.976			0.997			0.979			0.982	
Satd. Flow (prot)	0	1818	1583	0	1857	1583	0	1824	1583	0	1771	0
Flt Permitted		0.976			0.997			0.979			0.982	
Satd. Flow (perm)	0	1818	1583	0	1857	1583	0	1824	1583	0	1771	0
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			197	
Travel Time (s)		10.6			10.3			10.7			4.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	247	259	41	17	260	32	36	49	268	26	28	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	506	41	0	277	32	0	85	268	0	71	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	
Intersection Summary												
Area Type:	Other											
Control Type:	Roundabout											
Intersection Capacity Utilization	58.9%					ICU Level of Service B						
Analysis Period (min)	15											

Educational Use Only

Figure A.6. Marginal Way T-Intersection

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
1: I-295

7/26/2016

Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑				↑↑↑			↑↑	↑
Traffic Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Future Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	12	12	12
Storage Length (ft)	0	150	0	0	0		0	0		0
Storage Lanes	0	1	0	0	0		0	0		1
Taper Length (ft)	25		25		25			25		
Lane Util. Factor	1.00	0.76	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Flt		0.850							0.941	0.850
Flt Protected										
Satd. Flow (prot)	0	4091	0	0	0	5085	0	0	3190	1441
Flt Permitted										
Satd. Flow (perm)	0	4091	0	0	0	5085	0	0	3190	1441
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		310							224	711
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	798		534			410			212	
Travel Time (s)	18.1		12.1			8.0			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	812	0	0	0	770	0	0	940	1317
Shared Lane Traffic (%)										46%
Lane Group Flow (vph)	0	812	0	0	0	770	0	0	1546	711
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			0			0	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		Cl+Ex				Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						Cl+Ex			Cl+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	

Baseline

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Page 1



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	
Permitted Phases										Free	
Detector Phase	7				2						
Switch Phase											
Minimum Initial (s)	5.0				5.0						
Minimum Split (s)	9.5				22.5						
Total Split (s)	16.0				24.0						
Total Split (%)	40.0%				60.0%						
Maximum Green (s)	11.5				19.5						
Yellow Time (s)	3.5				3.5						
All-Red Time (s)	1.0				1.0						
Lost Time Adjust (s)	0.0				0.0						
Total Lost Time (s)	4.5				4.5						
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0				3.0						
Recall Mode	None				C-Max						
Walk Time (s)	7.0										
Flash Dont Walk (s)	11.0										
Pedestrian Calls (#/hr)	0										
Act Effect Green (s)	10.0				21.0			40.0		40.0	
Actuated g/C Ratio	0.25				0.52			1.00		1.00	
v/c Ratio	0.64				0.29			0.48		0.49	
Control Delay	10.4				6.1			0.4		0.9	
Queue Delay	2.1				0.1			0.0		0.0	
Total Delay	12.6				6.1			0.4		0.9	
LOS	B				A			A		A	
Approach Delay	12.6				6.1			0.6			
Approach LOS	B				A			A			
90th %ile Green (s)	11.5				19.5						
90th %ile Term Code	Max				Coord						
70th %ile Green (s)	11.5				19.5						
70th %ile Term Code	Max				Coord						
50th %ile Green (s)	11.2				19.8						
50th %ile Term Code	Gap				Coord						
30th %ile Green (s)	9.0				22.0						
30th %ile Term Code	Gap				Coord						
10th %ile Green (s)	7.0				24.0						
10th %ile Term Code	Gap				Coord						
Stops (vph)	376				355			2		1	
Fuel Used(gal)	8				6			2		1	
CO Emissions (g/hr)	581				394			162		79	
NOx Emissions (g/hr)	113				77			31		15	
VOC Emissions (g/hr)	135				91			37		18	
Dilemma Vehicles (#)	0				88			0		0	
Queue Length 50th (ft)	39				32			0		0	
Queue Length 95th (ft)	70				50			0		0	
Internal Link Dist (ft)	718		454		330			132			
Turn Bay Length (ft)	150										
Base Capacity (vph)	1337				2634			3190		1441	

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 2: Marginal Way

7/26/2016



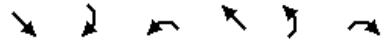
Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑	↑	↓	↑↑	↓↓	↓↓
Traffic Volume (vph)	1157	298	267	1525	390	495
Future Volume (vph)	1157	298	267	1525	390	495
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	150		0	150
Storage Lanes		1	1		2	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.88
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	3433	2787
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3539	1583	1770	3539	3433	2787
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		324				538
Link Speed (mph)	35			30	30	
Link Distance (ft)	212			514	456	
Travel Time (s)	4.1			11.7	10.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1258	324	290	1658	424	538
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1258	324	290	1658	424	538
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	CI+Ex			CI+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	4		2	8	5	
Permitted Phases		4				2

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 2: Marginal Way

7/26/2016



Lane Group	SET	SER	NWL	NWT	NEL	NER
Detector Phase	4	4	3	8	5	2
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	9.5	22.5
Total Split (s)	36.0	36.0	20.0	56.0	24.0	24.0
Total Split (%)	45.0%	45.0%	25.0%	70.0%	30.0%	30.0%
Maximum Green (s)	31.5	31.5	15.5	51.5	19.5	19.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max
Walk Time (s)	7.0	7.0		7.0		7.0
Flash Dont Walk (s)	11.0	11.0		11.0		11.0
Pedestrian Calls (#/hr)	0	0		0		0
Act Effct Green (s)	31.4	31.4	15.1	51.0	20.0	20.0
Actuated g/C Ratio	0.39	0.39	0.19	0.64	0.25	0.25
v/c Ratio	0.91	0.40	0.87	0.74	0.49	0.49
Control Delay	32.4	4.7	59.0	12.3	28.2	4.1
Queue Delay	46.6	1.1	0.0	1.2	0.0	0.0
Total Delay	79.0	5.8	59.0	13.5	28.2	4.1
LOS	E	A	E	B	C	A
Approach Delay	64.0			20.3	14.7	
Approach LOS	E			C	B	
90th %ile Green (s)	31.5	31.5	15.5	51.5	19.5	19.5
90th %ile Term Code	Max	Max	Max	Max	Coord	Coord
70th %ile Green (s)	31.5	31.5	15.5	51.5	19.5	19.5
70th %ile Term Code	Max	Max	Max	Max	Coord	Coord
50th %ile Green (s)	31.5	31.5	15.5	51.5	19.5	19.5
50th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
30th %ile Green (s)	31.5	31.5	15.5	51.5	19.5	19.5
30th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
10th %ile Green (s)	31.1	31.1	13.3	48.9	22.1	22.1
10th %ile Term Code	Gap	Gap	Gap	Hold	Coord	Coord
Stops (vph)	950	53	233	965	324	43
Fuel Used(gal)	17	1	6	15	5	2
CO Emissions (g/hr)	1157	80	389	1067	379	169
NOx Emissions (g/hr)	225	16	76	208	74	33
VOC Emissions (g/hr)	268	18	90	247	88	39
Dilemma Vehicles (#)	47	0	0	0	0	0
Queue Length 50th (ft)	295	0	141	256	94	0
Queue Length 95th (ft)	#421	32	#273	336	138	40
Internal Link Dist (ft)	132			434	376	
Turn Bay Length (ft)			150			150
Base Capacity (vph)	1395	819	342	2278	859	104
Starvation Cap Reductn	31.7	28.1	0	37.2	0	0

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↔↔	↑↑	↔	↔	↑↑	↔	↔↔	↑	↔	↔	↑	↔↔
Traffic Volume (vph)	434	1054	191	98	1264	68	385	113	49	55	80	449
Future Volume (vph)	434	1054	191	98	1264	68	385	113	49	55	80	449
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	200		200	200		150	0		100	0		200
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3775	1583	1770	3539	1583	3433	1863	1583	1770	1863	2787
Flt Permitted	0.950			0.950			0.950			0.678		
Satd. Flow (perm)	3433	3775	1583	1770	3539	1583	3433	1863	1583	1263	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			171			149			104			403
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		514			1268			509			565	
Travel Time (s)		11.7			24.7			11.6			12.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	472	1146	208	107	1374	74	418	123	53	60	87	488
Shared Lane Traffic (%)												
Lane Group Flow (vph)	472	1146	208	107	1374	74	418	123	53	60	87	488
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4			8			2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	9.5	9.5	9.5	22.5	22.5
Total Split (s)	20.0	49.3	49.3	17.7	47.0	47.0	18.2	33.4	33.4	9.6	24.8	24.8
Total Split (%)	18.2%	44.8%	44.8%	16.1%	42.7%	42.7%	16.5%	30.4%	30.4%	8.7%	22.5%	22.5%
Maximum Green (s)	15.5	44.8	44.8	13.2	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0					7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0					11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0					0	0
Act Effect Green (s)	15.5	46.9	46.9	11.1	42.5	42.5	13.7	30.8	30.8	25.4	20.3	20.3
Actuated g/C Ratio	0.14	0.43	0.43	0.10	0.39	0.39	0.12	0.28	0.28	0.23	0.18	0.18
v/c Ratio	0.98	0.71	0.27	0.60	1.01	0.11	0.98	0.24	0.10	0.19	0.25	0.58
Control Delay	83.4	29.5	6.1	60.9	59.8	0.3	87.3	33.1	0.6	26.6	40.7	11.1
Queue Delay	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.4	31.6	6.1	60.9	59.8	0.3	87.3	33.1	0.6	26.6	40.7	11.1
LOS	F	C	A	E	E	A	F	C	A	C	D	B
Approach Delay		42.1			57.1			68.3			16.6	
Approach LOS		D			E			E			B	
90th %ile Green (s)	15.5	44.8	44.8	13.2	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	15.5	44.8	44.8	13.2	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	15.5	46.1	46.1	11.9	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
50th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord	Coord	Max	Coord	Coord
30th %ile Green (s)	15.5	47.9	47.9	10.1	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
30th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord	Coord	Max	Coord	Coord
10th %ile Green (s)	15.5	50.7	50.7	7.3	42.5	42.5	13.7	38.5	38.5	0.0	20.3	20.3
10th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord	Coord	Skip	Coord	Coord
Stops (vph)	386	846	30	93	1120	0	342	86	0	40	67	86
Fuel Used(gal)	11	15	1	3	35	1	10	2	0	1	1	3
CO Emissions (g/hr)	786	1064	82	197	2473	44	717	118	14	53	97	242
NOx Emissions (g/hr)	153	207	16	38	481	9	140	23	3	10	19	47
VOC Emissions (g/hr)	182	247	19	46	573	10	166	27	3	12	22	56
Dilemma Vehicles (#)	0	0	0	0	54	0	0	0	0	0	0	0
Queue Length 50th (ft)	173	348	15	73	~509	0	154	69	0	28	53	28
Queue Length 95th (ft)	#277	438	63	130	#672	0	#254	120	3	59	101	82
Internal Link Dist (ft)		434			1188			429			485	
Turn Bay Length (ft)	200		200	200	50				100			200
Base Capacity (vph)	483	1608	772	212	1367	703	427	522	518	315	343	842

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 5: Somerset Street

7/26/2016

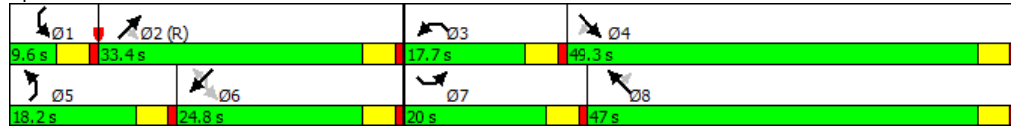


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	308	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.88	0.27	0.50	1.01	0.11	0.98	0.24	0.10	0.19	0.25	0.58

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:NET, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.01
 Intersection Signal Delay: 47.0 Intersection LOS: D
 Intersection Capacity Utilization 76.2% ICU Level of Service D
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 5: Somerset Street



Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Future Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		100	0		100	0		100
Storage Lanes	1		1	1		1	0		1	1		1
Taper Length (ft)	25		25		25		25		25		25	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.980				0.850
Flt Protected	0.950			0.950				0.979		0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	3396	0	1770	1863	1583
Flt Permitted	0.950			0.950				0.759		0.402		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	2633	0	749	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			143		22				143
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			1268			295			268	
Travel Time (s)		9.4			24.7			6.7			7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1238	22	161	1008	41	165	170	53	17	176	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1238	22	161	1008	41	0	388	0	17	176	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	8		7	1		5	2		1	6	
Permitted Phases							4	2		6		6

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8	8	7	4	4	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5
Total Split (s)	11.6	35.0	35.0	13.0	36.4	36.4	9.5	22.5		9.5	22.5	22.5
Total Split (%)	14.5%	43.8%	43.8%	16.3%	45.5%	45.5%	11.9%	28.1%		11.9%	28.1%	28.1%
Maximum Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	5.0	18.0		5.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	None	Max	Max	None	Max		None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0			11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0			0	0
Act Effct Green (s)	7.1	30.5	30.5	8.5	31.9	31.9		25.6		27.5	27.5	27.5
Actuated g/C Ratio	0.09	0.38	0.38	0.11	0.40	0.40		0.32		0.34	0.34	0.34
v/c Ratio	0.18	0.92	0.03	0.86	0.71	0.06		0.45		0.05	0.28	0.20
Control Delay	36.7	36.0	0.1	74.7	23.7	0.2		23.3		17.9	20.5	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Delay	36.7	36.0	0.1	74.7	23.7	0.2		23.3		17.9	20.5	3.8
LOS	D	D	A	E	C	A		C		B	C	A
Approach Delay		35.4			29.7			23.3			13.7	
Approach LOS		D			C			C			B	
90th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	18.0		5.0	27.5	27.5
90th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
70th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
50th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
50th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
30th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
30th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
10th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
10th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	27	989	0	124	749	0		263		12	113	13
Fuel Used(gal)	0	20	0	5	19	0		4		0	1	0
CO Emissions (g/hr)	34	1380	5	317	1300	24		277		10	103	29
NOx Emissions (g/hr)	7	268	1	62	253	5		54		2	20	6
VOC Emissions (g/hr)	8	320	1	74	301	6		64		2	24	7
Dilemma Vehicles (#)	0	69	0	0	58	0		0		0	0	0
Queue Length 50th (ft)	13	303	0	81	216	0		72		6	63	0
Queue Length 95th (ft)	37	#438	0	#187	287	0		134		19	111	29
Internal Link Dist (ft)		400			1188			215			188	
Turn Bay Length (ft)	100		100	200		100						100
Base Capacity (vph)	157	1349	632	188	1411	717		857		321	640	638
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	0

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 12: Congress Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↘	↗	↘	↘	↗	↗		↗	↘		↗	↘
Traffic Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Future Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	100		150	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.993				0.850
Flt Protected	0.950			0.950				0.975			0.994	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	3427	0	0	1852	1583
Flt Permitted	0.950			0.950				0.671			0.905	
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	2358	0	0	1686	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			230			164		7				196
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			828			235			220	
Travel Time (s)		9.4			16.1			5.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	655	230	32	838	53	254	216	22	33	227	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	192	655	230	32	838	53	0	492	0	0	260	196
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	2		5	2		1	6	
Permitted Phases			4			8		2		6		6

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 12: Congress Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5
Total Split (s)	14.0	27.0	27.0	10.0	23.0	23.0	9.5	23.5		9.5	23.5	23.5
Total Split (%)	20.0%	38.6%	38.6%	14.3%	32.9%	32.9%	13.6%	33.6%		13.6%	33.6%	33.6%
Maximum Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	5.0	19.0		5.0	19.0	19.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0		7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0		0	0	0
Act Effct Green (s)	9.4	28.4	28.4	5.5	18.5	18.5		28.6			28.6	28.6
Actuated g/C Ratio	0.13	0.41	0.41	0.08	0.26	0.26		0.41			0.41	0.41
v/c Ratio	0.81	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26
Control Delay	57.0	17.6	4.0	34.6	39.5	0.4		17.5			16.5	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	57.0	17.6	4.0	34.6	39.5	0.4		17.5			16.5	3.3
LOS	E	B	A	C	D	A		B			B	A
Approach Delay		21.7			37.1			17.5			10.8	
Approach LOS		C			D			B			B	
90th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
70th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
50th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
50th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
30th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
30th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
10th %ile Green (s)	9.0	31.8	31.8	0.0	18.3	18.3	0.0	29.2		0.0	29.2	29.2
10th %ile Term Code	Gap	Hold	Hold	Skip	Gap	Gap	Skip	Coord		Skip	Coord	Coord
Stops (vph)	153	428	27	31	675	0		319			161	20
Fuel Used(gal)	4	7	1	1	16	0		4			2	1
CO Emissions (g/hr)	267	522	78	43	1110	21		294			131	37
NOx Emissions (g/hr)	52	102	15	8	216	4		57			25	7
VOC Emissions (g/hr)	62	121	18	10	257	5		68			30	9
Dilemma Vehicles (#)	0	37	0	0	51	0		0			0	0
Queue Length 50th (ft)	82	92	0	13	182	0		79			76	0
Queue Length 95th (ft)	#183	172	44	38	#286	0		122			132	35
Internal Link Dist (ft)		400			748			155			140	
Turn Bay Length (ft)	200		200	100		150						
Base Capacity (vph)	246	1413	778	139	935	539		969			689	763
Starvation Cap Reductn	0	0	0	0	0	0		0			0	0

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Future Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		100	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967			0.998			0.992			0.928	
Flt Protected		0.994			0.999			0.971			0.995	
Satd. Flow (prot)	0	3402	0	0	3529	0	0	1794	0	0	1720	0
Flt Permitted		0.811			0.939			0.741			0.955	
Satd. Flow (perm)	0	2776	0	0	3317	0	0	1369	0	0	1651	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		69			3			6			104	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		828			303			251			371	
Travel Time (s)		16.1			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	468	155	11	596	9	222	130	21	18	74	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	709	0	0	616	0	0	373	0	0	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	2			2			6	
Permitted Phases	4			8			2			6		

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 16: Middle Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	22.6		9.5	22.6		22.9	22.9		22.9	22.9	
Total Split (%)	17.3%	41.1%		17.3%	41.1%		41.6%	41.6%		41.6%	41.6%	
Maximum Green (s)	5.0	18.1		5.0	18.1		18.4	18.4		18.4	18.4	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead	Lead							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)		15.1			15.1			18.5			18.5	
Actuated g/C Ratio		0.35			0.35			0.43			0.43	
v/c Ratio		0.69			0.52			0.63			0.25	
Control Delay		14.4			12.4			16.7			5.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.4			12.4			16.7			5.7	
LOS		B			B			B			A	
Approach Delay		14.4			12.4			16.7			5.7	
Approach LOS		B			B			B			A	
90th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
90th %ile Term Code	Skip	Max		Skip	Max		MaxR	MaxR		Hold	Hold	
70th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
70th %ile Term Code	Skip	Max		Skip	Hold		MaxR	MaxR		Hold	Hold	
50th %ile Green (s)	0.0	16.6		0.0	16.6		18.4	18.4		18.4	18.4	
50th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
30th %ile Green (s)	0.0	13.6		0.0	13.6		18.4	18.4		18.4	18.4	
30th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
10th %ile Green (s)	0.0	10.0		0.0	10.0		18.4	18.4		18.4	18.4	
10th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
Stops (vph)		455			398			250			59	
Fuel Used(gal)		9			6			3			1	
CO Emissions (g/hr)		645			396			200			70	
NOx Emissions (g/hr)		125			77			39			14	
VOC Emissions (g/hr)		149			92			46			16	
Dilemma Vehicles (#)		65			52			0			0	
Queue Length 50th (ft)		65			58			69			13	
Queue Length 95th (ft)		109			93			#179			45	
Internal Link Dist (ft)		748			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1223			1418			596			774	
Starvation Cap Reductn		0			0			0			0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 19: Fore Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Future Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.981			0.928			0.981			0.990	
Flt Protected	0.950				0.998			0.987			0.998	
Satd. Flow (prot)	1770	1827	0	0	1725	0	0	3427	0	0	3497	0
Flt Permitted	0.600				0.986			0.779			0.921	
Satd. Flow (perm)	1118	1827	0	0	1704	0	0	2705	0	0	3227	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			112			36			16	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	224	33	11	146	179	133	310	65	16	287	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	257	0	0	336	0	0	508	0	0	324	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 19: Fore Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.7	11.7			11.7			11.9			11.9	
Actuated g/C Ratio	0.35	0.35			0.35			0.36			0.36	
v/c Ratio	0.40	0.39			0.50			0.51			0.28	
Control Delay	12.2	10.0			8.8			10.3			8.4	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	12.2	10.0			8.8			10.3			8.4	
LOS	B	B			A			B			A	
Approach Delay		10.8			8.8			10.3			8.4	
Approach LOS		B			A			B			A	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	18.0		0.0	18.0	
90th %ile Term Code	Max	Max		Hold	Hold		Skip	Max		Skip	Hold	
70th %ile Green (s)	15.5	15.5		15.5	15.5		0.0	14.5		0.0	14.5	
70th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	11.3	11.3		11.3	11.3		0.0	11.9		0.0	11.9	
50th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
30th %ile Green (s)	8.6	8.6		8.6	8.6		0.0	9.1		0.0	9.1	
30th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
10th %ile Green (s)	6.4	6.4		6.4	6.4		0.0	7.3		0.0	7.3	
10th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
Stops (vph)	96	141			141			289			169	
Fuel Used(gal)	1	2			2			4			3	
CO Emissions (g/hr)	83	123			143			292			184	
NOx Emissions (g/hr)	16	24			28			57			36	
VOC Emissions (g/hr)	19	29			33			68			43	
Dilemma Vehicles (#)	0	0			0			53			31	
Queue Length 50th (ft)	19	29			27			30			17	
Queue Length 95th (ft)	62	82			86			77			47	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	662	1088			1055			1574			1867	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.24	0.24			0.32			0.32			0.17	

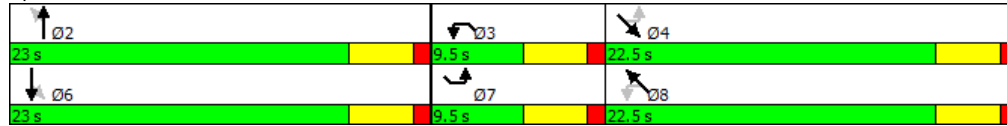
Baseline

Synchro 9 Classroom Report
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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	33.2
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.51
Intersection Signal Delay:	9.7
Intersection LOS:	A
Intersection Capacity Utilization:	67.0%
ICU Level of Service:	C
Analysis Period (min):	15
90th %ile Actuated Cycle:	45.5
70th %ile Actuated Cycle:	39
50th %ile Actuated Cycle:	32.2
30th %ile Actuated Cycle:	26.7
10th %ile Actuated Cycle:	22.7

Splits and Phases: 19: Fore Street



Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 22: Commercial Street

7/26/2016













Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Future Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	1		1	0		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.997		0.950			0.950	0.995	
Satd. Flow (prot)	1770	1863	1583	0	1857	1583	1770	1863	1583	1681	1761	1583
Flt Permitted	0.406				0.971		0.440			0.725	0.968	
Satd. Flow (perm)	756	1863	1583	0	1809	1583	820	1863	1583	1283	1713	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			176			176			268			176
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			218	
Travel Time (s)		10.6			10.3			10.7			5.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	247	259	41	17	260	32	36	49	268	26	28	17
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	247	259	41	0	277	32	36	49	268	23	31	17
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	custom	NA	custom
Protected Phases	5	2		1	6		7	4				
Permitted Phases	2		2	6		6	4		4	8	8	8

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T 2 Thru.syn
 22: Commercial Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase	5	2	2	1	6	6	7	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	10.0	23.5	23.5	9.5	23.0	23.0	9.5	32.0	32.0	22.5	22.5	22.5
Total Split (%)	15.4%	36.2%	36.2%	14.6%	35.4%	35.4%	14.6%	49.2%	49.2%	34.6%	34.6%	34.6%
Maximum Green (s)	5.5	19.0	19.0	5.0	18.5	18.5	5.0	27.5	27.5	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0	0	0	0
Act Effct Green (s)	20.5	20.5	20.5		12.8	12.8	8.1	8.1	8.1	6.7	6.7	6.7
Actuated g/C Ratio	0.54	0.54	0.54		0.34	0.34	0.21	0.21	0.21	0.18	0.18	0.18
v/c Ratio	0.44	0.26	0.04		0.45	0.05	0.12	0.12	0.49	0.10	0.10	0.04
Control Delay	8.1	6.0	0.1		14.4	0.1	14.2	14.2	5.9	18.4	17.9	0.2
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	6.0	0.1		14.4	0.1	14.2	14.2	5.9	18.4	17.9	0.2
LOS	A	A	A		B	A	B	B	A	B	B	A
Approach Delay		6.5			13.0			7.9			13.8	
Approach LOS		A			B			A			B	
90th %ile Green (s)	5.5	28.5	28.5	0.0	18.5	18.5	5.0	17.6	17.6	8.1	8.1	8.1
90th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Max	Hold	Hold	Gap	Gap	Gap
70th %ile Green (s)	5.5	24.2	24.2	0.0	14.2	14.2	0.0	7.1	7.1	7.1	7.1	7.1
70th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
50th %ile Green (s)	5.5	20.5	20.5	0.0	10.5	10.5	0.0	6.3	6.3	6.3	6.3	6.3
50th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
30th %ile Green (s)	5.5	19.0	19.0	0.0	9.0	9.0	0.0	5.8	5.8	5.8	5.8	5.8
30th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
10th %ile Green (s)	0.0	11.2	11.2	0.0	11.2	11.2	0.0	5.5	5.5	5.5	5.5	5.5
10th %ile Term Code	Skip	Dwell	Dwell	Skip	Dwell	Dwell	Skip	Gap	Gap	Hold	Hold	Hold
Stops (vph)	101	105	0		185	0	27	35	37	20	27	0
Fuel Used(gal)	2	1	0		2	0	0	0	1	0	0	0
CO Emissions (g/hr)	106	103	9		159	7	22	29	89	16	21	2
NOx Emissions (g/hr)	21	20	2		31	1	4	6	17	3	4	0
VOC Emissions (g/hr)	24	24	2		37	2	5	7	21	4	5	0
Dilemma Vehicles (#)	0	0	0		0	0	0	0	0	0	0	0
Queue Length 50th (ft)	19	20	0		44	0	6	8	0	4	5	0
Queue Length 95th (ft)	76	79	0		126	0	24	30	42	25	30	0
Internal Link Dist (ft)		308			298			314			138	
Turn Bay Length (ft)			160				270					
Base Capacity (vph)	561	1114	1017		939	304	305	1402	1257	644	859	882
Starvation Cap Reductn	0	0	0		0	0	0	0	0	0	0	0


Baseline

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Figure A.7. Marginal Way T-Intersection Roundabout

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
1: I-295

7/26/2016



Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑				↑↑↑			↑↑	↑
Traffic Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Future Volume (vph)	0	747	0	0	0	708	0	0	865	1212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	12	12	12	12	12	12	12	12
Storage Length (ft)	0	150	0	0	0		0	0		0
Storage Lanes	0	1	0	0	0		0	0		1
Taper Length (ft)	25		25		25			25		
Lane Util. Factor	1.00	0.76	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Flt		0.850							0.941	0.850
Flt Protected										
Satd. Flow (prot)	0	4091	0	0	0	5085	0	0	3190	1441
Flt Permitted										
Satd. Flow (perm)	0	4091	0	0	0	5085	0	0	3190	1441
Right Turn on Red		Yes					Yes			Yes
Satd. Flow (RTOR)		310							224	711
Link Speed (mph)	30		30			35			35	
Link Distance (ft)	798		534			410			212	
Travel Time (s)	18.1		12.1			8.0			4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	812	0	0	0	770	0	0	940	1317
Shared Lane Traffic (%)										46%
Lane Group Flow (vph)	0	812	0	0	0	770	0	0	1546	711
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0		0			0			0	
Link Offset(ft)	0		0			0			0	
Crosswalk Width(ft)	16		16			16			16	
Two way Left Turn Lane										
Headway Factor	0.85	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15		9	15		9
Number of Detectors		1				2			2	1
Detector Template		Right				Thru			Thru	Right
Leading Detector (ft)		20				100			100	20
Trailing Detector (ft)		0				0			0	0
Detector 1 Position(ft)		0				0			0	0
Detector 1 Size(ft)		20				6			6	20
Detector 1 Type		Cl+Ex				Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)		0.0				0.0			0.0	0.0
Detector 1 Queue (s)		0.0				0.0			0.0	0.0
Detector 1 Delay (s)		0.0				0.0			0.0	0.0
Detector 2 Position(ft)						94			94	
Detector 2 Size(ft)						6			6	
Detector 2 Type						Cl+Ex			Cl+Ex	
Detector 2 Channel										
Detector 2 Extend (s)						0.0			0.0	
Turn Type		Prot				NA			NA	Perm
Protected Phases		7				2			Free	

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
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Lane Group	EBL	EBR	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	
Permitted Phases										Free	
Detector Phase	7				2						
Switch Phase											
Minimum Initial (s)	5.0				5.0						
Minimum Split (s)	9.5				22.5						
Total Split (s)	16.0				24.0						
Total Split (%)	40.0%				60.0%						
Maximum Green (s)	11.5				19.5						
Yellow Time (s)	3.5				3.5						
All-Red Time (s)	1.0				1.0						
Lost Time Adjust (s)	0.0				0.0						
Total Lost Time (s)	4.5				4.5						
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0				3.0						
Recall Mode	None				C-Max						
Walk Time (s)	7.0										
Flash Dont Walk (s)	11.0										
Pedestrian Calls (#/hr)	0										
Act Effect Green (s)	10.0				21.0			40.0		40.0	
Actuated g/C Ratio	0.25				0.52			1.00		1.00	
v/c Ratio	0.64				0.29			0.48		0.49	
Control Delay	10.4				6.1			0.5		1.2	
Queue Delay	0.0				0.0			0.0		0.0	
Total Delay	10.4				6.1			0.5		1.2	
LOS	B				A			A		A	
Approach Delay	10.4				6.1			0.7			
Approach LOS	B				A			A			
90th %ile Green (s)	11.5				19.5						
90th %ile Term Code	Max				Coord						
70th %ile Green (s)	11.5				19.5						
70th %ile Term Code	Max				Coord						
50th %ile Green (s)	11.2				19.8						
50th %ile Term Code	Gap				Coord						
30th %ile Green (s)	9.0				22.0						
30th %ile Term Code	Gap				Coord						
10th %ile Green (s)	7.0				24.0						
10th %ile Term Code	Gap				Coord						
Stops (vph)	376				355			1		1	
Fuel Used(gal)	8				6			2		1	
CO Emissions (g/hr)	581				394			163		82	
NOx Emissions (g/hr)	113				77			32		16	
VOC Emissions (g/hr)	135				91			38		19	
Dilemma Vehicles (#)	0				88			0		0	
Queue Length 50th (ft)	39				32			0		0	
Queue Length 95th (ft)	70				50			0		0	
Internal Link Dist (ft)	718		454		330			132			
Turn Bay Length (ft)	150										
Base Capacity (vph)	1337				2654			3190		1441	

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
2: Marginal Way

7/26/2016



Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑↑	↑	↓	↑↑	↓↓	↑
Traffic Volume (vph)	1157	298	267	1525	390	495
Future Volume (vph)	1157	298	267	1525	390	495
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	150		0	300
Storage Lanes		1	1		2	1
Taper Length (ft)			25		25	
Lane Util. Factor	0.91	1.00	1.00	0.95	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	5085	1583	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	5085	1583	1770	3539	3433	1583
Link Speed (mph)	35			30	30	
Link Distance (ft)	212			514	456	
Travel Time (s)	4.1			11.7	10.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1258	324	290	1658	424	538
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1258	324	290	1658	424	538
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Yield			Free	Yield	

Intersection Summary

Area Type:	Other
Control Type:	Roundabout
Intersection Capacity Utilization	59.9%
ICU Level of Service	B
Analysis Period (min)	15

Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
5: Somerset Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↔↔	↑↑	↔	↔	↑↑	↔	↔↔	↑	↔	↔	↑	↔↔
Traffic Volume (vph)	434	1054	191	98	1264	68	385	113	49	55	80	449
Future Volume (vph)	434	1054	191	98	1264	68	385	113	49	55	80	449
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Storage Length (ft)	200		200	200		150	0		100	0		200
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	0.88
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3775	1583	1770	3539	1583	3433	1863	1583	1770	1863	2787
Flt Permitted	0.950			0.950			0.950			0.678		
Satd. Flow (perm)	3433	3775	1583	1770	3539	1583	3433	1863	1583	1263	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			171			149			104			403
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		514			1268			509			565	
Travel Time (s)		11.7			24.7			11.6			12.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	472	1146	208	107	1374	74	418	123	53	60	87	488
Shared Lane Traffic (%)												
Lane Group Flow (vph)	472	1146	208	107	1374	74	418	123	53	60	87	488
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	

Baseline

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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Permitted Phases			4			8			2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	9.5	9.5	9.5	22.5	22.5
Total Split (s)	20.0	49.3	49.3	17.7	47.0	47.0	18.2	33.4	33.4	9.6	24.8	24.8
Total Split (%)	18.2%	44.8%	44.8%	16.1%	42.7%	42.7%	16.5%	30.4%	30.4%	8.7%	22.5%	22.5%
Maximum Green (s)	15.5	44.8	44.8	13.2	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0					7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0					11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0					0	0
Act Effect Green (s)	15.5	46.9	46.9	11.1	42.5	42.5	13.7	30.8	30.8	25.4	20.3	20.3
Actuated g/C Ratio	0.14	0.43	0.43	0.10	0.39	0.39	0.12	0.28	0.28	0.23	0.18	0.18
v/c Ratio	0.98	0.71	0.27	0.60	1.01	0.11	0.98	0.24	0.10	0.19	0.25	0.58
Control Delay	83.4	29.5	6.1	60.9	59.8	0.3	87.3	33.1	0.6	26.6	40.7	11.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.4	29.5	6.1	60.9	59.8	0.3	87.3	33.1	0.6	26.6	40.7	11.1
LOS	F	C	A	E	E	A	F	C	A	C	D	B
Approach Delay		40.8			57.1			68.3			16.6	
Approach LOS		D			E			E			B	
90th %ile Green (s)	15.5	44.8	44.8	13.2	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	15.5	44.8	44.8	13.2	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	15.5	46.1	46.1	11.9	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
50th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord	Coord	Max	Coord	Coord
30th %ile Green (s)	15.5	47.9	47.9	10.1	42.5	42.5	13.7	28.9	28.9	5.1	20.3	20.3
30th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord	Coord	Max	Coord	Coord
10th %ile Green (s)	15.5	50.7	50.7	7.3	42.5	42.5	13.7	38.5	38.5	0.0	20.3	20.3
10th %ile Term Code	Max	Hold	Hold	Gap	Max	Max	Max	Coord	Coord	Skip	Coord	Coord
Stops (vph)	386	846	30	93	1120	0	342	86	0	40	67	86
Fuel Used(gal)	11	15	1	3	35	1	10	2	0	1	1	3
CO Emissions (g/hr)	786	1064	82	197	2473	44	717	118	14	53	97	242
NOx Emissions (g/hr)	153	207	16	38	481	9	140	23	3	10	19	47
VOC Emissions (g/hr)	182	247	19	46	573	10	166	27	3	12	22	56
Dilemma Vehicles (#)	0	0	0	0	54	0	0	0	0	0	0	0
Queue Length 50th (ft)	173	348	15	73	~509	0	154	69	0	28	53	28
Queue Length 95th (ft)	#277	438	63	130	#672	0	#254	120	3	59	101	82
Internal Link Dist (ft)		434			1188			429			485	
Turn Bay Length (ft)	200		200	200	50				100			200
Base Capacity (vph)	483	1608	772	212	1367	703	427	522	518	315	343	842

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 5: Somerset Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.71	0.27	0.50	1.01	0.11	0.98	0.24	0.10	0.19	0.25	0.58

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 0 (0%), Referenced to phase 2:NET, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.01
 Intersection Signal Delay: 46.5 Intersection LOS: D
 Intersection Capacity Utilization 76.2% ICU Level of Service D
 Analysis Period (min) 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 5: Somerset Street

01	02 (R)	03	04
9.6 s	33.4 s	17.7 s	49.3 s
05	06	07	08
18.2 s	24.8 s	20 s	47 s

Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Future Volume (vph)	26	1139	20	148	927	38	152	156	49	16	162	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	200		100	0		100	0		100
Storage Lanes	1		1	1		1	0		1	1		1
Taper Length (ft)	25		25		25		25		25		25	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.980				0.850
Flt Protected	0.950			0.950				0.979		0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	3396	0	1770	1863	1583
Flt Permitted	0.950			0.950				0.759		0.402		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	2633	0	749	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			143		22				143
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			1268			295			268	
Travel Time (s)		9.4			24.7			6.7			7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	1238	22	161	1008	41	165	170	53	17	176	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	1238	22	161	1008	41	0	388	0	17	176	129
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	6	8		7	1		5	2		1	6	
Permitted Phases							4	2		6		6

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 10: Cumberland Street

7/26/2016

Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	3	8	8	7	4	4	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5
Total Split (s)	11.6	35.0	35.0	13.0	36.4	36.4	9.5	22.5		9.5	22.5	22.5
Total Split (%)	14.5%	43.8%	43.8%	16.3%	45.5%	45.5%	11.9%	28.1%		11.9%	28.1%	28.1%
Maximum Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	5.0	18.0		5.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5		4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	None	Max	Max	None	Max		None	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0			11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0			0	0
Act Effct Green (s)	7.1	30.5	30.5	8.5	31.9	31.9		25.6		27.5	27.5	27.5
Actuated g/C Ratio	0.09	0.38	0.38	0.11	0.40	0.40		0.32		0.34	0.34	0.34
v/c Ratio	0.18	0.92	0.03	0.86	0.71	0.06		0.45		0.05	0.28	0.20
Control Delay	36.7	36.0	0.1	74.7	23.7	0.2		23.3		17.9	20.5	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Delay	36.7	36.0	0.1	74.7	23.7	0.2		23.3		17.9	20.5	3.8
LOS	D	D	A	E	C	A		C		B	C	A
Approach Delay		35.4			29.7			23.3			13.7	
Approach LOS		D			C			C			B	
90th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	18.0		5.0	27.5	27.5
90th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
70th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
50th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
50th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
30th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
30th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
10th %ile Green (s)	7.1	30.5	30.5	8.5	31.9	31.9	0.0	27.5		0.0	27.5	27.5
10th %ile Term Code	Coord	Coord	Coord	Max	MaxR	MaxR	Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	27	989	0	124	749	0		263		12	113	13
Fuel Used(gal)	0	20	0	5	19	0		4		0	1	0
CO Emissions (g/hr)	34	1380	5	317	1300	24		277		10	103	29
NOx Emissions (g/hr)	7	268	1	62	253	5		54		2	20	6
VOC Emissions (g/hr)	8	320	1	74	301	6		64		2	24	7
Dilemma Vehicles (#)	0	69	0	0	58	0		0		0	0	0
Queue Length 50th (ft)	13	303	0	81	216	0		72		6	63	0
Queue Length 95th (ft)	37	#438	0	#187	287	0		134		19	111	29
Internal Link Dist (ft)		400			1188			215			188	
Turn Bay Length (ft)	100		100	200		100						100
Base Capacity (vph)	157	1349	632	188	1411	717		857		321	640	638
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	0

Baseline

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 10: Cumberland Street

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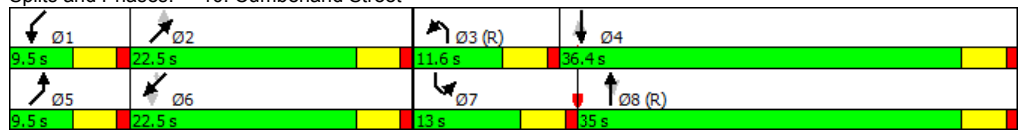


Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	0
Reduced v/c Ratio	0.18	0.92	0.03	0.86	0.71	0.06		0.45		0.05	0.28	0.20

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 80
 Offset: 0 (0%), Referenced to phase 3:NBL and 8:NBT, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 29.6 Intersection LOS: C
 Intersection Capacity Utilization 73.5% ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 10: Cumberland Street



Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
12: Congress Street

7/26/2016

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↘	↗	↘	↘	↗	↗		↗	↘		↗	↘
Traffic Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Future Volume (vph)	177	603	212	29	771	49	234	199	20	30	209	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	100		150	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Frt			0.850			0.850		0.993				0.850
Flt Protected	0.950			0.950				0.975			0.994	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	3427	0	0	1852	1583
Flt Permitted	0.950			0.950				0.671			0.905	
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	2358	0	0	1686	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			230			164		7				196
Link Speed (mph)		35			35			30			25	
Link Distance (ft)		480			828			235			220	
Travel Time (s)		9.4			16.1			5.3			6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	655	230	32	838	53	254	216	22	33	227	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	192	655	230	32	838	53	0	492	0	0	260	196
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	2		5	2		1	6	
Permitted Phases							8	2		6		6

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 12: Congress Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5		9.5	22.5	22.5
Total Split (s)	14.0	27.0	27.0	10.0	23.0	23.0	9.5	23.5		9.5	23.5	23.5
Total Split (%)	20.0%	38.6%	38.6%	14.3%	32.9%	32.9%	13.6%	33.6%		13.6%	33.6%	33.6%
Maximum Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	5.0	19.0		5.0	19.0	19.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	C-Max
Walk Time (s)		7.0	7.0		7.0	7.0		7.0		7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0		0	0	0
Act Effct Green (s)	9.4	28.4	28.4	5.5	18.5	18.5		28.6			28.6	28.6
Actuated g/C Ratio	0.13	0.41	0.41	0.08	0.26	0.26		0.41			0.41	0.41
v/c Ratio	0.81	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26
Control Delay	57.0	17.6	4.0	34.6	39.5	0.4		17.5			16.5	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	57.0	17.6	4.0	34.6	39.5	0.4		17.5			16.5	3.3
LOS	E	B	A	C	D	A		B			B	A
Approach Delay		21.7			37.1			17.5			10.8	
Approach LOS		C			D			B			B	
90th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
70th %ile Green (s)	9.5	22.5	22.5	5.5	18.5	18.5	0.0	28.5		0.0	28.5	28.5
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Skip	Coord		Skip	Coord	Coord
50th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
50th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
30th %ile Green (s)	9.5	32.5	32.5	0.0	18.5	18.5	0.0	28.5		0.0	28.5	28.5
30th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Skip	Coord		Skip	Coord	Coord
10th %ile Green (s)	9.0	31.8	31.8	0.0	18.3	18.3	0.0	29.2		0.0	29.2	29.2
10th %ile Term Code	Gap	Hold	Hold	Skip	Gap	Gap	Skip	Coord		Skip	Coord	Coord
Stops (vph)	153	428	27	31	675	0		319			161	20
Fuel Used(gal)	4	7	1	1	16	0		4			2	1
CO Emissions (g/hr)	267	522	78	43	1110	21		294			131	37
NOx Emissions (g/hr)	52	102	15	8	216	4		57			25	7
VOC Emissions (g/hr)	62	121	18	10	257	5		68			30	9
Dilemma Vehicles (#)	0	37	0	0	51	0		0			0	0
Queue Length 50th (ft)	82	92	0	13	182	0		79			76	0
Queue Length 95th (ft)	#183	172	44	38	#286	0		122			132	35
Internal Link Dist (ft)		400			748			155			140	
Turn Bay Length (ft)	200		200	100		150						
Base Capacity (vph)	246	1413	778	139	935	539		969			689	763
Starvation Cap Reductn	0	0	0	0	0	0		0			0	0

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 12: Congress Street

7/26/2016

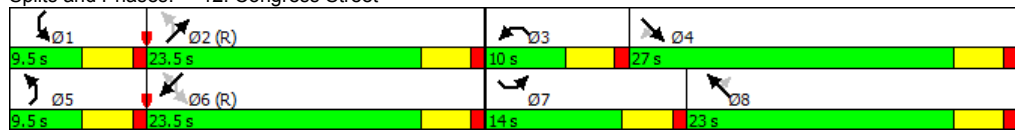


Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn	0	0	0	0	0	0		0			0	0
Storage Cap Reductn	0	0	0	0	0	0		0			0	0
Reduced v/c Ratio	0.80	0.46	0.30	0.23	0.90	0.10		0.51			0.38	0.26

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 24.1 Intersection LOS: C
 Intersection Capacity Utilization 71.7% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 12: Congress Street



Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 16: Middle Street

7/26/2016



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Future Volume (vph)	79	431	143	10	548	8	204	120	19	17	68	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		100	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.967			0.998			0.992			0.928	
Flt Protected		0.994			0.999			0.971			0.995	
Satd. Flow (prot)	0	3402	0	0	3529	0	0	1794	0	0	1720	0
Flt Permitted		0.811			0.939			0.741			0.955	
Satd. Flow (perm)	0	2776	0	0	3317	0	0	1369	0	0	1651	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		69			3			6			104	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		828			303			251			371	
Travel Time (s)		16.1			5.9			6.8			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	468	155	11	596	9	222	130	21	18	74	104
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	709	0	0	616	0	0	373	0	0	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	2			2			6	
Permitted Phases	4			8			2			6		

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 16: Middle Street

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	9.5	22.6		9.5	22.6		22.9	22.9		22.9	22.9	
Total Split (%)	17.3%	41.1%		17.3%	41.1%		41.6%	41.6%		41.6%	41.6%	
Maximum Green (s)	5.0	18.1		5.0	18.1		18.4	18.4		18.4	18.4	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead	Lead							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0		0	0		0	0	
Act Effct Green (s)		15.1			15.1			18.5			18.5	
Actuated g/C Ratio		0.35			0.35			0.43			0.43	
v/c Ratio		0.69			0.52			0.63			0.25	
Control Delay		14.4			12.4			16.7			5.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.4			12.4			16.7			5.7	
LOS		B			B			B			A	
Approach Delay		14.4			12.4			16.7			5.7	
Approach LOS		B			B			B			A	
90th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
90th %ile Term Code	Skip	Max		Skip	Max		MaxR	MaxR		Hold	Hold	
70th %ile Green (s)	0.0	18.1		0.0	18.1		18.4	18.4		18.4	18.4	
70th %ile Term Code	Skip	Max		Skip	Hold		MaxR	MaxR		Hold	Hold	
50th %ile Green (s)	0.0	16.6		0.0	16.6		18.4	18.4		18.4	18.4	
50th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
30th %ile Green (s)	0.0	13.6		0.0	13.6		18.4	18.4		18.4	18.4	
30th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
10th %ile Green (s)	0.0	10.0		0.0	10.0		18.4	18.4		18.4	18.4	
10th %ile Term Code	Skip	Gap		Skip	Hold		MaxR	MaxR		Hold	Hold	
Stops (vph)		455			398			250			59	
Fuel Used(gal)		9			6			3			1	
CO Emissions (g/hr)		645			396			200			70	
NOx Emissions (g/hr)		125			77			39			14	
VOC Emissions (g/hr)		149			92			46			16	
Dilemma Vehicles (#)		65			52			0			0	
Queue Length 50th (ft)		65			58			69			13	
Queue Length 95th (ft)		109			93			#179			45	
Internal Link Dist (ft)		748			223			171			291	
Turn Bay Length (ft)												
Base Capacity (vph)		1223			1418			596			774	
Starvation Cap Reductn		0			0			0			0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 19: Fore Street

7/26/2016













												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Future Volume (vph)	145	206	30	10	134	165	122	285	60	15	264	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Frt		0.981			0.928			0.981			0.990	
Flt Protected	0.950				0.998			0.987			0.998	
Satd. Flow (prot)	1770	1827	0	0	1725	0	0	3427	0	0	3497	0
Flt Permitted	0.600				0.986			0.779			0.921	
Satd. Flow (perm)	1118	1827	0	0	1704	0	0	2705	0	0	3227	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			112			36			16	
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		368			363			303			394	
Travel Time (s)		10.0			9.9			5.9			7.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	224	33	11	146	179	133	310	65	16	287	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	257	0	0	336	0	0	508	0	0	324	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6			4			8		
Detector Phase	2	2		6	6		7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	

Baseline

Synchro 9 Classroom Report
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Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 19: Fore Street

7/26/2016

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		9.5	22.5		9.5	22.5	
Total Split (%)	41.8%	41.8%		41.8%	41.8%		17.3%	40.9%		17.3%	40.9%	
Maximum Green (s)	18.5	18.5		18.5	18.5		5.0	18.0		5.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5			4.5			4.5			4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0			7.0			7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.7	11.7			11.7			11.9			11.9	
Actuated g/C Ratio	0.35	0.35			0.35			0.36			0.36	
v/c Ratio	0.40	0.39			0.50			0.51			0.28	
Control Delay	12.2	10.0			8.8			10.3			8.4	
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	12.2	10.0			8.8			10.3			8.4	
LOS	B	B			A			B			A	
Approach Delay		10.8			8.8			10.3			8.4	
Approach LOS		B			A			B			A	
90th %ile Green (s)	18.5	18.5		18.5	18.5		0.0	18.0		0.0	18.0	
90th %ile Term Code	Max	Max		Hold	Hold		Skip	Max		Skip	Hold	
70th %ile Green (s)	15.5	15.5		15.5	15.5		0.0	14.5		0.0	14.5	
70th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
50th %ile Green (s)	11.3	11.3		11.3	11.3		0.0	11.9		0.0	11.9	
50th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
30th %ile Green (s)	8.6	8.6		8.6	8.6		0.0	9.1		0.0	9.1	
30th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
10th %ile Green (s)	6.4	6.4		6.4	6.4		0.0	7.3		0.0	7.3	
10th %ile Term Code	Gap	Gap		Hold	Hold		Skip	Gap		Skip	Hold	
Stops (vph)	96	141			141			289			169	
Fuel Used(gal)	1	2			2			4			3	
CO Emissions (g/hr)	83	123			143			292			184	
NOx Emissions (g/hr)	16	24			28			57			36	
VOC Emissions (g/hr)	19	29			33			68			43	
Dilemma Vehicles (#)	0	0			0			53			31	
Queue Length 50th (ft)	19	29			27			30			17	
Queue Length 95th (ft)	62	82			86			77			47	
Internal Link Dist (ft)		288			283			223			314	
Turn Bay Length (ft)												
Base Capacity (vph)	662	1088			1055			1574			1867	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.24	0.24			0.32			0.32			0.17	

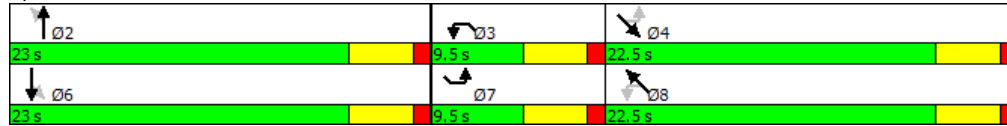
Baseline

Synchro 9 Classroom Report
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Intersection Summary

Area Type:	Other
Cycle Length:	55
Actuated Cycle Length:	33.2
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.51
Intersection Signal Delay:	9.7
Intersection LOS:	A
Intersection Capacity Utilization:	67.0%
ICU Level of Service:	C
Analysis Period (min):	15
90th %ile Actuated Cycle:	45.5
70th %ile Actuated Cycle:	39
50th %ile Actuated Cycle:	32.2
30th %ile Actuated Cycle:	26.7
10th %ile Actuated Cycle:	22.7
























Splits and Phases: 19: Fore Street



Educational Use Only

Franklin Street Alternate Afternoon 2035 Urban Street Marginal T Round 2 Thru.syn
 22: Commercial Street

7/26/2016













												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Future Volume (vph)	227	238	38	16	239	29	33	45	247	24	26	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		160	0		0	270		0	0		0
Storage Lanes	1		1	0		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.997		0.950			0.950	0.995	
Satd. Flow (prot)	1770	1863	1583	0	1857	1583	1770	1863	1583	1681	1761	1583
Flt Permitted	0.406				0.971		0.440			0.725	0.968	
Satd. Flow (perm)	756	1863	1583	0	1809	1583	820	1863	1583	1283	1713	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			176			176			268			176
Link Speed (mph)		25			25			25			30	
Link Distance (ft)		388			378			394			218	
Travel Time (s)		10.6			10.3			10.7			5.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	247	259	41	17	260	32	36	49	268	26	28	17
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	247	259	41	0	277	32	36	49	268	23	31	17
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	custom	NA	custom
Protected Phases	5	2		1	6		7	4				
Permitted Phases	2		2	6		6	4		4	8	8	8

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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Detector Phase	5	2	2	1	6	6	7	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	10.0	23.5	23.5	9.5	23.0	23.0	9.5	32.0	32.0	22.5	22.5	22.5
Total Split (%)	15.4%	36.2%	36.2%	14.6%	35.4%	35.4%	14.6%	49.2%	49.2%	34.6%	34.6%	34.6%
Maximum Green (s)	5.5	19.0	19.0	5.0	18.5	18.5	5.0	27.5	27.5	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead			Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Min	Min	None	Min	Min	None	None	None	None	None	None
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0	0	0	0
Act Effct Green (s)	20.5	20.5	20.5		12.8	12.8	8.1	8.1	8.1	6.7	6.7	6.7
Actuated g/C Ratio	0.54	0.54	0.54		0.34	0.34	0.21	0.21	0.21	0.18	0.18	0.18
v/c Ratio	0.44	0.26	0.04		0.45	0.05	0.12	0.12	0.49	0.10	0.10	0.04
Control Delay	8.1	6.0	0.1		14.4	0.1	14.2	14.2	5.9	18.4	17.9	0.2
Queue Delay	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	6.0	0.1		14.4	0.1	14.2	14.2	5.9	18.4	17.9	0.2
LOS	A	A	A		B	A	B	B	A	B	B	A
Approach Delay		6.5			13.0			7.9			13.8	
Approach LOS		A			B			A			B	
90th %ile Green (s)	5.5	28.5	28.5	0.0	18.5	18.5	5.0	17.6	17.6	8.1	8.1	8.1
90th %ile Term Code	Max	Hold	Hold	Skip	Max	Max	Max	Hold	Hold	Gap	Gap	Gap
70th %ile Green (s)	5.5	24.2	24.2	0.0	14.2	14.2	0.0	7.1	7.1	7.1	7.1	7.1
70th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
50th %ile Green (s)	5.5	20.5	20.5	0.0	10.5	10.5	0.0	6.3	6.3	6.3	6.3	6.3
50th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
30th %ile Green (s)	5.5	19.0	19.0	0.0	9.0	9.0	0.0	5.8	5.8	5.8	5.8	5.8
30th %ile Term Code	Max	Hold	Hold	Skip	Gap	Gap	Skip	Gap	Gap	Hold	Hold	Hold
10th %ile Green (s)	0.0	11.2	11.2	0.0	11.2	11.2	0.0	5.5	5.5	5.5	5.5	5.5
10th %ile Term Code	Skip	Dwell	Dwell	Skip	Dwell	Dwell	Skip	Gap	Gap	Hold	Hold	Hold
Stops (vph)	101	105	0		185	0	27	35	37	20	27	0
Fuel Used(gal)	2	1	0		2	0	0	0	1	0	0	0
CO Emissions (g/hr)	106	103	9		159	7	22	29	89	16	21	2
NOx Emissions (g/hr)	21	20	2		31	1	4	6	17	3	4	0
VOC Emissions (g/hr)	24	24	2		37	2	5	7	21	4	5	0
Dilemma Vehicles (#)	0	0	0		0	0	0	0	0	0	0	0
Queue Length 50th (ft)	19	20	0		44	0	6	8	0	4	5	0
Queue Length 95th (ft)	76	79	0		126	0	24	30	42	25	30	0
Internal Link Dist (ft)		308			298			314			138	
Turn Bay Length (ft)			160				270					
Base Capacity (vph)	561	1114	1017		939	304	305	1402	1257	644	859	882
Starvation Cap Reductn	0	0	0		0	0	0	0	0	0	0	0

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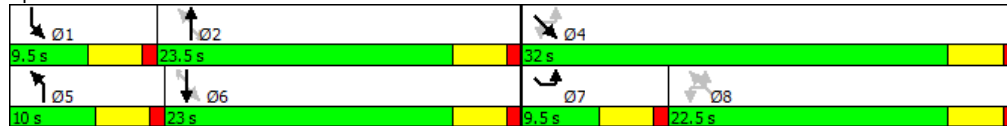
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Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Spillback Cap Reductn	0	0	0		0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0		0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.23	0.04		0.30	0.04	0.12	0.03	0.21	0.04	0.04	0.02

Intersection Summary

Area Type:	Other
Cycle Length:	65
Actuated Cycle Length:	38.1
Natural Cycle:	65
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.49
Intersection Signal Delay:	8.8
Intersection LOS:	A
Intersection Capacity Utilization:	45.8%
ICU Level of Service:	A
Analysis Period (min):	15
90th %ile Actuated Cycle:	55.1
70th %ile Actuated Cycle:	40.3
50th %ile Actuated Cycle:	35.8
30th %ile Actuated Cycle:	33.8
10th %ile Actuated Cycle:	25.7

Splits and Phases: 22: Commercial Street



Educational Use Only

APPENDIX B: Annual Average Daily Traffic for Franklin Street

This Appendix shows the annual average daily traffic for Franklin Street.

LOCATION	AADT08	AADT09	AADT10	AADT11	AADT12
US 1A (COMMERCIAL) SW/O US 1A (FRANKLIN)			11290	10130	
US 1A (FRANKLIN ST)(NB) NW/O COMMERCIAL			2880	2290	
FOX ST NE/O US 1A (FRANKLIN ST)		5530		5790	
US 1A (FRANKLIN ST)(NB) SE/O CUMBERLAND			8970	8000	
US 1A (FRANKLIN ST) (NB) NW/O CUMBERLAND		10150	10550	10100	
US 1A (FRANKLIN)(NB) SE/O I-295 NB RAMPS		13840		13870	
US 1A (FRANKLIN ST)(NB) SE/O FORE ST				2550	
US 1A(FRANKLIN ST)(NB) SE/O MARGINAL WAY		13960	14170	13840	
US 1A (FRANKLIN ST)(NB) SE/O CONGRESS			5310	5190	
SOMERSET ST SW/O US 1A (FRANKLIN ST)		6510		7110	
MARGINAL WAY NE/O US 1A (FRANKLIN ST)		5190		5300	
FOREST NE/O US 1A (FRANKLIN ST)				4000	
FOREST SW/O US 1A (FRANKLIN ST)	5370		3860	5160	
MARGINAL WAY SW/O US 1A (FRANKLIN ST)		13810		14850	
MIDDLE ST NE/O US 1A (FRANKLIN ST)				3240	
MIDDLE ST SW/O US 1A (FRANKLIN ST)				5300	
CONGRESS ST NE/O US 1A (FRANKLIN ST)	8670		8640	9300	
CONGRESS ST SW/O US 1A (FRANKLIN ST)				9630	
CUMBERLAND AVE NE/O US 1A (FRANKLIN ST)			6590	6730	
CUMBERLAND AVE SW/O US 1A (FRANKLIN ST)			6370	6250	
I-295 NB OFF RAMP TO FRANKLIN ST	5490	5780		5670	5890
I-295 (NB) N/O OFF RAMP TO FRANKLIN ST			29010	25150	
I-295 NB ON RAMP FROM FRANKLIN ST	7350	7300	7280	7320	7470
I-295 SB ON RAMP FROM FRANKLIN ST	6320	6350	5760	5880	6420
I-295 SB OFF RAMP TO FRANKLIN ST	6380	6570	5940	7070	7140
US 1A (FRANKLIN ST)(NB) NW/O FORE ST				3830	
US 1A (FRANKLIN ST)(SB) NW/O COMMERCIAL			2960	2610	
US 1A(FRANKLIN ST)(SB) SE/O SOMERSET AVE		10050		9760	
US 1A (FRANKLIN ST)(SB) SE/O CUMBERLAND			8650	8770	
US 1A (FRANKLIN ST) (SB) NW/O CUMBERLAND		9800		9700	
US 1A (FRANKLIN)(SB) SE/O I-295 NB RAMPS		12530		13990	
US 1A (FRANKLIN ST)(SB) NW/O FOREST				3820	
US 1A(FRANKLIN ST)(SB) SE/O MARGINAL WAY		12790		12480	
US 1A (FRANKLIN ST)(SB) SE/O CONGRESS			5590	5570	
COMMERCIAL ST NE/O US 1A (FRANKLN ST)	5870			6340	
(PW) LANCASTER ST SW/O US 1A(FRNKLN)(SB)				440	

Figure B.1: Average Annual Daily Traffic for Franklin Street and its Connecting Street

BIOGRAPHY OF AUTHOR

Matthew Henri Pelletier was born in Brunswick, Maine on October 4th, 1992. He was raised in Topsham, Maine and graduated from Mt. Ararat High School in 2010. He attended the University of Maine in Orono and graduated in 2014 with a Bachelor's degree in Civil Engineering. He returned to the University of Maine and entered the Civil Engineering graduate program in the fall of 2014. Matthew is a candidate for the Master of Science degree in Civil Engineering from The University of Maine for August 2016.