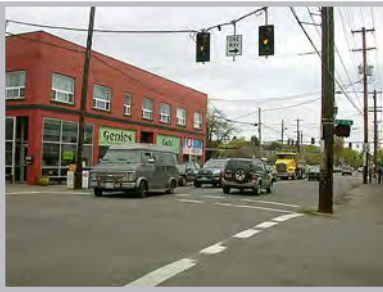


SOUTHEAST DIVISION STREET: 6th to 39th Avenue

STREETSCAPE AND STREET RECONSTRUCTION PROJECT



Final Draft

June 2010
City of Portland
Bureau of Transportation

City of Portland, Oregon

City Council

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SOUTHEAST DIVISION STREET: 6th to 39th Avenue

STREETSCAPE AND STREET RECONSTRUCTION PROJECT



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Special Thanks

St. Philip Neri Church for hosting the monthly CAC meetings
Seven Corners New Seasons for hosting the January Outreach Meetings

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	1
2. INTRODUCTION	3
Overview of the Plan	3
Project Background	3
Project Area	4
Project Approach	4
3. PUBLIC INVOLVEMENT	5
Summary of Community Outreach	5
Citizen Advisory Committee	5
4. PROJECT GOALS	7
Shared Economy	7
Clean and Green Environment	7
Healthy Community	7
Making a Place	8
5. TRANSPORTATION ANALYSIS	9
Transportation Objectives	9
Existing Conditions Summary	10
Traffic Analysis Summary	14
Diversion Statment	16
6. PLAN ELEMENTS	17
Zoning Treatments	17
Commercial Zone Treatments	17
Residential Zone Treatments	17
Design Elements	17
Pedestrian Safety Improvements	17
Green Infrastructure	18
Bus Stops	19
Bicycle Amenities	19
Public Art	19
On Street Parking	19
Paving of Frontage Zone	20
Signal Improvements	20
Street Lighting	20
Additional Elements Considered	20
Street Furniture	20
Build-Out of the Seven Corners Intersection	20
Streetscape Concept Plan	22

7. NEXT STEPS 35

8. APPENDIX 37

Appendix A: Citizen Advisory Committee Position Statement

Appendix B: Citizen Advisory Committee Meeting Notes

Appendix C: Public Feedback Master List

Appendix D: Kittelson Existing Conditions Report

Appendix E: Kittelson Traffic Analysis

This report documents the goals, process, and recommendations of the Division Streetscape and Street Reconstruction Project. For more than a year, City of Portland project staff and a team of consultants worked with stakeholders in the community to develop recommendations for improving Division Street for pedestrians, bikes, transit, and auto traffic.

The Division Streetscape and Street Reconstruction Project addresses the section of Division Street between SE 10th and 39th Avenue. The project is made possible by local and federal transportation funds. Major work items include resurfacing the roadway, building streetscape and green street improvements, and improving the public right-of-way for all users of the Division Street corridor.

As part of the MLK Viaduct Project, the Oregon Department of Transportation rehabilitated the pavement from SE 6th to SE 8th Avenues. As part of the Portland-Milwaukie Light Rail Project, improvements will be made from SE 8th to SE 10th Avenues. As a result, the section from SE 6th to SE 10th Avenue was removed from the project limits.

Throughout the project, City and consultant staff worked with a Citizen Advisory Committee (CAC) and the broader community to identify opportunities and constraints, potential solutions, and recommended improvements.

During the design phase, project staff developed an urban design scheme and completed a transportation analysis for the corridor, building upon previous analyses conducted as part of the 2006 Division Green Street/Main Street Plan. The key areas of analysis addressed:

- Balancing transportation demands with and through streetscape improvements
- Examining the feasibility of removing pro-time lanes between SE 11th Avenue and SE 28th Place
- Providing easy, safe, and efficient access and movement along and across Division Street for pedestrians and bicyclists
- Opportunities for incorporating green street elements into the streetscape design
- Designing a flexible right-of-way that sets the stage on which local businesses and the community can grow and flourish

As a result of this design development process, the CAC recommended that the City make improvements throughout the corridor. Improvements will include:

- Pavement restoration and preservation
- changes to traffic operations, including improved operations at intersections, removal of pro-time lanes outside of major nodes, and updated signalization
- improved pedestrian access through curb extensions, marked crosswalks, and pedestrian countdown timers at signalized intersections
- improvements to bicycle access, including two bike boxes on SE Ladd and SE 21st (to assist circulation through the Seven Corners intersection), and additional bike parking throughout the corridor
- changes to transit stops, such as new bus-length curb extensions, bus zones, and consolidated stops that will enhance transit comfort and service
- green streetscape elements such as bioswales, stormwater planters, and street trees that will help make SE Division Street a more sustainable and pedestrian friendly main street.
- Major utility improvements for the Bureau of Environmental Services (BES) including approximately one mile of pipe improvements in addition to surface stormwater management facilities

The project is funding with:

- City revenues derived from gas taxes
- Transportation System Development Charges (SDCs)
- Federal transportation funds allocated through Metro
- Bureau of Environmental Services Tabor to the River Project funds

The total amount of funding is currently \$6 million for transportation and streetscape improvements. BES funds total approximately \$7 million.

The next phase of the project includes preliminary and final design of the proposed improvements outlined in this report. City staff will continue to work with the CAC and adjacent property owners to refine the project design and plan for implementation.

OVERVIEW OF THE PLAN

The Division Streetscape and Street Reconstruction Project will construct streetscape improvements from SE 10th to 39th Avenues and repave Division Street from SE 11th to 39th Avenues. Streetscape improvements will include street trees, bioswales, curb extensions, new crosswalks, streetlights, improved signalization, and public art.

The City has taken a holistic approach toward improving a deficient transportation corridor and improving the health of the local watershed by implementing innovative, sustainable green street design practices. Once complete, the community will have an attractive main street with increased access to transit, improved pedestrian and bicycle facilities, and improved air and water quality.

Project Highlights:

- Implements design elements that will manage on-street stormwater, provide ecosystem benefits, and advance watershed goals
- Increases safety, access, and visibility for pedestrians, bicyclists, and transit users
- Improves traffic operations through the corridor and provides on-street parking opportunities
- Helps stimulate the local economy
- Provides aesthetic benefits that will increase the attractiveness of the neighborhood

PROJECT BACKGROUND

Between spring 2003 and fall 2005, the City of Portland developed the *Division Green Street/Main Street Plan* with grant funds from the State of Oregon Transportation and Growth Management (TGM) Program. The plan was a collaborative effort between the City of Portland and the community to improve the livability of Division Street between SE 11th and SE 60th Avenues over the next 20 years. The plan identified possible strategies for creating a pedestrian-friendly, economically vibrant and environmentally sustainable main street.

After receiving federal and local funds to move forward with the transportation components, the City initiated the Division Streetscape and Street Reconstruction Project to analyze and improve traffic operations along the corridor and to develop the conceptual streetscape plan for Division Street from SE 10th to 39th Avenues.



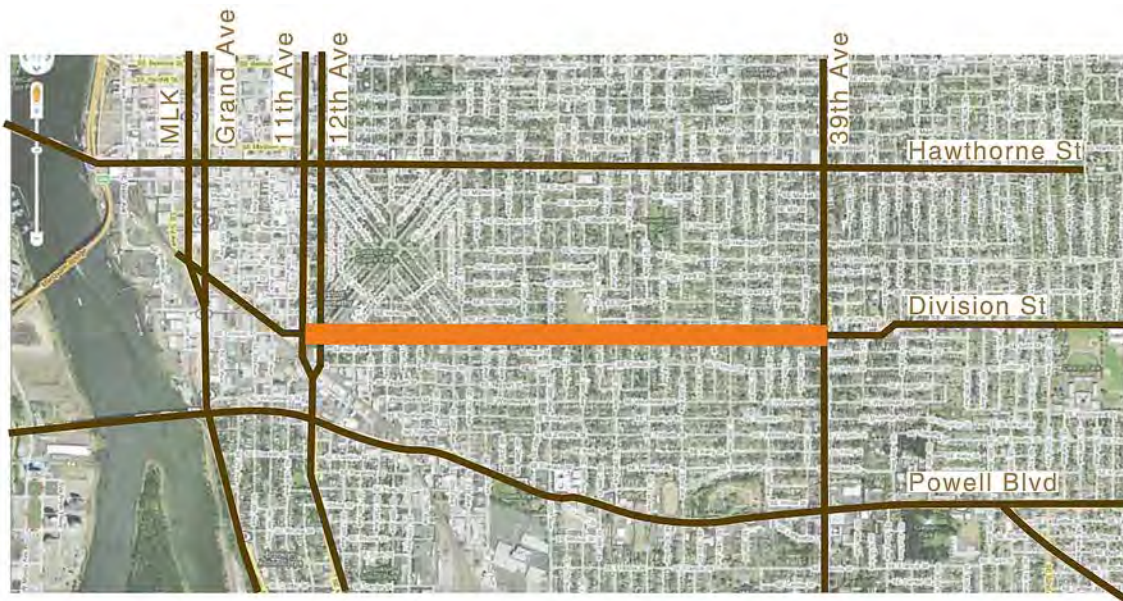


Kittelson Associates, Inc. was hired to perform the traffic analysis for Division Street. Landscape architects Nevue Ngan Associates were hired to develop the conceptual streetscape design. The City also established a 20-member Citizen Advisory Committee (CAC) to help review the traffic analysis and develop the conceptual plan for the streetscape project.

PROJECT AREA

The project area includes the public right-of-way on SE Division Street from SE 10th to SE 39th Avenues.

Project Location and Boundary



PROJECT APPROACH

- Create street improvements that **balance the multi-modal transportation** demands along SE Division Street with the desire to create a sustainable main street and community place.
- **Balance the use of the public right-of-way** for parking (motor vehicle and bike parking), pedestrians and green space
- **Work with the Bureau of Environmental Services (BES)** to achieve the goals of the Tabor to the River Project and overall watershed health
- Address the **specific goals, issues, and ideas identified in the Division Green Street/Main Street Plan** related to street improvements that are within the scope of this project
- Address the **broader vision of the Division Green Street/Main Street Plan** by designing a flexible right-of-way that sets the stage on which local businesses and the community can grow and flourish



SUMMARY OF COMMUNITY OUTREACH

The proposed streetscape plan is the result of an extensive public involvement process involving more than 300 community members and a 23-person Citizen Advisory Committee. The public process for the Division Streetscape and Street Reconstruction Project included a range of public involvement opportunities for residents and stakeholders. The team used several approaches to provide information and gather input from the community.

Project staff worked with community members to design the outreach process and involve as many people as possible. Before formally beginning the process, staff:

- Attended meetings at the Hosford Abernethy Neighborhood Association (HAND) and Division Clinton Business Association
- Promoted the project through the City's project website, community emails, and the local newspaper
- Established and staffed the CAC

CITIZEN ADVISORY COMMITTEE

The Citizen Advisory Committee (CAC) was appointed by Mayor Sam Adams to represent a variety of neighborhood, community, and business interests and guide the plan's development throughout the process. The committee met monthly to give direction, review work by the project team, and listened to the comments received by community members as the plan was developed and refined.

See Appendix A for the CAC Position Statement

See Appendix B for the CAC Meeting Notes and Materials



What are your Top 3 Priorities for Division Street ?		
These streetscape elements are intended to support the many needs and goals of the community. While each element is likely to be included in the plan to some degree, limitations in available street space and budget constraints will result in some elements being used less than others.		
Please help us prioritize by placing your three dots next to the three streetscape elements which are most important to you.		
Streetscape Element		Place "Dots" Here
Provide pedestrian improvements such as curb extensions and emphasize sidewalk space for pedestrians.		31
Emphasize landscape areas and street tree planting where possible along the corridor.		27
Introduce stormwater facilities in addition to those that satisfy the needs of the Tabor to the River Project.		8
Frame flexible spaces within the streetscape parking zone in commercial areas.		11
Invest in extra street furnishings such as lighting and new sidewalk at "7 Corners" to highlight this area as a special place along the corridor.		11
Preserve vehicular parking adjacent to Division Street businesses.		13
Reduce Division Street to 2 travel lanes through the corridor whenever possible to provide more space for other streetscape elements.		31
Keep 4 travel lanes during peak hours, where needed, to prevent congestion on Division Street.		17

October 2009 Design Workshop



June 2009 Open House



Community Events (Open Houses, Design Workshop, Business Outreach)

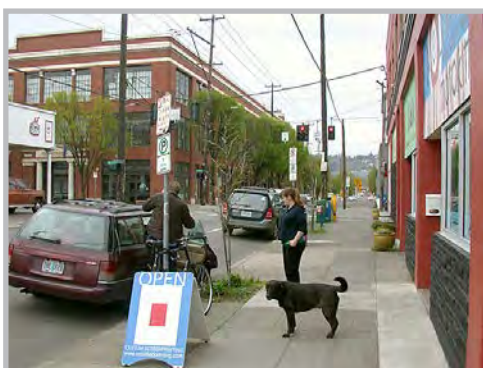
The team held a community workshop or open house during each phase of the project (3 total) to ensure the broader community had opportunities to review plan alternatives and provide feedback before the project proceeded to the next phases.

The June 2009 open house provided an introduction to the project and an opportunity for participants to review and affirm the project goals and streetscape design ideas. This event also provided an opportunity for community members to highlight specific locations in need of improvements. There were 80 community members in attendance at this event.



In October 2009, a workshop for participants to review the conceptual design and prioritize specific the list of design elements being considered for Division Street was held. Attendees were encouraged to provide site-specific feedback. There were over 100 community members in attendance at this event.

Over three days in January 2010, the project team held outreach meetings to the business and property owners on Division Street with locations directly impacted by the project. These community members were invited to meet with designers one-on-one and review what was being proposed in front of their business/property. Following these meetings, staff revised the plan (if necessary) based on the feedback received addressing the needs of the property/business owners along the street (i.e. parking and loading needs, visibility of business signage and display windows, etc.). Thirty percent of Division Street businesses attended these outreach meetings.



In February 2010, the project team held a final open house to allow community members to review the latest draft of the conceptual design and provide their final feedback. There were over 100 community members in attendance at this event.

See Appendix C for public feedback master list

The project goals were developed by the Citizen Advisory Committee (CAC) and project staff. The community also provided feedback at the June 2009 open house.

The categories were pulled directly from the 2006 Division Green Street/Main Street Plan. The goals identify how this streetscape project will serve to address the larger objectives from the 2006 plan through multi-modal transportation improvements.



Creating a Green Street/Main Street for the Community

SHARED ECONOMY

- Preserve parking where needed for business vitality
- Preserve visibility and sidewalk access to businesses
- Design street improvements that allow for flexibility and creativity in the ways in which businesses interface with and occupy the street



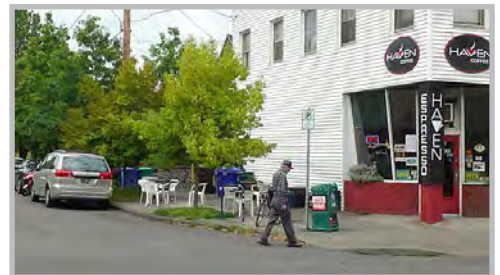
CLEAN AND GREEN ENVIRONMENT

- Introduce stormwater facilities and reduce impervious surfaces where possible
- Add street trees to maximize tree canopy while maintaining visibility for businesses
- Design streetscape amenities to support safe and efficient alternative transportation modes
- Develop guidelines for future street improvements, incorporating green infrastructure where practical



HEALTHY COMMUNITY

- Encourage walking and bicycling through improved bike, pedestrian, and transit amenities
- Encourage the community to discover and create community gathering places for all ages
- Increase the visibility of the schools near Division Street and make sure that bike and pedestrian infrastructure reflects school locations
- Support traffic speeds that are consistent with high levels of pedestrian activities





MAKING A PLACE

- Design street improvements that enable and encourage creative flexible use of public space by local artists and businesses
- Incorporate functional art into the street's design and redevelopment
- Incorporate historical markers or other features that commemorate the history of the area

SE Division Street is a diverse street, with a variety of land uses and traffic conditions. Historically, SE Division Street has played an integral role in the Portland grid system by serving much of the traffic that travels through the surrounding neighborhoods. In recent years, neighborhood retail shops and related activities along SE Division Street have increased in number and popularity. As such, pedestrian and bicycling activity has increased through the corridor. Division Street remains an important east/west thoroughfare and is used by people whose trips originate, end in, or pass through neighborhoods.

TRANSPORTATION OBJECTIVES

The transportation objectives for the Division Streetscape Project include revitalizing the street from SE 10th to 39th Avenue to make it a more transit-oriented, economically vibrant and environmentally sustainable main street. The transportation concept is intended to balance the competing travel demands on Division Street, including traffic, transit, trucks, pedestrians, and bicyclists. Improvements should also enhance livability for local residents and businesses.

During the planning phase, the community requested that Transportation consider removing the pro-time travel lanes on Division Street between SE 11th and 28th Place to help meet the transportation objectives for the project and balance the competing modes and uses through the corridor. Removing the pro-time lanes on Division Street would help improve:

- pedestrian safety and comfort
- bicycle movement and safety
- bus stops and travel times
- on-street parking to support businesses
- neighborhood livability
- manage congestion
- provide right-of-way for stormwater management facilities
- create community places

Criteria for Improvements

The following criteria were established for Transportation's analysis of traffic operations on Division Street:

Vehicle Operations: Maintain adequate vehicle and truck access to local businesses and residences. Provide adequate parking. Discourage through truck traffic.

Access to Transit: Improve pedestrian and bicycle access to bus transit and future light rail line.



Pedestrian Enhancements: Enhance the pedestrian environment through the corner and crossing improvements at major crossing locations, as well as green street improvements (street trees, bioswales) that will provide a buffer from the street.

Bike Accessibility: Support accommodations for bicyclists by providing safe access and parking in the project area.

Safety: Create an attractive, safe environment for all users of the street with adequate lighting and other design improvements.

In order to determine where the existing 4-lane cross section of SE Division Street could be narrowed to two travel lanes, traffic engineers studied the existing conditions on Division Street (traffic volumes, speed, turning movements, and lane utilization through the corridor) and modeled future conditions under the proposed two-lane scenario.

A summary of the Existing Conditions Report and Traffic Analysis can be found below. The full reports are attached as Appendix E and F, respectively.

EXISTING CONDITIONS SUMMARY

SE Division Street has 60 feet of right-of-way with 36 feet of pavement between curbs. Each weekday, approximately 15,000 vehicles travel through the corridor from SE 11th – 39th Avenues. The posted speed limit along Division Street is generally 25 mph, with reduced speeds near school zones. The 85th percentile for vehicle speeds range from 26-31 mph.

Street Classification:

The Transportation Element (TE) of the City of Portland's Comprehensive Plan classifies SE Division Street as follows:

- Traffic: Neighborhood Collector
- Transit: Major Transit Priority Street
- Bicycle: Local Service Bikeway
- Pedestrian: City Walkway
- Freight: Truck Access Street
- Emergency: Major Emergency Response Street
- Street Design: Community Main Street

Land Use:

The land use character along SE Division Street varies markedly. Division Street is occupied by residential (single and multi-family dwellings) and commercial uses (professional services, retail, restaurant, and industrial uses). Uses between SE 11th and 13th Avenues are predominantly small single story businesses with limited off-street parking. Land between SE 13th and 19th Avenues consists of single family residential and institutional uses. The properties around the complex Seven Corners intersection are the most

auto-oriented commercial uses in the project area. Properties between SE 21st and SE 39th Avenue are an eclectic mix of retail, specialty services, single-family residential, and apartments.

Traffic Features:

Transit: TriMet service along Division Street consists of one “frequent service” line, Number 4, and several other lines that cross Division Street at 11th/12th, Seven Corners, and 39th Avenues. The Number 4 line serves downtown Portland to Gresham with buses every 15 minutes or better during the day. The most heavily used stops are at SE 12th and 39th where transfers occur.

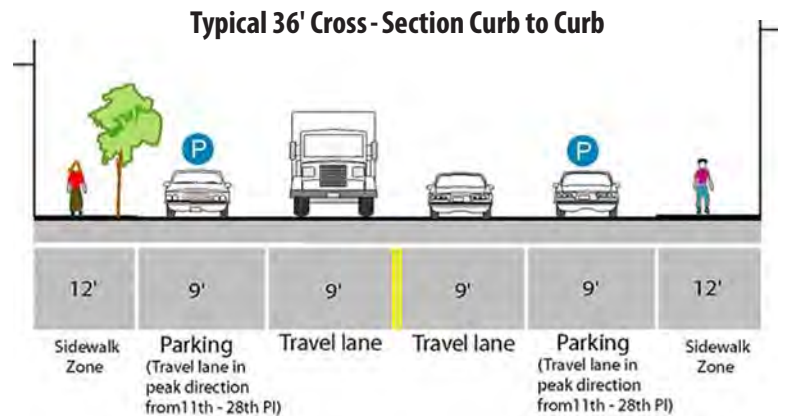
Pedestrian Features: Division Street has a 12-foot sidewalk corridor between the curbs and property lines. Typically, this consists of a 12-foot paved sidewalk corridor in commercial areas and a six-foot sidewalk and six-foot planting strip between the curb and the sidewalk in residential areas. All the signalized intersections provide marked pedestrian crossing. Crosswalks are marked at all intersections to designate each intersection’s legal crossings. “Ladder” style crosswalks are marked at the two official school zone crosswalks located at SE Orange Street and SE 28th Place. Marked crossings also exist at SE 30th and SE 31st Avenues to compliment the curb extensions and help with crossings in this busy commercial area.

Parking/Pro-Time Travel Lanes: One of the most defining characteristics of the corridor is the pro-time lanes. Between SE 11th and 28th Place, the parking lane becomes a travel lane for the two-hour peak, in the peak direction (7 to 9 AM westbound and 4 to 6 PM eastbound). While these outside lanes are underutilized, they do provide extra capacity and are particularly useful for bus and bicycle movements. Unfortunately, the on-street parking is also underutilized because people do not want to chance leaving a car in the parking lane during the peak period.

Striping: Between SE 11th and SE 28th Avenue, the traffic lane striping consists of a double solid yellow centerline to separate opposing directions of travel and a white dashed line in both directions of travel that creates two traffic lanes in each direction. Each of the four lanes is nine feet wide.

Signage: Traffic-related signage is minimal on SE Division Street. Signage consists of speed and school zone signing.

Signals: Traffic signals are located at the following intersections on SE Division Street: SE 11th, 12th, Orange, 17th, Seven Coners, 26th, 28th Place, 34th, and 39th. All operate independent of each other. The signals are not “interconnected” and are therefore not able to coordinate their routines to help manage vehicle speeds or minimize delay.

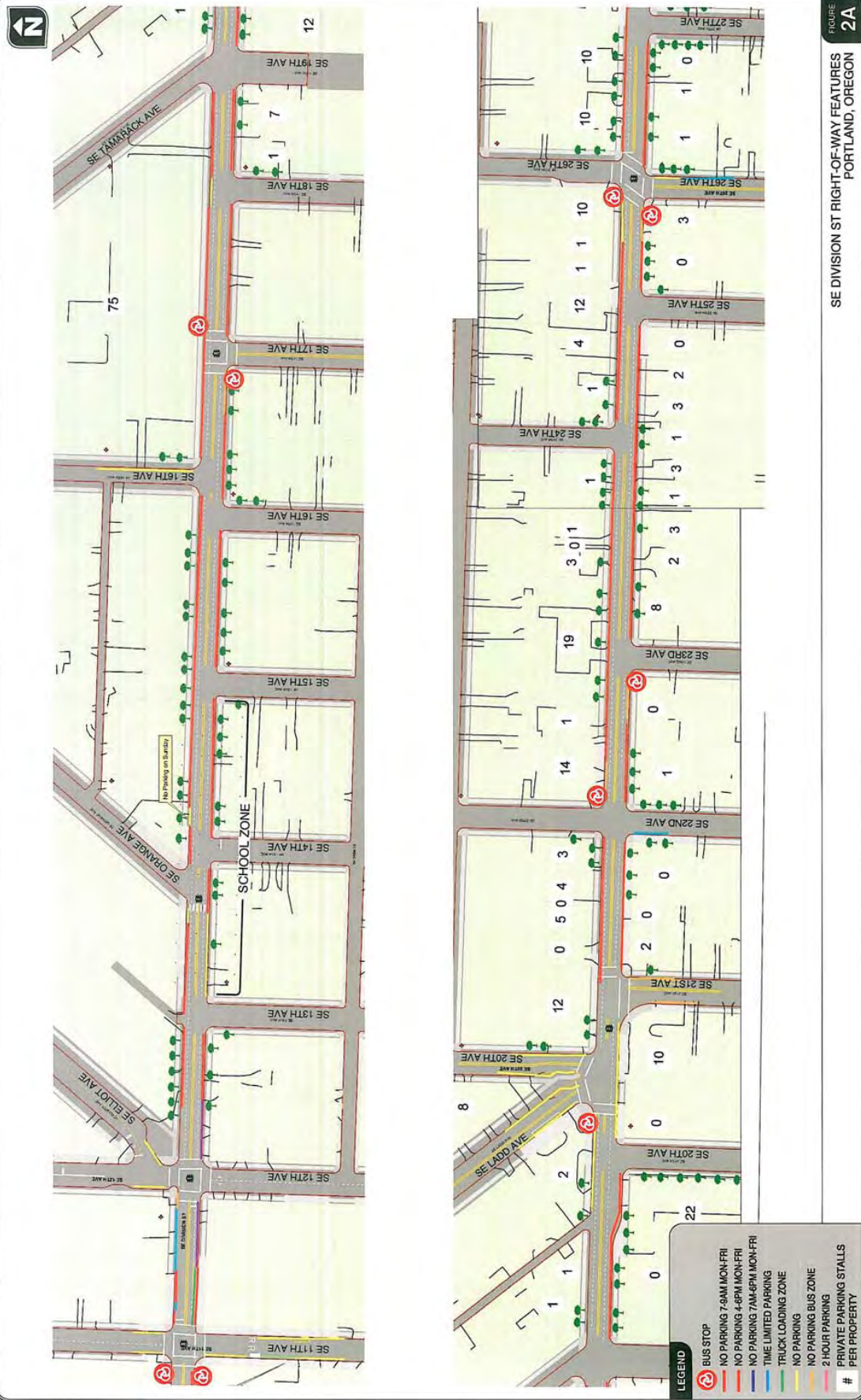




SE DIVISION ST RIGHT-OF-WAY FEATURES
PORTLAND, OREGON

Division St. SE 8th Ave to SE 39th Ave

February 2009



KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING

TRAFFIC ANALYSIS SUMMARY

Transportation improvements along the Division Street corridor should provide ease of movement while balancing the needs of all modes of transportation including pedestrians, bicycles, automobiles, and trucks. Improvements should also enhance livability for local residents and businesses.

Project engineers worked to find a balance between maintaining adequate traffic capacity for Division Street and providing the necessary right-of-way for improvements to the streetscape. An emphasis on traffic capacity alone can come at the expense of the pedestrian environment, on-street parking, bicycle access and green street improvements. Providing insufficient vehicle capacity can create congestion, poor vehicle and transit access, and traffic diversion on to adjacent residential streets.

Objectives for the traffic operations analysis included:

- Determine where the existing 4-lane section of SE Division Street can be reduced to a single lane in each direction
- For areas requiring more than a single travel lane in each direction, recommend solutions that support the project goals and satisfy the City's performance standards
- Identify additional transportation amenities that support project goals

Findings and Recommendations

The performance of each signalized intersection in the corridor was analyzed using the procedures outlined in the 2000 Highway Capacity Manual, published by the Transportation Research Board. The intersection performance analysis provided a way to systematically evaluate and compare the effects of the following two scenarios under current and future traffic volumes: existing conditions (two lanes in each direction) and the proposed scenario (one lane in each direction). See Appendix E for complete Traffic Analysis report.

In summary, staff found that SE Division Street can adequately serve traffic with one lane in each direction, except at the major nodes (SE 11th/12th couplet, the Seven Corners intersection, and SE 26th). At these intersections, a 4-lane cross-section is needed to provide capacity and address the traffic demands during peak travel times.

The performance of these intersections during peak periods is influenced significantly by how drivers use the available peak-hour (pro-time) lanes between SE 11th and SE 28th Avenues. Field observations indicated that 35% of the westbound traffic uses the curb lane during the 7 to 9 AM period when the lane is available. Approximately 30% of the eastbound traffic uses the curb lane during the 4 to 6 PM peak travel period when the lane is available. SE Division Street does not operate as efficiently as it would if the curbside peak hour lane shared the traffic demand equally with the inside lanes.

The relatively narrow widths of the striped lanes (9 feet) help explain why the curbside lane is less desirable than the inside lane. Except during the busiest part of the day, the corridor operates very much like a two lane facility. Drivers prefer to use the inside lanes and tend to only use the pro-time curbside lanes:

- when signal-induced queues are perceived to be excessively long
- to pass large slow-moving vehicles that are queued in front
- to pass signal-induced queues and avoid left-turning vehicles

As such, staff recommend that pro-time lanes be removed outside of the major nodes on Division Street and replaced with other streetscape features (full-time parking, stormwater facilities, etc.).

Recommendations:

SE 11th/12th:

- Two westbound lanes are needed at SE 11th/12th to address morning traffic demands. This requires two lanes westbound between SE 11th and SE 13th Avenues. Outside of the AM peak, on-street parking will be allowed on the north side of Division Street between SE 11th and SE 12th Avenues.
- Two eastbound lanes are needed between SE 11th and SE 12th Avenues. Outside the PM peak, on-street parking will be allowed from SE 11th to SE 13th Avenues.

Seven Corners:

- Due to the complexity of this intersection and the multi-modal traffic demands, staff recommend that the four lane cross-section remain in place through Seven Corners.
- Remove any parking currently allowed in the intersection to help with transit operations and results of collision history in the area.
- Add bike boxes on the intersection approaches of SE Ladd Avenue and SE 21st Avenue.

SE 26th:

- Prohibit parking along the north side of SE Division Street, immediately east of SE 26th Avenue for 50 feet. This will enable adequate space for westbound through vehicles to maneuver around left-turning vehicles .
- Increase the effectiveness of the traffic signal by reallocating more green time to SE 26th Avenue. This will reduce delays and queuing on SE 26th Avenue and will maintain acceptable operating conditions on SE Division Street.

SE 13th – 19th/SE 21st – 28th Place:

- Remove pro-time lanes and either restore on-street parking or provide other streetscape improvements (curb extensions and/or stormwater management facilities). See streetscape design plan for details.

DIVERSION STATEMENT

The Clinton Street Bicycle Boulevard is a vibrant and well-established bicycle facility in the City of Portland and is an important east/west connection for the cycling community.

During the design development phase, some members of the community and the City's Bicycle Advisory Committee expressed concern that any changes to the traffic capacity on Division Street may cause drivers to divert to Clinton Street, thereby increasing auto volumes on this local service street and negatively impacting a popular bicycle route.

Therefore, in conjunction with the Division Streetscape Project, PBOT has agreed to:

- monitor traffic volumes on Division Street and Clinton Street (SE 12th to 39th)
- mitigate for any diversion of autos from Division Street onto Clinton (SE 12th to 39th) as a direct result of the project

PBOT will conduct a series of before and after counts on both Division Street and Clinton Street. The counts will be taken during the same time period (week and month) and under similar weather conditions. Counts will also be conducted when the local schools are in session.

If PBOT determines that diversion has occurred as a direct result of traffic changes on Division Street, staff will take measures to prevent any further diversion. Staff will work with the community and residents on Clinton to examine additional traffic calming devices or passive/active diversion measures on Clinton Street (SE 12th to 39th).

The SE Division Street corridor connects a variety of uses through residential and commercial zones. Below are ways that the plan aims to:

- reinforce quiet residential pockets and strengthen active commercial nodes creating a distinct feel for each zone
- connect the corridor making it feel like a unique and unified place

Overall Recommendations

ZONE TREATMENTS

Commercial Zone Treatments

The conceptual plan for commercial areas along Division Street strives to create a more livable, economically viable, environmentally sustainable, and safe street for all users. These will be achieved through:

- curb extensions, marked crossings, and new corner ramps to facilitate pedestrian crossings and create more usable space for the community
- strategically placed bioswales to effectively manage stormwater, minimize parking loss, and maximize green landscaping along the street
- an abundance of medium to large canopy trees to maximize shade for pedestrians while maintaining visibility of businesses and improving the overall health of the watershed



Residential Zone Treatments

The conceptual plan for residential sections along Division Street strives to help these areas cope with being located on a busy main street. The project will help achieve this goal through:

- curb extensions at corners to add landscaping and soften the street environment
- stormwater facilities to narrow the feel of the street
- large canopy trees to help distinguish the residential zone and provide privacy from the street



DESIGN ELEMENTS

Pedestrian Safety Improvements

Pedestrian safety improvements include the installation of curb extensions, marked crossings, curb ramps, and pedestrian count down timers at existing signals.

Curb extensions will help increase pedestrian safety by reducing crossing distance, improving the visibility of and for pedestrians. They will be placed throughout the corridor at marked crossings, bus stops, and in conjunction with stormwater facilities. In most locations, the plan mirrors extensions on the north and south side of the street.





New marked crosswalks will be striped with either a ladder or standard (parallel) marking to indicate the crosswalk in accordance with the MUTCD (Manual for Uniform Traffic Control Devices) policy for striping crosswalks. Existing marked crosswalks are generally located at signalized intersections and other approved crossings on Division Street, such as school crossings and areas with high pedestrian activity. The project will mark four new pedestrian crossings between SE 34th and SE 39th Avenues and retain the existing marked crossings throughout the corridor.

Green Infrastructure

Street trees are being proposed throughout the corridor. Besides providing shade for the street, trees will also provide seasonal color and fragrance to enhance the streetscape. Staff will be working with individual property owners to review the tree planting plan (species/location) adjacent to their property. The planting palette will be developed during the design phase in conjunction with the Bureau of Environmental Services and the City Forester. Where new trees are shown in front of businesses, staff will work with owners to place them where they will not compromise visibility to signage, window displays, seating areas, etc.



The proposed plan preserves most of the existing trees along Division Street. Some columnar trees are shown as being replaced to provide for broad canopy trees for greater cover through the corridor.

Large canopy trees are planned only for the north side of Division Street due to utility conflicts on the south side. These large trees will shade the street, help intercept stormwater, and unify the diverse planting plan on the corridor by planting one or two varieties throughout the corridor.

Small canopy trees will be planted on the south side of Division Street and on the north side, where necessary, to avoid conflict with existing street features.



Stormwater management facilities are also proposed throughout the corridor. These facilities will help to reduce flow to the combined sewer system, manage stormwater more naturally, and restore watershed health. These vegetated planters will be placed along Division Street and on some side streets to collect street stormwater and filter out pollutants.

Based on community feedback, the plan now includes three different types/sizes of facilities:

- Stormwater facilities in curb extensions and furnishing zones to maximize the landscape area for stormwater management along Division Street. These will be placed along the north side of Division Street since there are no apparent tree or utility conflicts

- Stormwater facilities in curb extension areas only will help keep the existing use of the furnishing zone for pedestrians, street furnishings, other landscaping and on-street parking
- Stormwater facilities in furnishing zones only are being proposed in a few locations along the south side of Division Street to provide green infrastructure and minimize impervious area while avoiding utility conflicts in the right-of-way

Bus Stops

The project team worked with TriMet to identify ways to improve transit service through the corridor. They determined that it would be possible to improve, move, or consolidate bus stops in a way that would provide:

- improved spacing between stops and create consistency with TriMet policy
- increased safety for passengers by building curb extensions and crossing improvements at major stops along the corridor
- additional bus zones that will allow a bus to pull out of traffic and up to the curb for loading/unloading passengers



Bicycle Amenities

Although the project is not proposing any bike lanes along Division Street, it will enhance bike access through the corridor by:

- improving travel across Division Street with curb extensions and marked crossings that will calm Division Street traffic street and provide a shorter crossing for bicyclists
- bike boxes on SE Ladd and SE 21st to improve crossing the Seven Corners intersection
- on-street bike parking (bike corrals) throughout the corridor



Public Art

The Regional Arts and Culture Council (RACC) will be working with an artist to develop public art for the project area that will interpret and convey the character of the community. The resulting work will be pedestrian-scaled and episodic in nature (i.e., occurring multiple times in various ways along Division Street).



On Street Parking

Since on-street parking is considered a critical element to the vitality of main streets, the project will add focus on adding full time on-street parking in commercial zones throughout the corridor. Full time parking provides more pedestrian and streetscape opportunities compared to peak hour restricted parking. It also supports the pedestrian environment objectives by functioning as an important buffer between the pedestrian and traffic environments. The preferred alternative provides the most full-time parking of all the alternatives under consideration.





Paving of Frontage Zone

During the engineering phase, the project team will identify opportunities to provide as much space for pedestrians as possible while also adding green street elements such as bioswales and street trees. This may include paving landscaped frontage zones in commercial zones and/or grating over stormwater facilities.

Signal Improvements

This project will include new Intelligent Transportation System (ITS) infrastructure throughout the corridor which will enhance the City's ability to monitor performance of traffic conditions and improve the pedestrian environment. ITS infrastructure upgrades could include the following:

- New Traffic Signals with Adaptive Signal Control would allow Transportation to monitor traffic flows through the corridor and adjust the lengths of signal phases as necessary throughout the day
- Transit Signal Priority (installed sensors would detect approaching transit vehicles and alter signal timings to improve transit performance)
- Improved Pedestrian Signals (would include countdown timers and the ability to provide leading pedestrian intervals where necessary to insure safe crossings)



Street Lighting

Street lighting improvements may be included in the streetscape improvements if funding is available. These improvements could include installation of pedestrian scaled street lighting. A corridor lighting analysis will be performed during the design phase to insure consistency along Division Street and facilitate safe crossings for pedestrians at key locations.

Additional Elements Considered

Street Furniture

During community events, staff received requests to add benches and trashcans throughout the Division Street Corridor. Due to the City being unable to maintain street furniture and due to funding constraints, these items were not added to the plan. These items can be added to the street in the future if funding and maintenance agreement can be established with a local community group.



Build-Out of the Seven Corners Intersection

The Seven Corners intersection (SE 20th, Ladd, 21st Avenues) is viewed by many as the heart of the Division Street community. The intersection is heavily used by pedestrians, bicyclists, and transit users. Many community members expressed the desire to remove the curbside travel lane and build pedestrian improvements into the right-of-way in order to create a sense of place at the intersection and provide a buffer from traffic. Due to the complexity of the intersection and the high daily traffic

volumes, the City was unable to remove the curbside travel lanes and build improvements into the right-of-way. The City's analysis indicated that given present and future predicted travel patterns, narrowing the Seven Corners intersection to a two-lane profile could result in significant congestion on Division Street and diversion of vehicles into the adjacent neighborhood.

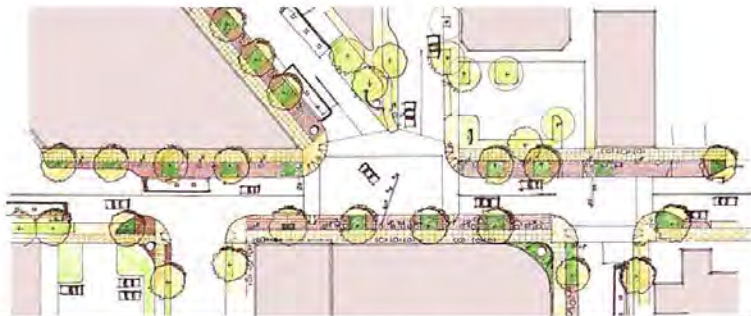
However, it was important to the Citizen Advisory Committee that staff identify what Seven Corners could look like if traffic volumes were reduced significantly over time and the City narrowed the intersection. These drawings depict future design options for the intersection and show how a greater "sense of place" could be created at this busy intersection given more sidewalk space and redevelopment. This vision is contingent upon a drop in traffic volumes over time and private redevelopment of adjacent properties.



Future Design Alternatives

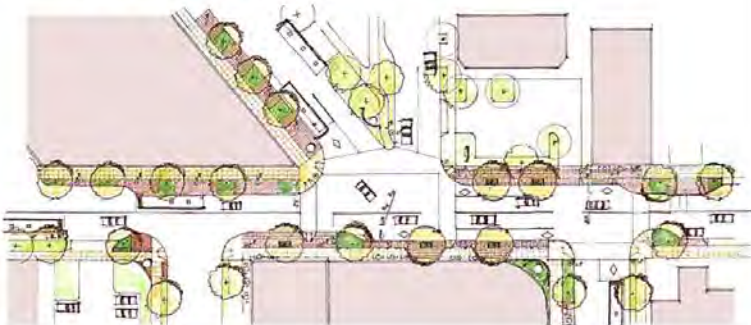
Future 2-lane Build Out Wide Sidewalk

- Moves curbs out 6' along Division from existing locations to create wider sidewalk environment
- Incorporates improvements potentially built in the 4-lane design



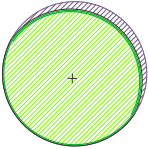




















Future 2-lane Build Out with bike lanes

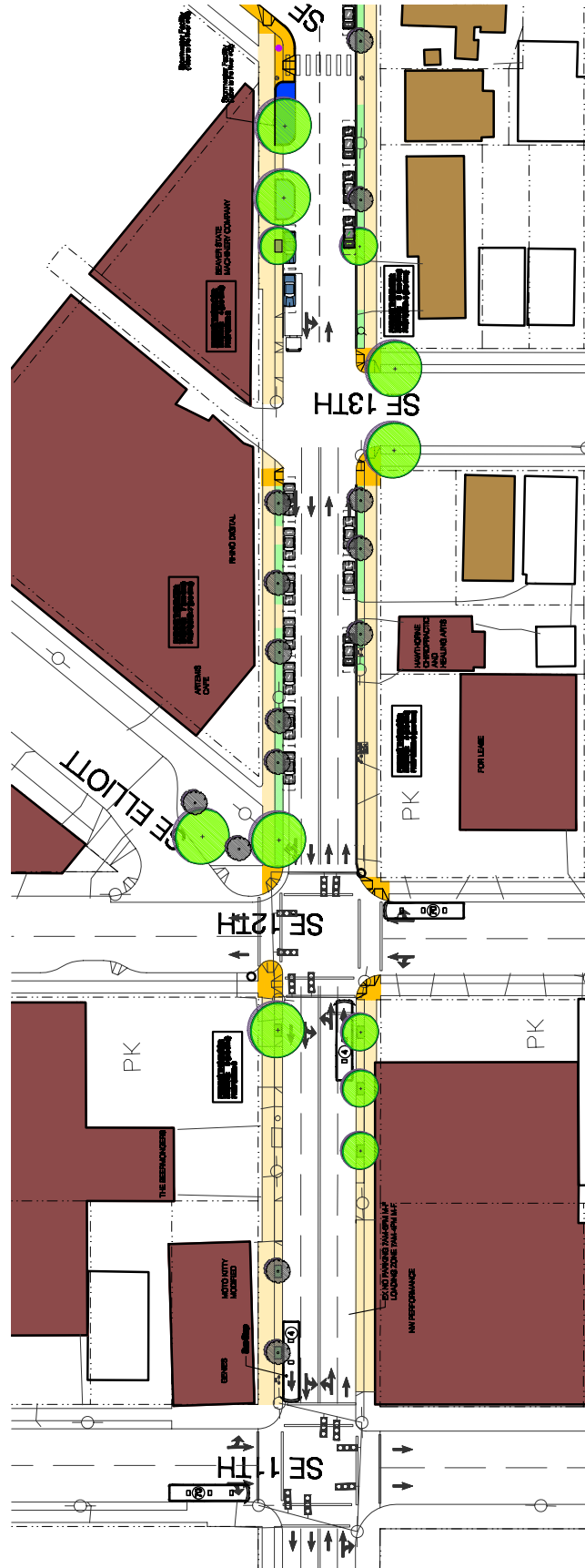
- Retains existing curb to accommodate bike lanes between 20th and 21st
- Moves curbs out 6' along Division west of 20th and east of 21st to create wider sidewalk environment
- Incorporates improvements potentially built in the 4-lane design

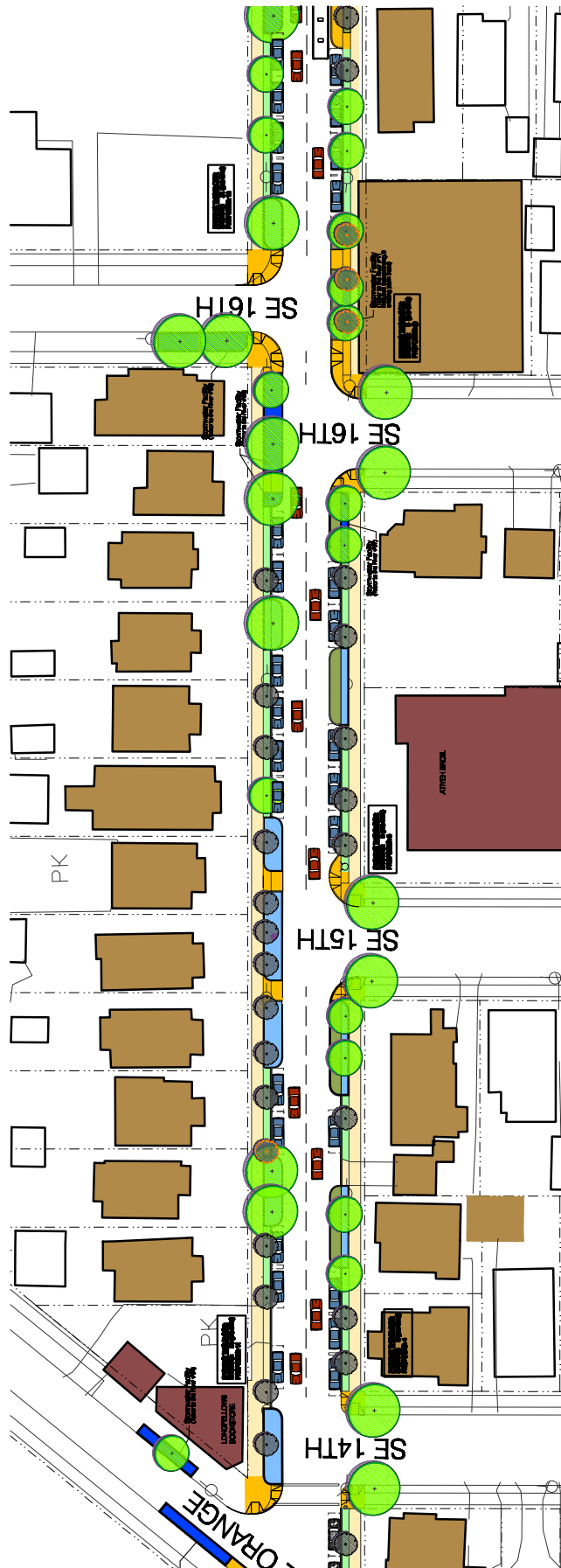


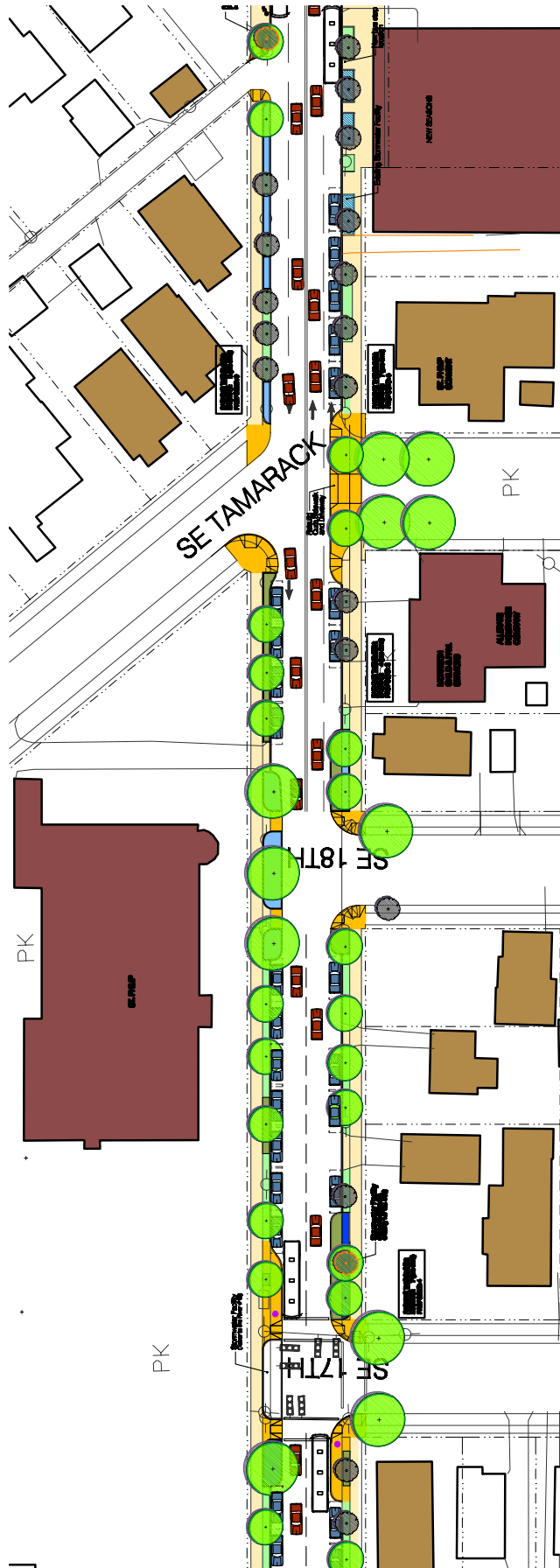
STREETSCAPE CONCEPT PLAN

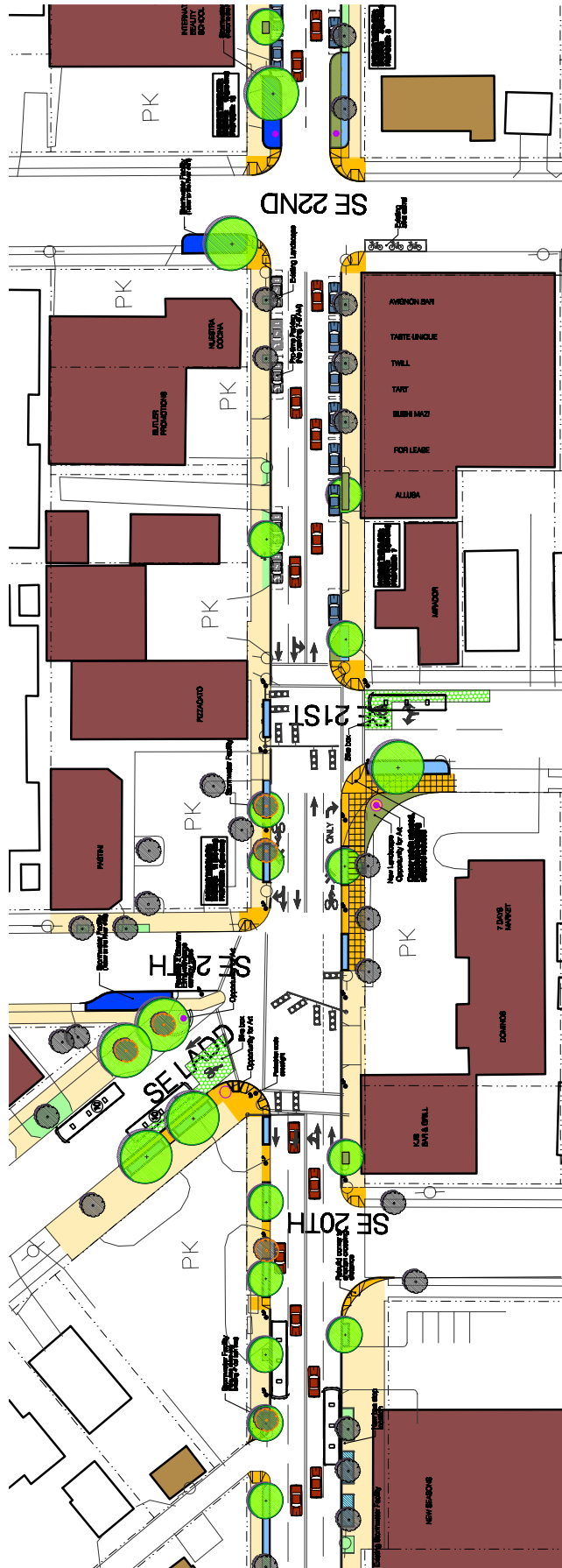
Legend:

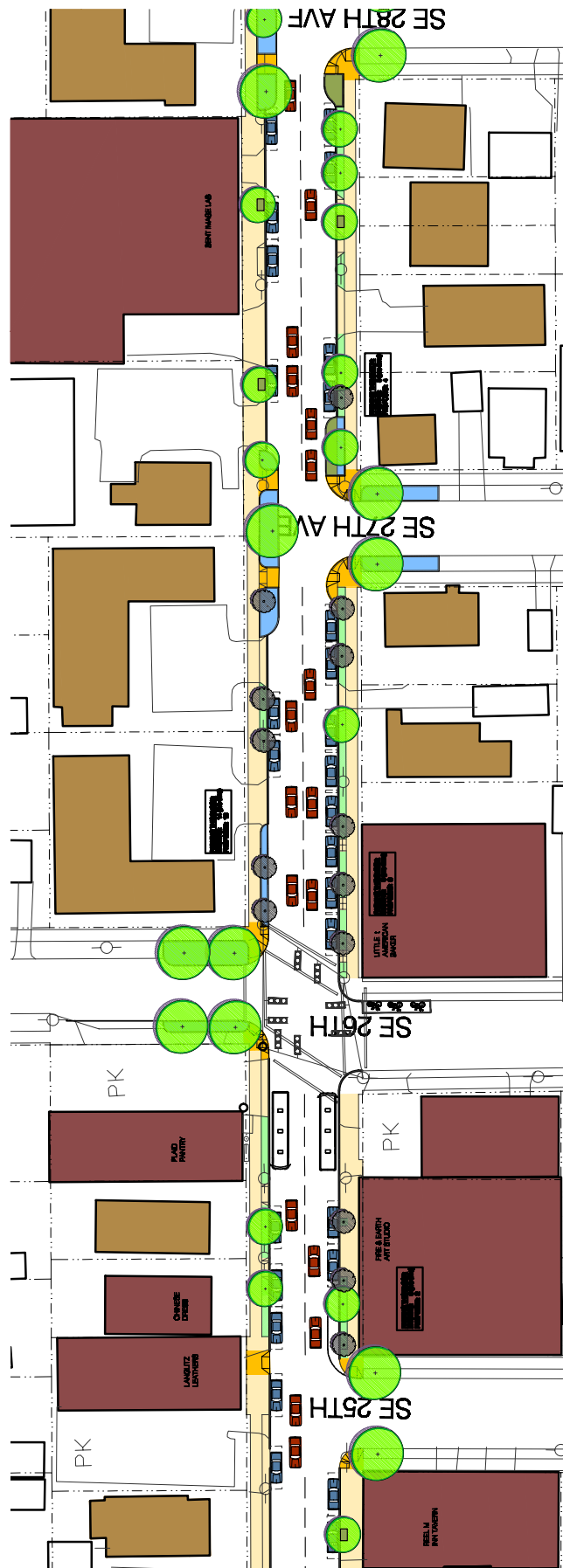
	New Large Canopy Tree
	New Small Canopy Tree
	Existing Trees to remain
	Existing Trees to remove / relocate
	Existing Landscape
	New Landscape
	New Stormwater Facility
	Tabor to the River Stormwater Facility
	New Hardscape
	Existing Sidewalk
	New Curb Ramp
	
	Existing Residential Building
	Existing Commercial / Institutional Building
	Parking
	Moving Car
	Pro-Time Parking (No Parking during Peak Traffic Hours)
	Bus Stop
	Bike Corral
	Proposed Crosswalk
	Existing Crosswalk

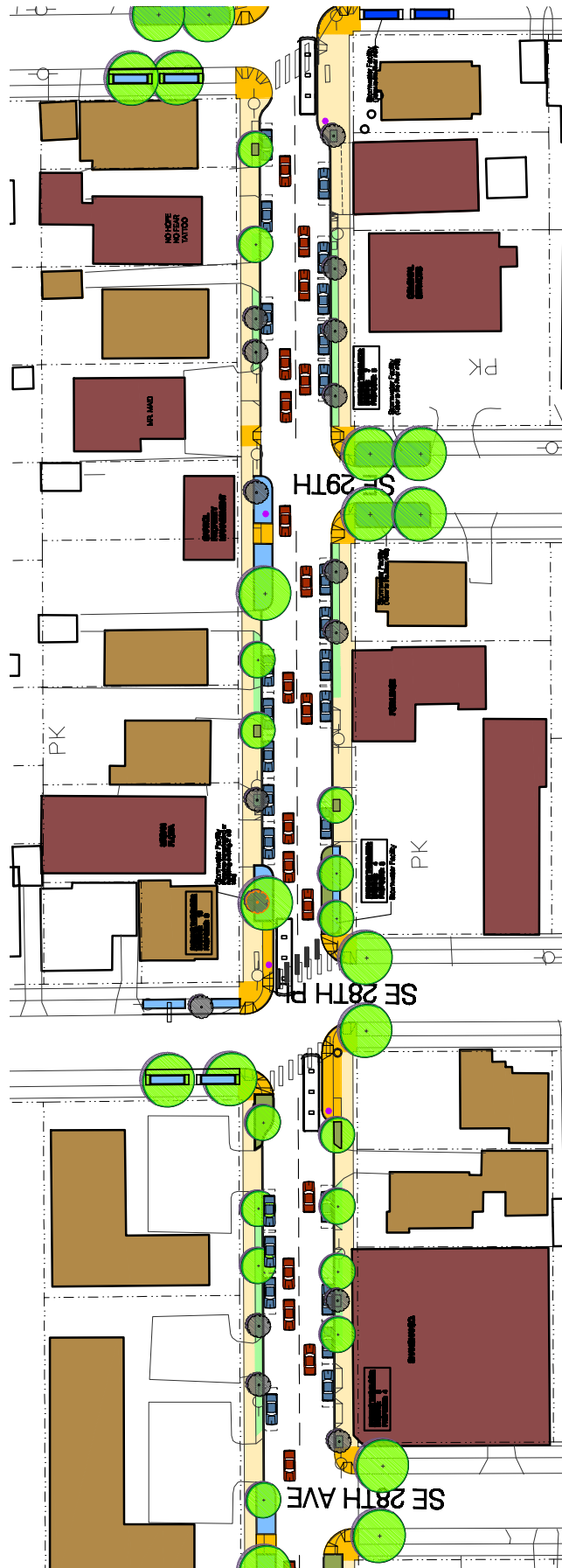


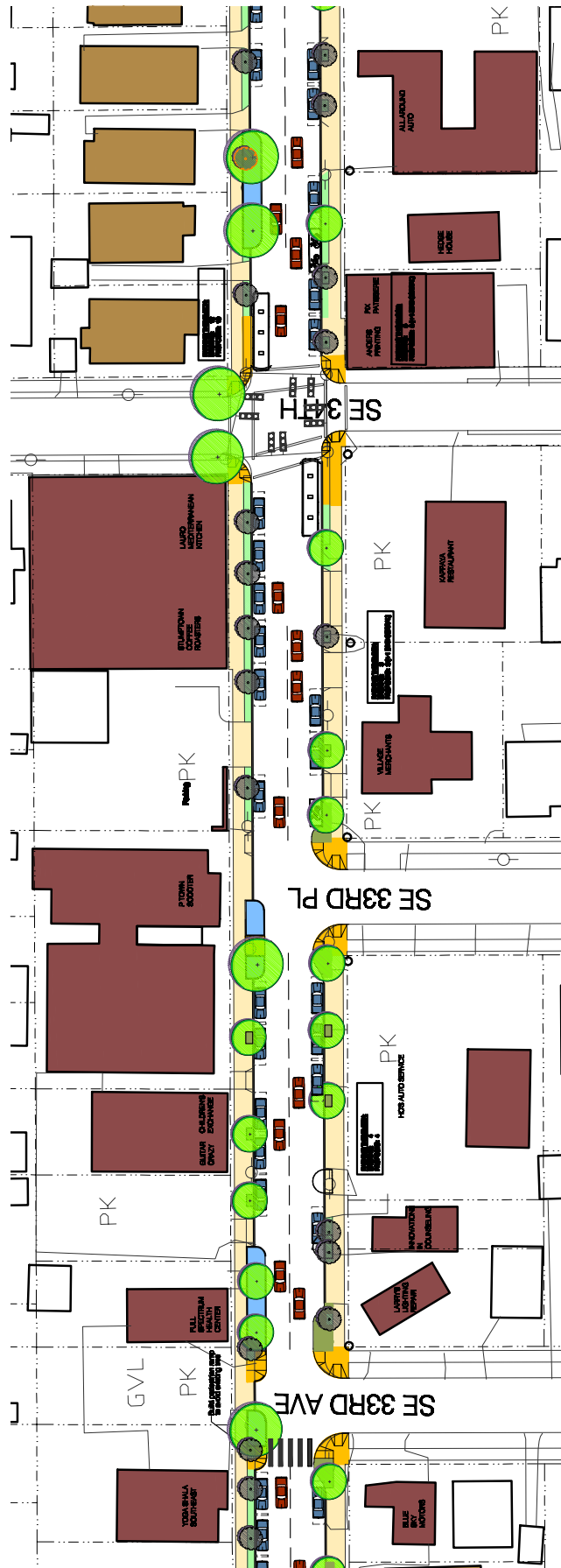


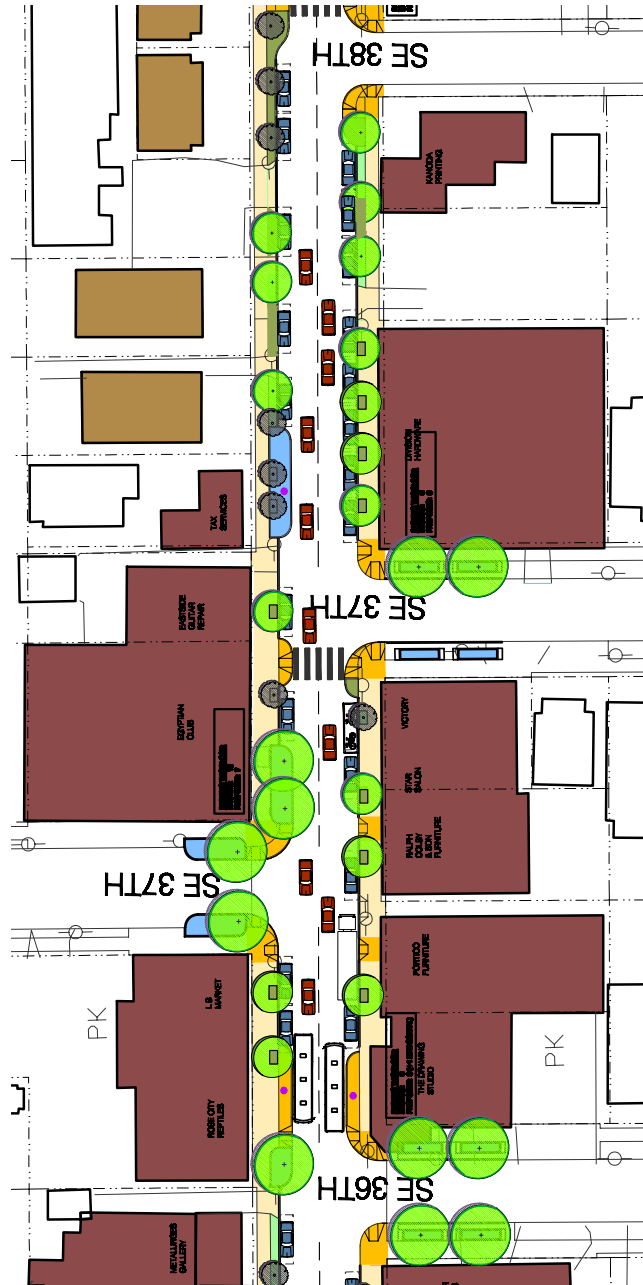


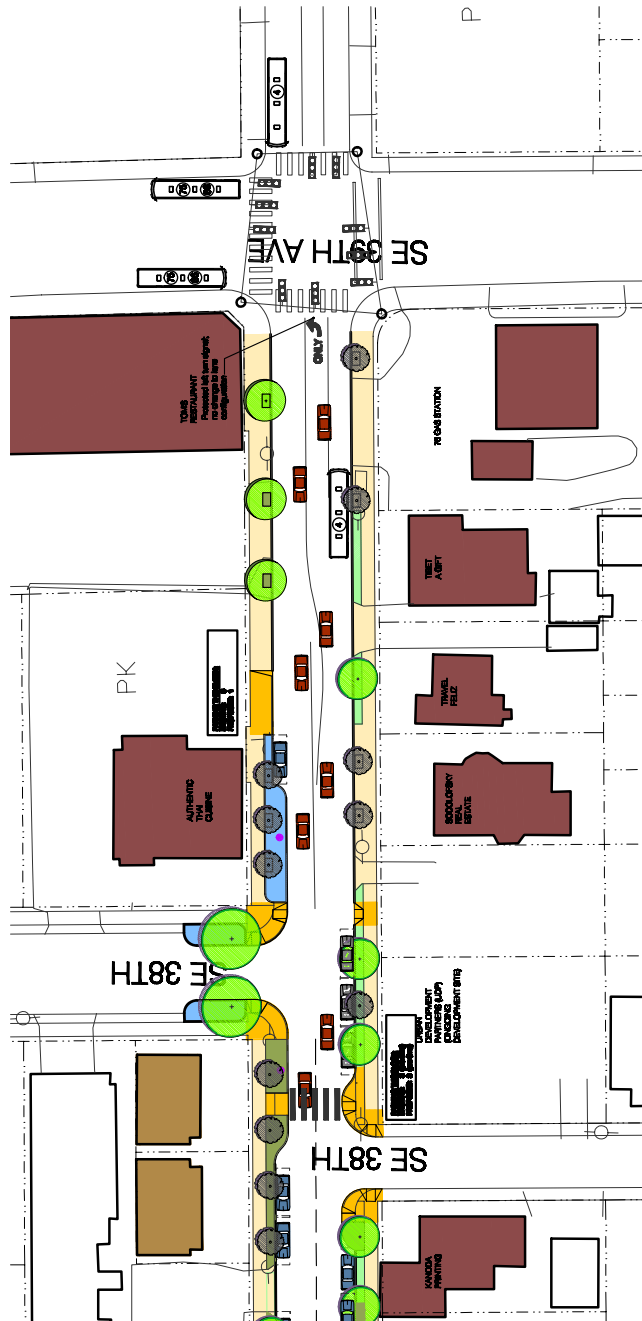










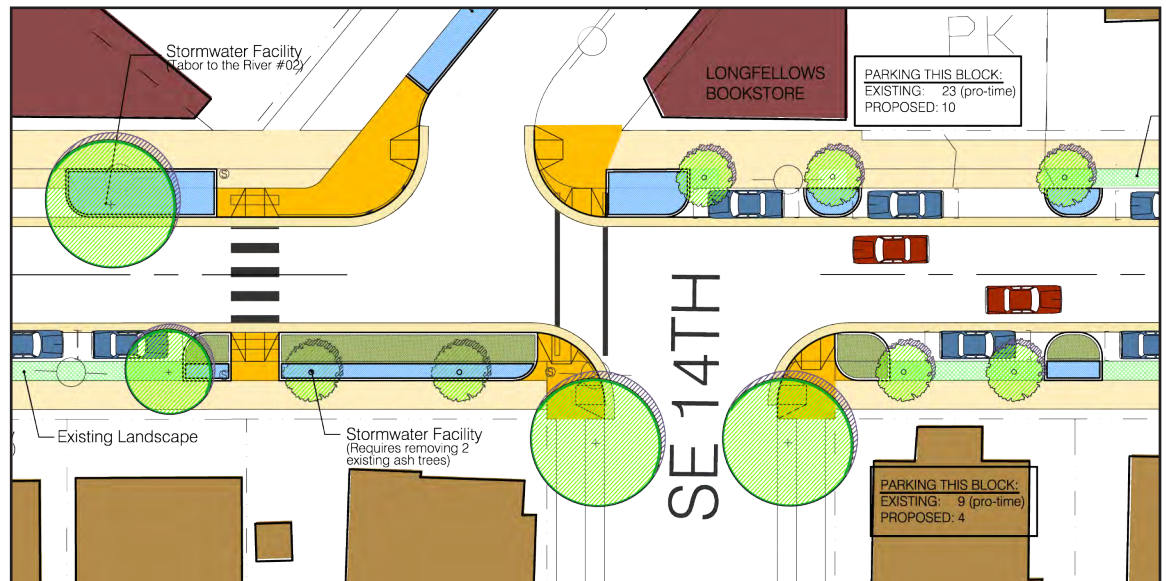


The implementation of the design concept for the Division Streetscape and Street Reconstruction Project will include the following:

- Present the Division Streetscape and Street Reconstruction plan to Portland City Council for adoption, by resolution, as the guiding document for public right-of-way improvements on Division Street from SE 10th to 39th Avenue
- Proceed into the preliminary and final engineering phases of the project
- Continue working with members of the Division Streetscape Citizen Advisory Committee (CAC) and business and property owners on plan refinements during the design phase
- Seek and secure any additional funding, if needed, to construct the recommended improvements
- Work with community members, business and property owners, and other public agencies to design the improvements and schedule construction in a manner that minimizes community impacts to the extent possible
- Construct streetscape improvements and pavement restoration work of SE Division Street from SE 10th to 39th Avenues beginning in 2011. The expected construction duration is approximately 18 to 24 months



Streetscape Plan - SE 14th and Division Street



APPENDIX A – Citizen Advisory Committee Position Statement

APPENDIX B – Citizen Advisory Committee Meeting Notes

APPENDIX C – Public Feedback Master List

APPENDIX D – Kittelson Existing Conditions Report

APPENDIX E – Kittelson Traffic Analysis

APPENDIX A - CITIZEN ADVISORY COMMITTEE POSITION STATEMENT

May 17, 2010

Elizabeth Mahon, Project Manager
Portland Bureau of Transportation
1120 SW 5th Avenue
Portland, Oregon 97204

Dear Ms. Mahon,

We are the Division Streetscape and Street Reconstruction Project Citizens Advisory Committee (CAC) as well as active members of the local community. Our members live, work, and recreate along the Division Street corridor, and regularly walk, bike, drive, and use transit in our neighborhood. Over the course of this project we have attended open houses, neighborhood and business association meetings, and spoken with our neighbors, sharing our ideas with others and allowing our perspectives to be altered as well.

As a CAC, we began this process with different perspectives on the removal of pro-time lanes. After much discussion and analysis, the majority of CAC members support removing some segments of pro-time lanes consistent with the Division Streetscape Concept, as a step towards achieving the *Division Green Street/Main Street Plan's* vision of a more pedestrian-friendly, economically vibrant, and environmentally sustainable Division Street. Though the majority of CAC members support this position, we wanted to recognize that this support was not unanimous. Individual CAC members are concerned that removal of pro-time lanes will cause an increase in congestion on Division Street, resulting in the diversion of some traffic from Division Street to local streets. Other individual CAC members support removal of more pro-time lanes to increase pedestrian safety and enhance the "main street" feel of Division Street, realizing that such removal must be coupled with a reduction in current and future auto traffic demands.

Though individually we represent a range of opinions on pro-time lanes, the CAC has achieved consensus on a significant point. If pro-time lane removal remains consistent with what is shown in the Division Streetscape Concept, the CAC unanimously supports the remaining elements of the streetscape concept as drafted. The Division Streetscape Concept represents the CAC's best efforts to balance the competing travel demands on Division Street, including auto traffic, transit, trucks, pedestrians, and bicyclists both along and across Division Street, and most of us feel it is a step in the right direction and support its implementation.

We recognize that the project will now move into the implementation phase, and that a Design Advisory Committee (DAC), comprised of members of the CAC, will be formed to provide two functions. First, the DAC will work with PBOT to prioritize expenditures on the streetscape improvements identified in the conceptual plan, once revised cost estimates are available. Secondly, the DAC will provide input on the project elements related to community identity, which may include selection of plant material for the stormwater facilities and the artistic design elements of stormwater facilities, bike corrals, and tree wells. In an effort to reinforce community identity through art and integrated design, we encourage project designers, the DAC and the project artist to work together to forge a unique identity that unites the Division Corridor.

Although the Division Streetscape Concept will continue to provide the CAC's vision for Division Street, we know the Portland Bureau of Transportation (PBOT) will have to make countless site-specific decisions in conjunction with the DAC during the engineering process. As such, we are summarizing our support for the project in writing to help guide PBOT and the DAC as they seek to maintain a balanced project.

In short, we support:

- Creating safer crossing opportunities for pedestrians. This includes support for frequently spaced pedestrian curb extensions that increase visibility of pedestrians and reduce crossing distances throughout the corridor. We also support marked crosswalks highlighting the safest and most important places for pedestrians to cross.

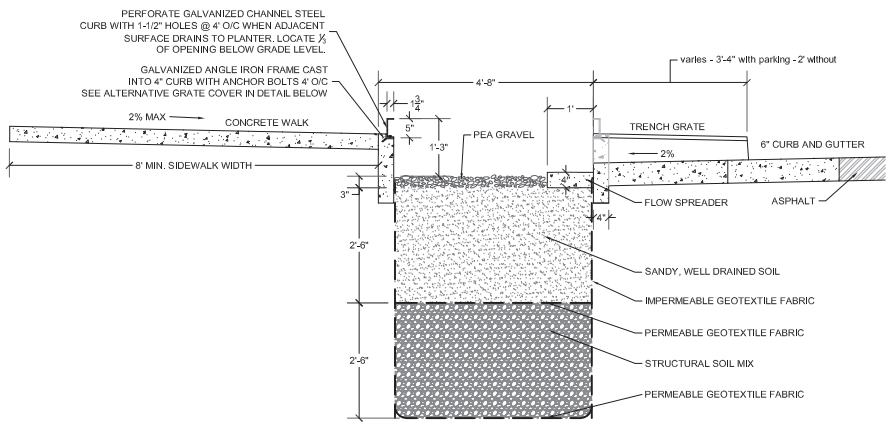
- Adopting design elements that limit vehicle speed along Division Street and encourage safe driving practices, especially in areas with high pedestrian activity and in areas around schools.
- Creating safer crossing opportunities for bicyclists. We recognize that bike ridership in the Division corridor is increasing and that Lincoln/Harrison and Clinton provide the primary corridors for bicyclists traveling east-west through our community. The largest unmet need is to provide safer ways for bicyclists to cross Division Street and we encourage PBOT to optimize bicyclist safety in engineering key intersections.
- Improving bus service through the carefully chosen stop locations and curb extensions shown in the draft design concept.
- Incorporating innovative stormwater treatment into the street's design and reconstruction. In addition to facilities along Division Street itself, we are particularly interested in opportunities for stormwater facilities at side street locations and designing facilities that can accommodate coverings so that sidewalk space remains available for other uses. The CAC recommends that in commercial zones that stormwater facilities be designed to allow for "flush flexible space," as an example, see Exhibit A.
- The planting of street trees to maximize tree canopy along Division Street, carefully balancing site selection with the needs of pedestrians, businesses, and property owners.
- Providing for a vibrant pedestrian and small business environment with wide sidewalk widths throughout the corridor, and especially in commercial areas. The committee prefers a minimum of 8' clear in Commercial Zones. To this end, we also encourage the exploration of pedestrian stopping places in conjunction with the stormwater facilities.
- Locating on-street parking and loading zone access to support business needs.

- Avoiding diversion of Division Street auto traffic to neighborhood streets and bicycle boulevards.
- A left turn phase from Division Street to César E. Chávez Blvd.
- Looking for opportunities to provide a buffer between pedestrians and traffic in and around the 7 Corners intersection, especially during peak hours.
- Program signals to prioritize pedestrians and crossing traffic during off-peak hours.

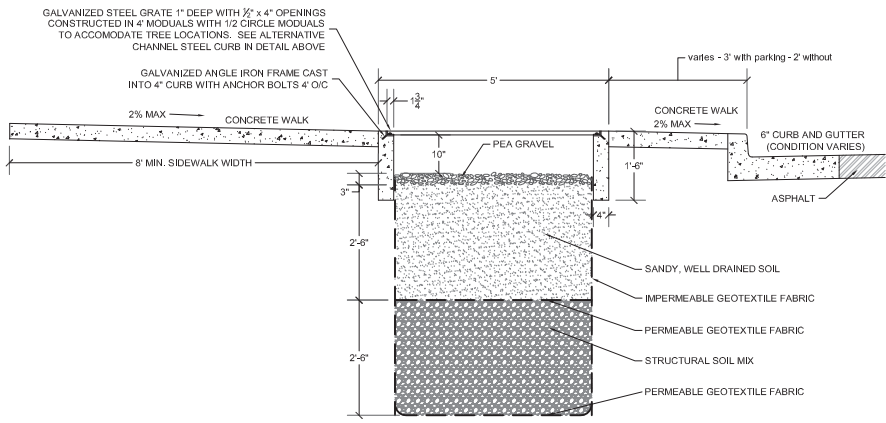
We support the Division Streetscape Concept even though we feel that there is a significant lost opportunity at 7 Corners. Though nothing in the concept precludes 7 Corners from eventually becoming a significant gathering place for the community, the concept does not significantly foster a sense of place or create the comfortable pedestrian environment the community desires.

As members of our community, we will continue to work towards encouraging more people to use our neighborhood streets as bicyclists, pedestrians, and transit riders. We strongly encourage PBOT to assist us in our efforts to reduce auto use in keeping with the City's Climate Action Plan goals. We expect PBOT will monitor traffic counts over time on Division Street and other key nearby streets, including SE 20th, 21st, 26th, and the Clinton and Lincoln/Harrison Street Bike Boulevards, and will report back to the community as well as take steps to mitigate any diversion that occurs. We also expect that, when we meet our goal of reduced auto traffic, PBOT will revisit the possibility of further removing pro-time lanes in order to create a true green "main street" and to make 7 Corners a safer, more attractive, and more vibrant neighborhood core.

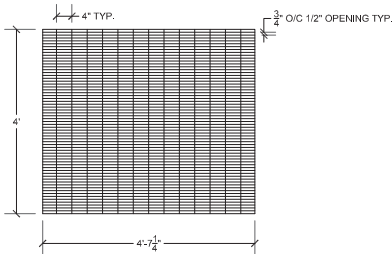
Exhibit A



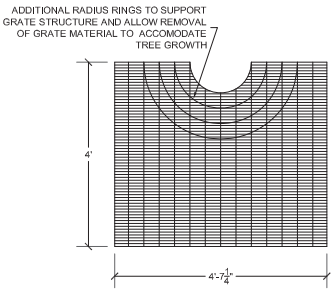
SECTION - INFILTRATION PLANTER WITH C-CHANNEL CURB AT INLET



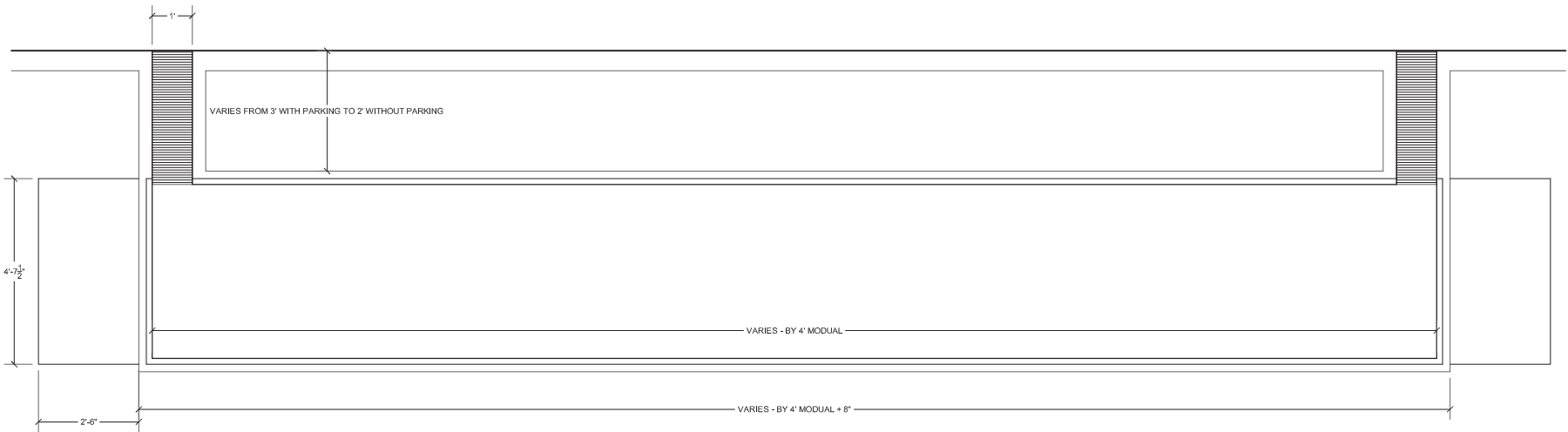
SECTION - INFILTRATION PLANTER WITH GRATE COVER



PLAN - TYPICAL GRATE



PLAN - GRATE WITH TREE OPENING



PLAN - INFILTRATION PLANTER

APPENDIX B - CITIZEN ADVISORY COMMITTEE MEETING NOTES

Sam
Adams
Mayor

Susan D.
Keil
Director

MEETING SUMMARY

**Division Streetscape and Street Reconstruction Project
Citizen Advisory Committee Meeting #1
St. Philip Neri Church, Carvlin Hall
April 1, 2009
6:00 – 8:00 PM**

Committee Members in Attendance:

Stakeholder group:	Primary Member:	Alternate:
Art	Rinn Carroll Jackson	
At Large	Rex Fisher	
At Large	Chris Eykamp	
Bicycle Advisory Committee	Tom Ralley	
Business Representative	Andy Butler	
Business Representative	Brian Rohter Greg Harrenbrook for Brian Rohter	
Clinton St. Representative	Joseph Auth	
Division Clinton Business Association	Jean Baker	
Division Vision Coalition	Charles Kingsley	
Hosford Abernethy N.A.	Amy Lewin	Kina Voelz
Hosford Abernethy Resident	Linda Nettekoven	
Local Schools / PTAs	Elizabeth Gatti	
Pedestrian Advisory Committee	David Aulwes	Doug Klotz
Richmond Neighborhood Association	Seth Gallant	
Richmond Neighborhood Resident	Jill Cropp	Ben Vaughn
Youth Representative	Julia Steig	
Ad Hoc Members:		
Bureau of Environmental Services	Anne Nelson	
Public Members / Interested Parties:		
Kathryn Notson – South Tabor Resident		
Staff:		
Elizabeth Mahon – PBOT		
Jody Yates - PBOT		
Ben Ngan – Nevue Ngan		
Olena Turula – Nevue Ngan		
Michael Harrison - Parametrix		

Meeting Summary:

- Welcome and Introductions – All
- During the introductions, each meeting attendee was asked to answer the following question(s):
 - Why are you interested in this project?*
 - What do you want to see implemented on Division?*
 - What is the most important thing that should come out of this project?*

Summary of Responses:

- develop a well thought out plan – integrated design, execute plan
- personal/professional interest in the project
- interested in gym at 35th and Division, want to see neighborhood improvements

- resident, bike representative, hope that we create a livable and pleasant Division Street that is developed in way that supports variety of transportation options and most importantly – bicycles and keep Clinton as a premium bikeway
 - interest in future of Division, zoned for additional density, vibrant place
 - explore highest aspirations of deep ecology, community, and place making for main street
 - opportunity to create model for green streets in Portland
 - creating sense of place or identity for Division – own identity separate from nearby areas/districts
 - interest in the narrowing of Division and subsequent diversion and increase in traffic on Clinton
 - interests include safety, livability, community, creating identity for Division,
 - crosswalks along Division
 - create a plan that is sufficiently flexible – can grow with future density, acceptable enough to avoid land use issues, access to business, left turn light at 39th/Division
 - support of small business
 - create process that allows us to work with change that is happening – process that allows us to be in touch with the integrity of the community
 - mobility of community – how we are traveling, examine node concept, developing gathering spaces
 - find a way to move people and vehicles along Division safely and efficiently
 - interest in various modes, crosswalks between 30th and 39th (crossing issues with offset intersections), making Division pedestrian friendly, encouraging new development that supports all modes, maintain unique/funky identity
 - better emphasize the street as a center point for community core of walkable community, safer/easier crossings, more opportunities for businesses that serve neighborhood and build upon idea of walkable community.
 - maintain maximum use of public right of way for pedestrians, creating gathering places, expanding pedestrian area into the street
 - gathering places on sidewalks, ADA accessible, efficient movement of people, density/development concerns
3. Liz reviewed draft CAC Roles and Responsibilities and Operating Protocols. CAC members requested the following changes/additions:
- frequent “process checks” during a meeting
 - room/table set-up so that members can see each other
 - for broader public involvement: mailings, media distribution, etc. to guarantee attendance (ex: SE Examiner ad)
 - Executive summary emailed out to listserv

The committee also agreed to establish steering committee to help with process during design development phase. CAC members on steering committee include: Linda Nettekoven, Charles Kingsley, Jill Cropp. City staff members include Jody Yates and Liz Mahon (Transportation), Anne Nelson (Environmental Services), Tom Armstrong (Planning and Sustainability). Design team members include Ben Ngan and Michael Harrison.

4. Schedule / Budget / Process

Liz briefly reviewed budget and schedule. An updated schedule and budget will be provided at future CAC meetings.

Ben Ngan and Michael Harrison provided overview of design development process and breakdown of topics for each CAC meeting.

5. Existing Conditions Report

Report distributed to members in CAC folder. Members were asked to review report before and bring any questions/concerns to discuss at CAC meeting #2. Mike Coleman from Kittelson Associates will provide briefing of existing conditions report at next meeting.

7. Discussion: Project Goals (All)

Tabled for CAC meeting #2

8. Questions / Next Steps

- Next meeting scheduled for Wednesday, May 6th
- CAC members asked to identify alternate for the stakeholder group they are representing and contact Liz to discuss in advance or bring info to next meeting.



Sam
Adams
Commissioner

Susan D.
Keil
Director

Don
Gardner
Engineering &
Development

Lavinia
Gordon
System
Management

Suzanne
Kahn &
Eric
Peterson
Maintenance

John
Rist
Business
Services

Paul
Smith
Planning

Division Streetscape and Street Reconstruction Project

CAC Meeting #2 – May 6, 2009

Streetscape Alternatives – Design Review

Notes – Comments from Group Break-Out Session

Stormwater v. Parking

- Swales can block access between businesses and parking stalls – “New Seasons” has swales which do not prevent access
- Swales can reduce the number of on-street parking spaces, negatively affecting businesses and blocking access to businesses from remaining parking spaces.
- Concern about trees blocking view of business frontage and signs.
- Question as to whether on-street parking and stormwater facilities can co-locate, through concepts such as pervious paver parking strips and/or narrower stormwater facilities
- Swales establish identity for the community – which could make it a more attractive destination for commercial activity
- Swales can provide more community green space than currently exists
- Request for information on the difference between the amount of square footage of swales and the number of on-street parking spaces between 2a and 4
- Swales might be most appropriate, at least on a large scale, where residential uses predominate
- Some question as to whether the project design should respond to the current uses, or the current zoning, along the street
- In some locations, swales on side streets might be more appropriate
- Swales should be interactive and easy to cross
- Swales can compete with sidewalk cafes for space in the right of way
- Trees – big canopy in street
- Trees – issues with visibility of businesses
- Trees – utilities affect tree selection
- Trees – provide green buffer
- Stormwater – theme of nodes, rhythms, gateways
- Commercial nodes in need of parking
- Spread out stormwater throughout corridor
- Possible theme – ability to unite corridor through stormwater
- Does it need to be a trade-off? Stormwater in planting strip

Traffic Lanes

- Having a single traffic lane in each direction would create a more consistent flow of traffic and thereby increase safety for all modes
- Having a single traffic lane in each direction would narrow the distance pedestrians and bicyclists are required to cross, increasing safety
- Desire for a left turn signal at 39th, to reduce the amount of cut-through traffic on Clinton Street
- Amendment to cross-section is not just about Division – our decisions impact Clinton / Harrison / Lincoln – issues with Diversion
- Curb tight sidewalks along pro-time lanes – exposed, doesn't feel safe as pedestrian
- Bus – school with turning movements – with respect to curb extensions

- 21st - wide sweeping turn for buses heading south on 21st. Unsafe conditions for bikes/pedestrians (long crossing)
- Consider how TriMet operates
- Curb extensions – always concrete?
- Pro-time removal = increased parking, creates “friendly” feeling corridor
- Curb extensions = removed parking
- Identify needs on street and design streetscape to address needs
- In favor of removing pro-time lanes to the greatest extent possible

Bike Infrastructure

- The Draft Bike Master Plan shows bike lanes on Division Street – make sure the Bike Master Plan and Division Street planning processes are coordinated
- Bicycling on Division Street is not a priority and should not necessarily be encouraged
- Ensure safe bike crossings, especially where young people cross (for example, near schools)
- Consider using innovative bike signal technology, such as is used at 41st and East Burnside
- Bike parking on side streets saves more space on Division for swales, auto parking, sidewalk cafes, etc. However parking on side streets may result in increased bike theft.
- Need more bike parking/ corrals on Division
- Bike corrals and individual bike racks should be functional and artistic
- Currently, bikes use the signalized crossing at 28th place.
- Bike / ped signal could be incorporated at se 30th
- A bike corral would be good around 30th, especially if the gym opens there.
- Bike – create north/south connections

Pedestrian and Transit

- Create public gathering areas
- Placing bus stops at curb extensions will be safer for pedestrians and won't slow traffic more than buses already slow traffic
- “Far-side” bus stops provide improved transit times, as they clear the red light and then pick up customers, rather than stopping for customers and then stopping for red lights
- “Far-side” bus stops require longer curb extensions to ensure the buses clear the intersection and require passengers to catch buses away from the intersection, rather than at the intersection
- The need for curb extensions is most critical in the commercial areas.
- Need another crossing between 36th and 39th
- In favor of consolidating stops

Overall Goals

- Safety for all modes
- Encourages transportation modes that are energy efficient (walking and biking especially)
- Public gathering spaces – parks / plazas
- To update Division Street with respect to all transportation modes

Division Streetscape and Street Reconstruction Project
CAC Meeting – August 05, 2009
Traffic Discussion

Intersection:

11th/12th

- Can we have parking on south side of Division since we only need one east bound lane?
- Should we have an advanced stop bar WB to assist with LT movements from 11th onto Division?
- If we have one lane EB 11th and 12th – will bus stop be moved or pullout provided?
- Will Division Place be closed?
- Will you be able to pass a left-turner?
- Can westbound be 1 lane and a left turn pocket at 11th?
- Should not allow parking on North Side 11-12th, lots of reasons for backups – train/LRT
- Buses change drivers – dwell time larger than normal (thus should provide pullout for EB bus at the stop near this intersection)
- Regarding the businesses that will lose parking – orange/11th - what accommodations will be made? (parking study)

Seven Corners

- Bike boxes – access compromised if obstacles like parked cars in way. Please remove parking and extend entrance into bike box (colored bike lane) further back than normal
- Never seen anyone line up in a bike box
- 12-15 deep, bikes can line up 2 deep (need maneuvering room / line up, may need more green time)
- Who has right of way NB at 21st if bike is turning left / car turning right – bike has ROW since its in a bike box
- Bikes cut off by right turners onto 20th
- Dual signals are confusing
- The idea of restricting parking at New Seasons on street (between 19th and 20th) needs more work – 7 spaces on street, if they go away, these cars will need to park in neighborhood
- Left turn out of parking lot causes impacts to Clinton and Ivon
- 19th – 22nd – businesses will be affected if parking is removed
- crosswalk (new) at 20th creates hazard for peds – but peds cross there anyway
- Need pedestrian analysis @ 7 corners to make it more friendly for peds as well as bikes/cars.
- Phasing can allow the new crossing

- Can flex parking happen on North side between 21st and 22nd (request submitted by business owner)
- Idea – don't allow parking certain distance (150'?) from an intersection

26th

- 2 lanes – or 1 wide lane
- Why no dedicated LT turn lanes? – A: identified in the past as a need (related to all 3 intersections) - right turn lane provided 21st to Division
- Can you prohibit left turns? – Policy might prevent this because of diversion onto side streets
- Is this today or are the projections into the future? Will it go up or down (expect to be the same)
- Eliminating parking will change these locations
- Moving traffic so efficiently means no one will stop – business concern
- This is an emergency corridor
- Cut down truck traffic on Division (truck traffic already low volume)
- What's next – how do you use our feed back?
- Don't lose sight of the City's mode mix models – next 20 years, traffic should go down (Powell's targets may affect Division)
- Explain next time how mode mix changes is reflected in design
- Future level of service will include peds/bikes as well autos

Green Streets / Tabor to River

- 22 stormwater facilities identified for Division to help Tabor to the River capacity problems
- 35th to 39th needs pipe replacement and other locations
- May utilize private property to locate stormwater facilities, with willing owners
- is it bioswales – yes, plus green roofs and other methods
- Need to look at tree spacing standards near intersections (should allow closer)
- trees should be in stormwater facilities
- is this the only area for private property program – so far – benefits here affect the locations and down the line
- Will street crown be reduced to better serve stormwater and curb ramps

Open House

- Get bus amenities back on street – comment from attendees
- some participants surprised to see traffic counts go down – they perceive them as going up
- Too much text – need more graphics in place
- Directional signage at open house
- Move dots on images
- More people drawn to large plan
- Most businesses still waiting to comment need more information

- 70+ participants
- People were worn out by the end
- Need a chance to gather in small groups to have dialogue. Have separate facilitated tables – workshop environment instead of open house.
- Don't know what dots mean on some boards – need better way to gather comments
- People that come to public meeting need to know we need information from them
- survey with more specific questions? Shared dialogue creates more involvement than asking for comments – with a seeded questions
- Questionnaire – is this appropriate? In addition to participatory tables? luck to get ___ % response (5%?)
- Get specific locations – people together to talk about these locations
- People in neighborhood skeptical that the project will happen “Believe it when I see it”
- Tool kit templates for people to design their own plan

Additional comments:

- limit residential design to residential properties
- People like flexible space idea
- Related comments: sustainable / green (heavily planted?)
- Commentary / Placemaking – this flex space idea does both
- Lots pf people near curb extensions on Mississippi
- Question about businesses using own frontage identity for tables / chair – should Division design guidelines require dedication for frontage
- Want large canopy
- Make 2 layers of trees 60' apart in park zone and back

Sam
Adams
Mayor

Susan D.
Keil
Director

**Division Streetscape and Street Reconstruction Project
Citizen Advisory Committee Meeting
St. Philip Neri Church, Carvlin Hall
November 4, 2009
6:00 – 8:00 PM**

AGENDA:	TIME:
1. Welcome – Michael Harrison <ul style="list-style-type: none"> • Agenda Review • Public Testimony 	6:00
2. October Design Workshop & Streetscape Design Next Steps - Liz <ul style="list-style-type: none"> • Review feedback • Comments / Questions <ul style="list-style-type: none"> • Jean Baker – There is not enough public interest. We need more maps and information in storefronts and other public places <ul style="list-style-type: none"> ○ Scott – We are working on public displays along the project corridor • Liz Gatti – It looks like there is more than one community vision <ul style="list-style-type: none"> ○ Michael – We need to use the priority matrix to make decisions October's design workshop had intentional attendees; June's was impulsive with a very visual meeting location • Rex Fisher – Priority matrix doesn't show an overwhelming support for 2 lane reduction • Amy Lewin – I liked site specific feedback. We need to retain large trees • Jody Yates – Are curb extensions are crucial? <ul style="list-style-type: none"> ○ Keep in mind it may be better to direct money where development has already occurred. Future development can include updated designs. • Liz G. – What can be learned from the painted streets in NYC? <ul style="list-style-type: none"> ○ Ben (NN) – Solar reflective coatings are so far resilient to buses. Solid yellow for crosswalks instead of white stripes? The coating also creates less solar heat gain than plain blacktop. We are still researching the lifespan and maintenance aspect. ○ Jill Cropp – Bike dots might be confusing. Why do different markings then people are used to. • Jill Cropp - What do we do with the open house comments? <ul style="list-style-type: none"> ○ Liz M. – We will digest the information and will come up with drawing you can comment on. ○ Michael – For December we will design a table of options, showing available funds, and how many particular upgrades we can do, to better direct the plans ○ Ben (NN) – We will re-draw the corridor for the January CAC • Jean Baker – If a business owner says absolutely no trees, where do we stand? 	6:15

- Liz G – What happens if we make a plan and the business refuses, what is the fall back plan?
 - Rhetta – We have a certain number of trees we must add, especially where we take out trees. If the planned tree is in a Tabor to River stormwater facility, they would need to have a pretty good objection. We are however willing to work with property owners on what trees to use.
 - Liz M – We need to focus on the connection between customers of their business wanting trees, same idea with parking removal.
 - Ben (NN) – The next phase (engineering) will deal more with business specific models
 - Jean Baker – Main business objectives are obstructing signage, mess with leaves and water, parking impedence, and liability when sidewalks heave.
 - Amy Lewin – Is there a shrub option for businesses that don't want trees?
- **Discussion – Paving Frontage Zone (Doug Klotz)**
 - The frontage zone is currently narrowed by residents and businesses building fences and landscaping in this space, i.e. Pizzicato
 - The extra 2ft of sidewalk space is most important at major signals with high pedestrian traffic. Let's pave the frontage zone at parking lots in commercial areas.
 - Let's make a policy change for the city regarding frontage zone paving.
 - Jill – It doesn't require a policy change, issues are more site specific.
 - Let's get documentation of community support for future development.
 - There is a difference between frontage and furnishing zone.
 - Chris Eykamp – Anything we can do at 7 corners to widen the sidewalk is necessary.
 - Liz G. – I second Chris. Would be nice for strollers, wheelchairs, etc. Be creative!
 - Anne Nelson – Don't use impervious materials in the frontage zone. Pervious pavers could work as long as they comply with ADA.
 - Liz M – We don't add 2' of sidewalk because of liabilities of uneven surfaces. We will look at the cost of rebuilding sidewalks as they are not in the original designs.
 - Liz G. – 26th Ave bus sidewalk needs to be widened.
 - **Streetscape Design Next Steps**
 - December CAC – We'll bring options to meeting. Example A,B,C
 - Move January CAC later in the month with revised streetscape ideas
 - Early February Public Meeting – Gather public input for February CAC meeting
 - February CAC 2nd-3rd week: Develop consensus from public input
 - Between now and January CAC, reach out to businesses and more community
 - Schedule 2 hr "storefront hours" for businesses to give input

<ul style="list-style-type: none"> ○ Linda Nettekoven – Door to Door would be better ○ Ben (NN) – Old Town Project held 6 lunch hour meetings and got good business support ○ Jean Baker – We are getting into the holiday rush for businesses. Meetings in the New Year would be best ○ Rhetta – Focus on shoppers’ aspect during December ○ Jean – Division/Clinton Business Association Annual Meeting on January at 30th and Division. Very visual spot with parking. Coordinate meetings? ○ Send businesses information about the project and meetings with their block drawing and proposed changes. ○ Vary meeting times between days and early evenings. 	
<p>3. Traffic Updates – Kathy / Liz</p> <ul style="list-style-type: none"> • Waiting for Light Rail proposal for final design specs. • Doug – what is the analysis of eastbound traffic turning left between 11th and 12th, left turn lane? • Liz G. – Is crash data reliable? • Rex – Large vehicles turning use more than their lane • Joseph Auth – What is the diversion analysis from traffic cues 11th - 13th • Westbound 12th-13th not allowing passing • Chris – Move merge west to get a crosswalk east of 19th Ave. • Liz G – Make sure curb extensions don’t impede turns from narrowed streets. • No curb extension on 28th, make extension on Division. • Slowing of school parents at 28th a good idea. • Liz M – One lane through 7 corners doesn’t work because it cues off the screen. • Faster Pedestrian signal response time • Ped Scramble = enough time to cross longest angle. Doesn’t work • Ped Phase = enough time to cross longest crosswalk. Still researching <ul style="list-style-type: none"> ○ Is it possible to do a Ped phase off peak? • Crosswalks needed at 35th Pl or 36th Ave and 38th. • Jody - We are moving the bus zone closer to 39th. 	6:45
<p>4. Review Project Schedule and Discuss Next Steps – Liz</p> <p>Liz Mahon – CAC planned extension into March, any problems contact us. We will email tentative dates for February meetings.</p>	7:30
ADJOURN	8:00

Sam
Adams
Mayor

Susan D.
Keil
Director

Division CAC
December 2, 2009
General Meeting Notes

Liz Mahon – Between now and the next CAC, we will have updated figures for street reconstruction and other required improvements such as ADA compliance. This will give us a better idea of how much money we have for streetscape improvements. The exercise we are doing today will show us where we can adjust our proposal to best fit the public need while staying on budget.

Public testimony – When designing locations for bike corrals, take into consideration emergency services.

- What would be the difference in an emergency situation between a bike corral and a parked vehicle?
- Any changes to 11th and 12th especially should consider the fire station's needs

Business meetings schedule:

- January 12th 7:30am – 9:30am in the 1st floor deli area
- January 13th 11am – 1pm in the 2nd floor community room
- January 14th 5pm – 7pm in the 2nd floor community room

Traffic Update – Work is still being done to fine tune our proposal regarding crosswalks and lane configuration. Currently focus is on 11th and 12th Ave protime utilization for peak travel and off peak parking. At 7 corners, pedestrian counts along and across Division will be taken to assess the possibility for a crossing between Tamarack and 20th.

- If we retained the protime curb lane, could we mark a crosswalk east of Tamarack?
- Kathy – Crash data shows unsafe vehicle movements creating safety concerns for pedestrians. Adding a merge will distract drivers from watching for pedestrians.
- People will be crossing anyways. Will they be safer with a marked crossing or just a curb extension?
- Under what situation can we mark this crosswalk?
- A merge designed for 5 mph over the speed limit will encourage drivers to continue speeding.
- The merge creates a pinch point that may slow down cars.
- What are the markings / signage for the merge
- Slanted arrows painted on the roadway as well as signs indicating a lane drop will be incorporated.
- Can we taper the curb along the merge increase green public space?

What are the positives of Signal ITS

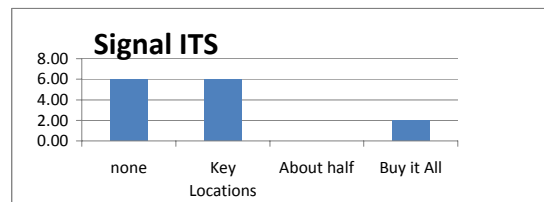
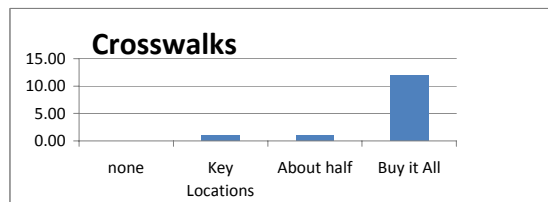
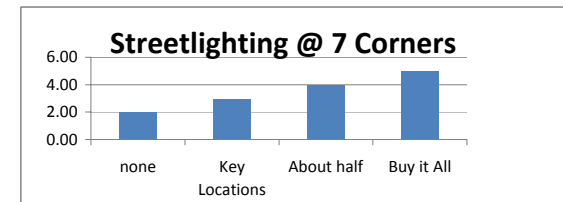
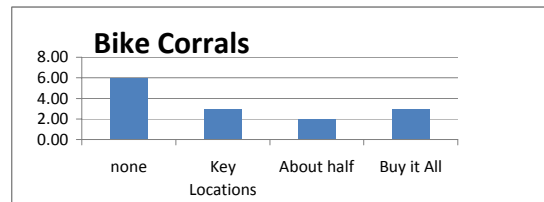
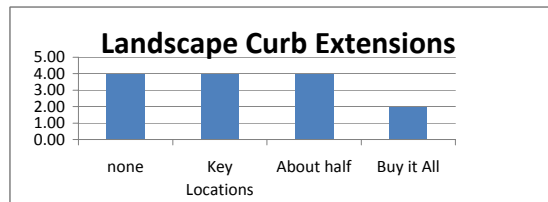
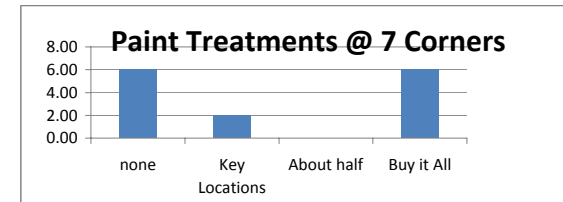
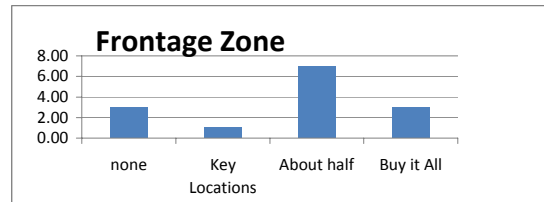
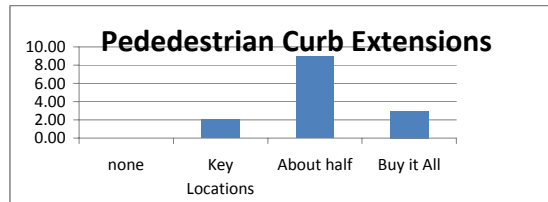
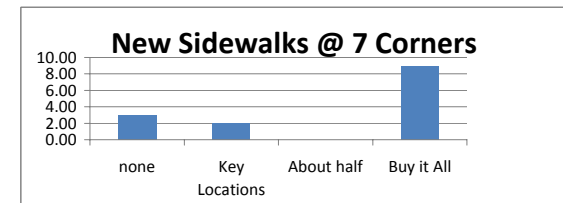
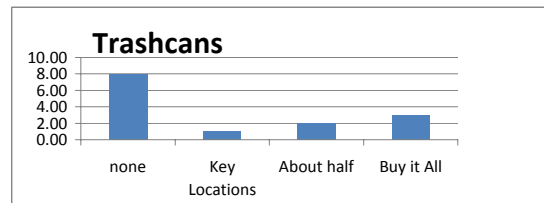
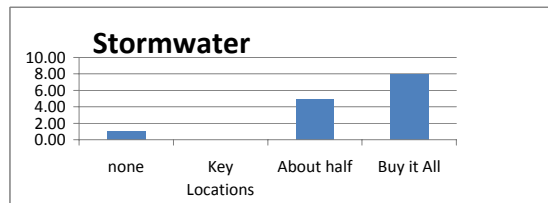
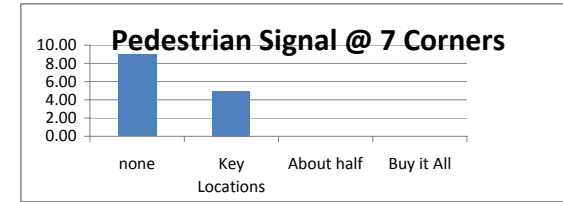
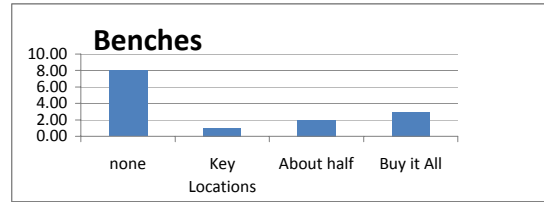
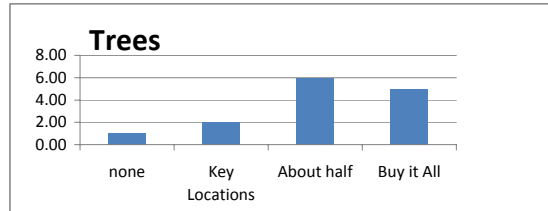
- By linking signals, unexpected vehicle demand detoured from an accident on Hawthorne would flow smoother. It will also be helpful when Light Rail comes into play.
 - Can we get Light Rail to help pay?
 - Not for this project, but possibly if their project creates a need for it.

Do the BES Tabor to River stormwater facilities treat 100% of the water?

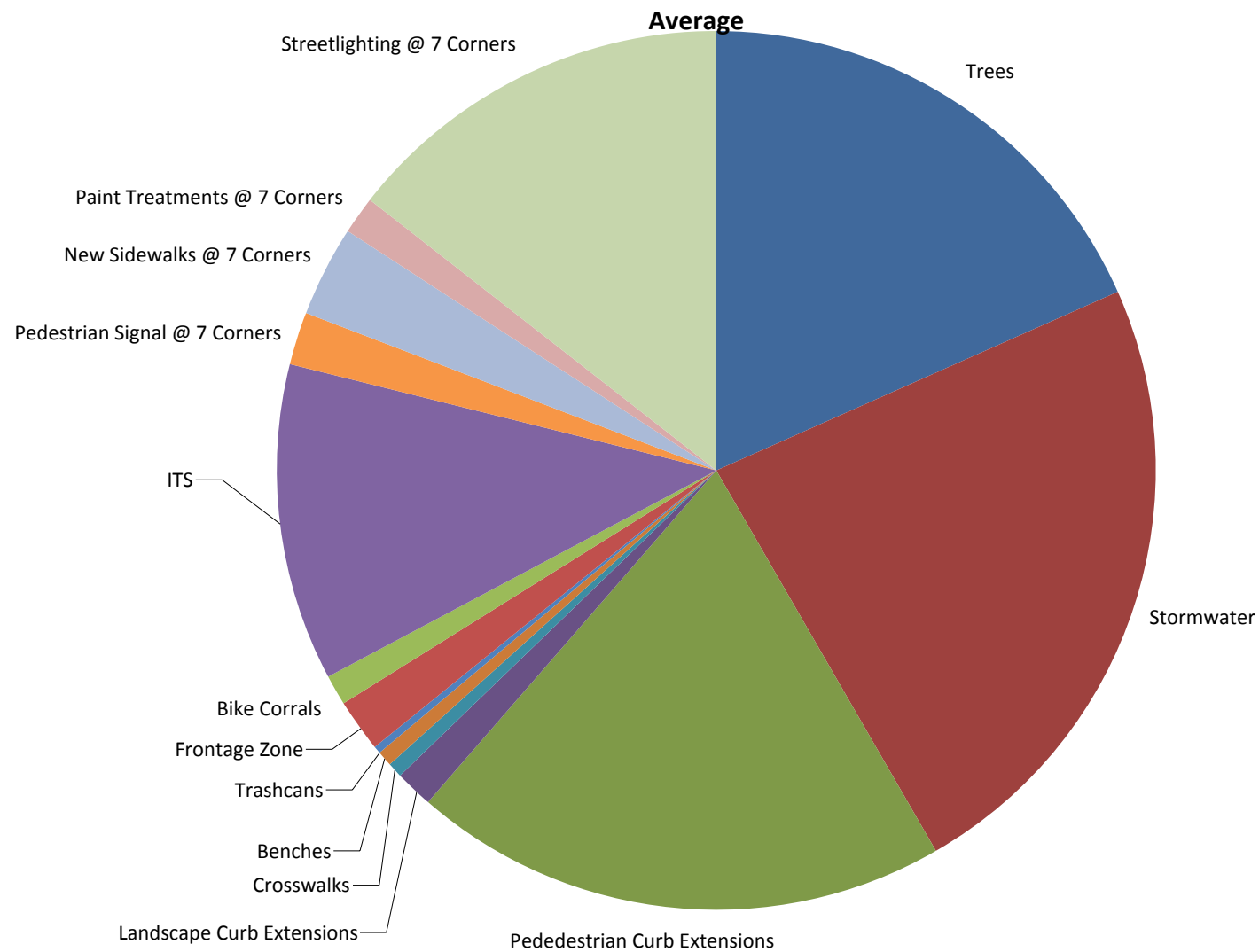
- No, it currently meets the minimum requirement, which may increase in the future.
- Over and Above the BES proposal are functional and some will likely be required by city / federal standards

Submitted,
Scott Snair

Division Streetscape and Street Reconstruction
December CAC
Relative Cost Matrix Analysis
Breakdown by Category



Division Streetscape and Street Reconstruction
December CAC
Relative Cost Matrix Analysis
Pie Chart



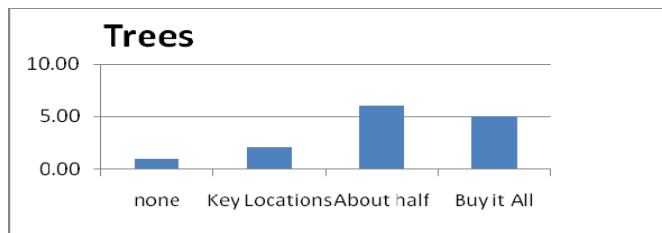
**Division Streetscape and Street Reconstruction Project
Design Memorandum, December 22, 2009**

This memorandum was compiled by Nevue Ngan, Parametrix and PBOT staff to establish and record the current design direction as a result of comments received from meetings with the Citizens Advisory Committee, Public Open Houses and from other stakeholders.

During the December 2 CAC meeting, the committee was divided into three groups and completed an exercise to prioritize improvements shown on the current plan that are additional to the basic improvements that will be included in the street reconstruction project. Thirteen voting CAC members were present and participated in the exercise along with one citizen was ask to join in. The following information for each component of the plan includes:

- Summary chart of how participants voted
- Preliminary estimate of cost prepared by the design team based on the current plan presented at the last public open house
- CAC comments during the exercise
- Recommendations for modifying the current plan

Note that these components are in addition to the basic work necessary for the resurfacing project.



Estimated Cost \$293,000

CAC Comments

- Be mindful of restricting view of signage in business districts
- Provide shade throughout the corridor
- Spend money now or add later
- Low – Though trees are important they can be planted later without impacting our project funds:
 - Let developers pay for trees as development occurs.
 - Address street trees through a Friends of Trees planting
- Medium – Create an overall character by planting some trees now
 - Idea of establishing a rhythm of open and shaded areas
- High – Street trees establish the structure of the street
- Balance – don't take away from pedestrian safety
- Rhythmic with distinction

- Visibility in commercial areas
 - Consider signage, safety and buses

Recommendations for Street Trees

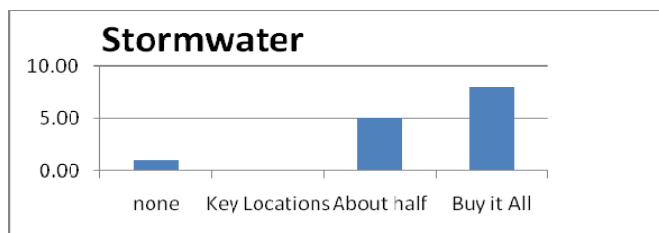
During the open houses, there was a lot of support for planting street trees. They were one of the top three priorities along with landscape areas. Though the CAC seemed split on the importance of funding trees now, the majority of members supported a half level of expenditure for new trees to be included in the project. Positive reasons for planting trees are to enhance the structure and character of the street, provide shade, and to set a visible precedent (for green/sustainability?). Cautious comments indicate members of the CAC were worried about trees blocking the visibility of businesses, compromising pedestrian safety, and paying more than needed to accomplish the same thing.

The design team will continue to research other ways of providing trees for the project at a lower cost, possibly partnering with Friends of Trees or through other City programs (BES?). The number of trees will be reduced by removing trees from areas that will not be affected too much without them or may benefit by not having trees planted at all. We anticipate that some businesses will not want trees.

Several different species make up the existing street trees along the project area. One design notion is to propose a distinctive tree that could be planted along the corridor to provide a consistent rhythm and framework for the existing collection of tree species. For instance, planting native Oregon Oaks (*Quercus garryana*) close to the intersection corners along the side streets would establish important landmark trees that also serve as gateways into the residential neighborhoods with their foliage growing into Division. In time, these majestic trees would become a signature of Division.

New trees are also proposed along Division. Besides providing shade along Division, trees can also provide seasonal color and fragrance to enhance the streetscape. Where new trees are shown in front of businesses, we will make an effort to place them where they will compromise visibility of signage. We will also work with Urban Forestry to provide a list of trees that include existing species that have done well and a few additional species that would enhance the current palette.

Regarding establishment and long-term maintenance for street trees, past streetscape projects that planted trees as part of the general project have budgeted for Urban Forestry to provide establishment services for a two-year period. This includes watering, pruning and other remedial work necessary. During that time, the contractor is responsible for replacement of trees that do not survive the first two years. After that, maintenance is usually the responsibility of the adjacent property owner. If trees were planted as a program with Friends of Trees, the establishment and maintenance is usually the responsibility of the property owner or neighborhood group immediately after planting.



Estimated Cost \$608,000

CAC Comments

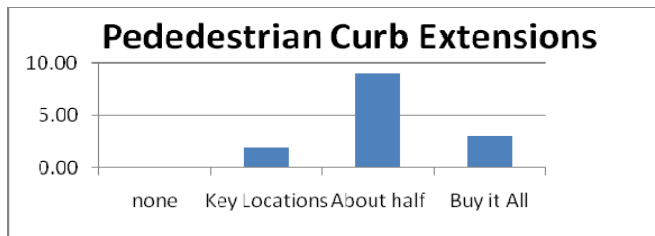
- Added benefit of buffering high pedestrian traffic from the street
- High Priority at 11th and 12th, 7 corners, and 26th
- Creating character and structure **but \$ resp. to deal with stormwater**
- Key locations – future federal stormwater regulations might require other types of investments, so spending on trees now might be ill advised
- Some Areas
 - Parking trade-off
 - Price tag
 - Distribute the more limited number of facilities throughout the project alignment
 - Important aspect of design
 - Character
 - Can developers pay for them?
- If reduce to ¼ - locate near residential
- If reduce to ½ - focus on rhythm, **concerns with facilities in commercial areas**

Recommendations for Greenstreet Stormwater Facilities

Comments from the October open house suggested much support for stormwater facilities even though it was not one of the top three priorities. The CAC vote indicates the majority of them wants between full and half expenditure on stormwater facilities along the corridor. Although there was concern about the high cost, it was a high priority for more than half of the CAC. Positive reasons for providing additional stormwater facilities beyond what is proposed for the Tabor to River project are they add green character to the street and could help buffer pedestrian traffic from the street (when sidewalk is next to a travel lane). On the negative side, the facilities would affect on-street parking. Other comments reflect thoughts regarding the most important places to locate them including at most of the signalized intersections to buffer more active sidewalk areas from curb side travel lanes, focusing on residential, or focusing on commercial areas. There are also a comment suggesting creating a rhythm of stormwater facilities throughout the project area.

The design team will review the current plan with BES again to validate which facilities are the most valuable to build in addition to the Tabor to River facilities. We will then remove stormwater facilities from the plan that are least beneficial and would not affect the overall concept. For instance, removing some of the smaller half-round facilities would leave larger blocks of parking while eliminating a facility that because of its size, provides less benefit for the cost of construction. A priority might be keeping larger facilities that are coupled with other improvements like curb extensions and ramps. To respond to the varying comments about location of stormwater facilities, we will continue to show them throughout the project area to establish a consistent presence especially at the signalized intersections to buffer the pedestrian area from travel lanes next to the curb.

Establishment and maintenance of greenstreet stormwater facilities will be the responsibility of the City. The establishment period can be part of the construction contract. Once the contract is complete, BES is responsible to provide four visits to each facility a year to do whatever is necessary to keep them in good health. More can be done by adjacent property owners or the neighborhood and is encouraged by BES as long as they are aware and approve of additional provisions.



Estimated Cost \$340,000

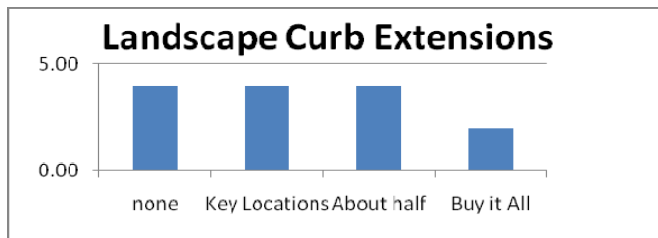
CAC Comments

- Not needed every spot identified, having fewer in an established pattern can effectively reduce vehicular speed
- All – Establish the structure of street as a part of this project
- Some -
 - Where sight distance is lacking (between driver and pedestrian)
 - Every other intersection, maintains more parking spaces
 - Key to nodes and school crossings
 - Safe routes to school program may build some
- Key Places – Clusters
 - Where they help identify parking
- Need parking in commercial nodes

Recommendations for Pedestrian Curb Extensions

The participants in the October open house voted pedestrian improvements such as curb extensions one of the top three priorities. Comments showed heavy support for adding curb extensions and marked crossings to provide better pedestrian safety. The CAC vote indicates the majority of them wanted to reduce pedestrian curb extensions to half the amount shown on the plan. Comments identify their value in helping to provide more structure for pedestrians along the street which may help calm traffic speed, but many did not believe they are needed at every location currently shown. They are most important where they will increase visibility of pedestrians at important crossing points to schools, parks, and other identified safe routes. One comment indicated that they should not compromise parking at commercial area.

The design team will determine where they could be removed from the plan. This needs to be carefully coordinated with stormwater facilities because they are often paired together. Existing curb ramps are also being evaluated to determine which may be in good condition and built to close enough to current standards to be left in place. If these locations coincide with new curb extension shown on the plan, the new curb extension could be removed to save costs as long as a good curb ramp exists at the crossing point. Pedestrian curb extensions will be continue to be shown at bus stops (except where a layover/pull-out stop is planned), school crossings, and at crossing points that need that extra measure of safety. There are several intersections that are offset by quite some distance and are not through routes. Having pedestrian curb extensions at all of them may be more than necessary and will compromise on-street parking in commercial areas. In general, the strategy will be to provide them at a consistent and reasonable spacing along the project area.



Estimated Cost \$34,000

CAC Comments

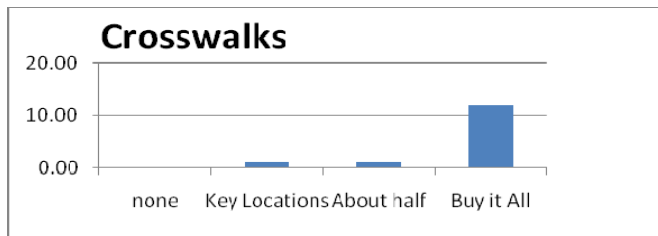
- Concerns about parking (loss of or ease of access?)
- Avoid in commercial areas because preclude parking and walking
- Who maintains the landscape?
- Structural pattern with aesthetic value, slow traffic
- High
 - If less stormwater facilities are built, replace them with landscaped curb extensions to keep the rhythm
 - Landscaped curb extensions provide more green infrastructure for the money, compared with stormwater facilities
- Low
 - I don't like the landscaped curb extensions as designed, they seem like "random" bulb outs
 - Greening of roadway not a priority
- Can we use this cheaper option to pedestrian curb extensions at low count pedestrian crossings
- Should not be used at busy intersections i.e. 28th Ave

Recommendations for Landscape Curb Extensions

The vote indicates the majority of the CAC wanted to reduce landscape curb extensions to between half to none of the amount shown on the plan. Comments indicate that some have issues with the loss of parking and pedestrian space in commercial areas and who will maintain them. Someone expressed a preference for green landscape along the street and another did not think it was a priority.

The design team will consider the comments from the CAC. There are not many landscape only curb extensions. They are mostly paired with stormwater facilities along the south side furnishing zone and curb ramps. They serve to remove parking adjacent to stormwater facilities and to further reduce impervious surface. As we select some of those components to be removed the associated landscape curb extensions will also be eliminated.

Regarding long-term maintenance, our initial thought is that they should be planted with drought tolerant plants or grass if adjacent to other grass areas. After they are established through the construction contract, they are the responsibility of the adjacent property owner to maintain. They should be simple in nature to not present an unwanted burden, but the property owner can always enhance them if desired.



Estimated Cost \$6,000

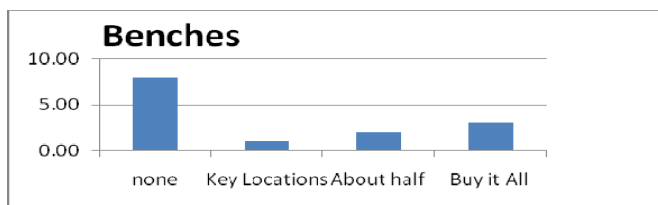
CAC Comments

- Bang for buck
- Locate new marked crosswalks at 32nd Ave for new Pok Pok building, 35th pl to the north, 37th to the north, and 38th to the north
- All –
 - Marked crossings are an inexpensive safety feature
 - Getting marked crossings approved is difficult, so this project represents a great opportunity to try to get them approved all at once.
- Some – Not necessary everywhere
- Key – Too many marked crosswalks is visual clutter
 - Pedestrian right of way
 - They provide pedestrians with a false sense of security

Recommendations for Marked Cross Walks

The participants in the October open house commented heavily to add marked crossings to provide better pedestrian safety. Most comments linked them with pedestrian curb extensions which was one of the three top priorities. The CAC was nearly unanimous in wanting all the marked cross walks. They realized that the cost is small for something that could be a big asset for pedestrians. There were suggestions on some locations that would benefit from them. The only negative is whether they present a false sense of security to the pedestrian.

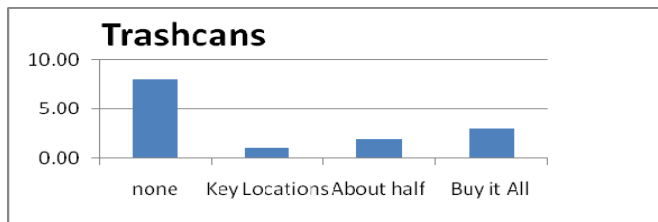
The design team will locate marked cross walks for consideration by PBOT staff. They will be included in the final plan if allowed. Twelve crosswalks are in the cost estimate as a budget. More can be added if desired. There was some discussion on adding pedestrian scale lighting at marked crossings. We will consider adding that to the plan, however it is doubtful that there is funding to add them.



Budgeted Cost \$20,000

CAC Comments

- High – Minor cost. Good investment if the maintenance issue is resolved
- Low – Benches are already at inbound bus stops. No need to spend project money on more benches
- Spend money on infrastructure instead
- Delay street furniture to later phases, after improvements are built



Budgeted Cost \$10,000

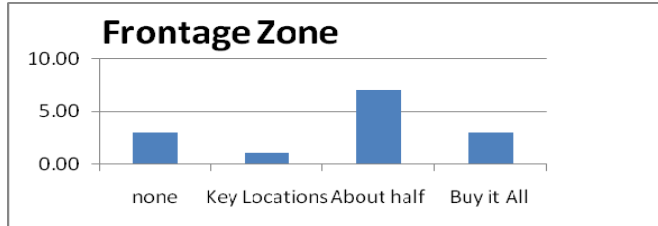
CAC Comments

- Incorporate Recycling
- High – Minor cost. Good if the maintenance issue is resolved
 - Spend money on infrastructure
- Delay street furniture to later phases, after improvements are built

Recommendations for Benches and Trash Cans

Though six CAC members supported varying levels of investment on benches and trash cans, the majority of the CAC did not want any money spent on these site furnishings. The comments suggest that other improvements were a higher priority. There were worries about servicing and maintenance. These items are wanted for the street, but maybe later when more funding is available.

The plan will not show locations for these site furnishings or include them in the budget.



Estimated Cost \$40,000 (adjacent to signaled intersections only)

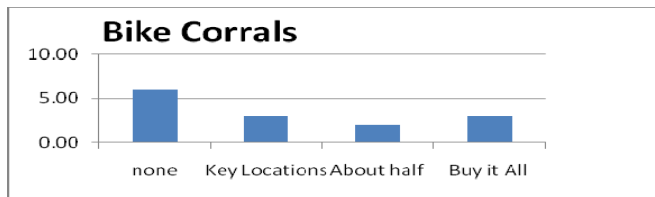
CAC Comments

- Important at 7 Corners and other commercial areas, i.e. Little t's
 - Good for commercial zones in pedestrian areas
 - Not throughout corridor, every site is unique

Recommendations for Frontage Zone Paving

The CAC seemed to be split on this, half the members voted for half of the allocated budget. The rest were split on all or none. The few comments suggested that it would be important at busy commercial areas to have as much paving as possible in the sidewalk area.

The design team will continue to investigate if additional paving at the building frontage zones should be included in the plan at the signalized intersections of 11th/12th, 7 Corners, 26th, and 34th. See recommendations for new sidewalks at 7 Corners.



Estimated Cost \$25,000 (for five corrals)

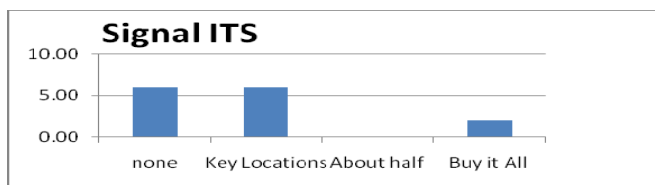
CAC Comments

- Not extremely important for this project because businesses will pay for them in the future at no cost to the project
- Not in front of Division Hardware because it blocks the loading zone. Move it to 38th in front of urban development project
- Bike corrals eliminate on-street parking, which limits places where emergency vehicles can park when responding to emergencies
- Reasons to support them include the fact that they are used, and including them is also a good “nod” to the bike community
- Need one at Division and 34th
- They are not key to character of the street, so shouldn't be a funding priority

Recommendations for Bike Corrals

At the October open house there were several comments for and against bike corrals on Division. The majority of the CAC voted for one or no bike corrals. There was a concern about impeding emergency vehicles if placed on Division and one location shown is not a good one. Other comments suggested that they are a good addition to Division, but should not be paid for by this project.

The design team will continue to show the preliminary locations provided by PBOT, but will include only one in the budget for the time being.



Estimated Cost \$250,000 (possible to implement a partial system?)

CAC Comments

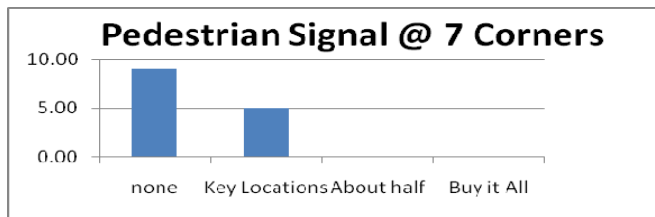
- How do we rationalize the cost for this project? Only worth the money if it reduces Division to two travel lanes.
- Can increase travel efficiency on Division
- Can help with easing traffic issues related to light rail
- Once economy picks up more, there will be more traffic. Taking away lanes could be problematic in the future.
- No unless Division can have fewer lanes

Recommendations for Signal ITS

The CAC vote was split, six for, six against including it, with two voting for funding a quarter of it (not sure if partial funding is possible). Comments indicated that it is not worth spending a

significant part of the budget to increase efficiency unless it would change the street cross section by eliminating two travel lanes for the entire project area.

The results of the traffic analysis did not include Signal ITS to arrive at conclusions for the corridor, therefore it is not necessary. PBOT should continue to evaluate the benefits of including it and update the CAC if there is a significant reason to re-evaluate including it.



Estimated Cost \$50,000 (all or none)

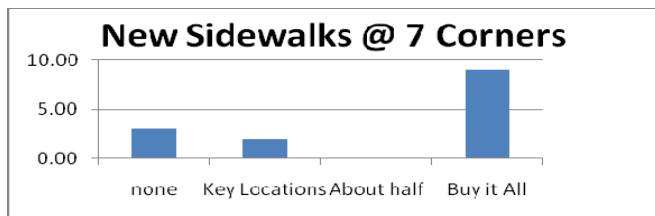
CAC Comments

- Not a priority, but in favor
- Opposed because it is unsafe

Recommendations for New Pedestrian Signal/Crosswalk at 7 Corners

The majority of the CAC vote was to not include the crosswalk and signal. Comments were that it was not a priority and that it was not viewed as safe.

The crosswalk and signal will be removed from the plan.



Estimated Cost \$48,000

CAC Comments

- Wait for developer to improve the sidewalks
- Make the corner at 21st look good
- Don't rebuild the existing sidewalk, but add the sidewalk extension as shown in design

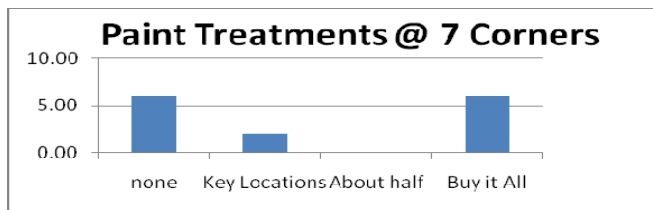
Recommendations for New Sidewalks at 7 Corners

The majority of the CAC voted to include new sidewalks or a smaller portion in the plan. Only 3 voted to not include any. There were only a few comments that suggested waiting for redevelopment to rebuild the sidewalks except at the SW corner of 21st that will be reconfigured in this project to create more sidewalk area for pedestrians which reduces street paving and crossing distance.

Rebuilding the sidewalks is closely coupled with introducing stormwater facilities, street lights, and street trees. The reason new sidewalks were shown on the plan was since the street cross section was going to be the same at 7 Corners, rebuilding the sidewalk area is one of the only

ways left to at least make it a better place for pedestrians. But building new sidewalks and new lighting is very expensive for one isolated area of the project. Deferring new lighting and only building new sidewalks may require partial demolition and reconstruction at a later date of to add lighting. An argument can be made to defer new sidewalks and lighting improvements off until the redevelopment of the Reach site and the Dominos/Market site could pay for them. The plan would become a development guideline for them. The only problem is how long we have to wait for redevelopment to take place.

The design team will finalize the plan showing new sidewalk at the Reach and Domino's site. It can be determined later if any is included in this project besides the SW corner at 21st. If not, the design work could at least serve as design guideline for the developers when they redevelop the 7 Corners sites. See 7 Corners street lighting.



Estimated Cost \$27,000

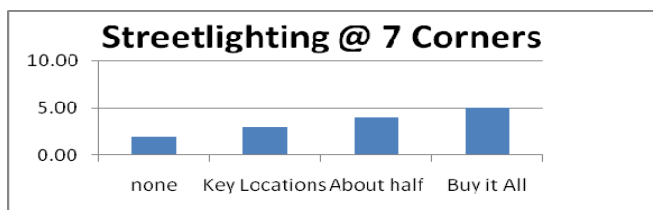
CAC Comments

- Don't use project funds on painting the infrastructure
- The paint will look bad over time
- Don't like the aesthetics of the paint design
- How long will it last?
 - 2-5 years

Recommendations for Intersection Paint at 7 Corners

The CAC vote was split, six for, six against including it, with two voting for funding a quarter of it similar to new sidewalks. Comments indicated concern about durability of the coating.

The design team will remove this from the plan. We may continue to research the product to know for sure what its longevity and maintenance routine would be.



Estimated Cost \$255,000

CAC Comments

- Add street lighting @ 26th to Clinton St.
- Streetlights at all marked crossings
- Where no cobras today, supplement with ornamentals
- Keep a logical rhythm

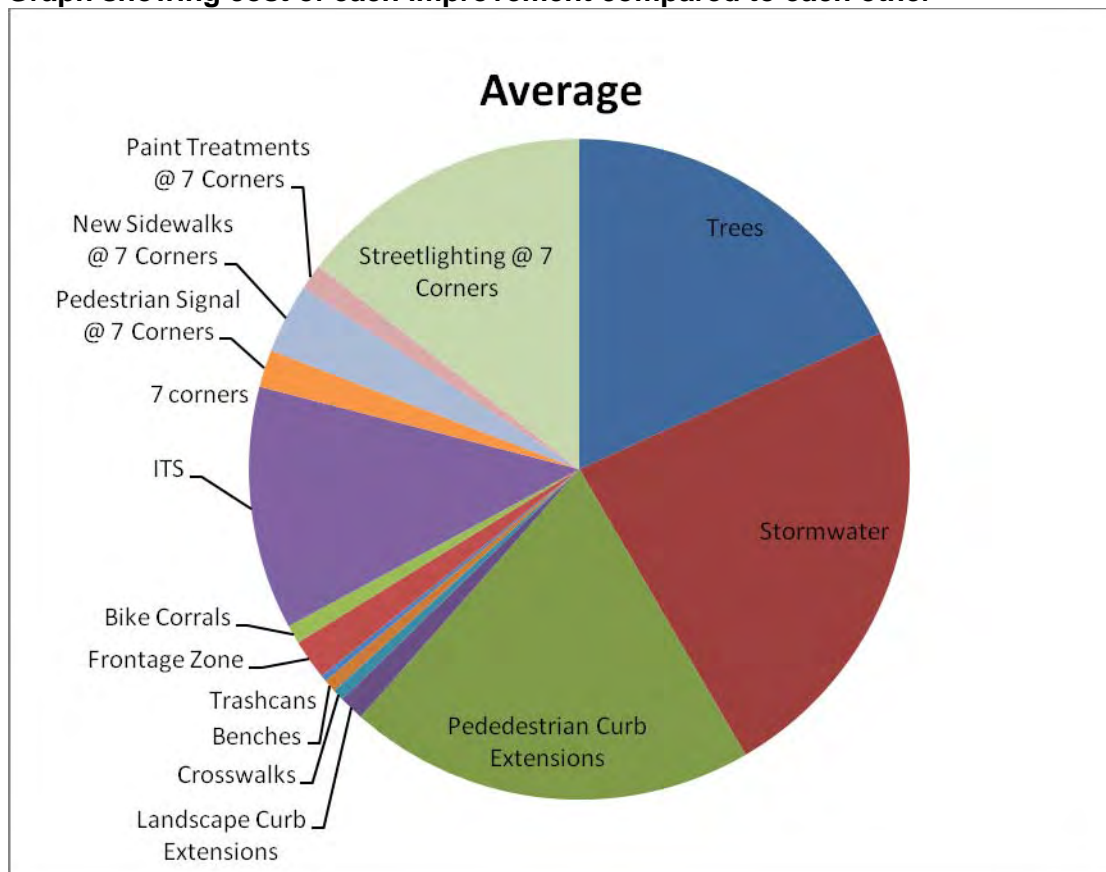
- Not only at 7 corners. Spread new lights through the corridor
- ½ at 7 corners, distribute the rest
- Want pedestrian lights but they don't have to be at 7 corners
- Create key nodes along the corridor, a sense of place
- Lights are infrastructure that you can do now, but not later

Recommendations for Street Lighting at 7 Corners

The CAC vote was weighted toward providing between half to full expenditure for street lights at 7 Corners. The comments also voiced a want to have lights at other locations in the project area.

The design team will review the layout lighting layout at 7 Corners. The intent was to provide pedestrian scale ornamental lights, 15-foot tall fixtures, in a more frequent spacing than necessary. This would provide a vertical element on the street that would enhance 7 Corners. The spacing could be farther apart to reduce costs, but will still have to work with other improvements like street trees and stormwater facilities in the furnishing zone. In addition, we will develop other ideas on integrating more fixtures into the plan. However, the expectation of including lighting, even at 7 Corners, should be tempered with the reality that there is currently no budget for it and it would likely be one of the first items to eliminate from the project scope.

Graph showing cost of each improvement compared to each other



Sam
Adams
Mayor

Susan D.
Keil
Director

Meeting Summary

Division Streetscape and Street Reconstruction
Community Advisory Committee (CAC) Meeting
January 28, 2009 – 6pm to 8pm
St. Philip Neri, 2408 SE 16th Ave
Portland, Or 97214
Carvlin Hall

CAC Members Present:

Amy Lewin, Carolyn Brock, Doug Klotz, Seth Gallant, Andy Butler, Linda Nettekoven, Charles Kingsley, Joseph Auth, Rex Fisher, Tom Ralley, Ben Vaughn, Jill Cropp, Holly Krennek, Liz Gatti, Neel Pender, Chris Eykamp, David Aulwes, Matt Wickstrom(ad-hoc)

CAC Members Absent:

Darice Robinson, Jean Baker, Julia Steig, Kina Volez

Members of the Public:

Kathryn Notson

Staff:

Liz Mahon(PBOT), Jody Yates(PBOT), Scott Snair(PBOT), Michael Harrison(Parametrix), Ben Ngan(NNA), Olena Turula(NNA), Kayo Tokuda(NNA), Kevin Robert Perry(NNA)

Public Testimony

Sending the block by block designs to businesses was a great idea! Hoped to get more responses then we obtained in Phase 1. Be sure to ask about driveway access and loading zones. These concerns could make/break parts of the plan. Concerns with trees came up regarding leaves on roofs and vandals climbing to graffiti buildings.

Project Updates / Schedule Review

Liz Mahon - Looking forward, the schedule for next month includes:

- Open House on February 10th 4pm-7pm
- CAC Meeting February 16th 6pm-8pm
 - In conflict with HAND Meeting and other City Meetings
 - We will reschedule February's CAC or defer to our March 3rd meeting
- CAC Meeting March 3rd 6pm-8pm

RACC Process moving forward with a new project manager

Presentation of Revised Streetscape Design

Review Project Goals and Design Priorities – *PowerPoint Presentation*

Questions from CAC Members:

- Can we include Smart Trips as an element of this project?
 - Our SDC funding requires an increase in transportation capacity; we can look into Smart Trips, but not to build for less vehicular demand.

- CAC still doesn't have a grasp of what our budget is.
 - There are still unknowns in cost of paving and possible additional funding. We will come to the next meeting with a few scenarios of how our budget may work out.
- The CAC continues to have a disparity in streetscape and traffic ideas.
 - Consequences in achieving the prioritized project goals include certain traffic safety improvements. See our "7C Design Memo" for more discussion.
- Have you met with all the businesses losing parking?
 - Scott visited businesses door to door following up on block by block mailers showing potential parking losses. Attendees of our outreach meetings were also informed. Another contact will come during the design phase where project and design staff will again meet one on one with business owners to discuss changes to their property access.
- Concerns about increased pedestrian danger from paving over old surfaces and creating a shorter curb.
 - Our original paving estimate included grind and overlay, which would retain the curb height. We will bring attention to this detail when we receive the updated paving estimate.
- Large swales at 33rd, 35th, and 38th should be next on the cut list for budget restraints.

Group Discussion of Revised Streetscape Design

Can you support moving forward with this design and presenting it at the Feb 10th Open House?

- Remembering that this is a transportation project, this design does a good job balancing the aspects of multi-modal transportation strategies with enhanced streetscape design and safety.
- Traffic design with 4 lane intersections favors vehicular traffic.
- In my mind, 7 Corners is not an ideal place to create a community space. We should create smaller community spaces at calmer areas within the corridor.
- We need to prioritize pedestrians over vehicles.
- Without less demand, we will be creating diversion on neighborhood streets.
- Concerns about parking losses.
- We should be careful not to build infrastructure that prevents future improvements of 7 corners.
- This project needs Transportation Demand Management.
- The CAC should be involved in a process to deal with more or less budget.
- Include a plan to add improvements if demand is reduced.
- This is a chance to be green and incorporate the ideas of the Climate Action Plan.
- Include the foresight of spaces for benches and trashcans with public / private investment.
- Remember that implications to the traffic infrastructure affect the response time for emergency vehicles. Include the appropriate bureaus in the design process.
- The safest crossing at 7 corners is at the 21st Ave intersection.
- Swales and raised tree wells in the commercial districts reduce pedestrian space.
- What are we doing to remedy vehicles getting trapped in the signals at 7C's?
- What are the limitations for trees at transit stops? Will street trees get clipped by transit and large trucks?
- Incorporate streetscape elements and art.

Next Steps

- February 10th Open House
- Next CAC meeting March 3, 2010
- Final Project Report/ City Council

Sam
Adams
Mayor

Susan D.
Keil
Director

Division Streetscape and Street Reconstruction
March CAC
03/31/2010

Public Testimony

Make sure to preserve delivery and driveway access along Division Street

Project Updates

Updates to Conceptual Plan – Olena Turula

- Much of the plan remained the same. Where revisions occurred, they were minor adjustments / consolidation of stormwater facilities, as well as updating a recently installed bike corral at Whiskey Soda Lounge.

Engineering Phase – Elizabeth Mahon

- While we are still finishing up the conceptual design phase, we have begun preparation for the engineering phase. An RFP has been issued to KPFF engineering. Nevue Ngan will remain on board as the landscape designer to continue the themes developed in the CAC process. Volunteers from our CAC will form a Design Advisory Committee (DAC) to assist in specific project decisions in the engineering phase starting at 30%.
 - Linda Nettekoven– Will interested members of the CAC automatically make the DAC?
 - ◆ Elizabeth Mahon– Yes, and only CAC members will be asked to join because of their extensive background knowledge of the project.

Develop CAC's Final Recommendation

Michael Harrison – This letter was drafted in a meeting with CAC members Jill Cropp and Linda Nettekoven. While I crafted the wording with notes from our meeting, I will ask Jill and Linda to speak briefly about how they determined the bulleted ideas and theme of the letter.

- Jill Cropp– The purpose of my comments in this letter was to express the general consensus of this group.
- Linda Nettekoven – In realizing that some members of the CAC will not be continuing with the DAC, I wanted to guide the new committee with the message of the CAC.
 - Doug Klotz – Very comprehensive letter – good first attempt

Michael Harrison– Some observations I urge the committee to keep in mind as we edit this draft are:

- Is this a step forward in the progress of Division Street
- Don't make too many points. Your message may be lost in a letter of specific requests.

Rex Fisher – If there is a minority dissenting opinion, should we discuss it here, or draft our own letter?

- Michael Harrison – If it's a matter of wording, we should try to reconcile it here. If it's a difference in larger project ideas, please make your comment, but plan to write your own letter.

Jill Cropp – Is the CAC letter part of something bigger?

- Elizabeth – Yes, the CAC letter will accompany information gathered from CAC meetings and open houses throughout the public process, in addition to the streetscape design. This streetscape plan will be drafted in April.

Drafting of CAC Letter

Through 3 hours of draft edits, the CAC was able to create a majority final recommendation. The bullet items were decided, with wording on the final paragraph to be discussed over email. The minority opinion respectfully declined to recommend the letter, with the intention of writing their own letter.

Next Steps

Discussion to retain parking at the REACH lot – Chris Eykamp

- To be discussed over email

Presentation to City Council – Elizabeth Mahon

- A date has been set for City Council – May 26th at 10:00am time certain. We will be working to this goal by preparing the written Streetscape Plan to be presented to council.
- Michael Harrison – I encourage members of the committee to attend. It is one thing to send a letter on behalf of the CAC, but it shows more support for members to attend the hearing and testify in person.

APPENDIX C - PUBLIC FEEDBACK MASTER LIST

<div><div><div><div></div><div>CITY OF</div><div>PORTLAND</div><div>BUREAU OF</div><div>TRANSPORTATION</div></div></div></div>					June Open House
					October Open House Comments
					Initial Business Contact
					January Business Outreach Comments
					February Open House Comments
					Follow up Business Contact
Division Streetscape Design Workshop 10.10.09					
Design Notes					
	Block	Side of Street	Regards	Keyword	Note
	Corridor wide		Pedestrians	Sidewalk width	Be sure enough space for elderly/walkers/guide dogs/ and parents with strollers to walk safely on sidewalk
			Pedestrians	Urban Plazas	Create pedestrian stopping places
			Pedestrians	Marked crosswalks	Please consider more designated, striped crosswalks at curb extensions and all along Division St. (2)
			Pedestrians	Marked crosswalks	Creative crosswalks; raised / treatment differences
			Pedestrians	Marked crosswalks	Nice to add more crosswalks but make them smooth, otherwise, hard to cross in wheel chair.
			Pedestrians	Marked crosswalks	Brickwork hard for any kind of cane
			Pedestrians	Marked crosswalks	Painted method for striping crosswalks does not wear well and ends up looking tacky. I would rather have no marking
			Pedestrians	Pedestrian activated lights	I think crosswalks are really dangerous for pedestrians. Stick with pedestrian activated lights.
			Pedestrians	Pedestrian safety	Make Division a safe street for pedestrians. Slow traffic, mark every crosswalk and light them at night. Put as many corner extensions as possible and signalized 4 way traffic lights every 2 blocks to help slow traffic.
			Pedestrians	Curb extension	Reflective paint on curb extensions to help drivers see pedestrians at night
			Pedestrians	Curb height	Make sure curb exposure/ curb height complies with the 4" minimum recommended in the Pedestrian Design Guide
			Pedestrians	Street Lighting	Explore lighting options for safety
			Pedestrians	Street Lighting	Add street lighting at pedestrian crossings
			Furnishing Zone		Street lights, parking signs, benches
			Frontage Zone		Uses: window shopping, passing other walkers, café tables
			Flexible space	Outdoor Seating	Tables out on busy streets mean customers get to suck exhaust and shout over traffic noise. The only actually pleasant outdoor seating is off street courtyards
			Flexible space		Love space in front of business
			Flexible space		When developing public 'flex spaces' include spaces that are truly 'public' such as freestanding benches, benches incorporated into stormwater facilities, etc. Most of the spaces shown in the photos show primarily seating areas
			Flexible space		Will the store owner be charged for flexible space?
			Flexible space	Outdoor Seating	Love the café flex space: 5X down the street
			Sidewalks	Scoring	Scoring in new concrete should match existing historic scoring for smaller, pedestrian scaled units
			Sidewalks	Scoring	Scoring on all new corners should match historic scoring instead of plain blank concrete
			Road surface	Concrete band separating traffic from on street	Concrete band a great idea
			Road surface	Paver parking strip	love the paver parking area. Use as much as possible
			Road surface	Grass	On streets with low demand for parking, "depave" the parking portions of the street and let grass grow. More greenness, more pervious surface, cheaper to maintain. There is at least one street in Brooklyn, a block or two off of McLaughlin
			Signals	signalized intersections	Consider adding signalized intersections every two blocks (+/-) to slow down traffic and improve pedestrian crossing
			Signals	signalized intersections	Yes, Signals will also help channel bikes to/from Clinton.
			Signals	Visual and hearing impaired people	Prefer ABS signals. Visual and hearing impaired as well as older people need enhanced audible and visual signals
			Utilities	Underground	Put utilities underground (2)
			Utilities	Underground	Please Bury Utilities while street is opened (2)
			Bikes	Bike lanes	No bike lanes on Division
			Bikes	Bike Boulevards	Encourage bikes on Clinton, cars off Clinton
			Bikes	parking density	Some businesses are willing to trade vehicle spot for 20 cycle spots! That means more customers.
			Bikes	green bike box	Yes to 21st approaching Division
			Bikes	bike safety	Cars need to share road but as a cyclist I feel I am in more danger from other cyclists than cars; need law enforcement - numerous disrespectful anarchistic cyclists - have been cycling in Portland since 1970
			Bikes	bike parking	Create bike corrals at key, busy commercial spots in the place of one or two parking spots on Division. Maybe at the expense of a stormwater feature on that block. Be careful not to remove too many parking spaces on Division
			Bikes	bike parking	Design bike corrals to accommodate larger bikes, i.e. cargo bikes, tag along, etc.
			Bikes	bike safety	Cyclists are better/safer on Clinton st. than Division
			Bikes	bike safety	I bicycle on Division. It is faster and safer because of side street traffic and driveways on Clinton.
			Bikes	Signage	(2)Needs to be signage (visible to cyclists) to alert cyclists on Division and 39th to nearby Bike Blvd. locations
			Bikes	signage	Is signage going to be putting place to inform cyclists of nearby bike blvds? Get them off the street for safety.
			Bikes	signage	Signs to bicycle route
			Trash		Artistic trash cans needed
			Trash		Have trash receptacles and bottle recycling at bus stops
			Trash		Trash receptacles, big ones for lot of coffee cups. Place at many corners, especially at bus stops.
			Trash		Great idea, keep our streets clean
			Art	Design balance	Authenticity may be more important than unity and sameness. Allow different sections of Division to be different than others
			Art	Urban Plazas	Discover and create community gathering places for all ages
			Art	Historical markers	Leave one horse tie loop
			Art	Historical markers	We need better protection of historic structures.
			Art	Historical markers	This is cliché and a bit contrived. Let the neighborhood exist on its own without the orchestrated historical markers or exhibits

	Block	Side of Street	Regards	Keyword	Note
			Art	Local Artists	It would be nice to highlight the artists that exist on the street, reflect the local art walk & perhaps a community space or studio spaces for artists, as well as promote the sustainable gardening practices of many of the neighbors as features
			Art	Existing Character	Many of the 1-2 story commercial buildings, bungalows & other residential houses are being wiped out. These give Division its character. Don't tear them down to erect 4-story buildings
			Art	Design nodes	Places for Artsy Community bulletin boards at each node to reinforce/inform of node related info. 7 corners; 21st; 26th; Pok Pok block
			Art	Design nodes	Create design nodes at intersections with similar plantings creating "gateways"
			Gardens	Access to light	Consider "access to light" of residents. There can be no vegetable gardens when 4-story building block out all light
			Landscaping	Design Balance	Unify landscape and plant choices for added green against cars/street and color/texture
			Landscaping	More Green	Would love to see more green in area - including commercial nodes - to shade, protect from noise and create a more friendly stree
			Stormwater Facilitie	Pedestrian buffer	I support bioswales/ planters on Division. The more trees and planters, the greater number of pedestrians and feel of promenade on Division
			Trees	More Green	Love trees over the street
			Trees	Private incentives	Creative incentives for property owners to de-pave and plant trees. If the project can't cover all costs.
			Trees	Design guideline	Create design guidelines for street trees & preferred plantings. I like Katsura Maples!
			Trees	Transplant	Do all storm water facilities remove existing trees and put in new? Why not accommodate existing healthy trees?
			Trees	Native plantings	Please plant native trees to attract wildlife.
			Trees	Maintenance	Concerned about trees cracking sidewalk
			Trees	Maintenance	I have problems with large canopy trees and the maintenance needed
			Trees	Maintenance	Dwarf trees for commercial areas to reduce leaves on roof and for signage visibility
			Trees	More Green	Plant more trees, they help the environment
			Trees	Volunteer plantings	Contact city repair to organize volunteer planting with neighbors
			Trees	Maintenance	I support the plantings of trees, but have concerns about the maintenance costs for tree health, and leaf removal.
			Trees	Tree species	Please do not plant Gingko trees because of allergies and cleaning the debris.
			Tree rings	Historical markers	Do something to create the feel of what the huge old growth that were here.
			Tree rings	Personification	I love the tree rings idea. Allows for personification. Remember Pedestrians
			Tree rings	Sponsors	Tree ring sponsors are key.
			Tree rings	Pedestrian Movement	If the rings are too big, it makes it hard for guide dogs and double wide strollers.
			Tree rings	Pedestrian Movement	Tree rings interfere with handicap/wheelchair mobility. Takes up space needed to go around obstacles/obstructions
			Protime	Congestion	Please do not eliminate pro-time lanes, it will cause traffic congestion (4)
			Protime	Congestion	Cutting 12th - 20th to 1 lane each direction will make 7-9/4-6 backup traffic a lot. There's little retail and homes...
			Protime	Congestion	Removal of protime lanes will make Division traffic more unpredictable and slower
			Protime	Mistake	Elimination of the Pro-time lanes will be a very big mistake
			Protime	Diversion	Please do not eliminate pro-time lanes. Traffic will divert through neighborhoods to Clinton and Hawthorne (2)
			Protime	Diversion	I am the experiment. I drive on Clinton to avoid Division.
			Protime	Diversion	Do not eliminate pro-time lanes. Cars will be diverted to Clinton
			Protime	Diversion	Pro time lanes will divert traffic to side streets and increase problems on Lincoln/Clinton, plus increase traffic trouble trying to enter Division
			Protime	Diversion	A lot of traffic will spill onto Clinton. It is already a dangerous bike boulevard
			Protime	Diversion	More people move to Clinton, already busy as a bike blvd. We're tying to get cars over to Division (3)
			Protime	Diversion	It would be nice to add speed bumps on neighboring streets to reduce diversion.
			Protime	Plan for diversion	If this project creates Diversion, is there a way to reverse some aspects of the project by re-instituting the pro-time lanes?
			Protime	Mode Split	Perhaps increased traffic due to the elimination of pro-time lanes will encourage more people to take the bus or ride their bike. Or at least not take 84 or Powell instead. This could end up being a positive thing
			Protime		Pro-time lanes wreck the neighborhood feel.
			Protime		Reduced capacity = reduced traffic
			Clinton	1 way	My dream is to turn Clinton Street into 1 lane / 1 way car traffic with a designated bike/ped lane
			Clinton	1 way	Clinton: devote more roadway space to ped/bike (1-way street)
			Clinton	traffic calming	Hmm, I wonder...Clinton is a pretty slow street. Speed bumps, roundabouts, etc might make people choose different routes entirely, i.e. Powell. This could reduce overall traffic in the neighborhood or at least slow it down.
			Clinton	limit auto traffic	Can you discourage cars from using Clinton during rush hour or all the time?
			Clinton	limit auto traffic	Prevent diversion to Clinton by closing Clinton St. to auto traffic at various places e.g. east of 26th.
			Ladd	limit auto traffic	I like the ideas of improving the traffic flow on Division by limiting auto commuter traffic on Ladd Avenue. Perhaps making Ladd a right turn only onto Division or reducing the number of green lights to force cars of Ladd and onto Division / Haw
			Traffic	Diversion	I think we need to make sure with traffic speeds (reduced) that we don't end up pushing traffic onto side streets; I.e., we may need to look at traffic calming on these streets too
			Traffic	Diversion	Respect classification of cross and parallel streets
			Traffic	Turning lane	Dedicated turn lane will allow 3 lanes to move traffic efficiently
			Traffic	Optimize through traffic	Any consideration for short dedicated left turn lanes or removal of parking at some intersections? Seems like there might be backups at some locations due to the removal of pro-time lanes
			Traffic	Right turn trap	Consider right turn only areas so traffic can flow
			Traffic	Merge	Like the plan. Small concern on the eastbound merge length at Tamarack and traffic migration.
			Traffic	Curb extension	I urge caution with curb extensions and turning radius'. The extensions at 41st have a number of chunks missing.
			Parking		Parking lane too skinny
			Parking		I don't like all the parking on Division St. I'm concerned about traffic congestion and slowing down line 4. Do we really feel that there is a need for more parking?
			Parking		I like that this project is removing parking at intersections to allow for through traffic around left turns.
			Transit	Frequency	Need to increase public transit frequency, not cut down the bus schedule as has been happening
			Transit	Frequency	#4 bus's frequency and fluidity should be a priority if there's going to be a truly green future conscious
			Transit	Frequency	#4 is not as frequent as the #14 on Hawthorne
			Transit	Bus zones	It is important to get buses entirely out of traffic lane @ stops. If needed, pull sidewalk in 6"-1' for distance of bus zone
			Transit	Bus zones	Can the buses pull out of traffic if the approach is at an intersection?
			Transit	Bus zones	As a Division bus rider and driver, it is ok to eliminate pro time lanes if busses can pull out of travel lanes
			Transit	Bus zones	Not having bus pull outs will create big backups where pro-time lanes are eliminated. Steal some curb every couple stops If narrow width is an issue not allowing the bus to get completely out of lane. People get pissed sitting behind busses.
			Transit	Bus zones	I would like to see bus pullouts at every stop, or bus lanes.
			Transit	Advance Green	Give Trimet advance green

	Block	Side of Street	Regards	Keyword	Note
			Transit	Enhancements	Enhance bus stops with benches and shelters
			Transit	Lane Width	Want 11'-12' lanes for the westbound approach so the bus doesn't encroach on the other lane.
			Ideas	Implementation	Would an approach of implementing strategies on small portions of the Division St. plan (before implementing the total project) be wise?
			Ideas		Maximize stormwater and street parking
			R.O.W.		After creating a cross-section for certain segments on Division St, will the City be looking into asking for R.O.W. dedication from new development proposals to enhance pedestrian and roadway facilities?
			Construction		Street closure concerns (Serenity shop)
			Construction		Street closure concerns. Just experienced road construction at 50th and Division before I moved my business (Twill)
			Development	Tall buildings	No more 3-4 story buildings
			Development	Vacant lots	Fill vacant spaces before developing more
	7 corners		Traffic	cross section	Retaining 4 lanes will limit ability to make crossing enhancements such as curb extensions. Try alternate strategies such as a skipped phase on SE 20th, with a left turn lane on Division rather than 4 lanes
	11th Ave - 12th Ave		Traffic	cross section	4 lanes are critical to maintain efficient flow of traffic approaching 11th and 12th both eastbound and westbound
	12th Ave - 16th Ave		Protime lanes	Streetscape opportunities or full time parking	Concerned that eastbound between 12th and 16th needs two lanes during afternoon rush hour to avoid unacceptable congestion
	14th Ave - 39th Ave		Signals	Optimization	Add signal optimization (14th-39th) for peak hour traffic only. This offsets reduced capacity caused by dropping peak hour lanes and allows smoother traffic flow at reduced speeds
	22nd Ave - 25th Ave		Pedestrians	Marked crosswalks	Marked crossings needed between 22nd and 25th. Pedestrian activity: Apts, etc.
	34th Ave - 39th Ave		Signals	signalized intersections	Could signalized intersections be added roughly every 500' to reduce traffic speeds and improve pedestrian crossing safety? In addition to 34th and 39th, consider adding 4 way traffic signals at 35th and 37th, although that's more tricky.
	11th Ave - 12th Ave	N	Signals	Advance green	Advance Green for left turns
			Pedestrian	Movement	Guaranteed sidewalk movement
			Trees	New Tree	Pave frontage zone to allow pedestrian movement around street trees
				New Tree	Good addition of tree on Division corner of 12th, add another on 12th
			Transit	Moves zone west to 11th Ave intersection	Like the bus stop moving because it blocks my driveway (Beermongers)
			Transit	Moves zone west to 11th Ave intersection	Moving the bus zone west between 10th and 11th may allow through traffic to continue around left turns blocked by traffic on SE 11th at the railroad crossing
			Pro-time	4 travel lanes	Preference to have "NO PARKING AT ALL TIMES" between the signals to help operations
		N	Parking	4 travel lanes	Consider No Parking for the whole or half block between 11th and 12th
			Parking	4 travel lanes	No parking N side of Division 24 hours a day approaching 11th and 12th to allow for through traffic and right turns respectively, as well as the whole block between 10th and 11th
			Parking	4 travel lanes	Agree with others, no parking between SE 11th and 13th. Need lanes for backup caused by trains crossing SE 11th
		S	Right turn only lane	Keep two thru-lanes	Keep eastbound lanes west of 11th 2 lanes; don't make right lane exclusively right turn only. During peak traffic hours, best to get cars through the intersection. Traffic will back up more than currently occurs
		S	N/S connection	Cross street	The connection to Clinton over 11th and the railroad tracks is bad
			Transit	Advance green	Give bus early green light
		N	Pedestrian	Pave Frontage Zone	Pave frontage zone here (Beermongers parking lot) to ensure enough room for street trees, etc. Parking lot landscaping will be moved back
	12th Ave	Intersection	Street Lighting	Dark	Dark, needs street light; Ornamental ped lights?
		S of Intersection	Transit	Driveway	Bus blocks Muchas Gracias driveway
		S	Transit	Driveway	Bus stop (#70) blocks parking lot
		S	Plan description	Re-name	Update building names for APEX and Muchas Gracias
		N	Bikes	wrong way	Bikes heading SW on Elliott go the wrong way on 12th
				wrong way	It would be nice for a bicyclist to go from Elliott to Division Westbound
				wrong way	You could move the stop bar back on Division westbound and create a bike only ramp across the sidewalk, exiting onto Division in front of the stop bar with green paint
		N	Pedestrians	Curb extension	12th Ave curb extension a good idea, corner is very small now.
		N	Utility	Cracked pole	Utility pole (loc: ROW between Division and Elliot) is cracked
	12th Ave - 13th Ave	S	Loading	Daily Delivery 1216 SE Division	Daily beer delivery at 1216. No car parking required
		S	Driveway	Access	No driveway access needed for Apex (1216 SE Division); interested in bike parking
		S	Stormwater	Large puddles	Frequent large puddles in front of APEX., could use stormwater
			Bikes	Bike parking	Could use more bike parking in front of APEX
		N	Trees	New Trees	Good addition of large trees
		N	Trees	CSA garden	Artemis planning CSA, would native fruit trees be an option?
			Landscaping	Maintenance	Maintenance! Grasses too tall
			Landscaping	Maintenance	Trim bushes to make safe clearance for pedestrian traffic
			Parking	No parking	Maybe have no parking anytime. (2)
			Parking	Timed parking	Full time parking with two hour limit at 13 ave intersection
		S	Parking	Retain parking	No extension at 13th. Add parking for Health Care Clinic. Spots used daily
		S	Pro-time	Retain pro-time lanes	Keep two east bound traffic lanes. One lane does not serve peak traffic needs. No need for full-time parking on south side of street because of parking lot and empty lot on the block
	13th Ave - 14th Ave	N+S	Pro-time	Retain pro-time lanes	One lane doesn't serve peak traffic needs. No need for on street parking north side of street: all houses have parking in rear alley behind house. South side have driveways or side street parking
		S	Protime	Speed reduction	Single lane will help with speeding
			Parking	No parking needed	On weekends, very few cars park on street, showing there is little need for full time parking. Parking lane will be taken by downtown workers taking advantage of the free parking spaces.
		N	Parking	Eliminate protime lane	Explore appropriate time limits
			Transit	bus stop was removed a few years ago	Is the bus stop coming back? Bioswale or curb extension?

	Block	Side of Street	Regards	Keyword	Note
		N	Parking	Parking concerns	Parking concerns (Beaver State)
			Parking	Retain parking	Minimize 13th Ave curb extension. Add bike corral. Preserve two or three parking spaces and a bioswale
		N	Loading zone		Stormwater facility in front of Beaver State Machinery (close to 13th), blocks loading zone. 40 ft trailers
		S	Curb extension	Keep curb extension	Keep curb extension at 14th and Division even if stormwater is removed.
		S	Trees	New trees	Put new bigger trees here
	14th Ave	NE Corner	Stormwater	Add facility	Trees and bioswale NE corner
		N	Pedestrians	Curb extension	Not a safe crosswalk for blind
		Intersection	Pedestrians	Marked crosswalk	Crosswalk east of intersection?
			Bikes	Bike lane	Consider a bike lane for bikers coming from the south between 15th and 18th, heading north or west, combined with streetscape
	14th Ave - 15th Ave	N	Pedestrians	Trees block signal	Large trees midblock block flashing signal(2)
			Pedestrians	Trees block signal	Any trees over 6' will have to be topped so drivers can see the flashing school crossing light
	15th Ave - 16th Ave	N	Everything	New trees	Removal of protime lanes, larger trees, increase setback from traffic for a better, safer, more attractive walking environment on busy streets.
			Parking	Streetscape opportunities or full time parking	No parking necessary from Orange to 16th
	16th Ave - 17th Ave	S	Bikes	Crossing	Where do bikes coming from Clinton cross Division? Is there an opportunity to pick an intersection and make it easier to cross? Think of students going to Abernathy for example
		N	Bikes	Crossing	Bike crossing from 16th to 17th
			Parking	No parking needed	St. Philip Neri Parish has a large parking lot.
				No parking needed	No parking is needed here. Should give bike access for those traveling north on 17th and continuing north on 16th
		S	Bikes	No parking needed	No parking is needed here. Make block between 16th and 17th bike friendly for those using the 7 corners intersection
	18th Ave	Crosswalk	Pedestrian	Marked crossing	Pedestrian crosswalk west of intersection
				Marked crossing	Add marked crosswalk east of intersection
				Marked crossing	More people cross at east side of intersection
	18th Ave - 19th Ave	S	Parking	Retain parking	Keep 19th Avenue parking for employees and clients
			Parking	Retain parking	Will you keep parking between St. Phillip Convent and Morrison Child and Family services.
			Parking	Retain parking	Morrison C&F need parking at "pocket park", Long term impact to property value
			Pro-time	Retain pro-time lanes	One lane doesn't serve peak traffic needs.
			Merge	Merge west of Tamarack intersection	Move the merge East of Tamarack intersection
	19th Ave - 20th Ave	S	Transit	Don't move crosswalk	Keep bus stop in front of New Seasons. Need it close when carrying groceries. (2)
			Transit	Curb extension	Bingo! Bus stop is blocked by parked cars. I don't like to walk in the street to catch the bus. (2)
			Driveway	Access	I'd love New Seasons parking to flow in one direction from Division, out onto 20th (4)
			Driveway	Access	Close exit from New Seasons or exit only
			Driveway	Access	I disagree
			Driveway	Access	No entrance off of Division
			Driveway	Access	Close this New Season driveway. It causes congestion and hazardous turns. (3)
			Driveway	Access	Making left turns across Division into New Seasons adds stops/traffic jams and delays to traffic on Division. With the new bus stop, it will be worse. What about redesigning New Seasons lot flow leaving no entrance from division?
			Driveway	Access	Close hazardous driveway at New Seasons
			Driveway	Access	I agree either to outlet from lot or exit only
	20th Ave	S	Traffic	Median	Median to eliminate left hand turns onto 20th ave from the westbound lanes. (2)
		S	Traffic	Median	Should be no left turn at 20th traveling west on Division
		S	Traffic	One way	Change to one way for a block to eliminate hazardous turns
			Signage	Do not block intersection	Paint on roadway "Do Not Block Intersection" so that east bound cars stopped at 7 corners light don't block west bound cars trying to turn left on 20th. This is a constant problem
		Intersection	Signage	Do not block intersection	Request sign "Don't block intersection"
		Clinton & 20th	Clinton	Safety	Clinton & 20th intersection is very dangerous
		N	Pedestrians	Curb extension	Curb extension will reduce pedestrian danger
	Ladd Ave	N	Trees	Accolade elms	Plant Accolade Elms: See Metro Guide
		Entering Division	Construction	Traffic	What are the traffic implications on Ladd Ave when construction starts? Already so much cut through traffic that will likely increase when drivers try to avoid Division St. construction
	20th Ave - 21st Ave	N	Development	Project status	Reach Project: Asphalt cap to protect adj. neighbors; time frame at least a year from starting; affordable home ownership
			Stormwater	Addition of planters on sidewalk	Planters here will constrain sidewalk use in new mixed use building
			Parking	Retain parking	Issue of parking support too small for businesses
			Parking	Retain parking	Examine on street parking on this site. Four story mixed use project approved. On street parking for commercial tenants on Division is needed
		N	Transit	Bus stop relocation	To go downtown, people stand at the corner of Ladd and 20th. They run to whatever bus comes first, the 10 or the 4. If you move the 4 west, they won't get to the stop in time
			Transit	Bus stop relocation	Move bus zone closer to corner with Ladd
			Transit	Bus stop relocation	Have bus zone just west of intersection, heavier intersection
		S	Transit	Moved here from New Seasons	New bus location is closer to signal crossing

	Block	Side of Street	Regards	Keyword	Note
			Transit	Bus stop relocation	Bus stop now closer to Ladd allows folks to access both #4 and #10 buses.
			Transit	Bus stop relocation	Don't relocate bus zone here because street crossing is dangerous. Traffic, including big smokey trucks turn here. Bad intersection for blind/ elderly/ mobility impaired pedestrians
			Transit	Bus stop relocation	New bus zone is in KJ's smoking area. Also, bus zone will generate lots of trash in front of my business
			Transit	Bus stop relocation	Smokey to wait here plus dangerous to cross the street in inclement weather
			Transit	Bus stop relocation	Yes, relocate bus stop here as it's right beside the crosswalk. There shouldn't be smoking within 10' of doors.
		W	Trees	New Trees	Add another tree closer to corner
			Traffic	Close Ladd	Revisit idea of closing Ladd Ave to auto traffic at Division.
			Traffic	Close Ladd	Yes! I know this idea got thrown out due to the historic status of the neighborhood, but the bus going down Ladd isn't historic
			Bikes	Green dots to guide bike travel	Green dots are overkill and set up an expectation that bikes will only follow these routes and do those movements. Possibly rethink and scale back
		Intersection	Road Surface	Colored pavement	I like colored pavement. It will help a lot to make the intersection feel narrower.
			Road Surface	Colored pavement	Choose a color pallet that works for color blind people
			Road Surface	Colored pavement	I don't like red, perhaps a blue intersection.
			Development	Building	Need significant building to terminate Ladd and 20th. Talk with owner about redeveloping
			Driveway	Access	Close driveway across from 20th Ave south of Division (2)
			Driveway	Access	Need Driveway to Domino's property. 15yr time frame for redevelopment (property owner)
		S	Driveway	Access	Close hazardous driveway at Domino's
		S	Stormwater	Possible	Easternmost stormwater facility possible (property owner)
			Bikes	Pedestrian safety	Bikers should walk their bikes on sidewalks here.
		Intersection	Bikes	Advance signal	Advanced signal for bikes @ Ladd and 21st
		Intersection	Bikes	Safety	Bikes NB on 21st to Ladd will get hit by vehicles turning right onto 20th
			Bikes	Safety	Keep bikes in traffic lane to minimize conflict with cars turning right onto 20th and bikes going straight or turning right on Ladd
		N	Bikes	Bike box	Like the bike boxes
		S	Transit	Bike box	Bus zone in proposed green bike box
		Intersection	Pedestrians	Signal adjustment	Adjust Pedestrian signal on Division between 20th and Ladd
			Pedestrians	Impaired people	Make 7 corners crossing safer for visually and hearing impaired people
			Pedestrians	Signalized crossing	Safest crosswalk is east of the north leg of 20th. (2)
		Intersection	Pedestrians	Signalized crossing	Pedestrian crossing E of North leg of 20th at 7 corners
		Intersection	Pedestrians	Scramble	Scramble system for Pedestrians and bikes
		Intersection	Speed	Speed reduction	7 Corners speed reduction 20-25 mph
		Intersection	Road Surface	Signage	At 21st, paint on street, "Do not block intersection" for eastbound traffic
		S	Pedestrians	Pave frontage zone	Make sure the sidewalk gets widened to property line in front of parking lot. Landscaping has been done by property owner with knowledge of where property line is
		N	Pedestrians	Pave frontage zone	Make sure the frontage zone is paved as the stormwater facility will narrow the sidewalk to 6'. Paving that 2' will make a more usable 8' sidewalk between 20th and 21st
			Trees		Move street trees, work around signals
		N	Stormwater	Maintenance	Who maintains these facilities
			Stormwater	Side streets	Storm water facilities should not be on such a busy street where 12' sidewalks are needed. Put planters on side streets
			Stormwater	Pedestrian safety	Facility in front of Pizzicato should be removed for Pedestrian space
			Flex space	Outdoor Seating	Since Pizzicato can't put café tables in the parking lot walk, they will need space on sidewalk.
			Driveway	Access	Close this hazardous driveway for Pizzicato parking lot
		S	Traffic	Right turn trap	Keep two eastbound lanes west of SE 20th. Don't make exclusive right turn lane. Best to get cars through the intersection.
		S	Traffic	Right turn trap	Don't make right turn only lane at 21st. Make both straight +/- right turn (2)
			Parking	full time parking	No need for full time parking on south side of street. All properties have either driveways or side street parking.
			Bikes	Bike lane	Make a bike lane cut through in the new curb radius
	21st Ave		Bikes	Bike box	Yes to bike boxes on 21st approaching Division
	21st Ave - 22nd Ave	S	Pedestrians	Curb extension	Good
		S	Protime	Protime elimination	Elimination of Protime lane east of 21st will cause evening backups to 12th Ave
			Parking	full time parking	No need for full time parking on south side of street. All properties have either driveways or side street parking.
		S	Parking	Don't remove parking	Don't remove parking with stormwater
			Stormwater	Stormwater with parking	Can stormwater exist in furnishing zone without a curb extension? Maybe use a perforated grate to cover the facility
			Trees	New tree	Add large tree at corner
			Driveway	Parking	Yes, save entry to Mirador parking lot. One space in front is good, many customers use 21st anyways. As we get more dense, people will turn more to bikes and walking
			Driveway	Close driveway	Close hazardous driveway (2)
			Traffic	Eliminate protime lane	No parking across from 21st Ave intersection will allow traffic to flow with a left hand turn lane. Good move!
		N	Parking	No parking	Removing these two spaces will clear intersection faster (3)
		N	Parking	No parking	No parking across from 21st a big help
		N	Parking	No parking	Consider no parking for full or 1/2 block
			Parking	No parking	Need no parking at least 3 spaces all day. Traffic backs up to 22nd and beyond because of left turners weekday and weekend.
			Signals	Signal Visibility	Westbound signal heads at 21st ave can't be seen from inside the intersection.
		N	Signals	Signal Visibility	Westbound traffic stopped at 21st may go through red light because they see green in the distance. Can signals be hooded/shaded to not confuse drivers. Peds at 21st crosswalk are in danger!
			Pedestrians	Sidewalk	Good wide sidewalk
			Transit	Bus stop relocation	Is the bus zone moving east of 21st Ave intersection? If so, access N and S is harder.
			Parking	Paving	Good as shown, pave to right of way.
	22nd Ave	Intersection	Pedestrians	Marked Crossing	Marked crossing needed W of 22nd (2)
		Intersection	Art	Design Node	Art here to define this node
		N	Signage	Do not block intersection	Please install a "Do Not Block Intersection" sign for traffic heading west on Division at 22nd Ave.

	Block	Side of Street	Regards	Keyword	Note
	22nd Ave - 23rd Ave	N	Parking	Enforcement	Int'l beauty school doesn't allow students to park in their lot. They park on neighborhood streets. Need parking rules/enforcemen
			Trees	Building visibility	Major concern about trees blocking my building (IBS)
			Trees	Building visibility	Prefer smaller or thinner tree to allow signage visibility at SE corner International Beauty Schoo
		S	Stormwater	Mistake?	Facility may be wrong
	23rd Ave	Intersection	Pedestrians	Curb extension	Not marked but needs a wider pedestrian access to cross.
	23rd Ave - 24th Ave	N	Trees	Bigger trees	Would like to see bigger trees; Interested in talking about species as design continues; like what's shown
		S	Trees	Save existing trees	Look into saving existing tree
		S	Curb extensions	Issues	Curb ext tighten driveways and cause loading problems. Trucks loading on side streets will cause problems
	24th Ave - 25th Ave	N	Stormwater	Driveway Access	Keep the stormwater facility from tightening my driveway access (Langlitz Leathers')
			Tree	New tree	Will a tree fit next to the utility pole? (Langlitz Leathers)
	25th Ave	E+W	Storm water	None planned here	Why no water retention here but there is on other streets west of here?
	25th Ave - 26th Ave	S	Trees		Are the indicated Maple trees on the corner of 25th the ones that are there now or new? The current species is growing very fast and keeps breaking the sidewalk
		S	Stormwater	Curb extension and storm water facility	Move planter off of Division and put on side street.
			Pedestrians	Curb extension and storm water facility	Shorten curb extension
		N	Protime lanes	full time parking	Keep two westbound traffic lanes. One lane doesn't serve peak traffic needs. No need for full time parking; all business and homes have driveways or parking lots
			Left hand turns	Streetscape opportunities or full time parking	Left hand turns south onto 25th will stop traffic
			Trees	Add trees	Trees in front of Plaid Pantry
			Transit	Move bus stop	Bus stop needs more space, or move east of 26th ave intersection.
		S	Transit	Move bus stop	Move the eastbound bus stop east of 26th so busses don't block traffic during green lights.
			Art	Art location	Green wall for redevelopment
	26th Ave	E+W	Trees	Add trees	Trees required at this corner. Today, very loud, busy, needs softer approach (4)
			Signals	Left turns	Add left turn arrow at 26th and Division. Traveling south on 26th and turning east on Division, also north on 26th turning west on Division
			Signals	Green time	Extend green time on 26th to relieve back-up and decrease w-bound diversion on Ivon
		S	Signals	Left turns	Make the light at 26th left turn first so it doesn't backup past Clinton.
			Signals	Left turns	Left turn lane @ 26th
			Bikes	Bike detector	Add bike loop detectors to signals on 26th
			Pedestrians	Curb extensions	NW corner currently very unsafe for pedestrians. Plan shows curb bump out, trees, and containment of lot entrance. These seem like good ways to limit risk to pedestrians from cars racing into/out of Plaid Pantry
			Pedestrians	Curb Extensions	Add curb extensions at SE corner (2)
			Pedestrians	Crosswalk	Crosswalk west of 26th is offset angle-hard for guide dogs to know where to go
			Pedestrians	Hearing/Visually impaired	Vibration crossing signal at 26th, near the intersection
		S	Bikes	Curb extensions	Pedestrian curb extension could be extended across 26th to conceal bike corral or shift bike corral south to allow right turn on rec
		N	Driveway	Driveway narrowed?	Will Plaid Pantry's driveway on 26th be narrowed?
	26th Ave - 27th Ave	S	Parking	8 protime spaces to 7 full time spaces	Eliminate two parking spaces closest to 26th ave intersection and put in outdoor seating. Talk to owner of little t.
			Traffic	Left turns	Make sure drivers know they can go around left turning cars.
			Traffic	Left turns	I discount the through traffic going around left turning traffic on Division. There are not that many.
	27th Ave	SE+SW	Pedestrian	Curb extensions	Good access to park and Clinton.
	27th Ave - 28th Ave	N	Bike	Bike parking	Request bike and scooter parking (Bent Image)
			Bike	Bike parking	Possible bike parking W corner of Bent Image
			Bike	Bike parking	Request bike parking. 50 - 100 employees
		S	Landscaping	Prefer Landscaping	Prefer landscaping to full time parking
	28th Ave	SE+SW	Pedestrian	Curb extensions	Good improvements, access to park.
			Traffic	Narrow right of way	Street a little narrow. Could the sidewalks be narrowed?
	28th Ave	Intersection	Pedestrians	Marked crossing	Crossing needed on W side of 28th Ave
	28th Ave - 28th Pl	S	Loading	Streetscape opportunities or full time parking	This business loads out the front into trucks waiting on Division. It looks new parking spaces block their curb cut and loading area. (2)
			Loading	Streetscape opportunities or full time parking	Be careful around Shanghai. They have loading needs (people come to pick up their shipments)
		S	Stormwater	Drainage Problems	Drainage problem, no inlets
		N	Pedestrian	Curb extensions	As pedestrians we love it, school buses turning radius? Liz Gatti to call Kevin Bacon
			Pedestrian	Curb extensions	Like curb extensions
			Street lighting	Dark	Super dark. Street lighting is needed for school kids (2)
	28th Pl	Intersection	Signals	Slow response	Existing signal responds very slowly. Lots of kids cross here to Hosford MS. (2)

	Block	Side of Street	Regards	Keyword	Note
			Crosswalk	Straighten	Make crosswalk straighter instead of corner to corner
	28th Pl - 29th Ave	SW corner	Stormwater	Move facility to side street	Move stormwater facility to side street.
			Stormwater	New multi-res development	This stormwater facility will interfere with sidewalk use if a new building is built here right to the sidewalk.
			Vacant lot	Kim's Auto Center	Kim's auto center burnt out. Graffiti covered and impervious surfaces present huge water quality issues. What's happening?
		N	Driveway	Close driveway (2)	Close unused driveway in front of Urban Flora and put in street tree (at least one)
			Stormwater	Natural landscape	A series of bogs is not a natural landscape for the area
	29th Ave - 30th Ave	N	Stormwater	Maintenance	How is the management of these being foreseen. This is a rental house with minimal investment in landscaping
			Stormwater	Round facility	Round corners of facilities to flow pedestrian traffic.
		N	Driveway	Narrowing driveway	Concerns about facility tightening our driveway(Mr. Maid)
		S	Flexible space	Outdoor seating	Already sidewalk in front of Clay's; Please keep; Currently outdoor seating gives more pedestrian room
		S	Driveway	Alley access	Keep Alley access between Clay's and Colonial Services
	30th Ave	Intersection	Crosswalk	Repaint crosswalk	Repaint crosswalk
		Intersection	Signal	Very busy	Traffic signal at 30th, (very busy)? At least a pedestrian crossing light.
			Traffic	Entering Division St.	30th is used as a N-S route by many vehicles with bad visibility entering Division - flashing red light?
			Traffic	Offset	Too much offset (2)
			Traffic	Offset	I don't like 30th north of Division being narrowed and the curb shifted more offset. It will be hard for vehicles to pass each other on this busy street
			Stormwater	Offset	Reconsider storm water facility on the east side of 30th to create less of an offset of the two legs.
			Traffic	Narrow street	Also make sure there is room on the north leg for two vehicles to pass each other
		Intersection	Curb extension	Narrow street	Neighborhood traffic (Clinton - Hawthorne) uses 30th. Curb ext creates hazards
		N	Flexible space	Outdoor seating	This is a nice place to sit with your coffee
			Flexible space	Outdoor seating	Will existing rocks for seats be transplanted into stormwater? Café Pallino
			Pedestrians	Outdoor seating	Limited walk space from outside tables
		NE	Trees	Add trees	Add another tree just east of intersection.
		S	Trees	Crime prevention	Tree was taken out: Crime prevention group. Too Dark.
		N	Trees	Light for bus stop	Trees were removed in the 50's for safety and to allow light for bus stop
		Intersection	Stormwater	Facility placement	Water collects further NW (up 30th) then proposed; water main in area
		Intersection	Stormwater	Retain parking	Bridges across stormwater to allow for parking
	30th Ave - 31st Ave	S	Car charging station	Addition of car charging stations	Why put charging station in shopper parking. Put them in side streets. The cars will have to sit there a long time in a prime parking space.
		N	Bikes	Bike parking	Yes to bike corrals on Division
			Flexible Space	Dogs	Dogs in sidewalk
		S	Parking	Timed spots	2 hr parking spots very popular
			Transit	Move stop	Consider moving westbound bus stop away from 30th and Division (to 31st and Division). Pedestrians crossing can get hit by westbound cars passing the bus
	31st Ave	Intersection	Pedestrians	Marked crossing	Do something to help pedestrians crossing here. Cars don't recognize it as a pedestrian crossing as much
		Intersection	Pedestrians	Marked crossing	Crosswalk on west side of 31st Ave intersection
	31st Ave - 32nd Ave	N	Stormwater	Move to side street	These Tabor to River facilities should be moved. This location crimps the sidewalk space in front of the new 3 story mixed use building. Relocate them to 31st or 32nd if possible
		N	Flex space	Outdoor seating	Outdoor seating in front of Whiskey Soda Lounge?
		N	Trees	New tree	New tree planted in front of Whiskey Soda Lounge 12/09
		S	Parking lot	New park	Turn parking lot on corner of 31st and Division into a park.
			Trees	New trees	Need trees at bus stop on W corner of 32nd
	32nd Ave	Intersection	Pedestrians	Marked crossing	Crosswalk needed at 32nd Ave intersection. Only North Access for 3 blocks; park on 32nd; 2 bus stops at corner; offset; proposed crosswalk at 33rd "T" intersection is less dangerous.
			Pedestrians	Marked crossing	Add a crosswalk please (7)
			Pedestrians	Marked crossing	Crosswalk here instead of 33rd
			Pedestrians	Direction of pedestrian flow	Direction of pedestrian flow is NE/SW across offset intersection, consider striping accordingly
			Pedestrians	Marked crossing	Need a crossing near here
	32nd Ave - 33rd Ave	E	Pedestrians	High pedestrian activity	Lots of pedestrian activity on this block
			Pedestrians	Marked crossing	Crosswalk needed on E side of intersection
		N	Trees	New tree	New big tree?
		S	Bikes	Bike parking	Like bike parking in front of Pok Pok
		S	Bikes	Move bike parking	Move bike corral north of Division on 32nd Ave (3)
			Bikes	Move bike parking	Keep corral this block. Shift to corner.
			Loading	Move bike parking	Proposed bike corral impedes truck loading zone. Please keep zone and curb cut
			Stormwater	Too many facilities	Unnecessary amount of storm water facilities on this block
		N	Pedestrians	Sidewalk space	Bad sidewalk. Too many pole/heaters.
			Art	Existing art	Public art - 2 already bike stand has bike in it as art - welded.
			Art	Useful art	But is it useful for bikes?
	33rd Ave	Intersection	Pedestrians	Marked crossing	Yes to crossing at 33rd Ave

	Block	Side of Street	Regards	Keyword	Note
	33rd Ave - 33rd Pl	N	Trees	New tree	Giant trees will block signage
		N	Bikes	Bike parking	Add another bike corral between 32nd and 34th on Division or side street. North side?
		N	Parking	Stormwater possible	On-street parking not important because of parking lot(W of Guitar Crazy). Possible stormwater on private property
		N	Driveway	Plan correction	Driveway W of Children's Exchange
		N	Trees	Tree placement	Tree would be best in the middle of the building between Children's Exchange and Guitar Crazy
		N	Bikes	Bike parking	Interested in bike staples on sidewalk in front of their business (Children's exchange)
		S	Driveway	Close driveway	(Pete Morones) Driveway not used, rebuild sidewalk, likes stormwater facilities. If no stormwater, bike parking? Preserve parking elsewhere
		S	Trees	Existing tree	Keep or replace Bloodgood Maple
		N	Trees	Tree placement	P-Town likes magnolia; be careful not to block elevated window display
		N	Parking	Retain motorcycle parking	Retain motorcycle parking (P-town Scooters)
	33rd pl - 34th Ave	S	Flexible space	Sidewalk	They have an existing ugly triangle of concrete here that looks very ugly. It should be taken out and replaced with bike racks?
		S	Bikes	Bike parking	Can this corral move over or around the corner?
		S	Bikes	Bike parking	Need bike parking for Village Merchants
			Flexible space	Utility pole	Is their pole in the right of way
			Stormwater	Facility placement	Stormwater facility too close to corner, shorten it.
		N	Loading	Existing zones	Loading zones needed in existing locations
		S	Trees	New tree	Tree blocking front door of bus
		S	Trees	New tree	Add trees along Division this block
			Trees	Larger trees	Need larger trees then the bushes the property owner plants (2)
			Transit	Furnishing zone	Pave full right of way for bus stop.
			Transit	Bus access	City moved pole, bus access for blind
			Stormwater	Sidewalk space	Reduce the size of this stormwater facility near corner for easier walking to crosswalk, and more room on sidewalk
	34th Ave	N	Tree	New tree	Big tree on Division corner of 34th
		N	Stormwater	Water pools	Water pools in heavy rains
		S	Stormwater	Useful facility	Drainage issues, like swale on corner
		N	Parking	Flex car space	Is this space being moved or eliminated
			Stormwater	Flex car space	Stormwater takes flex car space
		N	Traffic	Narrow street	Narrowness of street creates safety issues for cars and bikes
		S	Utility	Hydrant	Fire Hydrant on corner of 34th and Division
		S	Utility	Cracked pole	Utility pole @ SE corner has cracked sidewalk
		S	Traffic	One way	Any way to make 34th a one way street. It is too narrow. At least slow traffic
		N	Parking	No parking	Extend no parking zone N from intersection
			Parking	No parking	Parking restrictions 20 ft from corner would help with sight distance for peds and allow vehicles to pass each other at green light (2)
			Trees	New trees	Like bigger trees
		Intersection	Bikes	Green bike boxes	What about green bike boxes @34th N and S (3)
			Bikes	Green bike boxes	Bikes usually in travel lane anyways, and cars are moving slowly when they turn right. Doesn't seem like there's much need for bike boxes here
			Traffic	Narrow street	Make sure these legs have enough width to allow two vehicles to pas each other (2)
			Traffic	Narrow street	There will never be enough room for two vehicles to pass each other at this intersection.
		N+S	Traffic	One way	34th - one way north?
			Pedestrians	Marked crossing	Aim crosswalk better
	34th Ave - 35th Ave	N	Tree	New tree	Add big tree that works with bus.
		S	Stormwater	Remove facility	Remove this stormwater facility. It gets in the way of existing sidewalk use. Also too near to corner, restricts access to corner.
		S	Bikes	Existing corral	We have a bike rack on our property open to the public, we would rather retain the parking space (Hedge House)
			Bikes	Bike corral	Concerned about loss of parking from bike corral
			Art	Art location	34th and Division possible art location
			Utility	Overhead power lines	Problems with large trucks clearing power lines
			Flexible space	Outdoor seating	Space in front of PIX should remain concrete for tables, etc. (2)
			Flexible space	Outdoor seating	Constrain sidewalk and more space for eating pasties outside.
			Pedestrians	Frontage zone	Pave frontage zone for wider sidewalks.
		S	Trees	New tree	Good tree location, need more shade here.
		S	Driveway	Retain driveways	Retain driveways and don't block access to driveways with trees. (AAA) see meeting notes
			Trees	Urban forester	Follow up on tree condition
		S	Trees	Tree placement	Tree on Corner of 35th Ave will get hit by trucks loading and unloading for my business (AAA)
	35th Ave	Intersection	Pedestrians	Marked crossing	Add crosswalk at 35th Ave intersection
	35th Ave - 35th Pl	S	Parking	Lack of parking	Someday this building will be sold and the Adult theatre may be a real theatre. There will be parking repercussions for neighbors
			Redevelopment	Theatre	We hope it will become a real theatre.
			Pedestrians	ADA ramps	Line up ramps with public transportation
		S	Bikes	Bike corral	Think that this one isn't necessary since one at haven will be enough.
			Bikes	Bike corral	I think two are better. There's no parking spaces to be saved by just one, both are legal crossings now. (3)

	Block	Side of Street	Regards	Keyword	Note
	35th PI	NW	Pedestrians	Flexible space	Extend sidewalk along west side of 35th as you do on east side. Can't assume use will always be DOW Columbia. (2)
			Stormwater	Smaller facility	Smaller storm planter
		N	Stormwater	Sidewalk space	Narrow stormwater facility here for more sidewalk room. It may be a busy corner
			Stormwater	Remove facility	No storm facility
		NE	Pedestrians	Curb extension	Good curb extension, reduce traffic on 35th PI
			Flexible space		Good sidewalk space for public use (2)
			Trees	New tree	Chinese Evergreen Oaks (to save)
		N	Trees	New tree	Chinese evergreen oak?
		Intersection	Pedestrians	Marked crossing	Marked crossing needed
		Intersection	Pedestrians	Marked crossing	Yes to crossing at 35th PI
			Pedestrians	Marked crossing	Curb extension should be visibly marked in some way to prevent accidents; Reflectors, lighting and warning signs are possibilities
		N	Parking	Timed spots	30 Min spots essential
		S	Parking	remove stormwater	Remove stormwater to retain parking (2)
		S	Parking	Old fire zone?	I understand that parking was restricted as a fire zone for the Waverly School. Can the parking be restored now that the school is closed?
		S	Stormwater	Freight turning radius	Facilities on side street make it difficult for freight turning onto Division
		S at intersection	Stormwater	Pools of water	Big pools of water
	35th PI - 36th Ave	N	Pedestrians	Marked crossing	Crosswalk across from 35th heading south of Division
		N	Parking	Parking in front of DOW Columbia	Why here?
		N	Trees	Clearance	Concerned about trees being hit by trucks/buses
		S	Parking	Shorten curb extension	Shorten curb extension for more parking
		S	Trees	Maintenance	Concerned about leaves on roof
			Trees	New trees	Need trees in front of Buy Right Outlet Furniture
		S	Trees	Tree placement	Design tree location to allow window/signage view (Buy Right)
			Loading & parking	Retain existing parking lane	Loading zones and parking biggest issues
		S	Loading	Retain existing parking lane	Don't need it to be a loading zone, just open for trucks
			Parking	Remove curb extensions	Don't need curb extensions on S side if just for planting ground cover or shrubs. Need parking to replace north side.
			Car charging	Add charging station	Financial compensation for businesses with car charging stations?
			Car charging	Move charging station	Move them to side streets.
		S	Car charging	Remove charging station	Remove charging spot
		N	Pedestrians	Marked crossing	Crosswalk at 35th PI or 36th Ave. Long way to nearest.
		N	Trees	Tree placement	Large tree between Metalurges and Rose City Reptiles will create a permanent blind spot and make my driveway more difficult and dangerous
		N	Bikes	Bike corral	Like bike corral
	36th Ave	SW	Flex space	Outdoor seating	Need space on 36th for café tables. Pave between trees or cover swale with grating.
		SE	Loading	Loading zone	Small truck loading is important
		S	Loading	Side street loading	Fleur uses side street for loading, stormwater may be a problem without parking
		S	Traffic	Narrow street	Direct connection to Powell, 2 cars don't fit with parked cars at intersection
		W	Trees	New Trees	More trees (magnolias) needed west side of 36th Ave.
	36th Ave - 37th Ave		Stormwater	Reduce stormwater	Reduce size of storm water facility for more sidewalk space.
		E	Pedestrians	Marked crossing	Pedestrian crosswalk to accommodate bus stops and local pedestrian crossing. Proper signage needed. Signs and lighted signals. Drivers still don't acknowledge pedestrian crossing that currently exists at 27th
		S	Transit	Bus pullout	Consider providing a bus pullout in the eastbound direction to help the flow of traffic and use of green time at 39th ave traffic signa
			Transit	Bus facilities	Bus shelters move with bus zone?
			Transit	Stop placement	Talk to trimet about busses directly opposite and completely blocking street.
		S	Transit	increased vandalism	Worried bus zones will attract more graffiti and vandalism
		S	Transit	Stormwater opportunity	Swale opportunity if bus is moved
			Loading	Large trucks	Need continuous spots for 40 - 75' trailers
		S	Loading	Large trucks	Accommodate Bigger trucks
			General	Looks great!	Improvements around 37th look great, Thanks
		S	Trees	Tree placement	Best display window, please shift tree
		S	Trees	Tree placement	Tree blocks window, Shift closer to front door or bus stop.
			Trees	Tree placement	Re-iterate my suggestion to move the tree planned for my building left or right to preserve my display window
		S	Bikes	Bike parking	Victory wants to keep the bike corral
			Loading	Side street loading zone	Need truck loading zone on Division or side street
		S	Stormwater	Retain parking	Remove to allow for parking and safety at night
		S	Parking	Timed spots	Requests to retain 15 minute parking spot, parking support already too small to support 4 businesses (Ralph Colby)
			Parking	Timed spots	Keep 15 minute parking
			Loading	Commercial deliveries	Concerns about loading zones for commercial deliveries
		S	Loading	Curb extensions	Delivery trucks need more room, do away with curb extensions (2)
		N	Parking	Retain parking	We cannot afford to lose any parking. We try to keep the neighborhood parking to a minimum because our patrons come and go very late.
			Parking	Side street parking	Concerned about removal of side street parking
			Trash	Lots of trash	Trash containers, lots of trash here.
			Trash	Litter patrol	Or community litter patrol (2)
			Stormwater	Reduce facility size	Reduce the size of stormwater facility on Division.
		N	Loading		Egyptian club also gets deliveries

	Block	Side of Street	Regards	Keyword	Note
	37th Ave	SW	Loading	Stormwater facility loading zone	Can loading be done over stormwater facilities? 15 min loading zone?
		N	Loading	Side street loading	Loading activity on 37th for LB Market
		S	Parking	Timed parking	Limited time parking adjacent to swales
			Pedestrians	Marked crossing	Yes to crossing at 37th
			Stormwater	Side street	Side street stormwater ok
		S of intersection	Trees	New tree?	Add trees?
	37th Ave - 38th Ave	N	Trees	New tree	No tree here. Two driveways close together. Harder to see safely.
			Trees	New tree	Tree will be pruned up. Put tree in front of parking lot.
		S	Bikes	Move bike corral	Why bikes here? Move car parking in front of Hardware store.
		S	Bikes	Like bike corral	Like bike corral, lots of employees and customers use bikes (Division Hardware)
		S	Trees	Maintenance	Trees clog the gutters on Division Hardware roof.
		S	Trees	Maintenance	Proposed trees would add to leaf debris we have to remove from gutters (Division Hardware)
			Trees	Maintenance	Trees are a huge concern clogging the gutters on our roof (Division Hardware)
		S	Loading	Existing loading zone	Large truck unloads here at 5am
		S	Loading	Existing loading zone	Curb extensions eliminate truck loading zone; "No Parking 5-7am loading zone" needed (Division Hardware
		S	Loading	Existing loading zone	Existing loading zone is next to the bus no parking zone. We need early morning loading zone. (Currently 2-7
		N	Construction	Tax season	Respect the busy tax season during construction (In or Out Tax Service)
	38th Ave	S of intersection	Traffic	One way	Propose one way traffic, heading north?, to cut down on cut through traffic, also to deter vehicle traffic to Clinton.
		Intersection	Bikes	N/S connection	Bikes use this to get to the other side of Division
		S	Trees	Tree placement	Trees closer to intersection on SE corner for shade
		S	Parking	Side street parking	Allow parking one side of street
		Intersection	Pedestrians	Marked crossing	Add painted crosswalk (2)
			Pedestrians	Curb extension	Yeah! Pedestrian crossing definitely needed and curb extension great to slow traffic
			Pedestrians	Curb extension	Will help transition to one lane.
			Pedestrians	Safety	Make this crosswalk, street narrowing, and bump outs the "introduction" to the 25 mph Division St. Slows traffic, increases awareness that this begins the new environment of Division. (3
	38th Ave - 39th Ave	S	Parking	Retain parking	Shorten curb extension E of 38th to get another parking space
		S	Parking	Retain parking	Remove curb extensions to retain parking(2)
		S	Parking	Full time parking	Eliminate protime and create full time parking
		S	Parking	Retain parking	Removing 2 spots with the UDP project is a bad idea
		S	Parking	Timed spots	Time limits for parking during the day to reserve parking for businesses.
		N	Driveway	Increase parking	Revise driveways to get more parking on north side
		S	Stormwater	Sidewalk space	Stormwater facility too long. Takes up sidewalk space that will be needed next to proposed 4 story building and access to crosswalk. Tree well sized
			Stormwater	Good addition	Stormwater facility will be a good addition to humanize building
		S	Trees	No new tree	No tree please. I already have a tree in my furnishing zone. Move the tree in front of Tibet A Gift.
		N	Trees	More trees	Narrow these driveways to allow more street trees and space for people. 4 trees instead of 2.
		N	Stormwater	Save existing tree	Build stormwater around existing tree
			Flex space	Outdoor seating	Leave sidewalk between trees for café tables. Keep stormwater in street area.
		S	Transit	Bus pull out	Any way to move bus zone out of traffic
	39th Ave		Pedestrians	Frontage zone	Widen sidewalk to building frontage
		NW	Transit	Shelter	Can we ask Tom's to extend their awning to provide shelter to southbound bus riders? Since there is not enough room for a shelter
			Signals	Left turns	39th needs left turn lights to curtail backups at light
		Intersection	Signals	Left turns	Left turn signal needed to streamline traffic backup. It is also very scary to try to make this turn because through traffic rushes light.
		Intersection	Signals	Left turns	No left turn signal = many cars turning left after green = dangerous
			Signals	Left turns	Dedicated L-turn is a great idea(2)
			Signals	Left turns	Timed left turn Division to 39th would mitigate backups in turn lane at high traffic times (2)
			Signals	Left turns	Protected left turn westbound for morning traffic
			Stormwater	Puddles	Lots of puddles @ 39th

APPENDIX D-KITTELSON EXISTING CONDITIONS REPORT



KITTELSON & ASSOCIATES, INC.

TRANSPORTATION ENGINEERING / PLANNING

610 SW Alder Street, Suite 700, Portland, OR 97205 P 503.228.5230 F 503.273.8169

Date: January 31, 2009 **Project #:** 9557.0

To: Elizabeth Mahon, Portland Department of Transportation

From: Mike Coleman

Cc: Julia Kuhn

Project: Division Street: SE 6th Avenue to SE 39th Avenue

Subject: Existing Transportation Conditions Summary

INTRODUCTION

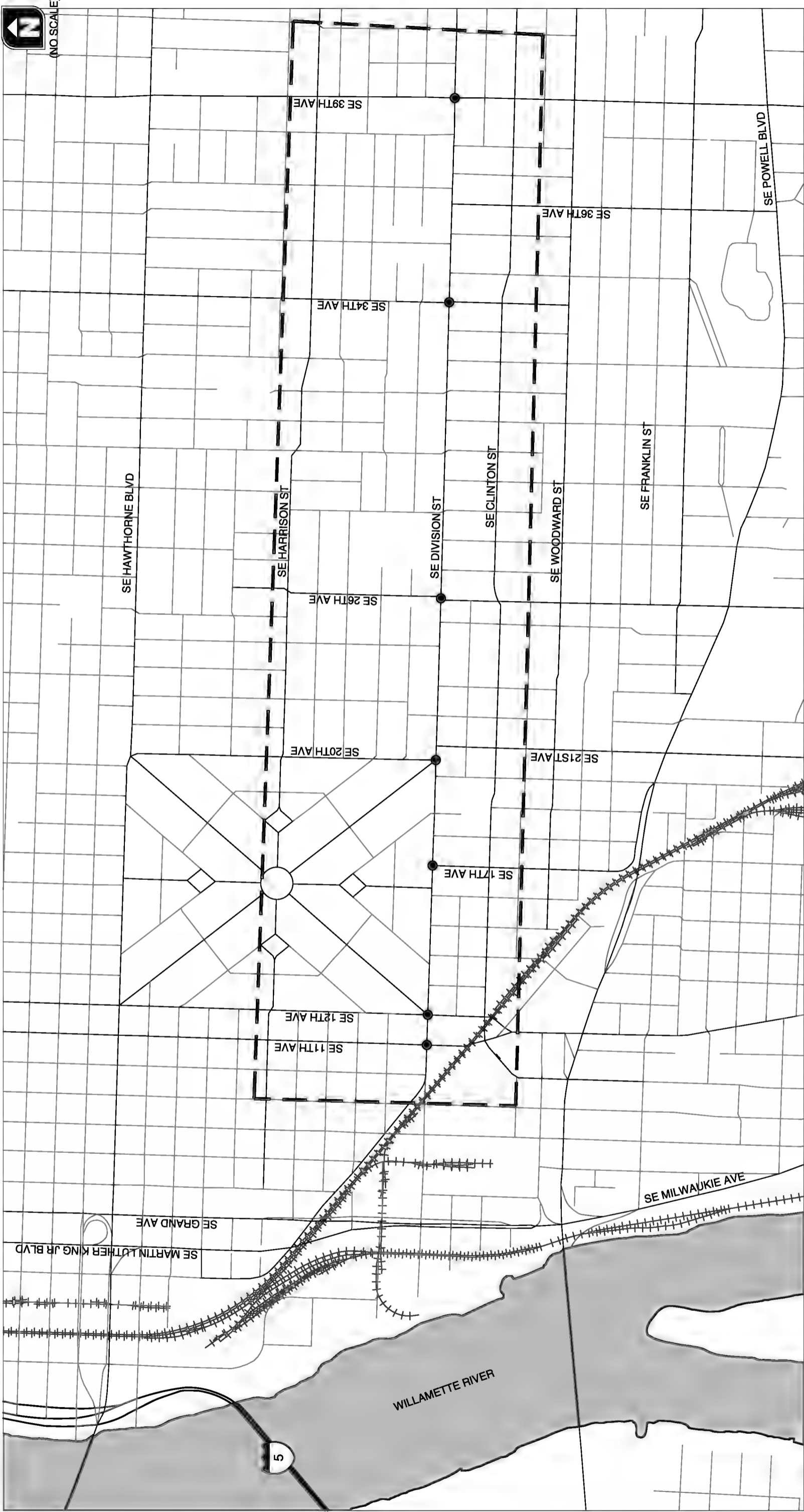
Historically, SE Division Street has played an integral role in the Portland grid system by serving much of the traffic that travels through the surrounding neighborhoods. During the past few years, neighborhood retail shops and related activities along SE Division Street have increased in number and popularity. Pedestrian and bicycling activity has also increased.

This memorandum provides a thorough summary of existing transportation conditions on SE Division Street between SE 11th Avenue and SE 39th Avenue. It also contains general contextual information about transportation conditions in the broader vicinity of SE Division Street. Figure 1 is a map of the SE Division Street corridor study area.

This memorandum relies on, updates, and expands on transportation information gathered in a previous study conducted in 2004 entitled *Division Green Street/Main Street Project: Multi-Modal Transportation and Urban Design Analysis*, prepared by David Evans and Associates for the Portland Bureau of Transportation (PDOT). See *Appendix A*. The information was updated on the basis of field observations, measurements, and counts gathered during August through December 2008. Additional information was provided by TriMet and PDOT's Transportation Planning Division.

The information is presented in three sections.

- The Transportation System Plan section assesses existing conditions on SE Division Street by comparing actual conditions to the desired conditions expressed in the City's Transportation Planning document, the Transportation System Plan (TSP).
- The Street Inventory section describes the existing features one would see if they walked along SE Division Street or along the other key streets in the vicinity of SE Division Street.
- The Operations and Use section describes how the various transportation modes actually use SE Division Street and the other key streets in the vicinity of SE Division Street. It describes the popularity of each mode, assesses the street network's ability to effectively serve each mode, and evaluates how the modes interact with each other.



LEGEND

● STUDY INTERSECTION

--- STUDY AREA

TRANSPORTATION SYSTEM PLAN: STREET CLASSIFICATIONS AND POLICIES

This portion of the memorandum assesses existing conditions on SE Division Street by comparing actual conditions to the desired conditions expressed in the Transportation System Plan (TSP).

Street Classifications

The multimodal role of each of the key streets within the study area, as defined by the TSP, is shown in Table 1. For the sake of brevity, only the TSP descriptions of SE Division Street's classifications are provided and discussed in this memorandum. To learn more about the remaining streets and their classifications, refer to:

<http://www.portlandonline.com/transportation/index.cfm?c=39112&a=155097>.

SE Division Street

To help assess the existing conditions on SE Division Street, the TSP's descriptions for SE Division Street's modal classifications provide a basis for making an initial assessment of how well the street satisfies its intended purposes. Each description is followed by a brief discussion intended to address especially pertinent issues related to existing conditions on SE Division Street.

Traffic: Neighborhood Collector

"Neighborhood Collectors are intended to serve as distributors of traffic from Major City Traffic Streets or District Collectors to Local Service Streets and to serve trips that both start and end within areas bounded by Major City Traffic Streets and District Collectors.

- **Land Use/Development.** Neighborhood Collectors should connect neighborhoods to nearby centers, corridors, station communities, main streets, and other nearby destinations. New land uses and major expansions of land uses that attract a significant volume of traffic from outside the neighborhood should be discouraged from locating on Neighborhood Collectors.
- **Connections.** Neighborhood Collectors should connect to Major City Traffic Streets, District Collectors, and other Neighborhood Collectors, as well as to Local Service Streets.
- **Function.** The design of Neighborhood Collectors may vary over their length as the land use character changes from primarily commercial to primarily residential. Some Neighborhood Collectors may have a regional function, either alone or in concert with other nearby parallel collectors. All Neighborhood Collectors should be designed to operate as neighborhood streets rather than as regional arterials.

Table 1 Existing Street Classifications

Street Name	Traffic	Transit	Bicycle	Pedestrian	Freight	Emergency	Street Design
SE Division St	Neighborhood Collector	Major Transit Priority Street	Local Service Bikeway	City Walkway	Truck Access Street	Major Emergency Response	Community Main Street ¹¹ Community Corridor ¹²
SE Hawthorne Blvd	District Collector	Major Transit Priority Street	City Bikeway	City Walkway	Truck Access Street	Major Emergency Response	Community Main Street
SE Harrison / SE Lincoln St	Local Service Traffic Street ¹	Local Service Transit Street	City Bikeway	City Walkway ⁶	Local Service Truck Street	Minor Emergency Response	Local Street
SE Clinton St	Local Service Traffic Street	Local Service Transit Street ²	City Bikeway	Local Service Walkway ⁷	Local Service Truck Street	Minor Emergency Response	Local Street
SE Powell Blvd	Major City Traffic Street	Major Transit Priority Street	Local Service Bikeway	City Walkway	Major Truck Street	Major Emergency Response	Regional Corridor
SE Ladd Ave.	Local Service Traffic Street	Community Transit Street	City Bikeway	City Walkway	Local Service Truck Street	Minor Emergency Response	Local Street
SE 11th Ave	Major City Traffic Street	Transit Access Street ³	City Bikeway ⁵	City Walkway ⁸	Major Truck Street ¹⁰	Major Emergency Response	Community Corridor
SE 12th Ave	Major City Traffic Street	Transit Access Street ³	Local Service ⁵	City Walkway ⁸	Major Truck Street ¹⁰	Major Emergency Response	Community Corridor
SE 21st Ave	Local Service Traffic Street	Local Service Transit Street ⁴	Local Service Bikeway	Local Service Walkway ⁹	Local Service Truck Street	Minor Emergency Response	Local Street
SE 39th Ave	Major City Traffic Street	Transit Access Street	Local Service Bikeway	City Walkway	Truck Access Street	Major Emergency Response	Regional Corridor

¹ Neighborhood collector between SE 26th Ave and SE 30th Ave

² Transit Access Street between SE 21st Ave and SE 26th Ave

³ Local Service Transit Street south of SE Powell Blvd

⁴ Transit Access Street between SE Division St and SE Powell Blvd

⁵ Local Service Bikeway south of SE Powell Blvd

⁶ Local Service Walkway west of SE 16th Ave

⁷ City Walkway between SE 21st Ave and SE 26th Ave

⁸ Local Service Walkway south of SE Powell Blvd

⁹ City Walkway between SE Division St and SE Powell Blvd

¹⁰ Local Service Truck Street south of SE Powell Blvd

¹¹ Community Main Street between Tamarack Alley and SE 50th Ave

¹² Community Corridor west of Tamarack Alley

- **On-Street Parking.** The removal of on-street parking and right-of-way acquisition should be discouraged on Neighborhood Collectors."

Discussion: The land use character along SE Division Street varies markedly. Uses between SE 11th and 13th Street are predominantly small single story businesses with very limited onsite parking. Land between 13th and 19th Avenues consists of single family residential and institutional uses. The properties around the complex intersection of SE Division Street, SE Ladd Avenue, SE 21st Avenue, and SE 20th Avenue (Seven Corners) are the most auto-oriented commercial in the study area. Properties between SE 21st and SE 39th Avenue are an eclectic mix of retail, specialty services, single-family residential, and apartments.

Onstreet parking is prohibited during specific times of day to create an additional traffic lane. To create an additional westbound lane during the morning peak traffic period, onstreet parking is prohibited along the north side of SE Division Street from 7:00 a.m. to 9:00 a.m. between SE 9th Avenue and SE 28th Place. To create an additional eastbound lane during the afternoon peak traffic period, onstreet parking is prohibited along the south side of the street from 4:00 p.m. and 6:00 p.m., between SE 9th Avenue and SE 28th Avenue. Demand for onstreet parking varies with the neighboring land uses. Parking is addressed in greater detail later in this memorandum.

Transit: Major Transit Priority Street

"Major Transit Priority Streets are intended to provide for high-quality transit service that connects the Central City and other regional and town centers and main streets.

- **Land Use.** Transit-oriented land uses should be encouraged to locate along Major Transit Priority Streets, especially in centers. Discourage auto-oriented development from locating on a Major Transit Priority Street, except where the street is outside the Central City, regional or town center, station community, or main street and is also classified as a Major City Traffic Street. Support land use densities that vary directly with the existing and planned capacity of transit service.

- **Access to Transit.** Provide safe and convenient access for pedestrians and bicyclists to, across, and along Major Transit Priority Streets.

- **Improvements.** Employ transit-preferential measures, such as signal priority and bypass lanes. Where compatible with adjacent land use designations, right-of-way acquisition or parking removal may occur to accommodate transit preferential measures or improve access to transit. The use of access management should be considered where needed to reduce conflicts between transit vehicles and other vehicles.

- **Transfer Points.** Provide safe and convenient transfer points with covered waiting areas, transit route information, benches, trash receptacles, enhanced signing, lighting, and telephones. Limited transit service should stop at transfer points and activity centers along Major Transit Priority Streets.

- **Dual Classification.** Streets with dual Regional Transitway and Major Transit Priority Street classifications should retain the operational characteristics of Major Transit Priority Streets, and development should orient to the street.

- **Bus Stops.** Locate bus stops to provide convenient access to neighborhoods and commercial centers. Stops should be located relatively close together in high density and medium-density areas, including regional and town centers and along most main streets, and relatively farther apart in lower-density areas. Passenger amenities should include shelters and route information."

Discussion: SE Division Street satisfies many of the aspects of a Major Transit Priority Street. TriMet Bus 4's bus stops are well spaced. Parking is prohibited at most stops so buses can serve passengers at curbside.

Amenities at SE 11th and 12th Avenues' transfer point with the Bus 70 are limited due to the narrow sidewalk area. There are no special transit-preferential measures at SE Division Street's signalized intersections.

Bicycle: Local Service Bikeway

"Local Service Bikeways are intended to serve local circulation needs for bicyclists and provide access to adjacent properties.

- **Classification.** All streets not classified as City Bikeways or Off-Street Paths, with the exception of Regional Trafficways not also classified as Major City Traffic Streets, are classified as Local Service Bikeways.

- **Improvements.** Consider the following design treatments for Local Service Bikeways: shared roadways, traffic calming, bicycle lanes, and extra-wide curb lanes. Crossings of Local Service Bikeways with other rights-of-way should minimize conflicts.

- **On-Street Parking.** On-street parking on Local Service Bikeways should not be removed to provide bicycle lanes.

- **Operation.** Treatment of Local Service Bikeways should not have a side effect of creating, accommodating, or encouraging automobile through-traffic."

Discussion: SE Division Street satisfies most aspects of a Local Service Bikeway. The street's relatively narrow roadway, onstreet parking and active sidewalks make cycling complicated. Cross streets are spaced 200 to 450 feet apart. This facilitates fairly convenient property access for cyclists who use the bike boulevards on SE Lincoln/Harrison and SE Clinton Streets to accomplish the majority of their cycling trip to and from locations along SE Division Street.

Pedestrian: City Walkway

“City Walkways are intended to provide safe, convenient, and attractive pedestrian access to activities along major streets and to recreation and institutions; provide connections between neighborhoods; and provide access to transit.

- **Land Use.** City Walkways should serve areas with dense zoning, commercial areas, and major destinations. Where auto-oriented land uses are allowed on City Walkways, site development standards should address the needs of pedestrians for access.
- **Improvements.** Use the Pedestrian Design Guide to design City Walkways. Consider special design treatment for City Walkways that are also designated as Regional or Community Main Streets.”

Discussion: SE Division Street’s sidewalk network is complete but not necessarily in universally good condition. Heaving from tree roots, and poor or neglected maintenance have made sidewalks uneven in some locations. The relatively short block lengths create regularly spaced legal pedestrian crossings, but only the signalized intersections and an occasional curb extension provide any form of extra pedestrian crossing protection. The Pedestrian Design Guide offers additional strategies for protecting and simplifying pedestrian crossings. The Guide can be found at <http://www.portlandonline.com/transportation/index.cfm?c=34955>

Freight: Truck Access Street

“Truck Access Streets are intended to serve as access and circulation routes for delivery of goods and services to neighborhood-serving commercial and employment uses.

- **Land Use.** Support locating commercial land uses that generate lower volumes of truck trips on Truck Access Streets.
- **Function.** Truck Access Streets provide access and circulation to land uses within a Transportation District. Non-local truck trips are discouraged from using Truck Access Streets.
- **Connections.** Truck Access Streets should distribute truck trips from Major Truck Streets to neighborhood-serving destinations.
- **Design.** Design Truck Access Streets to accommodate truck needs in balance with other modal needs of the street.”

Discussion: Field observations suggest that SE Division Street satisfies the aspects of a Truck Access Street. The location and time limits of onstreet truck loading zones appear to be established as needed to accommodate the needs of adjacent properties and do not impose on the availability of parking for other reasons. There does not appear to be an inordinate number of trucks on SE Division Street. As discussed later in the Operations and Use section, it was observed that approximately 6% of all motor vehicles on SE Division Street are trucks, most of which are service-oriented and delivery vehicles common to neighborhood collector streets.

Emergency: Major Emergency Response Streets

“Major Emergency Response Streets are intended to serve primarily the longer, most direct legs of emergency response trips.

- **Improvements.** Design treatments on Major Emergency Response Streets should enhance mobility for emergency response vehicles by employing preferential or priority treatments.
- **Traffic Slowing.** Major Emergency Response Routes are not eligible for traffic slowing devices in the future. Existing traffic slowing devices may remain and be replaced if necessary.”

Discussion: SE Division Street has no design treatments that enhance mobility for emergency response vehicles. Though it is a feature that has grown more common throughout the City, traffic signals on SE Division Street are not capable of preempting their routines in order to facilitate emergency vehicle mobility.

Street Design: Community Main Streets

Community Main Streets are designed to accommodate motor vehicle traffic, with special features to facilitate public transportation, bicycles, and pedestrians.

- **Land Use.** Community Main Streets are located within the Central City, Gateway regional enter, station communities, and town centers, and along most main streets. Development consists of a mix of uses oriented to the street.
- **Lanes.** Community Main Streets may include up to four lanes, with on-street parking. Fewer than four vehicle lanes are typically appropriate in Community Main Streets designs, particularly to allow on-street parking.
- **Design Elements.** Community Main Street design shall consider the following: low vehicle speeds; the use of medians and curb extensions to enhance pedestrian crossings where wide streets make crossing difficult; combined driveways; onstreet parking where possible; wide sidewalks with pedestrian amenities such as benches, awnings, and special lighting; landscape strips, street trees, or other design features that create a pedestrian buffer between curb and sidewalk; improved pedestrian crossings at all intersections and mid-block crossings where intersection spacing exceeds 400 feet; striped bikeways or wide outside lane; and vehicle lane widths that consider the above improvements.
- **Design Treatment.** During improvement projects, the preservation of existing vegetation, topography, vistas and viewpoints, driver perception, street lighting, and sight distance requirements should be considered.
- **Utilities.** Consider undergrounding or reducing the visual impact of overhead utilities along Community Main Streets.

Discussion: The Community Main Street portion of the study area, between Tamarack Alley and SE 39th Avenue, is lacking some of the attributes described in the TSP. It has no medians and there are curb extensions only at the SE 30th Avenue and SE 31st Avenue intersections. Essentially half of the onstreet parking is prohibited between SE 11th Avenue and SE 28th Place

during the busiest traffic periods of the day to accommodate a narrow additional traffic lane located immediately adjacent to the sidewalk. The peak period lanes are nine feet wide and there is no buffer between the sidewalks and the lanes. Sidewalk and pedestrian amenities are very rare. Where they are present, they are usually provided by an adjacent business.

Community Corridors

Community Corridors are designed to include special amenities to balance motor vehicle traffic with public transportation, bicycle travel, and pedestrian travel.

- **Land Use.** Community Corridors are located along transit corridors and between segments of Community Main Streets. Commercial and multifamily development should be oriented to the street where the street also has a transit designation.
- **Lanes.** Community Corridors typically have two travel lanes, usually with on-street parking.
- **Design Elements.** Community Corridor design shall consider the need for the following: moderate vehicle speeds; the use of medians and curb extensions to enhance pedestrian crossing and to manage motor vehicle access; combined driveways; on-street parking; buffered sidewalks with pedestrian amenities such as special lighting and special crossing amenities tied to major transit stops; landscape strips, street trees, or other design features that create a pedestrian buffer between curb and sidewalk; improved pedestrian crossings at intersections; striped bikeways or wide outside lanes; and usually narrower motor vehicle lane widths than Regional Corridors.

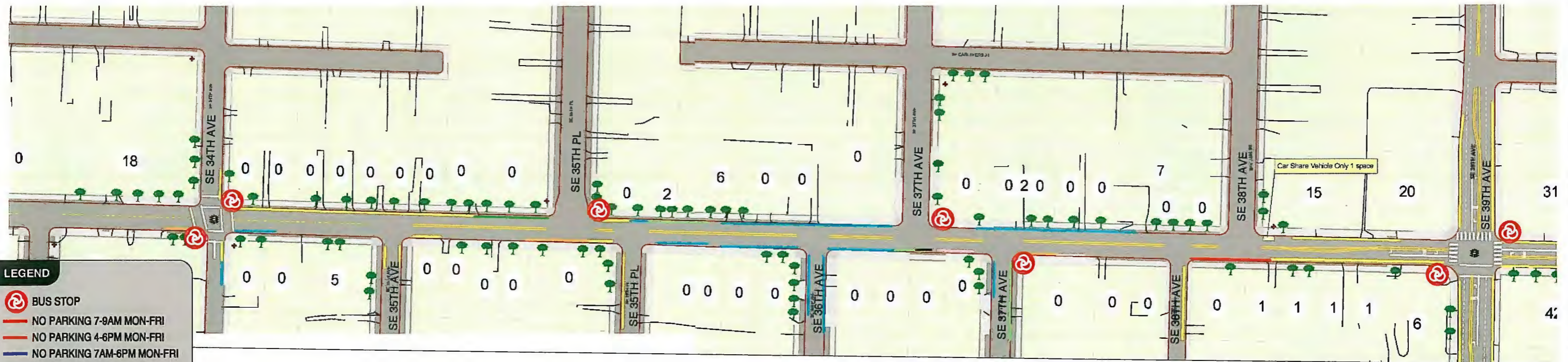
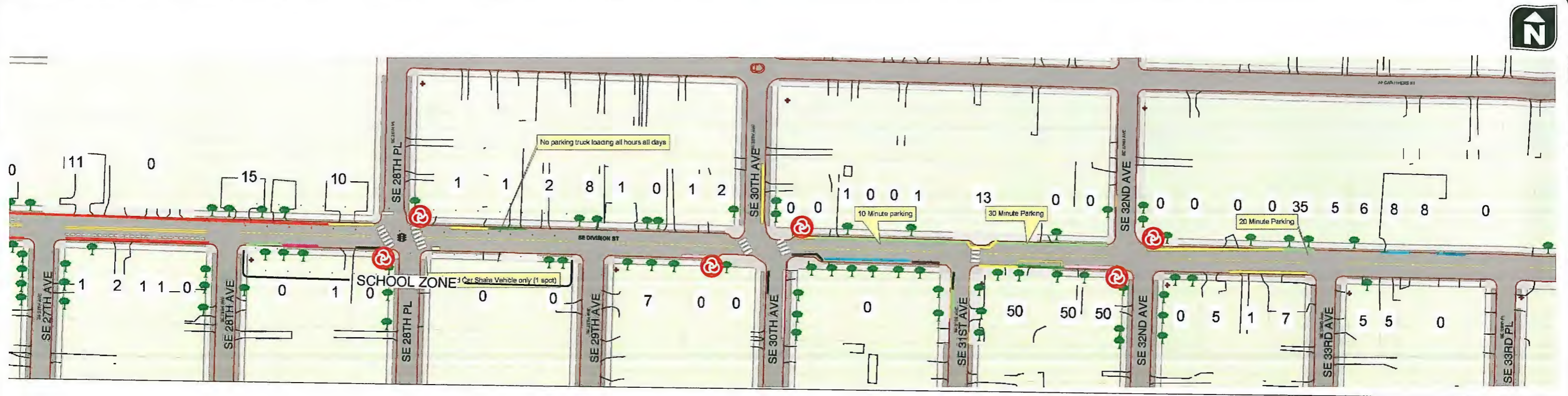
Discussion: The Community Corridor portion of the study area, between SE 11th Avenue and Tamarack Alley, does not have many of the attributes described in the TSP. There are no medians, curb extensions; but there are traffic signals that, among other things, facilitate marked pedestrian crossings at SE 11th, SE 12th, SE Orange, and SE 17th Avenues. The roadway is striped as a four-lane facility. Because parking activity is generally sparse, there is no buffer between curb and sidewalk.

STREET INVENTORY: RIGHT-OF-WAY FEATURES

This portion of the memorandum describes the existing right-of-way features one would see if they walked along SE Division Street or along the other key streets in the vicinity of SE Division Street.

Right-of-Way Features

Details about the existing features within the SE Division Street's right-of-way are illustrated in Figure 2. Specifically, the figure shows the location and type of pavement striping and markings, the location of traffic signals, the location of school zones, the location and shape of



LEGEND

- BUS STOP
- NO PARKING 7-9AM MON-FRI
- NO PARKING 4-6PM MON-FRI
- NO PARKING 7AM-6PM MON-FRI
- TIME LIMITED PARKING
- TRUCK LOADING ZONE
- NO PARKING
- NO PARKING BUS ZONE
- 2 HOUR PARKING
- PRIVATE PARKING STALLS PER PROPERTY

SE DIVISION ST RIGHT-OF-WAY FEATURES
PORTLAND, OREGON

FIGURE
2B



LEGEND

- BUS STOP
- NO PARKING 7-9AM MON-FRI
- NO PARKING 4-6PM MON-FRI
- NO PARKING 7AM-6PM MON-FRI
- TIME LIMITED PARKING
- TRUCK LOADING ZONE
- NO PARKING
- NO PARKING BUS ZONE
- 2 HOUR PARKING
- # PRIVATE PARKING STALLS PER PROPERTY

SE DIVISION ST RIGHT-OF-WAY FEATURES
PORTLAND, OREGON

FIGURE
2A

curb extensions, the type of onstreet parking signing, and the location of transit stops. It also provides an inventory of offstreet parking stalls on adjacent private property. This information includes and adds to David Evans and Associates' 2004 work. SE Division Street's 60-foot right-of-way consists of a 36-foot roadway and two 12-foot areas that consist of either 12-foot sidewalks or 6-foot sidewalks and planting strips that separate the sidewalk from the roadway.

Table 2 illustrates fundamental features and facts about the other key streets in the vicinity of SE Division Street. The table lists information about street widths, sidewalks, bike lanes, parking, and posted speeds. SE Ladd Avenue, SE Lincoln-Harrison Street, and SE Clinton Street are designed as bike boulevards. Specifically all are through streets where motor vehicle speeds are calmed with an assortment of traffic circles and speed humps and traffic volumes are minimized with strategically located and designed traffic diverters. For the sake of brevity, additional detail about the type and location of these features is omitted from this memorandum.

Table 2 Existing Transportation Facility Characteristics

Street Name	Paved Cross-section Width	Sidewalks/ Planter Strips	Bike Boulevard or Bike Lanes	On Street - Parking	Posted Speed
SE Harrison / Lincoln St	36 ft	12 ft	Boulevard	Yes	25
SE Division St	36 ft	12 ft	None	Yes ¹	25
SE Clinton St	36 ft	12 ft	Boulevard	Yes	25
SE Ladd Avenue	34 ft	18 ft	Boulevard	Yes	25
SE 11 th Ave	36 ft	12 ft	No	Yes	30
SE 12 th Ave	36 ft	12 ft	No	Yes	30
SE 21 st Ave	36 ft	12 ft	No	Yes	25
SE 26 th Ave, S of Division St	36 ft	12 ft	Bike Lanes	East Side	25

¹ except parking is prohibited between approximately SE 9th and SE 28th Avenue on the south side between 7:00 and 9:00 a.m. and on the north side between 4:00 and 6:00 p.m.

Traffic Features

- **Striping.** Between SE 11th and SE 28th Avenue, the traffic lane striping consists of a double solid yellow centerline to separate opposing directions of travel and a white dashed line in both directions of travel that creates two traffic lanes in each direction. Each of the four lanes is nine feet wide. Crosswalks are marked at all signalized intersections to designate each intersection's legal crossings. "Ladder" style crosswalks are marked at the two official school zone crosswalks located at SE Orange Street and SE 28th Place as well as at SE 30th and SE 31st Avenues to compliment the curb extensions in the vicinity of the former Nature's grocery store.

- **Signing.** Traffic-related signing is minimal due to the relatively flat straight nature of SE Division Street. Signing consists of speed zone signing (SPEED 25 signs) and school zone signing (Five-sided advance warning signs, SCHOOL SPEED 20 signs, five-sided school crosswalk signs and SPEED 25 signs) for both directions of travel through the corridor's two school zones.
- **Signals.** Traffic signals are located at SE Division Street's intersections with SE 11th, 12th, Orange, 17th, Seven Corners, 26th, 28th Pl, 34th, and 39th Avenues. All operate independent of each other, each executing their one particular routine. The signals are not "interconnected" and are therefore not able to coordinate their routines to help manage vehicle speeds or minimize vehicle delay.

Parking Features

- **Peak-Hour Parking Prohibition, SE 10th to SE 28th Avenues.** To create a second westbound traffic lane during the morning peak period, signs prohibit parking along the north side of SE Division Street between 7:00 and 9:00 a.m. Likewise, signs prohibit parking on the south side of the street in order to create a second eastbound lane between 4:00 and 6:00 p.m., during the afternoon peak period.
- **Parking Prohibition at Bus Zones.** NO PARKING areas have been created at most bus zones along SE Division Street. This creates space for bus drivers to maneuver to the curb to serve passengers. Prohibiting parking for bus zones is especially common when the zones are at signalized intersections. Providing room for buses to get out of traffic allows passengers to load and unload without compromising the capacity of the intersection.
- **Parking Prohibitions at intersections.** There are several locations where it appears that parking has been prohibited in order to improve sight distances from cross streets or to simplify turns from cross streets.
- **Truck Loading Zones.** There are only a few areas along SE Division Street that have been designated for truck loading during specific times of specific days. These are typically customized to address the particular needs of businesses.
- **Parking Time Zones.** Limiting parking durations is a common practice in many commercial districts. Time limits encourage customer "turn over" and prevent drivers from occupying parking spaces for long periods of time. "Park-and-ride" transit riders and retail employees are common long term parkers who are discouraged by parking time zones. In the case of SE Division Street, there are actually very few parking time zones, though there is a concentration of one-hour and two-hour zones in front of the shops near SE 12th Avenue. The use of the peak-hour prohibition signs may help explain the general absence of parking time zones between SE 11th and SE 28th Avenues.

OPERATIONS AND USE

This portion of the memorandum describes how the various transportation modes actually use SE Division Street and the other key streets in the vicinity of SE Division Street. It describes the popularity of each mode, assesses the street network's ability to effectively serve each mode, and evaluates how the modes interact with each other.

Motor Vehicles

Existing Traffic Volumes

To understand the current status of the transportation system on the SE Division Street Corridor, 24-hour bi-directional traffic volume counts were obtained at several locations along SE Division Street, SE Clinton Street, and SE Lincoln-Harrison Street in August 2008. The information was to compare the typical traffic volumes along the key neighborhood streets that parallel SE Division Street. The traffic volume profiles help indicate the relative popularity of each street. Tables 3 and 4 summarize the relative popularity of the streets during a typical weekday.

SE Harrison Street and SE Lincoln Street exhibit typical neighborhood street traffic activity during the average weekday. Peak hour volumes are similar to other hours of the day.

SE Clinton Street's hourly traffic volumes exhibit more of a commuter street pattern where the volumes in one direction spike significantly higher during the a.m. and p.m. peak hours.

Table 3 Eastbound Traffic Volumes on East-West Streets

EASTBOUND TRAFFIC	Time Frame	W. of 20/21st	W. of 26th	W. of 34th	W. of 39th
SE Lincoln-Harrison St	8:00 – 9:00 a.m.	10	40	35	35
	5:00 – 6:00 p.m.	30	55	125	95
	Daily Total	260	610	920	820
SE Division Street	8:00 – 9:00 a.m.	210	220	230	230
	5:00 – 6:00 p.m.	570	660	655	545
	Daily Total	5290	6370	6310	6170
SE Clinton Street	8:00 – 9:00 a.m.	30	255	na	75
	5:00 – 6:00 p.m.	145	165	na	165
	Daily Total	970	1310	na	1100

Table 4 Westbound Traffic Volumes on East-West Streets

WESTBOUND TRAFFIC	Time Frame	W. of 20/21st	W. of 26th	W. of 34th	W. of 39th
SE Lincoln-Harrison St	8:00 – 9:00 a.m.	10	25	35	35
	5:00 – 6:00 p.m.	5	25	40	25
	Daily Total	130	240	520	330
SE Division Street	8:00 – 9:00 a.m.	655	520	540	525
	5:00 – 6:00 p.m.	315	385	410	450
	Daily Total	6100	6650	6740	7080
SE Clinton Street	8:00 – 9:00 a.m.	135	125	na	30
	5:00 – 6:00 p.m.	75	95	na	35
	Daily Total	1120	1330	na	400

SE Division Street experiences a fairly typical weekday commuter traffic profile, with high peaking characteristics in the weekday a.m. and p.m. peak hours. Traffic activity is less during the time between commuter peaks, but remains high relative to SE Lincoln-Harrison and SE Clinton Streets.

Traffic Volume Trends

The 2008 data were compared to traffic counts conducted in 2004. Table 5 displays the intersection peak hour total entering volume (TEV) at each of SE Division Street's signalized intersections during the year 2004 conditions and year 2008 conditions. The 2008 traffic counts are consistently lower than the 2004 data. At some intersections the difference exceeds 25-percent.

A select link analysis conducted using the City's transportation model indicates approximately two-thirds of the traffic on SE Division Street could currently be considered local to the overall neighborhood. "Local" means that the origin and/or the destination of the vehicular trips in the corridor occur within the area bounded by SE 11th Avenue and SE 41st Avenue, and between SE Hawthorne Street and SE Powell Boulevard. The remaining one-third of the traffic could be considered as "through" traffic that travels the full length of the study area without stopping.

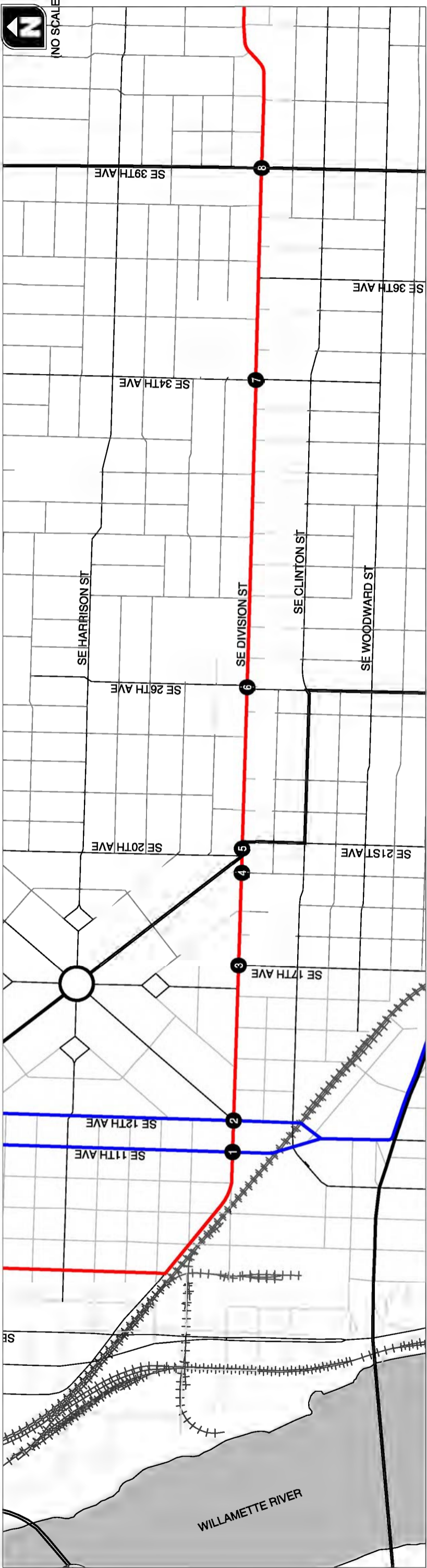
Table 5 Peak Hour Intersection Total Entering Volume

Intersection	Weekday AM TEV			Weekday PM TEV		
	Year 2004	Year 2008	Percent Change	Year 2004	Year 2008	Percent Change
SE Division Street/SE 11th Avenue	1,920	1,650	-14.1%	2,215	1,930	-13.0%
SE Division Street/SE 12th Avenue	2,200	2,000	-9.1%	1,945	1,685	-13.3%
SE Division Street/SE 17th Avenue	1,500	1,105	-26.5%	1,375	1,010	-26.6%
SE Division Street/SE 20th Avenue (South)	1,365	960	-29.9%	1,360	1,005	-26.0%
SE Division Street/SE 20th Avenue (North)-SE Ladd Avenue	1,645	1,200	-26.9%	1,570	1,365	-13.0%
SE Division Street/SE 21st Avenue	1,585	1,165	-26.5%	1,535	1,350	-12.1%
SE Division Street/SE 26th Avenue	1,625	1,245	-23.3%	1,850	1,460	-21.0%
SE Division Street/SE 34th Avenue	1,100	1,100	-0.3%	1,360	1,280	-6.0%
SE Division Street/SE 39th Avenue	2,175	2,510	15.6%	3,055	3,075	0.80%

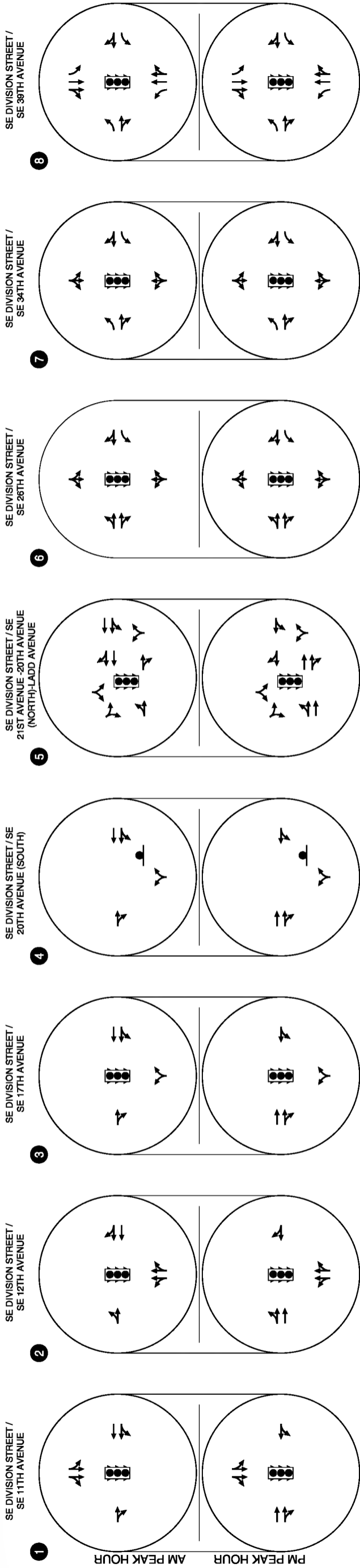
Signalized Intersection Performance

Figure 3 illustrates the intersection lane configurations for the signalized intersections along SE Division Street, between SE 11th and SE 39th Avenues. Figure 4 shows the motor vehicle volumes for each individual turning movement at the intersections as well as the **level-of-service** and **volume-to-capacity ratio** results during typical weekday a.m. and p.m. peak hours, respectively. As shown in this figure, the intersection of SE Division Street and SE 39th Avenue operates at capacity and level-of-service “E” during the a.m. peak hour. All other intersections currently operate acceptably per the operating standards of the City of Portland. See *Appendix B* for an explanation of level-of-service and volume-to-capacity ratio.

An additional test of a signal’s affect on traffic is to conduct a 95th percentile **queuing** analysis. Vehicle queue lengths at signalized intersections fluctuate throughout a typical day, but the 95th percentile queue length for any given intersection approach is the length that can be expected to be exceeded only 5 percent of the time. The analysis results can indicate how well a signal is serving the traffic demand on each intersection approach. It can also indicate whether queues can be expected to block adjacent intersections and driveways. Table 6 summarizes the results of the signalized queuing analyses for the existing peak hour traffic conditions.



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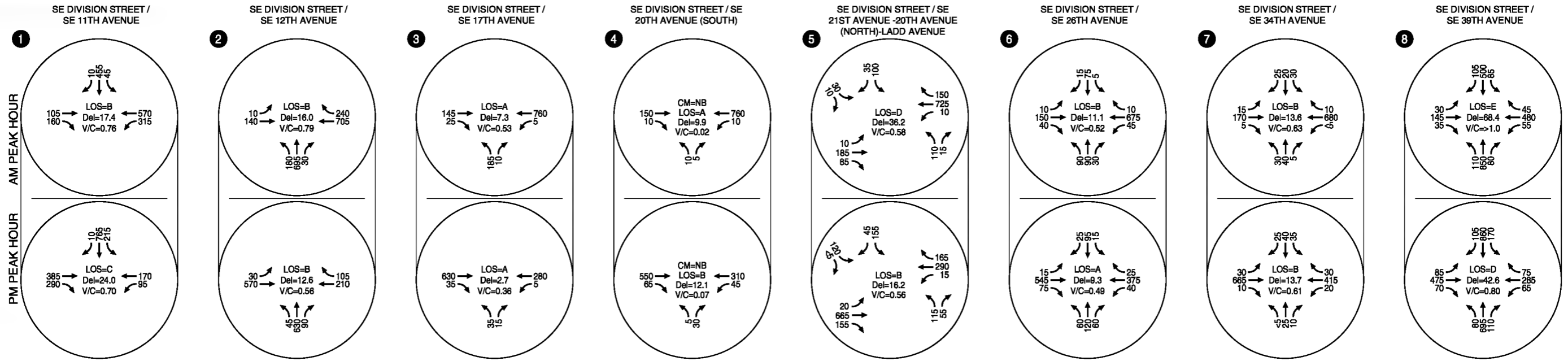
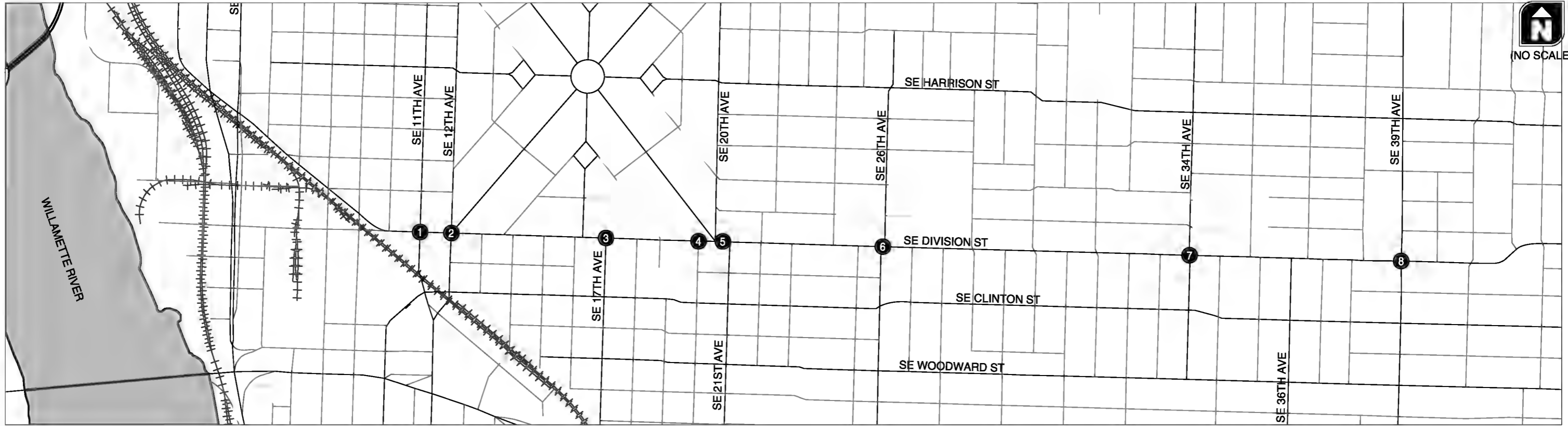


LEGEND

 - STOP SIGN

 - TRAFFIC SIGNAL

EXISTING LANE CONFIGURATIONS
AND TRAFFIC CONTROL DEVICES
PORTLAND, OREGON



LEGEND

- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

YEAR 2008 EXISTING TRAFFIC CONDITIONS
WEEKDAY AM AND PM PEAK HOURS
PORTLAND, OREGON

FIGURE
4

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As shown in Table 6, there are intersections where more than 5 percent of signal induced queues can be expected to block adjacent intersections and driveways. In most cases the queues are not necessarily excessive. Except occasionally during the peak traffic periods, queues dissipate with the next green light. The more common situation is that cross streets and driveways are too close to a signalized intersection.

Table 6 Estimated 95th Percentile Queue Lengths

Intersection	Movement & Approach	Weekday AM Peak Hour (ft)	Weekday PM Peak Hour (ft)	Distance from nearest intersection/driveway	Adequate Storage Available?
Division Street at SE 11 th Avenue	EBT	94	210	210	Yes
	WBT	170	64	200	Yes
Division Street at SE 12 th Avenue	EBT	101	145	200	Yes
	WBT	97	89	195	Yes
Division Street at SE 17 th Avenue	EBT	16	26	140	Yes
	WBT	136	40	200	Yes
Division Street at SE Ladd Avenue/SE 20 th Avenue (North)	EBT	133	184	345	Yes
Division Street at SE 21 st Avenue	WBT	373	231	200	No
Division Street at SE 26 th Avenue	EBT	21	73	130	Yes
	WBT	128	16	50	No
Division Street at SE 34 th Avenue	EBT	34	358	185	No
	WBT	191	155	250	Yes
Division Street at SE 39 th Avenue	EBT	38	427	130	No
	WBT	458	236	240	No

The performance of the intersections during the morning and afternoon peak periods is influenced significantly by how drivers use the available **peak-hour lanes** between SE 11th and SE 28th Avenues. Field observations in the vicinity of SE 21st Avenue indicate that 35% of the westbound traffic uses the curb lane during the 7:00 to 9:00 a.m. period when the lane is available. Approximately 30% of the eastbound traffic uses the curb lane during the 4:00 to 6:00 p.m. period when the lane is available. SE Division Street does not operate as efficiently as it would if the curbside peak hour lanes shared the traffic demand equally with the inside lanes.

The relatively narrow widths of the striped lanes (9-feet) probably help explain why the curbside lane is less desirable than the inside lane. Except during the busiest part of the day, the corridor operates very much like a two lane facility. Drivers prefer to use the inside lanes and tend to only use the pro-time curbside lanes:

- when signal-induced queues are perceived to be excessively long,

- to pass large slow-moving vehicles that are queued in front of them, and
- to pass signal-induced queues on the way to making a right turn at, or in the vicinity of, a signalized intersection.

Freight

According to counts conducted by PDOT in August 2008, approximately 6% of the vehicles using SE Division Street on a typical weekday are trucks. This includes buses of all kinds as well as all delivery trucks and larger vehicles used to provide services to properties throughout the immediate neighborhood. This percentage of trucks is considered typical for neighborhood collector streets like SE Division Street. It is also only slightly higher than the 4-5% trucks observed on SE Lincoln-Harrison and SE Clinton Streets, both of which are much lower-volumed local service streets.

Bicycle Facilities

While cycling for multiple blocks on SE Division Street is relatively uncommon, cycling on the bicycle boulevards in the vicinity of SE Division Street is growing more popular each year. In the summer the number of people cycling on SE Lincoln-Harrison, SE Clinton, and SE Ladd Avenue during a typical week day now exceeds the number of motor vehicles. This fact is illustrated in Table 7. Table 7 summarizes the annual bicycle volume counts conducted by PDOT at specific locations in the vicinity of SE Division Street during August and September of each year. Traffic volumes listed in the table were collected in August 2008.

Table 7 Daily Bicycle Volumes at Key Locations near SE Division Street

Location	Daily Traffic Volumes (vpd)	Daily Bicycle Volumes (vpd)					
		2008	2007	2006	2005	2004	2003
SE Harrison & Ladd Circle	2400	3975	1755	1850	1855	na	na
SE Clinton & 26 th Ave.	2640	2710	1770	1480	1551	1235	1040
SE Lincoln & 41 st Ave.	1440	1925	1025	1015	na	na	na
Hawthorne Bridge	na	7379	6423	5557	4829	4428	4055

The growing popularity of cycling significantly influences the Seven Corners intersection. This is the intersection where cyclists cross SE Division Street on their trips between SE Clinton Street and SE Ladd Avenue, via SE 21st Avenue. There are large numbers of cyclists sharing the intersection with motor vehicles, and the maneuvering required of drivers and cyclists to travel between SE 21st and SE Ladd Avenues is complicated and requires special care on the part of

cyclists and drivers alike. In particular, cyclists and drivers proceed from SE 21st at the same time. The drivers wishing to turn right onto SE 20th Avenue converge with and often cross paths with cyclists who are heading for SE Ladd Avenue.

Transit

A summary of routes that directly serve SE Division Street is provided in the following paragraphs. Information related to route operating hours, and frequency is included. The information was collected from published TriMet bus schedules. Figure 2 shows the location of TriMet bus stops along SE Division Street.

Route 4 Division provides service from Portland City Center to Gresham Transit Center. This route operates on SE Division Street. Service is provided Monday through Friday between the hours of 5:30 a.m. to 11:30 p.m., and on Saturdays and Sundays from 6:10 a.m. to 12:30 a.m. This is a frequent service bus which means that service is provided at 15-minute or better headways during the day every day.

Route 10 Harold crosses SE Division Street via SE Ladd and SE 21st Avenues, and provides service through several SE Portland neighborhoods between Portland City Center and SE 122nd Avenue and SE Reedway. Monday through Friday, service is provided between 6:30 a.m. and 8:30 p.m. Saturday service is provided between 8:15 a.m. and 6:30 p.m. and no service is provided on Sundays. During the weekday, busses operate on 20-30 minute headways (15-20 minute headways during peak commute periods). On Saturdays, service is provided on 60-minute headways.

Route 70 crosses SE Division Street at SE 11th and 12th Avenues, and provides service between the Rose Quarter Transit Center and the Milwaukie Transit Center. Daily service is provided between on 30-minute headways seven day a week.

Ridership

Average daily ridership data for Fall 2007 for Routes 4 and 10 were provided by TriMet. On a typical weekday; Bus 4, traveling from Portland City Center to Gresham Transit Center, sees 520 boardings and 660 alightings along SE Division Street, between SE 11th and SE 39th Avenues. In the reverse direction, total boarding's and alightings are 710 and 550 respectively.

For Route 10, traveling from Portland City Center to 122nd and Reedway, a total of 28 boardings and 80 alightings occur within the study area on an average weekday and in the reverse direction these numbers are 68 and 27 respectively.

Tables 8 and 9 provide boarding and alighting information for each bus stop in the study area. These tables give the reader an indication of which stops are most popular. They tables also indicate whether the stops are supported with pedestrian crossing amenities.

Table 8 Route 4 Division. Typical Daily Boardings and Alightings per Bus Stop

Bus Stop Location	From Portland City Center		To Portland City Center		Pedestrian Crossing Amenity
	On	Off	On	Off	
Division @ 12 th	109	72	102	131	Signal
Division @ 17 th	21	47	47	20	Signal
Division @ 20 th	69	98	91	48	Signal
Division @ 23 rd	23	30	27	17	None
Division @ 26 th	44	56	75	41	Signal
Division @ 28 th PI	31	36	33	32	Signal
Division @ 30 th	14	31	43	13	Curb Extensions/ Crosswalk
Division @ 32 nd	12	33	34	12	None
Division @ 34 th	16	47	38	17	Signal
Division @ 35 th PI	11	31	29	9	None
Division @ 37 th	20	35	47	15	None
Division @ 39 th	138	126	136	184	Signal

Table 9 Route 10 Harold. Typical Daily Boardings and Alightings per Bus Stop

Bus Stop Location	From Portland City Center		To Portland City Center		Pedestrian Crossing Amenity
	On	Off	On	Off	
Ladd @ Palm	4	9	6	3	Traffic Circle
Ladd @ Ladd Cir.	5	9	14	6	None
Ladd @ Lavender	2	9	5	2	Traffic Circle
Ladd @ Division	5	32	22	1	Signal
21 st @ Division	5	32	22	1	Signal
21 st @ Clinton	4	10	13	4	4-Way STOP
Clinton @ 23 rd	3	6	6	2	Traffic Circle
Clinton @ 26 th	19	23	23	16	4-Way STOP

Traffic Safety

The crash histories of the study intersections were reviewed in an effort to identify potential intersection safety issues. Crash records were obtained from ODOT for the five year period from January 1, 2003 through December 31, 2007.

A summary of the crash data is provided in Table 10, including the severity and type of crashes over the five-year analysis period.

Table 10 Study Intersection Crash History

Intersection	Total Number of Crashes	Crash Type					Crash Severity	
		Rear - End	Angle	Turning	Sideswipe	Other	PDO ¹	Injury
SE Division Street/SE 11th Avenue	15	3	4	8	0	0	7	8
SE Division Street/SE 12th Avenue	18	0	9	7	2	0	13	5
SE Division Street/SE 20th Avenue/SE 21st Avenue/SE Ladd Avenue plus 150 feet	24	8	0	9	3	4	16	8
SE Division Street/SE 26th Avenue	8	1	2	5	0	0	5	3
SE Division Street/SE 34th Avenue	4	0	4	0	0	0	4	0
SE Division Street/SE 39 th Avenue	24	7	6	8	1	2	15	9

¹ PDO = Property Damage Only

To evaluate the frequency of crashes with respect to the total volumes of traffic at each intersection, crash rates were calculated. Table 11 shows crash rates for the intersections, expressed in crashes per million entering vehicles (MEV).

Table 11 Study Intersection Crash Rate

Intersection	Number of Crashes	Crashes per Year	Peak Hour TEV	MEV/Year	Crashes /MEV
SE Division Street/SE 11 th Avenue	15	3	1929	7.04	0.43
SE Division Street/SE 12 th Avenue	18	3.6	1684	6.15	0.58
SE Division Street/SE 20 th Avenue/SE 21 st Avenue/SE Ladd Avenue plus 150 feet	24	4.8	1344	4.90	0.98
SE Division Street/SE 26 th Avenue	8	1.6	1460	5.33	0.3
SE Division Street/SE 34 th Avenue	4	0.8	1278	4.66	0.17
SE Division Street/SE 39 th Avenue	24	4.2	3077	11.23	0.38

LEGEND: TEV = Total Entering Volume, MEV = Million Entering Vehicles

As shown in Table 11, the crash rate at the Seven Corners intersection is relatively high compared to other intersections in the project area. Its rate approaches 1.0, a rate that is often viewed as the threshold for warranting closer analysis. Crash records were reviewed in greater detail at this location to determine possible contributing circumstances to the relatively high number of crashes at this location. All other intersections had relatively low crash rates.

Seven Corners Safety

A review of the crash patterns at the Seven Corners intersection revealed a high number of rear-end and turning movement crashes. In general these types of crashes are synonymous with high volume signalized intersections. Additionally, the intersection geometry likely contributes to the potential for turning crashes due to the unusually long crossing distance through the intersection. Of the 24 crashes at this intersection during the five year period, 8 were rear-end crashes, 9 were turning movement crashes, 3 were sideswipe, and other crash types accounted for 4 crashes. Although this intersection experiences a high volume of bike traffic, none of the reported crashes involved cyclists or pedestrians.

Appendix A: *Division Green Street Main Street Project. Multimodal Transportation and Urban Design Analysis.* David Evans and Associates. 2004

Appendix B: Level-of-Service Explanation

DRAFT

Attachment A

Division Green Street Main Street
Multimodal Transportation and Urban Design Analysis

DRAFT

Attachment B
Level-of-Service Explanation

Appendix B Level-of-Service Concept

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from “A” to “F”.¹

SIGNALIZED INTERSECTIONS

The six level-of-service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service “D” is generally considered to represent the minimum acceptable design standard.

Table B-1 Level-of-Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

¹ Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

Table B2 Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level of service for unsignalized intersections is presented in Table B4. Using this definition, Level of Service “E” is generally considered to represent the minimum acceptable design standard.

Table B3 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	<ul style="list-style-type: none">Nearly all drivers find freedom of operation.Very seldom is there more than one vehicle in queue.
B	<ul style="list-style-type: none">Some drivers begin to consider the delay an inconvenience.Occasionally there is more than one vehicle in queue.
C	<ul style="list-style-type: none">Many times there is more than one vehicle in queue.Most drivers feel restricted, but not objectionably so.
D	<ul style="list-style-type: none">Often there is more than one vehicle in queue.Drivers feel quite restricted.
E	<ul style="list-style-type: none">Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement.There is almost always more than one vehicle in queue.Drivers find the delays approaching intolerable levels.
F	<ul style="list-style-type: none">Forced flow.Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table B4 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

APPENDIX E - KITTELSON TRAFFIC ANALYSIS



KITTELSON & ASSOCIATES, INC.

TRANSPORTATION ENGINEERING / PLANNING

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Date: June 24, 2009 **Project #:** 9557.0
To: Elizabeth Mahon, Portland Bureau of Transportation (PBOT)
From: Mike Coleman
Cc: Julia Kuhn
Project: Division Street: SE 11th Avenue to SE 26th Avenue
Subject: Traffic Analysis: Two Lanes versus One Lane in Each Direction

The purpose of this technical memorandum is to provide a transportation assessment related to the urban design of SE Division Street between SE 11th Avenue and SE 26th Avenue. This review focuses on the feasibility of removing the pro-time lanes and modifying the cross-section of SE Division Street within the study area. The memorandum documents the City's design and operational guidelines, observations recorded during recent site visits, and forecast operations at the six study intersections under three analysis scenarios (i.e., two lanes in each direction, one lane in each direction with existing signal timings, and one lane in each direction with optimized signal timings). The study intersections are:

- SE 11th Avenue & SE Division Street,
 - SE 12th Avenue & SE Division Street,
 - SE 17th Avenue & SE Division Street,
 - SE 20th Avenue/Ladd Street & SE Division Street,
 - SE 21st Avenue & SE Division Street,
 - SE 26th Avenue & SE Division Street,
- } 7 Corners

DESIGN AND OPERATIONS GUIDELINES

The following information was provided by PBOT Traffic Engineering staff for the purpose of guiding roadway design alternatives for the SE Division Streetscape Project.

Geometric Design

A design speed of 30 miles per hour (mph) is appropriate along SE Division Street. The posted speed is 25 mph. In the Hosford Abernathy school zone, the speed limit is reduced to 20 mph when children are present. The 85th-percentile speed at SE 20th Avenue/21st Avenue/Ladd Street & SE Division Street (Seven corners) is between 26-31 mph.

For the alternatives in which the existing four travel lanes are maintained, 9-foot lanes are acceptable. Otherwise, minimum lane widths should be 10 feet. It is not acceptable to narrow existing sidewalk widths to provide a wider roadway cross-section.

Existing Traffic Signals

All of the signalized intersections along SE Division Street between 11th and 39th Avenues are equipped with 170 controllers. Signal operations improvements must acknowledge the opportunities and limitations associated with 170 controllers

Where traffic conditions allow, minimum green times should be equal to or greater than the time needed to accommodate the associated pedestrian crossing time. Use of pedestrian actuation equipment (push buttons) would be an acceptable alternative at locations where capacity limitations warrant using the green time to accommodate traffic demand when pedestrians are not present.

The City's measures of effectiveness for vehicular traffic are the level of service (LOS) and volume-to-capacity (v/c) ratio. The lowest acceptable level of services at a signalized intersection is LOS D. Intersections with a v/c greater than 0.95 can see no more than a 10 second increase in delay.

Transit

TriMet is responsible for bus service in the corridor and it will be assumed that all stops will remain in their current locations. With relation to this study, it is preferred that any future bus stops be located and designed so buses stop in a traffic lane rather than in the on-street parking area.

SITE VISITS AND FINDINGS

Site visits were conducted in June 2009 during both the a.m. and p.m. peak periods in order to gain a better understanding of the operations at the following three intersections:

- SE 12th Avenue & SE Division Street
- SE 20th Avenue/21st Avenue/Ladd Street & SE Division Street
- SE 26th Avenue & SE Division Street

These intersections were selected because previous analysis indicated that they were the most likely to require two lanes in each direction on SE Division Street in order to perform acceptably.

This field visit allowed for validation of the traffic analysis results. It also provided an important starting point for assessing alternative geometric improvements.

Specific attention was given to:

- various transportation modes and how they interacted,
- lane utilization,
- number of vehicles that could pass through the intersection during a given green phase,
- how often the green phase failed to serve the traffic demand, and
- vehicular queue lengths.

The general conclusions reached for each intersection are discussed below. *The specific observations made at each location are included in Appendix A.*

SE 12th Avenue & SE Division Street

Based on field observations and intersection operations, the two existing westbound lanes that approach SE 12th Avenue and continue through the 11th Avenue intersection need to be maintained to meet the city's guidelines. Weekday a.m. peak period volumes could likely not be served with a single westbound lane as this would result in significant impacts to traffic circulation, traffic delay, and vehicle queuing.

It appears that a single eastbound lane could accommodate traffic during the weekday p.m. peak period.

The locations of the existing bus stops should be reevaluated if any changes are made to striping and lane geometry at this intersection.

SE 20th Avenue/21st Avenue/Ladd Street & SE Division Street

At this intersection, motorists typically prefer to use the inside lane; however, due to the high weekday a.m. peak period volumes, the outside lane is needed to accommodate vehicle demand. For this reason, we don't advise reducing the westbound approach to a single-lane configuration.

We also do not recommend reducing SE Division Street's eastbound approach to a single lane given the intersection's complexity and the space required to make the different movements that this approach serves. The interaction between the unsignalized intersection of Division Street & 20th Avenue (south leg) and the signalized intersection of Division Street & Ladd Street/20th Avenue (north leg) generates an especially complicated condition during the mid-week weekday p.m. peak period. The queue formed at the Ladd Street intersection spills back to the west and beyond the 20th Avenue intersection.

SE 26th Avenue & SE Division Street

The field observations indicate that traffic can operate acceptably with a single-lane configuration for both the westbound and eastbound directions. However, alternatives for accommodating westbound left-turns and eastbound right-turns and reallocating green time to better serve users of the northbound approach should be explored.

TRAFFIC ANALYSIS

The performance of each signalized intersection in the corridor was analyzed using the procedures outlined in the 2000 Highway Capacity Manual (1), published by the Transportation Research Board. *Appendix B includes a description of level of service, the criteria by which it is determined, and how level of service is measured.* The intersection performance analysis provided a way to systematically evaluate and compare the effects of the following three scenarios:

- Existing characteristics - two lanes in each direction on Division Street and under existing signal timing;
- Characteristics proposed by urban design team - one lane in each direction on Division Street and under existing traffic signal timing; and
- Optimized proposed characteristics - one lane in each direction on Division Street and under new traffic signal timing that optimizes the performance of the proposed conditions.

The results are summarized in the following subsections. *The Synchro reports are included in Appendices C, D, and E.*

The Synchro analysis utilized vehicle turning movement counts that were collected in December 2008 and reflect the number of vehicles that passed through a given intersection during the counting period. Where intersection traffic demand exceeds intersection capacity, traffic counts will only reflect intersection capacity. Excess demand is best documented by field observations that confirm whether vehicles are passing through the intersection without having to wait for multiple signal cycles. Traffic volumes vary from day to day and season to season, but the count results are a dependable basis for comparing the relative performance of alternative intersection control strategies.

For the Proposed and Optimized Proposed scenarios, changes in volume-to-capacity ratio were assessed and the remaining capacity (e.g., "reserve capacity") was also determined. The results are summarized in the following subsections.

Existing Characteristics (Two Lanes in Each Direction)

Tables 1 and 2 summarize the delay and level of service results from the Synchro analysis for the existing weekday a.m. and p.m. peak hours respectively.

Table 1 Delay/LOS for Weekday a.m. Peak Hour (with Existing Lanes and Signal Timing)

Intersection with SE Division St	Delay/LOS Under Existing Characteristics				
	EB	WB	NB	SB	OV
SE 11 th Ave	23.9 C	15.7 B	X	21.4 C	18.8 B
SE 12 th Ave	8.3 A	12.1 B	20.9 C	X	15.8 B
SE 17 th Ave	2.0 A	2.9 A	29.8 C	X	7.4 A
SE Ladd Ave/SE 20 th Ave	17.4 B	8.6 A	X	22.9 C	12.0 B
SE 21 st Ave	0.9 A	51.8 D	37.3 D	X	38.6 D
SE 26 th Ave	4.2 A	6.9 A	28.1 C	21.8 B	11.3 B

EB: Eastbound Approach
WB: Westbound Approach
NB: Northbound Approach
SB: Southbound Approach
OV: Overall Intersection
X: Movement does not exist

Table 2 Delay/LOS for Weekday p.m. Peak Hour (with Existing Lanes and Signal Timing)

Intersection with SE Division St	Delay/LOS Under Existing Characteristics				
	EB	WB	NB	SB	OV
SE 11 th Ave	21.2 C	14.3 B	X	28.2 C	23.8 C
SE 12 th Ave	9.2 A	7.8 A	19.4 B	X	13.6 B
SE 17 th Ave	1.4 A	1.4 A	30.8 D	X	2.9 A
SE Ladd Ave/SE 20 th Ave	13.7 B	4.0 A	X	35.0 C	16.5 B
SE 21 st Ave	1.0 A	19.1 B	42.9 D	X	11.1 B
SE 26 th Ave	4.5 A	2.3 A	28.4 C	22.9 C	9.5 A

As shown in Table 2, all movements at all intersections operate acceptably during the weekday a.m. and p.m. peak hours. These analyses results are consistent with the results cited in the January 31, 2009 *Existing Transportation Conditions Summary* memorandum.

Reserve Capacity

Tables 3 and 4 display the “reserve capacities” expressed as percentages, which were calculated by subtracting the existing v/c ratio from 1.0 (an intersection at full capacity). All the intersections and individual movements have reserve capacities available during the weekday p.m. peak hour.

Table 3 Reserve Capacity during Weekday a.m. Peak Hour (with Existing Lanes and Signal Timing)

Intersection with SE Division St	Reserve Capacity (%) Under Existing Characteristics				
	EB	WB	NB	SB	OV
SE 11 th Ave	51%	12%	X	48%	26%
SE 12 th Ave	77%	14%	28%	X	21%
SE 17 th Ave	82%	50%	37%	X	47%
SE Ladd Ave/SE 20 th Ave	67%	26%	X	64%	63%
SE 21 st Ave	76%	1%	46%	X	57%
SE 26 th Ave	79%	48%	45%	79%	47%

Table 4 Reserve Capacity during Weekday p.m. Peak Hour (with Existing Lanes and Signal Timing)

Intersection with SE Division St	Reserve Capacity (%) Under Existing Characteristics				
	EB	WB	NB	SB	OV
SE 11 th Ave	34%	45%	X	15%	31%
SE 12 th Ave	53%	58%	32%	X	43%
SE 17 th Ave	63%	77%	74%	X	64%
SE Ladd Ave/SE 20 th Ave	30%	45%	X	29%	30%
SE 21 st Ave	54%	37%	26%	X	43%
SE 26 th Ave	53%	60%	43%	71%	50%

As shown in Tables 3 and 4, all movements and all intersections are currently operating with additional capacity during the mid-week weekday a.m. and p.m. peak hours.

Proposed Characteristics (One Lane in Each Direction)

The urban design team is proposing that SE Division be modified to one lane in each direction within the study area. This proposal was evaluated assuming the existing signal timings remain in place and also assuming optimized timing occurs in the corridor. This two-step process alters one variable at a time; number of lanes first, then green time reallocation. The following subsections summarize the results.

Existing Signal Timings

Tables 5 and 6 summarize the results of the analysis for *existing signal timings* at the study intersections. The results of the proposed 2-lane configurations are listed alongside the results previously reported for the existing 4-lane configurations.

Table 5 Comparison of Delay/LOS during Existing and Proposed Scenarios for Weekday a.m. Peak Hour with Existing Signal Timing

Intersection with SE Division St	Delay (sec) & LOS Under Existing Characteristics (4 Lanes and Existing Signal Timing)					Delay (sec) & LOS Under Proposed Characteristics (2 Lanes and Existing Signal Timing)				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	23.9 C	15.7 B	X	21.4 C	18.8 B	16.2 B	123.4 F	X	28.3 C	77.2 E
SE 12 th Ave	8.3 A	12.1 B	20.9 C	X	15.8 B	16.0 B	173.0 F	21.0 C	X	92.4 F
SE 17 th Ave	2.0 A	2.9 A	29.8 C	X	7.4 A	2.0 A	5.5 A	30.6 C	X	9.3 A
SE Ladd Ave/ SE 20 th Ave	17.4 B	8.6 A	X	22.9 C	12.0 B	19.9 B	73.8 E	X	22.9 C	60.1 E
SE 21 st Ave	0.9 A	51.8 D	37.3 D	X	38.6 D	0.9 A	234.0 F	38.4 D	X	160.5 F
SE 26 th Ave	4.2 A	6.9 A	28.1 C	21.8 B	11.3 B	4.4 A	10.6 B	28.8 C	22.0 C	13.5 B

EB: Eastbound Approach
WB: Westbound Approach
NB: Northbound Approach
SB: Southbound Approach
OV: Overall Intersection
X: Movement does not exist

As can be seen in Table 5, the intersections of SE 11th Avenue, SE 12th Avenue, and SE 21st Avenue are expected to fail (with a LOS F) under the configuration with only one lane in each direction on SE Division Street.

Table 6 Comparison of Delay/LOS during Existing and Proposed Weekday p.m. Peak Hour with Existing Signal Timing

Intersection with SE Division St	Delay (sec) & LOS Under Existing Characteristics (4 Lanes and Existing Signal Timing)					Delay (sec) & LOS Under Proposed Characteristics (2 Lanes and Existing Signal Timing)				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	21.2 C	14.3 B	X	28.2 C	23.8 C	24.1 C	27.0 C	X	28.3 C	26.7 C
SE 12 th Ave	9.2 A	7.8 A	19.4 B	X	13.6 B	21.1 C	8.6 A	16.4 B	X	16.6 B
SE 17 th Ave	1.4 A	1.4 A	30.8 D	X	2.9 A	3.2 A	1.6 A	31.6 C	X	4.2 A
SE Ladd Ave/ SE 20 th Ave	13.7 B	4.0 A	X	35.0 C	16.5 B	51.0 D	3.5 A	X	35.0 C	32.4 C
SE 21 st Ave	1.0 A	19.1 B	42.9 D	X	11.1 B	3.8 A	19.1 B	59.3 E	X	14.9 B
SE 26 th Ave	4.5 A	2.3 A	28.4 C	22.9 C	9.5 A	11.5 B	3.2 A	29.7 C	23.2 C	13.0 B

As shown in Table 6, all of the intersections are forecast to operate at a level-of-service "C" or better during the weekday p.m. peak hour with only one lane in each direction.

Reserve Capacity

Tables 7 and 8 list the reserve capacities of the study intersections under proposed characteristics with *existing signal timings*.

Table 7 Comparison of Reserve Capacity. Existing 4-Lanes and Proposed 2-Lanes. Weekday a.m. Peak Hour with Existing Signal Timing

Intersection with SE Division St	Reserve Capacity (%) Under Existing Characteristics					Reserve Capacity (%) Under Proposed Characteristics – Existing Signal Timing				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	51%	12%	X	48%	26%	54%	-25%	X	33%	-7%
SE 12 th Ave	77%	14%	28%	X	21%	65%	-35%	28%	X	-6%
SE 17 th Ave	82%	50%	37%	X	47%	81%	27%	36%	X	29%
SE Ladd Ave/ SE 20 th Ave	67%	26%	X	64%	63%	55%	-13%	X	64%	15%
SE 21 st Ave	76%	1%	46%	X	57%	76%	-46%	43%	X	24%
SE 26 th Ave	79%	48%	45%	79%	47%	75%	24%	43%	77%	29%

Concurrent with the level-of-service results in Table 5, the westbound approaches at the intersections of SE 11th Avenue, SE 12th Avenue, 7 Corners, and SE 26th Avenues do not have sufficient capacity to operate with one lane in each direction. In addition, the westbound direction at the intersection of SE 26th Avenue & SE Division would be expected to operate at capacity without special signal timing provisions.

Table 8 Comparison of Reserve Capacity. Existing 4-Lanes and Proposed 2-Lanes Weekday p.m. Peak Hour with Existing Signal Timing

Intersection with SE Division St	Reserve Capacity (%) Under Existing Characteristics					Reserve Capacity (%) Under Proposed Characteristics				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	34%	45%	X	15%	31%	24%	23%	X	15%	22%
SE 12 th Ave	53%	58%	32%	X	43%	14%	54%	45%	X	29%
SE 17 th Ave	63%	77%	74%	X	64%	40%	77%	65%	X	42%
SE Ladd Ave/ SE 20 th Ave	30%	45%	X	29%	30%	-2%	45%	X	25%	14%
SE 21 st Ave	54%	37%	26%	X	43%	30%	38%	13%	X	27%
SE 26 th Ave	53%	60%	43%	71%	50%	26%	51%	39%	69%	29%

Concurrent with the level-of-service results, all intersections are forecast to have some amount of residual capacity during the weekday p.m. peak hour. The eastbound direction at the 7 Corners intersection is expected to operate at capacity without special signal timing provisions.

Optimized Signal Timings

Tables 9 and 10 display the results for one lane scenario with the *signal timings optimized* using Synchro. The purpose of investigating this scenario was to determine to what degree adjustments to the existing signal timing would result in more satisfactory performances.

Table 9 Comparison of Peak Hour Delay/LOS. Proposed 2-Lanes with Existing Timing and Proposed 2-Lanes with Optimized Signal Timing. Weekday a.m. Peak Hour.

Intersection with SE Division St	Delay (sec) & LOS Under Proposed Characteristics (2 Lanes and Existing Signal Timing)					Delay (sec) & LOS Under Optimized Proposed Characteristics (2 Lanes and Optimized Signal Timing)				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	16.2 B	123.4 F	X	28.3 C	77.2 E	5.9 A	110.2 F	X	30.4 C	69.2 E
SE 12 th Ave	16.0 B	173.0 F	21.0 C	X	92.4 F	6.5 A	51.0 D	71.2 E	X	56.8 E
SE 17 th Ave	2.0 A	5.5 A	30.6 C	X	9.3 A	2.0 A	5.5 A	30.6 C	X	9.3 A
SE Ladd Ave/ SE 20 th Ave	19.9 B	73.8 E	X	22.9 C	60.1 E	18.1 B	33.0 C	X	25.1 C	30.3 C
SE 21 st Ave	0.9 A	234.0 F	38.4 D	X	160.5 F	2.0 A	156.0 F	38.4 D	X	108.5 F
SE 26 th Ave	4.4 A	10.6 B	28.8 C	22.0 C	13.5 B	3.1 A	9.5 A	32.3 D	23.5 C	13.5 B

As shown in Table 9, even with optimization of signal timings the westbound approaches at SE 11th Avenue and at 7 Corners intersections will continue to operate at a level-of-service "F" during the weekday a.m. peak hour.

Table 10 Comparison of Peak Hour Delay/LOS. Proposed 2-Lanes with Existing Timing and Proposed 2-Lanes with Optimized Signal Timing. Weekday p.m. Peak Hour.

Intersection with SE Division St	Delay (sec) & LOS Under Proposed Characteristics (2 Lanes and Existing Signal Timing)					Delay (sec) & LOS Under Optimized Proposed Characteristics (2 Lanes and Optimized Signal Timing)				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	24.1 C	27.0 C	X	28.3 C	26.7 C	13.5 B	28.2 C	X	25.8 C	21.8 C
SE 12 th Ave	21.1 C	8.6 A	16.4 B	X	16.6 B	10.1 B	3.0 A	26.2 C	X	16.1 B
SE 17 th Ave	3.2 A	1.6 A	31.6 C	X	4.2 A	2.6 A	2.1 A	31.6 C	X	3.9 A
SE Ladd Ave/ SE 20 th Ave	51.0 D	3.5 A	X	35.0 C	32.4 C	51.0 D	3.5 A	X	35.0 D	32.4 D
SE 21 st Ave	3.8 A	19.1 B	59.3 E	X	14.9 B	3.8 A	19.1 B	59.3 E	X	14.9 B
SE 26 th Ave	11.5 B	3.2 A	29.7 C	23.2 C	13.0 B	9.7 A	3.5 A	33.6 D	24.9 C	13.1 B

Optimization of signal timings during the weekday p.m. peak hour shows little to no benefit at the Division Street intersections due to the fact that the intersections are already operating at a level-of-service "C" or better and under capacity.

Reserve Capacity

Tables 11 and 12 show the reserve capacities of the study intersections with one lane in each direction on Division Street and *optimized traffic signal timings*.

Table 11 Comparison of Peak Hour Reserve Capacity. Proposed 2-Lanes with Existing Timing and Proposed 2-Lanes with Optimized Signal Timing. Weekday a.m. Peak Hour.

Intersection with SE Division St	Reserve Capacity (%) Under Proposed Characteristics (2 Lanes and Existing Signal Timing)					Reserve Capacity (%) Under Optimized Proposed Characteristics (2 Lanes and Optimized Signal Timing)				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	54%	-25%	X	33%	-7%	70%	-22%	X	28%	-9%
SE 12 th Ave	65%	-35%	28%	X	-6%	80%	-7%	-6%	X	-6%
SE 17 th Ave	81%	27%	36%	X	29%	81%	27%	33%	X	29%
SE Ladd Ave/ SE 20 th Ave	55%	-13%	X	64%	15%	70%	-4%	X	59%	15%
SE 21 st Ave	76%	-46%	43%	X	24%	76%	-25%	43%	X	25%
SE 26 th Ave	75%	24%	43%	77%	29%	76%	26%	37%	75%	29%

The results show that even the subsequent optimization of signal timings will not be enough to make all the intersections operate below capacity. The intersections of SE 11th Avenue & SE Division Street, SE 12th Avenue & SE Division Street are forecast to have insufficient capacity to operate with one lane in each direction during the weekday a.m. peak hour. Also, the westbound movement at the 7 Corners intersection is expected not to have sufficient capacity unless a special signal timing strategy is used to provide additional green time for the westbound direction.

Table 12 Comparison of Peak Hour Reserve Capacity. Proposed 2-Lanes with Existing Timing and Proposed 2-Lanes with Optimized Signal Timing. Weekday p.m. Peak Hour.

Intersection with SE Division St	Reserve Capacity (%) Under Existing Signal Timing					Reserve Capacity (%) Under Optimized Signal Timing				
	EB	WB	NB	SB	OV	EB	WB	NB	SB	OV
SE 11 th Ave	24%	23%	X	15%	22%	43%	25%	X	18%	22%
SE 12 th Ave	14%	54%	45%	X	29%	32%	63%	25%	X	29%
SE 17 th Ave	40%	77%	65%	X	42%	40%	67%	65%	X	42%
SE Ladd Ave/ SE 20 th Ave	-2%	45%	X	25%	14%	-2%	45%	X	25%	14%
SE 21 st Ave	30%	38%	13%	X	27%	30%	38%	13%	X	27%
SE 26 th Ave	26%	51%	39%	69%	29%	26%	51%	39%	69%	29%

According to the results of the Synchro analysis, all intersections are forecast to have some amount of residual capacity during the weekday p.m. peak hour. The eastbound movement at the 7 Corners intersection is expected to approach capacity and careful consideration should be given as to whether this movement could be served with only one lane.

CONCLUSIONS AND RECOMMENDATIONS

It has been determined that the following intersections have sufficient capacity to meet the City's level-of-service standards with one lane in each direction of SE Division Street:

- SE 17th Avenue & SE Division Street,
- SE 26th Avenue & SE Division Street, and

It is recommended that the following intersections be studied further to determine if lane configurations other than the existing four-lane striping would adequately serve the area's transportation needs.

- SE 11th Avenue & SE Division Street,
 - SE 12th Avenue & SE Division Street,
 - SE 20th Avenue/Ladd Street & SE Division Street,
 - SE 21st Avenue & SE Division Street, and
- } 7 Corners

Please contact us at (503) 228-5230 with any questions about this memorandum.

Appendix A: Site Visit Observations

Appendix B: Level-of-Service Explanation

Appendix C: Synchro Analysis - Existing Conditions

Appendix D: Synchro Analysis - Proposed Conditions with Existing Signal Timing

Appendix E: Synchro Analysis - Proposed Conditions with Optimized Signal Timing

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Appendix A
Site Visit Observations

Appendix A Site Visit Observations

Wednesday June 10, 2009

The following intersections were visited during the a.m. and p.m. peak periods:

1. SE 12th Avenue & SE Division Street
2. SE 20th Avenue/21st Avenue/Ladd Street & SE Division Street
3. SE 26th Avenue & SE Division Street

SE 12th Avenue & SE Division Street

Morning Peak Period - Westbound Movement

1. Majority of the westbound vehicles used the inner lane approaching SE 12th Avenue/SE Division St intersection. These vehicles then made a left turn at SE 11th Avenue/SE Division Street suggesting that the drivers try to position themselves at SE 12th Avenue in order to make a left turn at 11th Avenue.
2. Almost all the cycles had a westbound queue which spilled back to other intersections to the east (SE 13th and SE 14th). However, there was no traffic entering Division Street from these cross streets.
3. There were a few cycles when the westbound left turning queue on SE 11th Avenue spilled back to SE 12th Avenue/SE Division Street intersection affecting the operations of the intersection. This prevented the through traffic from entering the intersection even if the movement had a green light.
4. The block between SE 11th Avenue and SE 12th Avenue can accommodate up to 7 cars in a lane on average.
5. The lanes on Division Street are narrow. The buses and occasional heavy vehicles occupy and block both the lanes when operating on Division Street.
6. The westbound bus operations at the bus stop between SE 12th and SE 11th Avenue interfere with the traffic flow on Division Street. It was observed that the bus operators, when leaving the bus stop, tend to move to the inner lane rather than continue in the outer lane. As a result, the drivers wanting to enter the intersection of SE Division Street/SE 12th Avenue cannot do so.

Conclusion:

Field observations of the traffic condition during the morning commute period indicate that it will not be advisable to reduce the westbound section to a single lane. Moving the bus stop located between 11th and 12th Avenue to the west beyond 11th Avenue should be explored. While this could help minimize the impact of bus operations on traffic, it could inconvenience bus patrons.

Evening Peak Period - Eastbound Movement

1. More than 90% of the traffic used the inner lane. Most of the vehicles continued straight on Division with very few making a left turn on to SE 12th Avenue.

2. There were very few cycles when an eastbound queue was formed. For a majority of the signal cycles, there was always enough green time for all the vehicles approaching the intersection to get through with some residual capacity to accommodate a few more.
3. The outer lane carried very few vehicles, majority of them being buses stopping at the bus stop between SE 11th Avenue and SE 12th Avenue.

Conclusion:

Field observations suggest that reducing the eastbound two way section to a single lane shall not result in major traffic concerns. It should however be noted that if a lane is dropped, the buses stopping at the bus stop (which stop in the minimally used outer lane today) will interfere with the traffic operations causing some cycles to fail. Under such a scenario, it would be suggested to provide a far side bus bay where passengers can board and alight the bus without interfering with the traffic.

SE 20th Avenue/21st Avenue/Ladd Street & SE Division Street

Morning Peak Period - Westbound Movement: During the morning peak traffic period, the westbound approach of Division Street at the intersection known as “Seven Corners” was observed for 45 minutes between 7:45 am to 8:30 am.

1. The vehicular flow at this approach tends to use the inside lane (left lane from driver’s perspective) more often. Based on counts made during the observation period the inside lane is used by 64% of the drivers while the outside lane is used by 36%.
2. Drivers who arrive during the red light queue up in the inside lane. Drivers tend to begin using the outside lane when its queue is five or more vehicles shorter than the inside lane’s queue.
3. Queues formed during the red light are usually served during the next green light. Vehicles waiting a second cycle are a very rare occurrence.
4. Bicyclists crossing Division Street from 21st have to rely on a motor vehicle to receive a green light. 21st Avenue’s signal turns green when activated by a motor vehicle that queues on a loop detector.

Conclusion:

It is not advisable to reduce the westbound approach to a single lane configuration. Drivers prefer to use the inside lane; however due to the high volumes the lane utilization becomes similar once the queues are formed.

Evening Peak Period - Eastbound Movement: During the afternoon peak traffic period, the eastbound approach of Division Street at Seven Corners was observed for 45 min between 4:45 pm and 5:30 pm.

1. The eastbound approach is extremely complicated. Eastbound vehicles queuing at this approach often block the access to 20th Ave (south leg) or to the adjacent grocery store parking lot driveway. This complicates a driver’s ability to turn left to or from Division Street.
2. On occasion drivers turning left onto Division Street block the entire eastbound approach while they wait for a gap in westbound traffic. In some cases this waiting took the entire phase.

3. When a bus occupies the eastbound bus stop between 19th and 20th (south leg) Avenues, queues in the inside lane get longer than usual. Some drivers maneuver back into the outside lane after passing a stopped bus.
4. An average of 11 (70%) eastbound motor vehicles per cycle used the inside lane while 5 (30%) used the outside lane.

Conclusion:

The interaction between the unsignalized intersection at Division St. and 20th avenue (south leg) and the signalized at Division St. and Ladd St./20th Avenue (north leg) generates a specially complicated setup for queuing, technically the queue formed at the signalized intersection spills back to the unsignalized. It is not recommended to reduce this approach (eastbound) to a single lane given the complexity and the space required to make the different movement that this approach serves.

SE 26th Avenue & SE Division Street

Morning Peak Period - Westbound Movement

1. The majority of the westbound vehicles used the inner lane when approaching the SE 26th Avenue/SE Division St intersection. No more than 5 vehicles used the outside curb during any one green phase.
2. With the existing signal timing, and assuming no left-turning vehicles, the westbound capacity for a single lane was estimated to be 17 to 19 vehicles per green phase. This was observed to occur 5 times during the morning peak. In all but one case, no vehicles were observed using the outside lane because traffic arrived at the beginning of the green and did not have to queue at a red light.
3. The ratio of vehicles in the inside lane to vehicles in the outside lane averaged 5-to-1.
4. The sum of the volumes in both lanes very rarely exceeded 17 vehicles per green phase.
5. In 6 out of 30 observed signal cycles, there were drivers who had to wait a second cycle before proceeding. This never occurred in consecutive cycles.
6. On a few occasions westbound drivers were delay by westbound left-turning vehicles. In most cases, drivers maneuvered around the left-turn and proceeded without delay.

Conclusion:

Field observations of the traffic condition during the morning peak traffic period indicate that traffic could operate at an acceptable level if Division Street had one lane in each direction. Some consideration should be given to providing a way for westbound through traffic to maneuver around delayed left-turning vehicles.

Evening Peak Period - Eastbound Movement

1. The majority of the eastbound vehicles used the inner lane when approaching the SE 26th Avenue/SE Division St intersection. During the 32 signal cycles that were observed, only 50 drivers used the outside lane to approach the intersection. Only 16 of those drivers actually made through moves. The other 34 drivers turned right to go south on 26th Avenue.

2. With the existing signal timing, and assuming no left-turning vehicles, the westbound capacity for a single lane was estimated to be 17 to 19 vehicles per green phase. This was observed to occur 6 times during the afternoon peak. In all but 2 cases, no vehicles were observed using the outside lane to make a through move across the intersection.
3. The ratio of vehicles in the inside lane to vehicles using the outside lane to make a through move averaged 24-to-1.
4. In no case were there Division Street drivers who had to wait a second cycle before proceeding. Eastbound capacity always exceeded demand.
5. During the peak 30 minutes, northbound traffic demand was observed to consistently exceed the capacity of the green time allocated to 26th Avenue. The average capacity for the northbound approach was 6 vehicles per green phase. The demand per green phase ranged from 8 to 14.
6. A significant amount of pedestrian activity was observed.

Conclusion:

Field observations suggest that it is feasible to reduce the eastbound two lane section to a single lane without compromising the performance of Division Street. Reallocating green time by reducing Division Street's green time and increasing 26th's should be explored.

Retaining a Right-Turn-Only lane should be explored. This retain current levels of performance and it would provide a way for right-turning drivers to yield to pedestrians without impeding eastbound through traffic.

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Appendix B
Level-of-Service Explanation

Appendix B Level-of-Service Concept

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from “A” to “F”.¹

SIGNALIZED INTERSECTIONS

The six level-of-service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service “D” is generally considered to represent the minimum acceptable design standard.

Table B-1 Level-of-Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

¹ Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

Table B2 Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level of service for unsignalized intersections is presented in Table B4. Using this definition, Level of Service “E” is generally considered to represent the minimum acceptable design standard.

Table B3 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	<ul style="list-style-type: none">Nearly all drivers find freedom of operation.Very seldom is there more than one vehicle in queue.
B	<ul style="list-style-type: none">Some drivers begin to consider the delay an inconvenience.Occasionally there is more than one vehicle in queue.
C	<ul style="list-style-type: none">Many times there is more than one vehicle in queue.Most drivers feel restricted, but not objectionably so.
D	<ul style="list-style-type: none">Often there is more than one vehicle in queue.Drivers feel quite restricted.
E	<ul style="list-style-type: none">Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement.There is almost always more than one vehicle in queue.Drivers find the delays approaching intolerable levels.
F	<ul style="list-style-type: none">Forced flow.Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table B4 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.


















In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

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Appendix C
Synchro Analysis
Existing Conditions













Year 2008 Weekday AM Peak Hour
1: Division Street & 11th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	105	158	316	569	0	0	0	0	46	453	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	0.95	*0.75	1.00	1.00	1.00	1.00	0.95	0.95	0.95
Ped Bike Factor		0.99									1.00	
Frt		0.919									0.998	
Flt Protected					0.982						0.995	
Satd. Flow (prot)	0	1491	0	0	2479	0	0	0	0	0	3485	0
Flt Permitted					0.699						0.995	
Satd. Flow (perm)	0	1491	0	0	1764	0	0	0	0	0	3482	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		137									2	
Link Speed (mph)		25			20			25			25	
Link Distance (ft)		355			263			1501			1376	
Travel Time (s)		9.7			9.0			40.9			37.5	
Confl. Peds. (#/hr)			12			2				5		10
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	2%	0%
Bus Blockages (#/hr)	0	5	5	8	8	0	0	0	0	0	5	5
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	118	178	355	639	0	0	0	0	52	509	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	296	0	0	994	0	0	0	0	0	570	0
Turn Type				pm+pt						Perm		
Protected Phases		8		7	4						2	
Permitted Phases				4						2		
Detector Phase		8		7	4					2	2	
Switch Phase												
Minimum Initial (s)		10.0		5.0	10.0					10.0	10.0	
Minimum Split (s)		24.6		9.4	48.4					19.6	19.6	
Total Split (s)	0.0	34.5	0.0	14.5	49.0	0.0	0.0	0.0	0.0	21.0	21.0	0.0
Total Split (%)	0.0%	49.3%	0.0%	20.7%	70.0%	0.0%	0.0%	0.0%	0.0%	30.0%	30.0%	0.0%
Yellow Time (s)		3.6		3.4	3.4					3.6	3.6	
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0	
Lost Time Adjust (s)	0.0	-0.5	0.0	-0.5	-0.5	0.0	0.0	0.0	0.0	-0.5	-0.5	0.0
Total Lost Time (s)	4.0	4.1	4.0	3.9	3.9	4.0	4.0	4.0	4.0	4.1	4.1	4.0
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		Max		Max	Max					C-Max	C-Max	
v/c Ratio		0.41			0.80						0.68	
Control Delay		9.0			13.6						28.7	

Year 2008 Weekday AM Peak Hour
1: Division Street & 11th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			2.7						0.0	
Total Delay		9.0			16.4						28.7	
Queue Length 50th (ft)		42			154						116	
Queue Length 95th (ft)		94			m170						166	
Internal Link Dist (ft)		275			183			1421			1296	
Turn Bay Length (ft)												
Base Capacity (vph)		725			1245						842	
Starvation Cap Reductn		0			151						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.41			0.91						0.68	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:SBTL, Start of Yellow

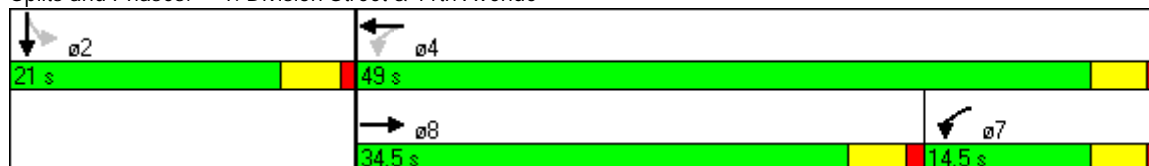
Natural Cycle: 70

Control Type: Actuated-Coordinated

* User Entered Value


















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Division Street & 11th Avenue




















Year 2008 Weekday AM Peak Hour
1: Division Street & 11th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					 						 	
Volume (vph)	0	105	158	316	569	0	0	0	0	46	453	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.1			3.9						4.1	
Lane Util. Factor		1.00			*0.75						0.95	
Frpb, ped/bikes		0.99			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.92			1.00						1.00	
Flt Protected		1.00			0.98						1.00	
Satd. Flow (prot)		1490			2480						3482	
Flt Permitted		1.00			0.70						1.00	
Satd. Flow (perm)		1490			1763						3482	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	118	178	355	639	0	0	0	0	52	509	9
RTOR Reduction (vph)	0	78	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	218	0	0	994	0	0	0	0	0	568	0
Confl. Peds. (#/hr)			12			2				5		10
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	2%	0%
Bus Blockages (#/hr)	0	5	5	8	8	0	0	0	0	0	5	5
Turn Type				pm+pt						Perm		
Protected Phases		8		7	4						2	
Permitted Phases				4						2		
Actuated Green, G (s)		29.9			44.6						16.4	
Effective Green, g (s)		30.4			45.1						16.9	
Actuated g/C Ratio		0.43			0.64						0.24	
Clearance Time (s)		4.6			4.4						4.6	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		647			1244						841	
v/s Ratio Prot		0.15			c0.12							
v/s Ratio Perm					c0.39						0.16	
v/c Ratio		0.34			0.80						0.68	
Uniform Delay, d1		13.1			9.1						24.1	
Progression Factor		1.00			0.94						1.00	
Incremental Delay, d2		1.4			3.3						4.3	
Delay (s)		14.5			11.9						28.4	
Level of Service		B			B						C	
Approach Delay (s)		14.5			11.9			0.0			28.4	
Approach LOS		B			B			A			C	
Intersection Summary												
HCM Average Control Delay			17.4		HCM Level of Service				B			
HCM Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			70.0		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			77.6%		ICU Level of Service				D			
Analysis Period (min)			15									
c Critical Lane Group												













Year 2008 Weekday AM Peak Hour
2: Division Street & 12th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	141	0	0	706	238	179	695	31	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	*0.75	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor					0.99			0.99				
Frt					0.962			0.995				
Flt Protected		0.997						0.990				
Satd. Flow (prot)	0	1649	0	0	2412	0	0	3476	0	0	0	0
Flt Permitted		0.909						0.990				
Satd. Flow (perm)	0	1503	0	0	2412	0	0	3460	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					61			6				
Link Speed (mph)		25			20			25			25	
Link Distance (ft)		263			461			1504			1317	
Travel Time (s)		7.2			15.7			41.0			35.9	
Confl. Peds. (#/hr)			8			8	19		7			
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	20%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	0	0	8	8	0	5	5	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	11	155	0	0	776	262	197	764	34	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	166	0	0	1038	0	0	995	0	0	0	0
Turn Type	Perm						Perm					
Protected Phases		2			2			4				
Permitted Phases	2						4					
Detector Phase	2	2			2		4	4				
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0		10.0	10.0				
Minimum Split (s)	16.4	16.4			16.4		21.4	21.4				
Total Split (s)	38.0	38.0	0.0	0.0	38.0	0.0	32.0	32.0	0.0	0.0	0.0	0.0
Total Split (%)	54.3%	54.3%	0.0%	0.0%	54.3%	0.0%	45.7%	45.7%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.4	3.4			3.4		3.4	3.4				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)	-0.5	-0.5	0.0	0.0	-0.5	0.0	-0.5	-0.5	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.9	3.9	4.0	4.0	3.9	4.0	3.9	3.9	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max			C-Max		Max	Max				
v/c Ratio		0.23			0.86			0.71				
Control Delay		13.9			13.1			21.0				

Year 2008 Weekday AM Peak Hour
2: Division Street & 12th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay		0.0			0.0			0.0				
Total Delay		13.9			13.1			21.0				
Queue Length 50th (ft)		58			60			182				
Queue Length 95th (ft)		m101			#97			248				
Internal Link Dist (ft)		183			381			1424			1237	
Turn Bay Length (ft)												
Base Capacity (vph)		732			1206			1393				
Starvation Cap Reductn		0			0			0				
Spillback Cap Reductn		0			0			5				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.23			0.86			0.72				

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 53.1 (76%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 50

Control Type: Actuated-Coordinated

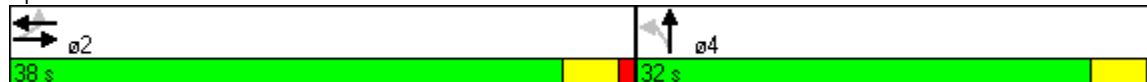
* User Entered Value

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: Division Street & 12th Avenue














Year 2008 Weekday AM Peak Hour
2: Division Street & 12th Avenue

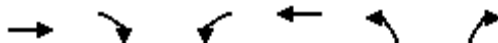
KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	141	0	0	706	238	179	695	31	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		3.9			3.9			3.9				
Lane Util. Factor		1.00			*0.75			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.96			0.99				
Flt Protected		1.00			1.00			0.99				
Satd. Flow (prot)		1648			2413			3460				
Flt Permitted		0.91			1.00			0.99				
Satd. Flow (perm)		1504			2413			3460				
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	155	0	0	776	262	197	764	34	0	0	0
RTOR Reduction (vph)	0	0	0	0	31	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	166	0	0	1007	0	0	991	0	0	0	0
Confl. Peds. (#/hr)			8			8	19		7			
Heavy Vehicles (%)	20%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	0	0	8	8	0	5	5	0	0	0
Turn Type	Perm						Perm					
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		33.6			33.6			27.6				
Effective Green, g (s)		34.1			34.1			28.1				
Actuated g/C Ratio		0.49			0.49			0.40				
Clearance Time (s)		4.4			4.4			4.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		733			1175			1389				
v/s Ratio Prot					c0.42							
v/s Ratio Perm		0.11						0.29				
v/c Ratio		0.23			0.86			0.71				
Uniform Delay, d1		10.3			15.8			17.6				
Progression Factor		1.24			0.30			1.00				
Incremental Delay, d2		0.6			7.2			3.2				
Delay (s)		13.5			11.9			20.7				
Level of Service		B			B			C				
Approach Delay (s)		13.5			11.9			20.7			0.0	
Approach LOS		B			B			C			A	
Intersection Summary												
HCM Average Control Delay			16.0			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			7.8			
Intersection Capacity Utilization			59.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Year 2008 Weekday AM Peak Hour
3: Division Street & 17th Avenue

KAI Edit
6/17/2009

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				 	 	
Volume (vph)	147	25	6	761	183	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	0.95	*0.75	1.00	1.00
Ped Bike Factor	1.00				1.00	
Frt	0.981				0.992	
Flt Protected					0.955	
Satd. Flow (prot)	1408	0	0	2524	1796	0
Flt Permitted				0.953	0.955	
Satd. Flow (perm)	1408	0	0	2405	1796	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	26				4	
Link Speed (mph)	25			20	25	
Link Distance (ft)	835			759	403	
Travel Time (s)	22.8			25.9	11.0	
Confl. Peds. (#/hr)		4				9
Confl. Bikes (#/hr)						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Parking (#/hr)	5	5				
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	162	27	7	836	201	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	189	0	0	843	214	0
Turn Type			Perm			
Protected Phases	2			2	4	
Permitted Phases			2			
Detector Phase	2		2	2	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	16.5		16.5	16.5	19.0	
Total Split (s)	50.5	0.0	50.5	50.5	19.5	0.0
Total Split (%)	72.1%	0.0%	72.1%	72.1%	27.9%	0.0%
Yellow Time (s)	3.5		3.5	3.5	3.0	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	-0.5	0.0	-0.5	-0.5	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
v/c Ratio	0.19			0.50	0.63	
Control Delay	2.0			3.0	34.1	



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.0			0.0	0.0	
Total Delay	2.0			3.0	34.1	
Queue Length 50th (ft)	10			18	84	
Queue Length 95th (ft)	m16			136	144	
Internal Link Dist (ft)	755			679	323	
Turn Bay Length (ft)						
Base Capacity (vph)	991			1680	401	
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.19			0.50	0.53	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 23 (33%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

* User Entered Value

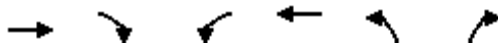
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Division Street & 17th Avenue



Year 2008 Weekday AM Peak Hour
3: Division Street & 17th Avenue

KAI Edit
6/17/2009



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩↩	↩	
Volume (vph)	147	25	6	761	183	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			*0.75	1.00	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.98			1.00	0.99	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1407			2523	1795	
Flt Permitted	1.00			0.95	0.96	
Satd. Flow (perm)	1407			2406	1795	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	162	27	7	836	201	13
RTOR Reduction (vph)	8	0	0	0	3	0
Lane Group Flow (vph)	181	0	0	843	211	0
Confl. Peds. (#/hr)		4				9
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Parking (#/hr)	5	5				
Turn Type	Perm					
Protected Phases	2			2	4	
Permitted Phases			2			
Actuated Green, G (s)	48.4			48.4	13.1	
Effective Green, g (s)	48.9			48.9	13.1	
Actuated g/C Ratio	0.70			0.70	0.19	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	983			1681	336	
v/s Ratio Prot	0.13				c0.12	
v/s Ratio Perm				c0.35		
v/c Ratio	0.18			0.50	0.63	
Uniform Delay, d1	3.6			4.9	26.2	
Progression Factor	0.44			0.41	1.00	
Incremental Delay, d2	0.4			0.8	3.6	
Delay (s)	2.0			2.8	29.8	
Level of Service	A			A	C	
Approach Delay (s)	2.0			2.8	29.8	
Approach LOS	A			A	C	










Intersection Summary

HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group












Year 2008 Weekday AM Peak Hour
4: Division Street & 20th Street

KAI Edit
6/17/2009

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	150	9	10	758	9	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	12	12
Grade (%)	0%			0%	0%	
Storage Length (ft)		0	0		0	0
Storage Lanes		0	0		1	0
Taper Length (ft)		25	25		25	25
Lane Util. Factor	1.00	1.00	0.95	*0.75	1.00	1.00
Ped Bike Factor						
Frt	0.992				0.969	
Flt Protected				0.999	0.963	
Satd. Flow (prot)	1402	0	0	2521	1773	0
Flt Permitted				0.999	0.963	
Satd. Flow (perm)	1402	0	0	2521	1773	0
Link Speed (mph)	25			20	25	
Link Distance (ft)	759			148	497	
Travel Time (s)	20.7			5.0	13.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Parking (#/hr)	5	5				
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	167	10	11	842	10	3
Shared Lane Traffic (%)						
Lane Group Flow (vph)	177	0	0	853	13	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
* User Entered Value						

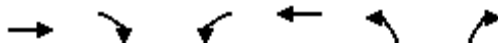
Year 2008 Weekday AM Peak Hour
4: Division Street & 20th Street

KAI Edit
6/17/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				 	 	
Volume (veh/h)	150	9	10	758	9	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	167	10	11	842	10	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	759			148		
pX, platoon unblocked					0.82	
vC, conflicting volume			177		615	172
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			177		102	172
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	100
cM capacity (veh/h)			1412		728	848
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	177	292	561	13		
Volume Left	0	11	0	10		
Volume Right	10	0	0	3		
cSH	1700	1412	1700	755		
Volume to Capacity	0.10	0.01	0.33	0.02		
Queue Length 95th (ft)	0	1	0	1		
Control Delay (s)	0.0	0.4	0.0	9.9		
Lane LOS		A		A		
Approach Delay (s)	0.0	0.1		9.9		
Approach LOS				A		
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			38.0%	ICU Level of Service		A
Analysis Period (min)			15			

Year 2008 Weekday AM Peak Hour
5: Division Street & 21st Avenue

KAI Edit
6/17/2009



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø3	ø4	ø6	ø7
Lane Configurations										
Volume (vph)	185	84	12	768	108	13				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Lane Width (ft)	9	9	9	9	12	12				
Grade (%)	0%			0%	0%					
Storage Length (ft)		0	0		0	0				
Storage Lanes		0	0		1	0				
Taper Length (ft)		25	25		25	25				
Lane Util. Factor	1.00	1.00	0.95	*0.75	1.00	1.00				
Ped Bike Factor										
Frt	0.958				0.985					
Flt Protected				0.999	0.957					
Satd. Flow (prot)	1569	0	0	2521	1791	0				
Flt Permitted				0.949	0.957					
Satd. Flow (perm)	1569	0	0	2395	1791	0				
Right Turn on Red		No				Yes				
Satd. Flow (RTOR)					7					
Link Speed (mph)	25			20	25					
Link Distance (ft)	129			1277	514					
Travel Time (s)	3.5			43.5	14.0					
Confl. Peds. (#/hr)										
Confl. Bikes (#/hr)										
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Growth Factor	100%	100%	100%	100%	100%	100%				
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%				
Bus Blockages (#/hr)	5	5	8	8	0	0				
Parking (#/hr)										
Mid-Block Traffic (%)	0%			0%	0%					
Adj. Flow (vph)	199	90	13	826	116	14				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	289	0	0	839	130	0				
Turn Type			Perm							
Protected Phases	2 7			2	1		3	4	6	7
Permitted Phases			2							
Detector Phase	2 7		2	2	1					
Switch Phase										
Minimum Initial (s)			20.0	20.0	3.0		3.0	3.0	20.0	3.0
Minimum Split (s)			28.0	28.0	13.0		15.0	7.0	28.0	12.0
Total Split (s)	57.0	0.0	30.0	30.0	13.0	0.0	11.0	16.0	43.0	27.0
Total Split (%)	81.4%	0.0%	42.9%	42.9%	18.6%	0.0%	16%	23%	61%	39%
Yellow Time (s)			3.7	3.7	3.0		3.0	3.0	3.7	3.0
All-Red Time (s)			1.0	1.0	0.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	-1.0	-1.0	1.0	0.0				
Total Lost Time (s)	3.7	4.0	3.7	3.7	4.0	4.0				
Lead/Lag			Lag	Lag	Lead		Lead	Lag		
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	Yes		
Recall Mode			C-Max	C-Max	Max		None	None	Max	Max
v/c Ratio	0.24			0.93	0.55					
Control Delay	0.9			37.4	36.7					



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø3	ø4	ø6	ø7
Queue Delay	0.8			10.3	0.0					
Total Delay	1.7			47.7	36.7					
Queue Length 50th (ft)	2			204	50					
Queue Length 95th (ft)	9			#373	#104					
Internal Link Dist (ft)	49			1197	434					
Turn Bay Length (ft)										
Base Capacity (vph)	1195			900	236					
Starvation Cap Reductn	626			0	0					
Spillback Cap Reductn	0			61	1					
Storage Cap Reductn	0			0	0					
Reduced v/c Ratio	0.51			1.00	0.55					

Intersection Summary

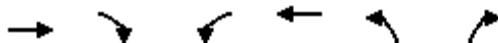
Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 47.3 (68%), Referenced to phase 2:EBWB, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
* User Entered Value
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Division Street & 21st Avenue

#5 ← ø1 13 s	#5 #9 ← → ø2 30 s	#9 → ø3 11 s	#9 → ø4 16 s
#9 ← ø6 43 s	#5 → ø7 27 s		

Year 2008 Weekday AM Peak Hour
5: Division Street & 21st Avenue

KAI Edit
6/17/2009



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩↩	↩	
Volume (vph)	185	84	12	768	108	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	3.7			3.7	4.0	
Lane Util. Factor	1.00			*0.75	1.00	
Frt	0.96			1.00	0.99	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1569			2522	1792	
Flt Permitted	1.00			0.95	0.96	
Satd. Flow (perm)	1569			2395	1792	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	199	90	13	826	116	14
RTOR Reduction (vph)	0	0	0	0	6	0
Lane Group Flow (vph)	289	0	0	839	124	0
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Turn Type	Perm					
Protected Phases	2 7			2	1	
Permitted Phases			2			
Actuated Green, G (s)	53.0			23.7	10.0	
Effective Green, g (s)	54.0			24.7	9.0	
Actuated g/C Ratio	0.77			0.35	0.13	
Clearance Time (s)				4.7	3.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)	1210			845	230	
v/s Ratio Prot	c0.18				c0.07	
v/s Ratio Perm				c0.35		
v/c Ratio	0.24			0.99	0.54	
Uniform Delay, d1	2.2			22.6	28.6	
Progression Factor	0.18			0.93	1.00	
Incremental Delay, d2	0.4			27.3	8.8	
Delay (s)	0.8			48.2	37.3	
Level of Service	A			D	D	
Approach Delay (s)	0.8			48.2	37.3	
Approach LOS	A			D	D	


















Intersection Summary

HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group













Year 2008 Weekday AM Peak Hour
6: Division Street & 26th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	150	40	47	676	12	90	91	31	7	77	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	25		0	25		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	0.95	*0.75	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.98			1.00			0.99			1.00	
Frt		0.969			0.997			0.980			0.980	
Flt Protected	0.950				0.997			0.979			0.997	
Satd. Flow (prot)	1433	1372	0	0	2505	0	0	1813	0	0	1851	0
Flt Permitted	0.251				0.925			0.856			0.979	
Satd. Flow (perm)	379	1372	0	0	2325	0	0	1585	0	0	1817	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		38			4			12			12	
Link Speed (mph)		25			20			25			25	
Link Distance (ft)		1277			503			614			479	
Travel Time (s)		34.8			17.1			16.7			13.1	
Confl. Peds. (#/hr)			23			19			7			7
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	8	158	42	49	712	13	95	96	33	7	81	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	8	200	0	0	774	0	0	224	0	0	103	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Detector Phase	2	2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5		15.5	15.5		19.0	19.0		19.0	19.0	
Total Split (s)	48.5	48.5	0.0	48.5	48.5	0.0	21.5	21.5	0.0	21.5	21.5	0.0
Total Split (%)	69.3%	69.3%	0.0%	69.3%	69.3%	0.0%	30.7%	30.7%	0.0%	30.7%	30.7%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-0.5	-0.5	0.0	-0.5	-0.5	0.0	-0.5	-0.5	0.0	-0.5	-0.5	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	4.0	3.5	3.5	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max		Max	Max	
v/c Ratio	0.03	0.23			0.52			0.54			0.22	
Control Delay	4.1	3.7			7.1			26.8			19.6	

Year 2008 Weekday AM Peak Hour
6: Division Street & 26th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	4.1	3.7			7.1			26.8			19.6	
Queue Length 50th (ft)	1	22			78			78			31	
Queue Length 95th (ft)	m4	21			m128			144			67	
Internal Link Dist (ft)		1197			423			534			399	
Turn Bay Length (ft)	25											
Base Capacity (vph)	241	886			1479			416			476	
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	0.03	0.23			0.52			0.54			0.22	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 22 (31%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 45

Control Type: Actuated-Coordinated

* User Entered Value


















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Division Street & 26th Avenue






















Year 2008 Weekday AM Peak Hour
6: Division Street & 26th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	150	40	47	676	12	90	91	31	7	77	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0			3.5			3.5	
Lane Util. Factor	1.00	1.00			*0.75			1.00			1.00	
Frpb, ped/bikes	1.00	0.98			1.00			0.99			1.00	
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.97			1.00			0.98			0.98	
Flt Protected	0.95	1.00			1.00			0.98			1.00	
Satd. Flow (prot)	1433	1371			2506			1814			1850	
Flt Permitted	0.25	1.00			0.93			0.86			0.98	
Satd. Flow (perm)	379	1371			2326			1585			1818	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	158	42	49	712	13	95	96	33	7	81	15
RTOR Reduction (vph)	0	14	0	0	1	0	0	9	0	0	9	0
Lane Group Flow (vph)	8	186	0	0	773	0	0	215	0	0	94	0
Confl. Peds. (#/hr)			23			19			7			7
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	44.0	44.0			44.0			17.5			17.5	
Effective Green, g (s)	44.5	44.5			44.5			18.0			18.0	
Actuated g/C Ratio	0.64	0.64			0.64			0.26			0.26	
Clearance Time (s)	4.5	4.5			4.5			4.0			4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	241	872			1479			408			467	
v/s Ratio Prot		0.14										
v/s Ratio Perm	0.02				c0.33			c0.14			0.05	
v/c Ratio	0.03	0.21			0.52			0.53			0.20	
Uniform Delay, d1	4.7	5.4			7.0			22.3			20.4	
Progression Factor	0.77	0.69			0.86			1.00			1.00	
Incremental Delay, d2	0.3	0.5			0.9			4.8			1.0	
Delay (s)	3.9	4.3			6.9			27.2			21.3	
Level of Service	A	A			A			C			C	
Approach Delay (s)		4.2			6.9			27.2			21.3	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM Average Control Delay			11.1		HCM Level of Service				B			
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			70.0		Sum of lost time (s)				7.5			
Intersection Capacity Utilization			59.7%		ICU Level of Service				B			
Analysis Period (min)			15									
c Critical Lane Group												













Year 2008 Weekday AM Peak Hour
7: Division Street & 34th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	171	4	1	682	12	29	39	5	32	19	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	25		0	25		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25		25	25		25	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
Ped Bike Factor		1.00			1.00			1.00			0.99	
Frt		0.997			0.997			0.991			0.957	
Flt Protected	0.950			0.950				0.980			0.979	
Satd. Flow (prot)	1393	1433	0	1376	1443	0	0	1843	0	0	1767	0
Flt Permitted	0.275			0.641				0.877			0.867	
Satd. Flow (perm)	403	1433	0	928	1443	0	0	1649	0	0	1565	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			3			5			25	
Link Speed (mph)		25			20			25			25	
Link Distance (ft)		2034			1780			317			303	
Travel Time (s)		55.5			60.7			8.6			8.3	
Confl. Peds. (#/hr)			4			8			1			1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5						
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	14	180	4	1	718	13	31	41	5	34	20	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	14	184	0	1	731	0	0	77	0	0	79	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Detector Phase	2	2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	15.5	15.5		15.5	15.5		18.5	18.5		18.5	18.5	
Total Split (s)	49.0	49.0	0.0	49.0	49.0	0.0	21.0	21.0	0.0	21.0	21.0	0.0
Total Split (%)	70.0%	70.0%	0.0%	70.0%	70.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	-0.5	-0.5	0.0	-0.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max		Max	Max	
v/c Ratio	0.05	0.20		0.00	0.79			0.20			0.20	
Control Delay	4.2	4.7		7.0	15.8			21.9			17.5	

Year 2008 Weekday AM Peak Hour
7: Division Street & 34th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.2	4.7		7.0	15.8			21.9			17.5	
Queue Length 50th (ft)	2	20		0	237			25			19	
Queue Length 95th (ft)	m5	34		m0	m191			58			51	
Internal Link Dist (ft)		1954			1700			237			223	
Turn Bay Length (ft)	25			25								
Base Capacity (vph)	259	922		597	929			393			388	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.05	0.20		0.00	0.79			0.20			0.20	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 22 (31%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated



















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Division Street & 34th Avenue























Year 2008 Weekday AM Peak Hour
7: Division Street & 34th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	171	4	1	682	12	29	39	5	32	19	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.99			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)	1393	1432		1376	1443			1843			1768	
Flt Permitted	0.27	1.00		0.64	1.00			0.88			0.87	
Satd. Flow (perm)	403	1432		929	1443			1650			1566	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	180	4	1	718	13	31	41	5	34	20	25
RTOR Reduction (vph)	0	1	0	0	1	0	0	4	0	0	19	0
Lane Group Flow (vph)	14	183	0	1	730	0	0	73	0	0	60	0
Confl. Peds. (#/hr)			4			8			1			1
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5						
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	44.5	44.5		44.5	44.5			16.5			16.5	
Effective Green, g (s)	45.0	45.0		45.0	45.0			16.5			16.5	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.24			0.24	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	259	921		597	928			389			369	
v/s Ratio Prot		0.13			c0.51							
v/s Ratio Perm	0.03			0.00				c0.04			0.04	
v/c Ratio	0.05	0.20		0.00	0.79			0.19			0.16	
Uniform Delay, d1	4.6	5.1		4.5	9.0			21.4			21.3	
Progression Factor	0.76	0.82		1.56	1.50			1.00			1.00	
Incremental Delay, d2	0.4	0.5		0.0	0.6			1.1			0.9	
Delay (s)	3.9	4.7		7.0	14.2			22.5			22.2	
Level of Service	A	A		A	B			C			C	
Approach Delay (s)		4.6			14.2			22.5			22.2	
Approach LOS		A			B			C			C	
Intersection Summary												
HCM Average Control Delay			13.6			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.5			
Intersection Capacity Utilization			55.4%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												













Year 2008 Weekday AM Peak Hour
8: Division Street & 39th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	143	35	53	480	47	110	852	79	86	498	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	150		0	150		0	150		0	150		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor		1.00			1.00			1.00			0.99	
Frt		0.971			0.987			0.987			0.974	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1592	1609	0	1573	*1000	0	1769	*3000	0	1717	*3000	0
Flt Permitted	0.210			0.614			0.950			0.950		
Satd. Flow (perm)	352	1609	0	1016	1631	0	1769	3519	0	1717	3412	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			8			14			35	
Link Speed (mph)		25			15			35			35	
Link Distance (ft)		1780			778			579			672	
Travel Time (s)		48.5			35.4			11.3			13.1	
Confl. Peds. (#/hr)			4			8			4			22
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	3%	1%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	5	5	5	5	5	5
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	32	152	37	56	511	50	117	906	84	91	530	111
Shared Lane Traffic (%)												
Lane Group Flow (vph)	32	189	0	56	561	0	117	990	0	91	641	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		3.0	10.0		3.0	10.0	
Minimum Split (s)	23.3	23.3		23.3	23.3		6.0	19.6		6.0	20.6	
Total Split (s)	32.0	32.0	0.0	32.0	32.0	0.0	14.5	23.5	0.0	14.5	23.5	0.0
Total Split (%)	45.7%	45.7%	0.0%	45.7%	45.7%	0.0%	20.7%	33.6%	0.0%	20.7%	33.6%	0.0%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.0	3.6		3.0	3.6	
All-Red Time (s)	1.0	1.0		1.0	1.0		0.0	1.0		0.0	1.0	
Lost Time Adjust (s)	-0.5	-0.5	0.0	-0.5	-0.5	0.0	1.0	-0.5	0.0	1.0	-0.5	0.0
Total Lost Time (s)	3.8	3.8	4.0	3.8	3.8	4.0	4.0	4.1	4.0	4.0	4.1	4.0
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	Max	Max		Max	Max		None	C-Max		None	C-Max	
v/c Ratio	0.23	0.29		0.14	1.38		0.55	0.96		0.47	0.63	
Control Delay	10.4	6.7		15.1	198.6		38.4	47.3		36.7	23.3	

Year 2008 Weekday AM Peak Hour
8: Division Street & 39th Avenue







KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.4	6.7		15.1	198.6		38.4	47.3		36.7	23.3	
Queue Length 50th (ft)	4	21		11	~313		48	~247		37	120	
Queue Length 95th (ft)	13	38		m19	m#458		94	#391		77	183	
Internal Link Dist (ft)		1700			698			499			592	
Turn Bay Length (ft)	150			150			150			150		
Base Capacity (vph)	142	661		409	408		265	1029		258	1021	
Starvation Cap Reductn	0	0		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	0.23	0.29		0.14	1.38		0.44	0.96		0.35	0.63	

Intersection Summary





















Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 15.9 (23%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
 Natural Cycle: 120
 Control Type: Actuated-Coordinated
 * User Entered Value
 ~ 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: 8: Division Street & 39th Avenue

 ø1	 ø2	 ø4
14.5 s	23.5 s	32 s
 ø5	 ø6	 ø8
14.5 s	23.5 s	32 s

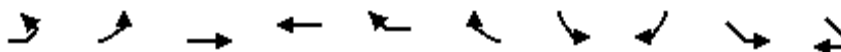
Year 2008 Weekday AM Peak Hour
8: Division Street & 39th Avenue

KAI Edit
6/17/2009

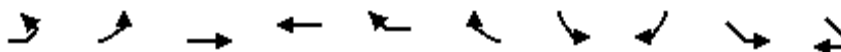
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	143	35	53	480	47	110	852	79	86	498	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)	3.8	3.8		3.8	3.8		4.0	4.1		4.0	4.1	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1592	1608		1573	1000		1769	3000		1717	3000	
Flt Permitted	0.21	1.00		0.61	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	353	1608		1016	1630		1769	3520		1717	3412	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	152	37	56	511	50	117	906	84	91	530	111
RTOR Reduction (vph)	0	13	0	0	5	0	0	9	0	0	24	0
Lane Group Flow (vph)	32	176	0	56	556	0	117	981	0	91	617	0
Confl. Peds. (#/hr)			4			8			4			22
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	3%	1%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	5	5	5	5	5	5
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	27.7	27.7		27.7	27.7		8.2	22.7		7.7	22.2	
Effective Green, g (s)	28.2	28.2		28.2	28.2		7.2	23.2		6.7	22.7	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.10	0.33		0.10	0.32	
Clearance Time (s)	4.3	4.3		4.3	4.3		3.0	4.6		3.0	4.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	648		409	403		182	994		164	973	
v/s Ratio Prot		0.11			c0.56		c0.07	c0.33		0.05	0.21	
v/s Ratio Perm	0.09			0.06								
v/c Ratio	0.23	0.27		0.14	1.38		0.64	0.99		0.55	0.63	
Uniform Delay, d1	13.7	14.0		13.2	20.9		30.2	23.2		30.2	20.1	
Progression Factor	0.45	0.44		1.07	0.75		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.6	1.0		0.4	180.3		7.5	25.5		4.0	3.2	
Delay (s)	9.8	7.2		14.6	196.1		37.7	48.7		34.2	23.3	
Level of Service	A	A		B	F		D	D		C	C	
Approach Delay (s)		7.6			179.6			47.6			24.6	
Approach LOS		A			F			D			C	
Intersection Summary												
HCM Average Control Delay			68.4			HCM Level of Service			E			
HCM Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			7.8			
Intersection Capacity Utilization			79.1%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Year 2008 Weekday AM Peak Hour
9: Division Street & 20th Avenue

KAI Edit
6/17/2009



Lane Group	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER	ø1	ø7
Lane Configurations			↕	↕			↕		↕			
Volume (vph)	3	5	145	725	77	74	97	35	27	8		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12		
Grade (%)			0%	0%			0%		0%			
Storage Length (ft)		0			0		0	0	0	0		
Storage Lanes		0			0		1	0	1	0		
Taper Length (ft)		25			25		25	25	25	25		
Lane Util. Factor	1.00	1.00	1.00	*0.75	0.95	0.95	1.00	1.00	1.00	1.00		
Ped Bike Factor												
Frt				0.974			0.964		0.969			
Flt Protected			0.997				0.965		0.963			
Satd. Flow (prot)	0	0	1605	2458	0	0	1767	0	1773	0		
Flt Permitted			0.926				0.965		0.963			
Satd. Flow (perm)	0	0	1491	2458	0	0	1767	0	1773	0		
Right Turn on Red							No			No		
Satd. Flow (RTOR)												
Link Speed (mph)			25	20			25		25			
Link Distance (ft)			148	129			397		464			
Travel Time (s)			4.0	4.4			10.8		12.7			
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90		
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Heavy Vehicles (%)	0%	8%	4%	0%	0%	0%	0%	0%	0%	0%		
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0		
Parking (#/hr)												
Mid-Block Traffic (%)			0%	0%			0%		0%			
Adj. Flow (vph)	3	6	161	806	86	82	108	39	30	9		
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	170	974	0	0	147	0	39	0		
Turn Type	Perm	Perm										
Protected Phases			2	6			4		3		1	7
Permitted Phases	2	2										
Detector Phase	2	2	2	6			4		3			
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0			3.0		3.0		3.0	3.0
Minimum Split (s)	28.0	28.0	28.0	28.0			7.0		15.0		13.0	12.0
Total Split (s)	30.0	30.0	30.0	43.0	0.0	0.0	16.0	0.0	11.0	0.0	13.0	27.0
Total Split (%)	42.9%	42.9%	42.9%	61.4%	0.0%	0.0%	22.9%	0.0%	15.7%	0.0%	19%	39%
Yellow Time (s)	3.7	3.7	3.7	3.7			3.0		3.0		3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0			1.0		1.0		0.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	3.7	3.7	3.7	3.7	4.0	4.0	4.0	4.0	4.0	4.0		
Lead/Lag	Lag	Lag	Lag				Lag		Lead		Lead	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes		Yes		Yes	
Recall Mode	C-Max	C-Max	C-Max	Max			None		None		Max	Max
v/c Ratio			0.30	0.71			0.35		0.24			
Control Delay			17.1	7.6			27.6		33.0			



Lane Group	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER	ø1	ø7
Queue Delay			0.0	10.7			0.0		0.0			
Total Delay			17.1	18.2			27.6		33.0			
Queue Length 50th (ft)			72	32			58		16			
Queue Length 95th (ft)			133	m52			111		43			
Internal Link Dist (ft)			68	49			317		384			
Turn Bay Length (ft)												
Base Capacity (vph)			560	1380			415		177			
Starvation Cap Reductn			0	386			0		0			
Spillback Cap Reductn			0	0			0		0			
Storage Cap Reductn			0	0			0		0			
Reduced v/c Ratio			0.30	0.98			0.35		0.22			

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 47.3 (68%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

* User Entered Value

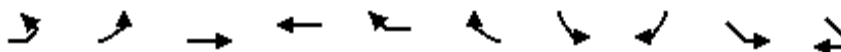
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Division Street & 20th Avenue

#5 ø1 13 s	#5 #9 ø2 30 s	#9 ø3 11 s	#9 ø4 16 s
#9 ø6 43 s	#5 ø7 27 s		

Year 2008 Weekday AM Peak Hour
9: Division Street & 20th Avenue

KAI Edit
6/17/2009


















Movement	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER
Lane Configurations			↕	↕			↕		↕	
Volume (vph)	3	5	145	725	77	74	97	35	27	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12
Total Lost time (s)			3.7	3.7			4.0		4.0	
Lane Util. Factor			1.00	*0.75			1.00		1.00	
Frt			1.00	0.97			0.96		0.97	
Flt Protected			1.00	1.00			0.96		0.96	
Satd. Flow (prot)			1606	2459			1767		1773	
Flt Permitted			0.93	1.00			0.96		0.96	
Satd. Flow (perm)			1490	2459			1767		1773	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	6	161	806	86	82	108	39	30	9
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	170	974	0	0	147	0	39	0
Heavy Vehicles (%)	0%	8%	4%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0
Turn Type	Perm	Perm								
Protected Phases			2	6			4		3	
Permitted Phases	2	2								
Actuated Green, G (s)			23.7	36.7			16.4		4.2	
Effective Green, g (s)			24.7	37.7			16.4		4.2	
Actuated g/C Ratio			0.35	0.54			0.23		0.06	
Clearance Time (s)			4.7	4.7			4.0		4.0	
Vehicle Extension (s)			3.0	3.0			3.0		3.0	
Lane Grp Cap (vph)			526	1324			414		106	
v/s Ratio Prot				c0.40			c0.08		c0.02	
v/s Ratio Perm			0.11							
v/c Ratio			0.32	0.74			0.36		0.37	
Uniform Delay, d1			16.5	12.3			22.4		31.6	
Progression Factor			0.99	0.52			1.00		1.00	
Incremental Delay, d2			1.6	1.9			0.5		2.2	
Delay (s)			17.9	8.2			22.9		33.8	
Level of Service			B	A			C		C	
Approach Delay (s)			17.9	8.2			22.9		33.8	
Approach LOS			B	A			C		C	
Intersection Summary										
HCM Average Control Delay			11.8		HCM Level of Service				B	
HCM Volume to Capacity ratio			0.60							
Actuated Cycle Length (s)			70.0		Sum of lost time (s)				11.7	
Intersection Capacity Utilization			45.7%		ICU Level of Service				A	
Analysis Period (min)			15							

c Critical Lane Group













Year 2008 Weekday PM Peak Hour
1: Division Street & 11th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	385	292	94	169	0	0	0	0	216	765	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Lane Util. Factor	1.00	*0.75	0.95	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95
Ped Bike Factor		0.99									1.00	
Frt		0.935									0.999	
Flt Protected					0.982						0.989	
Satd. Flow (prot)	0	*2500	0	0	1646	0	0	0	0	0	3503	0
Flt Permitted					0.511						0.989	
Satd. Flow (perm)	0	*2500	0	0	856	0	0	0	0	0	3497	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		153									1	
Link Speed (mph)		20			25			25			25	
Link Distance (ft)		355			263			1501			1376	
Travel Time (s)		12.1			7.2			40.9			37.5	
Confl. Peds. (#/hr)			10			7				6		4
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	7	7	5	5	0	0	0	0	0	5	5
Adj. Flow (vph)	0	414	314	101	182	0	0	0	0	232	823	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	728	0	0	283	0	0	0	0	0	1064	0
Turn Type				pm+pt							Perm	
Protected Phases		8		7	4						2	
Permitted Phases				4						2		
Detector Phase		8		7	4					2	2	
Switch Phase												
Minimum Initial (s)		10.0		5.0	10.0					10.0	10.0	
Minimum Split (s)		25.6		9.4	36.4					19.6	19.6	
Total Split (s)	0.0	31.0	0.0	10.0	41.0	0.0	0.0	0.0	0.0	29.0	29.0	0.0
Total Split (%)	0.0%	44.3%	0.0%	14.3%	58.6%	0.0%	0.0%	0.0%	0.0%	41.4%	41.4%	0.0%
Yellow Time (s)		3.6		3.4	3.4					3.6	3.6	
All-Red Time (s)		1.0		1.0	1.0					1.0	1.0	
Lost Time Adjust (s)	0.0	-0.5	0.0	-0.5	-0.5	0.0	0.0	0.0	0.0	-0.5	-0.5	0.0
Total Lost Time (s)	4.0	4.1	4.0	3.9	3.9	4.0	4.0	4.0	4.0	4.1	4.1	4.0
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		Max		Max	Max					C-Max	C-Max	
v/c Ratio		0.69			0.54						0.85	
Control Delay		18.1			16.0						29.5	
Queue Delay		0.0			2.2						0.0	
Total Delay		18.1			18.2						29.5	
Queue Length 50th (ft)		133			44						218	
Queue Length 95th (ft)		210			64						#330	
Internal Link Dist (ft)		275			183			1421			1296	
Turn Bay Length (ft)												
Base Capacity (vph)		1055			523						1245	
Starvation Cap Reductn		0			129						0	

Year 2008 Weekday PM Peak Hour
1: Division Street & 11th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.69			0.72						0.85	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 16.9 (24%), Referenced to phase 2:SBTL, Start of Yellow

Natural Cycle: 60

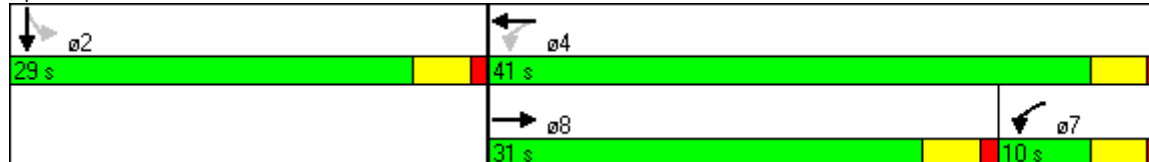
Control Type: Actuated-Coordinated

* User Entered Value

95th percentile volume exceeds capacity, queue may be longer.
















Queue shown is maximum after two cycles.

Splits and Phases: 1: Division Street & 11th Avenue


















Year 2008 Weekday PM Peak Hour
1: Division Street & 11th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	385	292	94	169	0	0	0	0	216	765	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.1			3.9						4.1	
Lane Util. Factor		*0.75			1.00						0.95	
Frpb, ped/bikes		0.99			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.94			1.00						1.00	
Flt Protected		1.00			0.98						0.99	
Satd. Flow (prot)		2500			1646						3496	
Flt Permitted		1.00			0.51						0.99	
Satd. Flow (perm)		2500			856						3496	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	414	314	101	182	0	0	0	0	232	823	9
RTOR Reduction (vph)	0	94	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	634	0	0	283	0	0	0	0	0	1063	0
Confl. Peds. (#/hr)			10			7				6		4
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	7	7	5	5	0	0	0	0	0	5	5
Turn Type			pm+pt							Perm		
Protected Phases		8		7	4						2	
Permitted Phases				4						2		
Actuated Green, G (s)		26.4			36.6						24.4	
Effective Green, g (s)		26.9			37.1						24.9	
Actuated g/C Ratio		0.38			0.53						0.36	
Clearance Time (s)		4.6			4.4						4.6	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		961			523						1244	
v/s Ratio Prot		c0.25			c0.05							
v/s Ratio Perm					0.24						0.30	
v/c Ratio		0.66			0.54						0.85	
Uniform Delay, d1		17.8			10.8						20.9	
Progression Factor		1.00			0.96						1.00	
Incremental Delay, d2		3.5			3.7						7.6	
Delay (s)		21.3			14.1						28.5	
Level of Service		C			B						C	
Approach Delay (s)		21.3			14.1			0.0			28.5	
Approach LOS		C			B			A			C	
Intersection Summary												
HCM Average Control Delay			24.0		HCM Level of Service				C			
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			70.0		Sum of lost time (s)			8.2				
Intersection Capacity Utilization			85.0%		ICU Level of Service			E				
Analysis Period (min)			15									
c Critical Lane Group												













Year 2008 Weekday PM Peak Hour
2: Division Street & 12th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	571	0	0	211	106	47	632	92	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Lane Util. Factor	0.95	*0.75	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor					0.99			1.00				
Frt					0.955			0.982				
Flt Protected		0.997						0.997				
Satd. Flow (prot)	0	2522	0	0	1590	0	0	3458	0	0	0	0
Flt Permitted		0.927						0.997				
Satd. Flow (perm)	0	2344	0	0	1590	0	0	3455	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					48			27				
Link Speed (mph)		20			25			25			25	
Link Distance (ft)		263			461			1504			1317	
Travel Time (s)		9.0			12.6			41.0			35.9	
Confl. Peds. (#/hr)			20			4	7		8			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	0	0	5	5	0	5	5	0	0	0
Adj. Flow (vph)	32	601	0	0	222	112	49	665	97	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	633	0	0	334	0	0	811	0	0	0	0
Turn Type	Perm						Perm					
Protected Phases		2			2			4				
Permitted Phases	2						4					
Detector Phase	2	2			2		4	4				
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0		10.0	10.0				
Minimum Split (s)	16.4	16.4			16.4		23.4	23.4				
Total Split (s)	36.0	36.0	0.0	0.0	36.0	0.0	34.0	34.0	0.0	0.0	0.0	0.0
Total Split (%)	51.4%	51.4%	0.0%	0.0%	51.4%	0.0%	48.6%	48.6%	0.0%	0.0%	0.0%	0.0%
Yellow Time (s)	3.4	3.4			3.4		3.4	3.4				
All-Red Time (s)	1.0	1.0			1.0		1.0	1.0				
Lost Time Adjust (s)	-0.5	-0.5	0.0	0.0	-0.5	0.0	-0.5	-0.5	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.9	3.9	4.0	4.0	3.9	4.0	3.9	3.9	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max			C-Max		Max	Max				
v/c Ratio		0.59			0.44			0.54				
Control Delay		10.8			7.2			15.9				
Queue Delay		0.5			0.0			0.0				
Total Delay		11.3			7.2			15.9				
Queue Length 50th (ft)		80			48			126				
Queue Length 95th (ft)		m145			89			176				
Internal Link Dist (ft)		183			381			1424			1237	
Turn Bay Length (ft)												
Base Capacity (vph)		1075			755			1501				
Starvation Cap Reductn		146			0			0				

Year 2008 Weekday PM Peak Hour
2: Division Street & 12th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.68			0.44			0.54				

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 45.1 (64%), Referenced to phase 2:EBWB, Start of Yellow

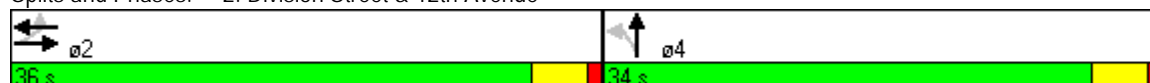
Natural Cycle: 45

Control Type: Actuated-Coordinated

* User Entered Value
















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Division Street & 12th Avenue














Year 2008 Weekday PM Peak Hour
2: Division Street & 12th Avenue

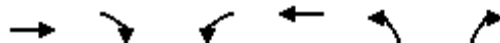
KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	571	0	0	211	106	47	632	92	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		3.9			3.9			3.9				
Lane Util. Factor		*0.75			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		2523			1590			3455				
Flt Permitted		0.93			1.00			1.00				
Satd. Flow (perm)		2344			1590			3455				
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	601	0	0	222	112	49	665	97	0	0	0
RTOR Reduction (vph)	0	0	0	0	26	0	0	15	0	0	0	0
Lane Group Flow (vph)	0	633	0	0	308	0	0	796	0	0	0	0
Confl. Peds. (#/hr)			20			4	7		8			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	0	0	5	5	0	5	5	0	0	0
Turn Type	Perm						Perm					
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		31.6			31.6			29.6				
Effective Green, g (s)		32.1			32.1			30.1				
Actuated g/C Ratio		0.46			0.46			0.43				
Clearance Time (s)		4.4			4.4			4.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		1075			729			1486				
v/s Ratio Prot					0.19							
v/s Ratio Perm		c0.27						0.23				
v/c Ratio		0.59			0.42			0.54				
Uniform Delay, d1		14.1			12.7			14.8				
Progression Factor		0.64			0.47			1.00				
Incremental Delay, d2		1.5			1.8			1.4				
Delay (s)		10.5			7.8			16.2				
Level of Service		B			A			B				
Approach Delay (s)		10.5			7.8			16.2			0.0	
Approach LOS		B			A			B			A	
Intersection Summary												
HCM Average Control Delay			12.6			HCM Level of Service			B			
HCM Volume to Capacity ratio			0.56									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			7.8			
Intersection Capacity Utilization			66.2%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Year 2008 Weekday PM Peak Hour
3: Division Street & 17th Avenue

KAI Edit
6/17/2009

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	630	33	7	280	35	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	12	12
Lane Util. Factor	*0.75	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				0.99	
Frt	0.992				0.959	
Flt Protected				0.999	0.966	
Satd. Flow (prot)	2349	0	0	1674	1744	0
Flt Permitted				0.984	0.966	
Satd. Flow (perm)	2349	0	0	1649	1744	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	12				16	
Link Speed (mph)	20			25	25	
Link Distance (ft)	834			456	403	
Travel Time (s)	28.4			12.4	11.0	
Confl. Peds. (#/hr)		1				14
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Parking (#/hr)	5	5				
Adj. Flow (vph)	663	35	7	295	37	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	698	0	0	302	53	0
Turn Type			Perm			
Protected Phases	2			2	4	
Permitted Phases			2			
Detector Phase	2		2	2	4	
Switch Phase						
Minimum Initial (s)	10.0		10.0	10.0	10.0	
Minimum Split (s)	16.5		16.5	16.5	19.0	
Total Split (s)	50.5	0.0	50.5	50.5	19.5	0.0
Total Split (%)	72.1%	0.0%	72.1%	72.1%	27.9%	0.0%
Yellow Time (s)	3.5		3.5	3.5	3.0	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	-0.5	0.0	-0.5	-0.5	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max		C-Max	C-Max	None	
v/c Ratio	0.35			0.22	0.20	
Control Delay	1.3			1.7	22.4	
Queue Delay	0.0			0.0	0.0	
Total Delay	1.3			1.7	22.4	
Queue Length 50th (ft)	22			13	14	
Queue Length 95th (ft)	26			m40	44	
Internal Link Dist (ft)	754			376	323	
Turn Bay Length (ft)						
Base Capacity (vph)	1988			1395	399	



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Starvation Cap Reductn	0			0	0	
Spillback Cap Reductn	0			0	0	
Storage Cap Reductn	0			0	0	
Reduced v/c Ratio	0.35			0.22	0.13	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 23 (33%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 40

Control Type: Actuated-Coordinated

* User Entered Value

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Division Street & 17th Avenue



Year 2008 Weekday PM Peak Hour
3: Division Street & 17th Avenue

KAI Edit
6/17/2009



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑	↑↑	
Volume (vph)	630	33	7	280	35	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	*0.75			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.99	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.96	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	2350			1674	1745	
Flt Permitted	1.00			0.98	0.97	
Satd. Flow (perm)	2350			1649	1745	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	663	35	7	295	37	16
RTOR Reduction (vph)	2	0	0	0	15	0
Lane Group Flow (vph)	696	0	0	302	38	0
Confl. Peds. (#/hr)		1				14
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Parking (#/hr)	5	5				
Turn Type	Perm					
Protected Phases	2			2	4	
Permitted Phases			2			
Actuated Green, G (s)	55.5			55.5	6.0	
Effective Green, g (s)	56.0			56.0	6.0	
Actuated g/C Ratio	0.80			0.80	0.09	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1880			1319	150	
v/s Ratio Prot	c0.30				c0.02	
v/s Ratio Perm				0.18		
v/c Ratio	0.37			0.23	0.26	
Uniform Delay, d1	2.0			1.7	29.9	
Progression Factor	0.36			0.62	1.00	
Incremental Delay, d2	0.5			0.3	0.9	
Delay (s)	1.2			1.4	30.8	
Level of Service	A			A	C	
Approach Delay (s)	1.2			1.4	30.8	
Approach LOS	A			A	C	










Intersection Summary

HCM Average Control Delay	2.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Year 2008 Weekday PM Peak Hour
4: Division Street & 20th Street

KAI Edit
6/17/2009

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	551	67	44	308	4	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	12	12
Lane Util. Factor	*0.75	0.95	1.00	1.00	1.00	1.00
Frt	0.984				0.880	
Flt Protected				0.994	0.995	
Satd. Flow (prot)	2333	0	0	1666	1664	0
Flt Permitted				0.994	0.995	
Satd. Flow (perm)	2333	0	0	1666	1664	0
Link Speed (mph)	20			25	25	
Link Distance (ft)	303			148	497	
Travel Time (s)	10.3			4.0	13.6	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Parking (#/hr)	5	5				
Adj. Flow (vph)	580	71	46	324	4	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	651	0	0	370	37	0
Sign Control	Free			Free	Stop	

Intersection Summary










Area Type: Other

Control Type: Unsignalized

* User Entered Value

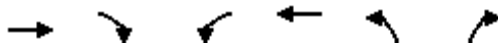
Year 2008 Weekday PM Peak Hour
4: Division Street & 20th Street

KAI Edit
6/17/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	551	67	44	308	4	31
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	580	71	46	324	4	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	759			148		
pX, platoon unblocked					0.90	
vC, conflicting volume			651		1032	325
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			651		979	325
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		98	95
cM capacity (veh/h)			945		214	676
Direction, Lane #	EB 1	EB 2	WB 1	NB 1		
Volume Total	387	264	371	37		
Volume Left	0	0	46	4		
Volume Right	0	71	0	33		
cSH	1700	1700	945	543		
Volume to Capacity	0.23	0.16	0.05	0.07		
Queue Length 95th (ft)	0	0	4	5		
Control Delay (s)	0.0	0.0	1.6	12.1		
Lane LOS			A	B		
Approach Delay (s)	0.0		1.6	12.1		
Approach LOS				B		
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			49.3%	ICU Level of Service		A
Analysis Period (min)			15			

Year 2008 Weekday PM Peak Hour
5: Division Street & 21st Avenue

KAI Edit
6/17/2009



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø3	ø4	ø6	ø7
Lane Configurations	↑↑			↑	↑					
Volume (vph)	663	157	15	337	115	57				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
Lane Width (ft)	9	9	9	9	12	12				
Lane Util. Factor	*0.75	0.95	1.00	1.00	1.00	1.00				
Frt	0.971				0.955					
Flt Protected				0.998	0.968					
Satd. Flow (prot)	2456	0	0	1672	1756	0				
Flt Permitted				0.937	0.968					
Satd. Flow (perm)	2456	0	0	1570	1756	0				
Right Turn on Red		No				Yes				
Satd. Flow (RTOR)					30					
Link Speed (mph)	20			25	25					
Link Distance (ft)	129			1277	514					
Travel Time (s)	4.4			34.8	14.0					
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%				
Bus Blockages (#/hr)	7	7	5	5	0	0				
Adj. Flow (vph)	705	167	16	359	122	61				
Shared Lane Traffic (%)										
Lane Group Flow (vph)	872	0	0	375	183	0				
Turn Type			Perm							
Protected Phases	2 7			2	1		3	4	6	7
Permitted Phases			2							
Detector Phase	2 7		2	2	1					
Switch Phase										
Minimum Initial (s)			20.0	20.0	3.0		3.0	3.0	20.0	3.0
Minimum Split (s)			27.7	27.7	13.0		15.0	7.0	28.0	12.0
Total Split (s)	57.0	0.0	30.0	30.0	13.0	0.0	11.0	16.0	43.0	27.0
Total Split (%)	81.4%	0.0%	42.9%	42.9%	18.6%	0.0%	16%	23%	61%	39%
Yellow Time (s)			3.7	3.7	3.0		3.0	3.0	4.0	3.0
All-Red Time (s)			1.0	1.0	0.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	-1.0	-1.0	1.0	0.0				
Total Lost Time (s)	3.7	4.0	3.7	3.7	4.0	4.0				
Lead/Lag			Lag	Lag	Lead		Lead	Lag		
Lead-Lag Optimize?			Yes	Yes	Yes		Yes	Yes		
Recall Mode			C-Max	C-Max	Min		None	None	Max	Max
v/c Ratio	0.46			0.62	0.77					
Control Delay	1.0			19.6	47.8					
Queue Delay	0.8			0.1	0.4					
Total Delay	1.8			19.7	48.2					
Queue Length 50th (ft)	3			142	64					
Queue Length 95th (ft)	18			231	#157					
Internal Link Dist (ft)	49			1197	434					
Turn Bay Length (ft)										
Base Capacity (vph)	1890			603	252					
Starvation Cap Reductn	643			0	0					
Spillback Cap Reductn	0			12	4					
Storage Cap Reductn	0			0	0					



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	ø3	ø4	ø6	ø7
Reduced v/c Ratio	0.70			0.63	0.74					

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 47.3 (68%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

* User Entered Value

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: Division Street & 21st Avenue

#5 ø1	#5 #9 ø2	#9 ø3	#9 ø4
13 s	30 s	11 s	16 s
#9 ø6	#5 ø7		
43 s	27 s		

Year 2008 Weekday PM Peak Hour
5: Division Street & 21st Avenue

KAI Edit
6/17/2009



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑	↑	
Volume (vph)	663	157	15	337	115	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	3.7			3.7	4.0	
Lane Util. Factor	*0.75			1.00	1.00	
Frt	0.97			1.00	0.95	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	2456			1672	1756	
Flt Permitted	1.00			0.94	0.97	
Satd. Flow (perm)	2456			1571	1756	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	705	167	16	359	122	61
RTOR Reduction (vph)	0	0	0	0	26	0
Lane Group Flow (vph)	872	0	0	375	157	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Turn Type	Perm					
Protected Phases	2 7			2	1	
Permitted Phases			2			
Actuated Green, G (s)	53.6			25.9	9.4	
Effective Green, g (s)	54.6			26.9	8.4	
Actuated g/C Ratio	0.78			0.38	0.12	
Clearance Time (s)				4.7	3.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)	1916			604	211	
v/s Ratio Prot	c0.35				c0.09	
v/s Ratio Perm				c0.24		
v/c Ratio	0.46			0.62	0.74	
Uniform Delay, d1	2.6			17.4	29.8	
Progression Factor	0.15			0.82	1.00	
Incremental Delay, d2	0.5			4.4	13.1	
Delay (s)	0.9			18.7	42.9	
Level of Service	A			B	D	
Approach Delay (s)	0.9			18.7	42.9	
Approach LOS	A			B	D	


















Intersection Summary













HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Year 2008 Weekday PM Peak Hour
6: Division Street & 26th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	545	73	41	377	27	58	120	62	13	95	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Storage Length (ft)	25		0	25		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	*0.75	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			0.99			0.99	
Frt		0.983			0.990			0.965			0.976	
Flt Protected		0.999		0.950				0.988			0.995	
Satd. Flow (prot)	0	2319	0	1592	1653	0	0	1799	0	0	1829	0
Flt Permitted		0.945		0.302				0.911			0.962	
Satd. Flow (perm)	0	2193	0	506	1653	0	0	1659	0	0	1768	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30			10			24			15	
Link Speed (mph)		20			25			25			25	
Link Distance (ft)		1277			504			552			449	
Travel Time (s)		43.5			13.7			15.1			12.2	
Confl. Peds. (#/hr)			5			10			11			13
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Adj. Flow (vph)	15	574	77	43	397	28	61	126	65	14	100	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	666	0	43	425	0	0	252	0	0	139	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Detector Phase	2	2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5		15.5	15.5		19.0	19.0		19.0	19.0	
Total Split (s)	48.5	48.5	0.0	48.5	48.5	0.0	21.5	21.5	0.0	21.5	21.5	0.0
Total Split (%)	69.3%	69.3%	0.0%	69.3%	69.3%	0.0%	30.7%	30.7%	0.0%	30.7%	30.7%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-0.5	-0.5	0.0	-0.5	-0.5	0.0	-0.5	-0.5	0.0	-0.5	-0.5	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	4.0	3.5	3.5	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max		Max	Max	
v/c Ratio		0.47		0.13	0.40			0.57			0.30	
Control Delay		4.5		1.9	2.3			26.2			20.7	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		4.5		1.9	2.3			26.2			20.7	
Queue Length 50th (ft)		27		1	10			85			43	
Queue Length 95th (ft)		73		m2	16			154			87	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1197			424			472			369	
Turn Bay Length (ft)				25								
Base Capacity (vph)		1405		322	1054			444			466	
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		0.47		0.13	0.40			0.57			0.30	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 22 (31%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 40

Control Type: Actuated-Coordinated

* User Entered Value


















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Division Street & 26th Avenue






















Year 2008 Weekday PM Peak Hour
6: Division Street & 26th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	545	73	41	377	27	58	120	62	13	95	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0		4.0	4.0			3.5			3.5	
Lane Util. Factor		*0.75		1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99			0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00			1.00	
Frt		0.98		1.00	0.99			0.97			0.98	
Flt Protected		1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)		2318		1592	1654			1799			1828	
Flt Permitted		0.94		0.30	1.00			0.91			0.96	
Satd. Flow (perm)		2192		506	1654			1659			1768	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	574	77	43	397	28	61	126	65	14	100	25
RTOR Reduction (vph)	0	11	0	0	4	0	0	18	0	0	11	0
Lane Group Flow (vph)	0	655	0	43	421	0	0	234	0	0	128	0
Confl. Peds. (#/hr)			5			10			11			13
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		44.0		44.0	44.0			17.5			17.5	
Effective Green, g (s)		44.5		44.5	44.5			18.0			18.0	
Actuated g/C Ratio		0.64		0.64	0.64			0.26			0.26	
Clearance Time (s)		4.5		4.5	4.5			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1393		322	1051			427			455	
v/s Ratio Prot					0.25							
v/s Ratio Perm		c0.30		0.08				c0.14			0.07	
v/c Ratio		0.47		0.13	0.40			0.55			0.28	
Uniform Delay, d1		6.6		5.1	6.2			22.5			20.8	
Progression Factor		0.54		0.21	0.21			1.00			1.00	
Incremental Delay, d2		1.0		0.8	1.0			5.0			1.5	
Delay (s)		4.6		1.8	2.3			27.5			22.4	
Level of Service		A		A	A			C			C	
Approach Delay (s)		4.6			2.3			27.5			22.4	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM Average Control Delay			9.3			HCM Level of Service				A		
HCM Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			7.5			
Intersection Capacity Utilization			61.0%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												













Year 2008 Weekday PM Peak Hour
7: Division Street & 34th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	663	8	19	416	32	2	27	12	33	39	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Storage Length (ft)	25		0	25		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25		25	25		25	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
Ped Bike Factor		1.00			1.00			0.98			0.99	
Frt		0.998			0.989			0.959			0.964	
Flt Protected	0.950			0.950				0.998			0.983	
Satd. Flow (prot)	1382	1451	0	1393	1446	0	0	1789	0	0	1781	0
Flt Permitted	0.439			0.290				0.991			0.902	
Satd. Flow (perm)	638	1451	0	425	1446	0	0	1776	0	0	1634	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			11			13			25	
Link Speed (mph)		20			25			25			25	
Link Distance (ft)		2033			1780			317			303	
Travel Time (s)		69.3			48.5			8.6			8.3	
Confl. Peds. (#/hr)			8			5			14			8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5				0		
Adj. Flow (vph)	32	698	8	20	438	34	2	28	13	35	41	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	32	706	0	20	472	0	0	43	0	0	104	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Detector Phase	2	2		2	2		4	4		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5		15.5	15.5		18.5	18.5		18.5	18.5	
Total Split (s)	49.0	49.0	0.0	49.0	49.0	0.0	21.0	21.0	0.0	21.0	21.0	0.0
Total Split (%)	70.0%	70.0%	0.0%	70.0%	70.0%	0.0%	30.0%	30.0%	0.0%	30.0%	30.0%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	-0.5	-0.5	0.0	-0.5	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max		Max	Max	
v/c Ratio	0.08	0.76		0.07	0.51			0.10			0.26	
Control Delay	7.7	17.1		5.5	8.8			17.0			19.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.7	17.1		5.5	8.8			17.0			19.0	
Queue Length 50th (ft)	6	175		3	90			10			27	
Queue Length 95th (ft)	m14	358		10	155			33			66	

Year 2008 Weekday PM Peak Hour
7: Division Street & 34th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)	1953			1700			237			223		
Turn Bay Length (ft)	25			25								
Base Capacity (vph)	410	934		273	934			429			404	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.08	0.76		0.07	0.51			0.10			0.26	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

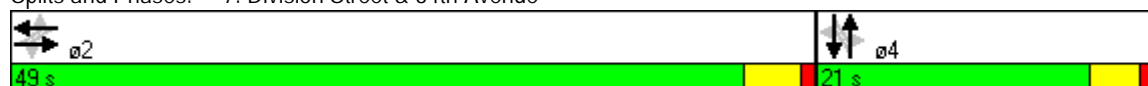
Offset: 22 (31%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 60

Control Type: Actuated-Coordinated



















m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Division Street & 34th Avenue























Year 2008 Weekday PM Peak Hour
7: Division Street & 34th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	663	8	19	416	32	2	27	12	33	39	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	0.99			0.96			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1382	1451		1393	1447			1788			1781	
Flt Permitted	0.44	1.00		0.29	1.00			0.99			0.90	
Satd. Flow (perm)	639	1451		425	1447			1776			1633	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	698	8	20	438	34	2	28	13	35	41	28
RTOR Reduction (vph)	0	1	0	0	4	0	0	10	0	0	19	0
Lane Group Flow (vph)	32	705	0	20	468	0	0	33	0	0	85	0
Confl. Peds. (#/hr)			8			5			14			8
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5				0		
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	44.5	44.5		44.5	44.5			16.5			16.5	
Effective Green, g (s)	45.0	45.0		45.0	45.0			16.5			16.5	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.24			0.24	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	411	933		273	930			419			385	
v/s Ratio Prot		c0.49			0.32							
v/s Ratio Perm	0.05			0.05				0.02			c0.05	
v/c Ratio	0.08	0.76		0.07	0.50			0.08			0.22	
Uniform Delay, d1	4.7	8.7		4.7	6.6			20.8			21.6	
Progression Factor	1.49	1.22		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.3	5.3		0.5	1.9			0.4			1.3	
Delay (s)	7.4	15.9		5.2	8.5			21.2			22.9	
Level of Service	A	B		A	A			C			C	
Approach Delay (s)		15.5			8.4			21.2			22.9	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM Average Control Delay			13.7			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.5			
Intersection Capacity Utilization			54.9%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												













Year 2008 Weekday PM Peak Hour
8: Division Street & 39th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	477	68	67	283	74	80	696	111	172	861	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Storage Length (ft)	150		0	150		0	150		0	150		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor		0.99			1.00			0.99			0.99	
Frt		0.981			0.969			0.979			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1579	1619	0	1592	1611	0	1769	*3000	0	1769	*3000	0
Flt Permitted	0.421			0.246			0.950			0.950		
Satd. Flow (perm)	700	1619	0	412	1611	0	1769	3462	0	1769	3466	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			17			18			14	
Link Speed (mph)		20			25			35			35	
Link Distance (ft)		1780			778			579			672	
Travel Time (s)		60.7			21.2			11.3			13.1	
Confl. Peds. (#/hr)			28			4			14			37
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	5	5	5	5	5	5
Adj. Flow (vph)	88	497	71	70	295	77	83	725	116	179	897	108
Shared Lane Traffic (%)												
Lane Group Flow (vph)	88	568	0	70	372	0	83	841	0	179	1005	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		3.0	10.0		3.0	10.0	
Minimum Split (s)	23.3	23.3		23.3	23.3		6.0	19.6		6.0	20.6	
Total Split (s)	50.0	50.0	0.0	50.0	50.0	0.0	11.5	31.5	0.0	18.5	38.5	0.0
Total Split (%)	50.0%	50.0%	0.0%	50.0%	50.0%	0.0%	11.5%	31.5%	0.0%	18.5%	38.5%	0.0%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.0	3.6		3.0	3.6	
All-Red Time (s)	1.0	1.0		1.0	1.0		0.0	1.0		0.0	1.0	
Lost Time Adjust (s)	-0.5	-0.5	0.0	-0.5	-0.5	0.0	1.0	-0.5	0.0	1.0	-0.5	0.0
Total Lost Time (s)	3.8	3.8	4.0	3.8	3.8	4.0	4.0	4.1	4.0	4.0	4.1	4.0
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	Max	Max		Max	Max		None	C-Max		None	C-Max	
v/c Ratio	0.27	0.75		0.37	0.49		0.66	0.95		0.78	0.91	
Control Delay	19.5	29.6		24.6	20.6		70.3	56.7		65.0	43.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.5	29.6		24.6	20.6		70.3	56.7		65.0	43.4	
Queue Length 50th (ft)	33	285		28	152		52	~281		110	324	
Queue Length 95th (ft)	71	427		69	236		#120	#416		#202	#465	
Internal Link Dist (ft)		1700			698			499			592	

Year 2008 Weekday PM Peak Hour
8: Division Street & 39th Avenue

KAI Edit
6/17/2009

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	150			150			150			150		
Base Capacity (vph)	323	753		190	753		133	881		257	1110	
Starvation Cap Reductn	0	0		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	0.27	0.75		0.37	0.49		0.62	0.95		0.70	0.91	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 62.9 (63%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

* User Entered Value







~ 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: 8: Division Street & 39th Avenue

 ø1	 ø2	 ø4
18.5 s	31.5 s	50 s
 ø5	 ø6	 ø8
11.5 s	38.5 s	50 s

Year 2008 Weekday PM Peak Hour
8: Division Street & 39th Avenue

KAI Edit
6/17/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	477	68	67	283	74	80	696	111	172	861	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)	3.8	3.8		3.8	3.8		4.0	4.1		4.0	4.1	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1579	1620		1592	1611		1769	3000		1769	3000	
Flt Permitted	0.42	1.00		0.25	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	699	1620		412	1611		1769	3463		1769	3466	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	88	497	71	70	295	77	83	725	116	179	897	108
RTOR Reduction (vph)	0	5	0	0	9	0	0	13	0	0	9	0
Lane Group Flow (vph)	88	563	0	70	363	0	83	828	0	179	996	0
Confl. Peds. (#/hr)			28			4			14			37
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	5	5	5	5	5	5
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	45.7	45.7		45.7	45.7		6.8	28.4		14.0	35.6	
Effective Green, g (s)	46.2	46.2		46.2	46.2		5.8	28.9		13.0	36.1	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.06	0.29		0.13	0.36	
Clearance Time (s)	4.3	4.3		4.3	4.3		3.0	4.6		3.0	4.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	323	748		190	744		103	867		230	1083	
v/s Ratio Prot		c0.35			0.23		0.05	0.28		c0.10	c0.33	
v/s Ratio Perm	0.13			0.17								
v/c Ratio	0.27	0.75		0.37	0.49		0.81	0.96		0.78	0.92	
Uniform Delay, d1	16.6	22.2		17.4	18.7		46.5	34.9		42.1	30.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	6.9		5.4	2.3		35.2	21.5		15.2	13.8	
Delay (s)	18.6	29.1		22.9	21.0		81.7	56.4		57.3	44.3	
Level of Service	B	C		C	C		F	E		E	D	
Approach Delay (s)		27.7			21.3			58.6			46.3	
Approach LOS		C			C			E			D	
Intersection Summary												
HCM Average Control Delay			42.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			7.8			
Intersection Capacity Utilization			82.1%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Year 2008 Weekday PM Peak Hour
9: Division Street & 20th Avenue

KAI Edit
6/17/2009



Lane Group	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SBR2	SEL2	SEL	SER
Lane Configurations			↑↑	↑			↑↑				↑↑	
Volume (vph)	2	17	569	292	54	109	157	43	1	15	105	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	9	9	9	9	9	9	12	12	12	12	12	12
Lane Util. Factor	0.95	0.95	*0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.952			0.971					
Flt Protected			0.998				0.962				0.950	
Satd. Flow (prot)	0	0	2524	1595	0	0	1775	0	0	0	1734	0
Flt Permitted			0.934				0.962				0.950	
Satd. Flow (perm)	0	0	2362	1595	0	0	1775	0	0	0	1734	0
Right Turn on Red						No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)			20	25			25				25	
Link Distance (ft)			148	129			397				464	
Travel Time (s)			5.0	3.5			10.8				12.7	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Adj. Flow (vph)	2	18	612	314	58	117	169	46	1	16	113	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	632	489	0	0	216	0	0	0	129	0
Turn Type	Perm	Perm								Perm		
Protected Phases			2	6			4				3	
Permitted Phases	2	2								3		
Detector Phase	2	2	2	6			4			3	3	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0			3.0			3.0	3.0	
Minimum Split (s)	27.7	27.7	27.7	28.0			7.0			15.0	15.0	
Total Split (s)	30.0	30.0	30.0	43.0	0.0	0.0	16.0	0.0	0.0	11.0	11.0	0.0
Total Split (%)	42.9%	42.9%	42.9%	61.4%	0.0%	0.0%	22.9%	0.0%	0.0%	15.7%	15.7%	0.0%
Yellow Time (s)	3.7	3.7	3.7	4.0			3.0			3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0			1.0			1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.7	3.7	3.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag				Lag			Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes				Yes			Yes	Yes	
Recall Mode	C-Max	C-Max	C-Max	Max			None			None	None	
v/c Ratio			0.70	0.55			0.71				0.75	
Control Delay			13.5	4.1			42.4				58.6	
Queue Delay			0.0	1.6			0.0				0.0	
Total Delay			13.5	5.8			42.4				58.6	
Queue Length 50th (ft)			116	12			89				55	
Queue Length 95th (ft)			184	m27			#182				#138	
Internal Link Dist (ft)			68	49			317				384	
Turn Bay Length (ft)												
Base Capacity (vph)			907	889			304				173	
Starvation Cap Reductn			0	234			0				0	
Spillback Cap Reductn			0	0			0				0	
Storage Cap Reductn			0	0			0				0	

Lane Group	ø1	ø7
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	1	7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	3.0	3.0
Minimum Split (s)	13.0	12.0
Total Split (s)	13.0	27.0
Total Split (%)	19%	39%
Yellow Time (s)	3.0	3.0
All-Red Time (s)	0.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	Min	Max
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		



Lane Group	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SBR2	SEL2	SEL	SER
Reduced v/c Ratio			0.70	0.75			0.71				0.75	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 47.3 (68%), Referenced to phase 2:EBWB, Start of Yellow

Natural Cycle: 70

Control Type: Actuated-Coordinated

* User Entered Value

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: 9: Division Street & 20th Avenue

#5 ← ø1 13 s	#5 #9 ← → ø2 30 s	#9 ← ø3 11 s	#9 ← ø4 16 s
#9 ← ø6 43 s	#5 → ø7 27 s		

Lane Group	ø1	ø7
Reduced v/c Ratio		
Intersection Summary		

Year 2008 Weekday PM Peak Hour
9: Division Street & 20th Avenue

KAI Edit
6/17/2009



Movement	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SBR2	SEL2	SEL	SER
Lane Configurations			↑↑	↑			↑↑				↑↑	
Volume (vph)	2	17	569	292	54	109	157	43	1	15	105	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)			3.7	4.0			4.0				4.0	
Lane Util. Factor			*0.75	1.00			1.00				1.00	
Frt			1.00	0.95			0.97				1.00	
Flt Protected			1.00	1.00			0.96				0.95	
Satd. Flow (prot)			2525	1595			1775				1734	
Flt Permitted			0.93	1.00			0.96				0.95	
Satd. Flow (perm)			2362	1595			1775				1734	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	2	18	612	314	58	117	169	46	1	16	113	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	632	489	0	0	216	0	0	0	129	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Turn Type	Perm	Perm								Perm		
Protected Phases			2	6			4				3	
Permitted Phases	2	2								3		
Actuated Green, G (s)			25.9	38.0			12.0				7.0	
Effective Green, g (s)			26.9	39.0			12.0				7.0	
Actuated g/C Ratio			0.38	0.56			0.17				0.10	
Clearance Time (s)			4.7	5.0			4.0				4.0	
Vehicle Extension (s)			3.0	3.0			3.0				3.0	
Lane Grp Cap (vph)			908	889			304				173	
v/s Ratio Prot				c0.31			c0.12					
v/s Ratio Perm			c0.27								0.07	
v/c Ratio			0.70	0.55			0.71				0.75	
Uniform Delay, d1			18.1	9.9			27.4				30.6	
Progression Factor			0.49	0.21			1.00				1.00	
Incremental Delay, d2			4.2	1.9			7.6				16.0	
Delay (s)			13.1	4.0			35.0				46.6	
Level of Service			B	A			C				D	
Approach Delay (s)			13.1	4.0			35.0				46.6	
Approach LOS			B	A			C				D	

Intersection Summary

HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

















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Appendix D
Synchro Analysis
One-Lane Existing Timings

HCM Signalized Intersection Capacity Analysis

1: Division Street & 11th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		1.00			1.00						0.95	
Frpb, ped/bikes		0.99			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.92			1.00						1.00	
Flt Protected		1.00			0.98						1.00	
Satd. Flow (prot)		1490			1626						3482	
Flt Permitted		1.00			0.68						1.00	
Satd. Flow (perm)		1490			1124						3482	
Volume (vph)	0	105	158	316	569	0	0	0	0	46	453	8
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	118	178	355	639	0	0	0	0	52	509	9
Lane Group Flow (vph)	0	296	0	0	994	0	0	0	0	0	570	0
Confl. Peds. (#/hr)			12			2				5		10
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	2%	0%
Bus Blockages (#/hr)	0	5	5	8	8	0	0	0	0	0	5	5
Turn Type			pm+pt							Perm		
Protected Phases		8		7	4						2	
Permitted Phases				4						2		
Actuated Green, G (s)		29.9			44.6						16.4	
Effective Green, g (s)		30.5			45.0						17.0	
Actuated g/C Ratio		0.44			0.64						0.24	
Clearance Time (s)		4.6			4.4						4.6	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		649			798						846	
v/s Ratio Prot		0.20			c0.19							
v/s Ratio Perm					c0.61						c0.16	
v/c Ratio		0.46			1.25						0.67	
Uniform Delay, d1		13.9			12.5						24.0	
Progression Factor		1.00			0.93						1.00	
Incremental Delay, d2		2.3			111.5						4.3	
Delay (s)		16.2			123.2						28.3	
Level of Service		B			F						C	
Approach Delay (s)		16.2			123.2			0.0			28.3	
Approach LOS		B			F			A			C	
Intersection Summary												
HCM Average Control Delay			77.1			HCM Level of Service				E		
HCM Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			97.0%			ICU Level of Service			E			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Division Street & 12th Avenue

6/30/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↱			↰↱				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			0.99				
Frt		1.00			0.97			0.99				
Flt Protected		1.00			1.00			0.99				
Satd. Flow (prot)		1648			1588			3449				
Flt Permitted		0.60			1.00			0.99				
Satd. Flow (perm)		985			1588			3449				
Volume (vph)	10	141	0	0	706	238	179	695	31	0	0	0
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	155	0	0	776	262	197	764	34	0	0	0
Lane Group Flow (vph)	0	166	0	0	1038	0	0	995	0	0	0	0
Confl. Peds. (#/hr)			8			8	19		7			
Heavy Vehicles (%)	20%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	0	0	8	8	0	5	5	0	0	0
Turn Type	Perm					Perm						
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		33.6			33.6			27.6				
Effective Green, g (s)		34.0			34.0			28.0				
Actuated g/C Ratio		0.49			0.49			0.40				
Clearance Time (s)		4.4			4.4			4.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		478			771			1380				
v/s Ratio Prot					c0.65							
v/s Ratio Perm		0.17						c0.29				
v/c Ratio		0.35			1.35			0.72				
Uniform Delay, d1		11.1			18.0			17.7				
Progression Factor		1.28			0.58			1.00				
Incremental Delay, d2		1.8			162.1			3.3				
Delay (s)		16.0			172.5			21.0				
Level of Service		B			F			C				
Approach Delay (s)		16.0			172.5			21.0			0.0	
Approach LOS		B			F			C			A	
Intersection Summary												
HCM Average Control Delay			92.2			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.06									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			91.6%			ICU Level of Service			E			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Division Street & 17th Avenue

6/30/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.98			1.00	0.99	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1407			1655	1795	
Flt Permitted	1.00			1.00	0.96	
Satd. Flow (perm)	1407			1652	1795	
Volume (vph)	147	25	6	761	183	12
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	162	27	7	836	201	13
Lane Group Flow (vph)	189	0	0	843	214	0
Confl. Peds. (#/hr)		4				9
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Parking (#/hr)	5	5				
Turn Type			Perm			
Protected Phases	2			2	4	
Permitted Phases			2			
Actuated Green, G (s)	48.5			48.5	13.0	
Effective Green, g (s)	49.0			49.0	13.0	
Actuated g/C Ratio	0.70			0.70	0.19	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	985			1156	333	
v/s Ratio Prot	0.13				c0.12	
v/s Ratio Perm				c0.51		
v/c Ratio	0.19			0.73	0.64	
Uniform Delay, d1	3.6			6.4	26.4	
Progression Factor	0.44			0.79	1.00	
Incremental Delay, d2	0.4			0.4	4.2	
Delay (s)	2.0			5.5	30.6	
Level of Service	A			A	C	
Approach Delay (s)	2.0			5.5	30.6	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			9.3		HCM Level of Service	A
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			68.2%		ICU Level of Service	B
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

5: Division Street & 21st Avenue

6/30/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.96			1.00	0.99	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1569			1654	1792	
Flt Permitted	1.00			0.99	0.96	
Satd. Flow (perm)	1569			1645	1792	
Volume (vph)	185	84	12	768	108	13
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	199	90	13	826	116	14
Lane Group Flow (vph)	289	0	0	839	130	0
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Turn Type	Perm					
Protected Phases	2 7			2	1	
Permitted Phases			2			
Actuated Green, G (s)	53.0			23.7	10.0	
Effective Green, g (s)	53.0			24.4	9.0	
Actuated g/C Ratio	0.76			0.35	0.13	
Clearance Time (s)				4.7	3.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)	1188			573	230	
v/s Ratio Prot	c0.18				c0.07	
v/s Ratio Perm				c0.51		
v/c Ratio	0.24			1.46	0.57	
Uniform Delay, d1	2.5			22.8	28.7	
Progression Factor	0.17			0.83	1.00	
Incremental Delay, d2	0.5			215.5	9.7	
Delay (s)	0.9			234.4	38.4	
Level of Service	A			F	D	
Approach Delay (s)	0.9			234.4	38.4	
Approach LOS	A			F	D	
Intersection Summary						
HCM Average Control Delay		160.5		HCM Level of Service		F
HCM Volume to Capacity ratio		0.76				
Actuated Cycle Length (s)		70.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		69.3%		ICU Level of Service		B
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Division Street & 26th Avenue

6/30/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.98			0.98	
Flt Protected		1.00			1.00			0.98			1.00	
Satd. Flow (prot)		1376			1644			1814			1847	
Flt Permitted		0.98			0.97			0.85			0.98	
Satd. Flow (perm)		1346			1602			1577			1813	
Volume (vph)	8	150	40	47	676	12	90	91	31	7	77	14
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	158	42	49	712	13	95	96	33	7	81	15
Lane Group Flow (vph)	0	208	0	0	774	0	0	224	0	0	103	0
Confl. Peds. (#/hr)			23			19			7			7
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		44.0			44.0			17.5			17.5	
Effective Green, g (s)		44.5			44.5			17.5			17.5	
Actuated g/C Ratio		0.64			0.64			0.25			0.25	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		856			1018			394			453	
v/s Ratio Prot												
v/s Ratio Perm		0.15			0.48			0.14			0.06	
v/c Ratio		0.24			0.76			0.57			0.23	
Uniform Delay, d1		5.5			9.0			22.9			20.9	
Progression Factor		0.67			0.79			1.00			1.00	
Incremental Delay, d2		0.7			3.5			5.8			1.2	
Delay (s)		4.4			10.6			28.8			22.0	
Level of Service		A			B			C			C	
Approach Delay (s)		4.4			10.6			28.8			22.0	
Approach LOS		A			B			C			C	

Intersection Summary

HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

7: Division Street & 34th Avenue

6/30/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.99			0.96	
Flt Protected		1.00			1.00			0.98			0.98	
Satd. Flow (prot)		1430			1444			1843			1768	
Flt Permitted		0.95			1.00			0.88			0.87	
Satd. Flow (perm)		1366			1444			1656			1574	
Volume (vph)	13	171	4	1	682	12	29	39	5	32	19	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	180	4	1	718	13	31	41	5	34	20	25
Lane Group Flow (vph)	0	198	0	0	732	0	0	77	0	0	79	0
Confl. Peds. (#/hr)			4			8			1			1
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5						
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		44.5			44.5			16.5			16.5	
Effective Green, g (s)		45.0			45.0			17.0			17.0	
Actuated g/C Ratio		0.64			0.64			0.24			0.24	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		878			928			402			382	
v/s Ratio Prot												
v/s Ratio Perm		0.14			0.51			0.05			0.05	
v/c Ratio		0.23			0.79			0.19			0.21	
Uniform Delay, d1		5.2			9.1			21.0			21.1	
Progression Factor		0.81			1.42			1.00			1.00	
Incremental Delay, d2		0.6			3.6			1.1			1.2	
Delay (s)		4.8			16.4			22.1			22.3	
Level of Service		A			B			C			C	
Approach Delay (s)		4.8			16.4			22.1			22.3	
Approach LOS		A			B			C			C	



















Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	A
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

8: Division Street & 39th Avenue

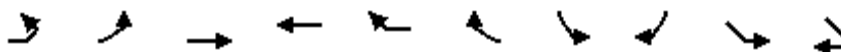
6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.99		1.00	0.99		1.00	0.97	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1611			1000		1769	3000		1717	3000	
Flt Permitted		0.89			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1447			1558		1769	3520		1717	3412	
Volume (vph)	30	143	35	53	480	47	110	852	79	86	498	104
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	152	37	56	511	50	117	906	84	91	530	111
Lane Group Flow (vph)	0	221	0	0	617	0	117	990	0	91	641	0
Confl. Peds. (#/hr)			4			8			4			22
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	3%	1%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	5	5	5	5	5	5
Turn Type	Perm		Perm			Prot			Prot			
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		27.7			27.7		8.2	22.8		7.6	22.2	
Effective Green, g (s)		28.0			28.0		7.2	23.4		6.6	22.8	
Actuated g/C Ratio		0.40			0.40		0.10	0.33		0.09	0.33	
Clearance Time (s)		4.3			4.3		3.0	4.6		3.0	4.6	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		579			623		182	1003		162	977	
v/s Ratio Prot							c0.07	c0.33		0.05	0.21	
v/s Ratio Perm		0.15			c0.40							
v/c Ratio		0.38			0.99		0.64	0.99		0.56	0.66	
Uniform Delay, d1		14.9			20.9		30.2	23.1		30.3	20.2	
Progression Factor		0.49			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.9			33.8		7.5	25.5		4.4	3.4	
Delay (s)		9.2			54.6		37.7	48.6		34.7	23.7	
Level of Service		A			D		D	D		C	C	
Approach Delay (s)		9.2			54.6			47.5			25.0	
Approach LOS		A			D			D			C	
Intersection Summary												
HCM Average Control Delay		39.8			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.89										
Actuated Cycle Length (s)		70.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		95.1%			ICU Level of Service			E				
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Division Street & 20th Avenue

6/30/2009



















Movement	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER
Lane Configurations			↰	↰			↰		↰	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12
Total Lost time (s)			4.0	4.0			4.0		4.0	
Lane Util. Factor			1.00	1.00			1.00		1.00	
Frt			1.00	0.98			0.96		0.97	
Flt Protected			1.00	1.00			0.96		0.96	
Satd. Flow (prot)			1606	1617			1767		1773	
Flt Permitted			0.67	1.00			0.96		0.96	
Satd. Flow (perm)			1081	1617			1767		1773	
Volume (vph)	3	5	145	725	77	74	97	35	27	8
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	6	161	806	86	82	108	39	30	9
Lane Group Flow (vph)	0	0	170	974	0	0	147	0	39	0
Heavy Vehicles (%)	0%	8%	4%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0
Turn Type	Perm	Perm								
Protected Phases			2	6			4		3	
Permitted Phases	2	2								
Actuated Green, G (s)			23.7	36.7			16.4		4.2	
Effective Green, g (s)			24.4	37.4			16.4		4.2	
Actuated g/C Ratio			0.35	0.53			0.23		0.06	
Clearance Time (s)			4.7	4.7			4.0		4.0	
Vehicle Extension (s)			3.0	3.0			3.0		3.0	
Lane Grp Cap (vph)			377	864			414		106	
v/s Ratio Prot			c0.60				c0.08		c0.02	
v/s Ratio Perm			0.16							
v/c Ratio			0.45	1.13			0.36		0.37	
Uniform Delay, d1			17.6	16.3			22.4		31.6	
Progression Factor			0.91	0.92			1.00		1.00	
Incremental Delay, d2			3.8	58.9			0.5		2.2	
Delay (s)			19.9	73.9			22.9		33.8	
Level of Service			B	E			C		C	
Approach Delay (s)			19.9	73.9			22.9		33.8	
Approach LOS			B	E			C		C	
Intersection Summary										
HCM Average Control Delay			60.2		HCM Level of Service			E		
HCM Volume to Capacity ratio			0.85							
Actuated Cycle Length (s)			70.0		Sum of lost time (s)			12.0		
Intersection Capacity Utilization			74.3%		ICU Level of Service			C		
c Critical Lane Group										

HCM Signalized Intersection Capacity Analysis

1: Division Street & 11th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		1.00			1.00						0.95	
Frpb, ped/bikes		0.99			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.94			1.00						1.00	
Flt Protected		1.00			0.98						0.99	
Satd. Flow (prot)		2500			1646						3492	
Flt Permitted		1.00			0.30						0.99	
Satd. Flow (perm)		2500			509						3492	
Volume (vph)	0	385	292	94	169	0	0	0	0	216	765	8
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	414	314	101	182	0	0	0	0	232	823	9
Lane Group Flow (vph)	0	728	0	0	283	0	0	0	0	0	1064	0
Confl. Peds. (#/hr)			10			7				6		4
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	7	7	5	5	0	0	0	0	0	5	5
Turn Type			pm+pt							Perm		
Protected Phases		8		7	4						2	
Permitted Phases				4						2		
Actuated Green, G (s)		26.4			37.0						24.4	
Effective Green, g (s)		27.0			37.0						25.0	
Actuated g/C Ratio		0.39			0.53						0.36	
Clearance Time (s)		4.6			4.4						4.6	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		964			367						1247	
v/s Ratio Prot		0.29			c0.07						c0.30	
v/s Ratio Perm					c0.34							
v/c Ratio		0.76			0.77						0.85	
Uniform Delay, d1		18.6			13.1						20.8	
Progression Factor		1.00			1.03						1.00	
Incremental Delay, d2		5.5			13.4						7.5	
Delay (s)		24.1			27.0						28.3	
Level of Service		C			C						C	
Approach Delay (s)		24.1			27.0			0.0			28.3	
Approach LOS		C			C			A			C	
Intersection Summary												
HCM Average Control Delay			26.7			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			107.8%			ICU Level of Service			F			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Division Street & 12th Avenue

6/30/2009

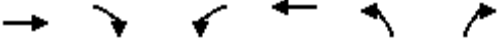


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↰↱				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		1658			1590			3455				
Flt Permitted		0.97			1.00			1.00				
Satd. Flow (perm)		1616			1590			3455				
Volume (vph)	30	571	0	0	211	106	47	632	92	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	601	0	0	222	112	49	665	97	0	0	0
Lane Group Flow (vph)	0	633	0	0	334	0	0	811	0	0	0	0
Confl. Peds. (#/hr)			20			4	7		8			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	0	0	5	5	0	5	5	0	0	0
Turn Type	Perm					Perm						
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		31.6			31.6			29.6				
Effective Green, g (s)		32.0			32.0			30.0				
Actuated g/C Ratio		0.46			0.46			0.43				
Clearance Time (s)		4.4			4.4			4.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		739			727			1481				
v/s Ratio Prot					0.21							
v/s Ratio Perm		c0.39						c0.23				
v/c Ratio		0.86			0.46			0.55				
Uniform Delay, d1		17.0			13.1			14.9				
Progression Factor		0.64			0.47			1.00				
Incremental Delay, d2		7.9			2.1			1.5				
Delay (s)		18.8			8.2			16.4				
Level of Service		B			A			B				
Approach Delay (s)		18.8			8.2			16.4			0.0	
Approach LOS		B			A			B			A	
Intersection Summary												
HCM Average Control Delay		15.7			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.71										
Actuated Cycle Length (s)		70.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		85.0%			ICU Level of Service			D				
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Division Street & 17th Avenue

6/30/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.99	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.96	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1443			1674	1745	
Flt Permitted	1.00			0.99	0.97	
Satd. Flow (perm)	1443			1656	1745	
Volume (vph)	630	33	7	280	35	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	663	35	7	295	37	16
Lane Group Flow (vph)	698	0	0	302	53	0
Confl. Peds. (#/hr)		1				14
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Parking (#/hr)	5	5				
Turn Type	Perm					
Protected Phases	2			2	4	
Permitted Phases			2			
Actuated Green, G (s)	55.5			55.5	6.0	
Effective Green, g (s)	56.0			56.0	6.0	
Actuated g/C Ratio	0.80			0.80	0.09	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1154			1325	150	
v/s Ratio Prot	c0.48				c0.03	
v/s Ratio Perm				0.18		
v/c Ratio	0.60			0.23	0.35	
Uniform Delay, d1	2.7			1.7	30.2	
Progression Factor	0.68			0.61	1.00	
Incremental Delay, d2	1.3			0.3	1.4	
Delay (s)	3.2			1.4	31.6	
Level of Service	A			A	C	
Approach Delay (s)	3.2			1.4	31.6	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			4.1		HCM Level of Service	A
HCM Volume to Capacity ratio			0.58			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			53.6%		ICU Level of Service	A
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

5: Division Street & 21st Avenue

















6/30/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↘↙	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.97			1.00	0.95	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1619			1672	1756	
Flt Permitted	1.00			0.95	0.97	
Satd. Flow (perm)	1619			1600	1756	
Volume (vph)	663	157	15	337	115	57
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	705	167	16	359	122	61
Lane Group Flow (vph)	872	0	0	375	183	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Turn Type	Perm					
Protected Phases	2 7			2	1	
Permitted Phases			2			
Actuated Green, G (s)	53.6			25.9	9.4	
Effective Green, g (s)	53.6			26.6	8.4	
Actuated g/C Ratio	0.77			0.38	0.12	
Clearance Time (s)				4.7	3.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)	1240			608	211	
v/s Ratio Prot	c0.54				c0.10	
v/s Ratio Perm				0.23		
v/c Ratio	0.70			0.62	0.87	
Uniform Delay, d1	4.2			17.6	30.3	
Progression Factor	0.50			0.79	1.00	
Incremental Delay, d2	1.1			4.1	29.1	
Delay (s)	3.2			18.1	59.3	
Level of Service	A			B	E	
Approach Delay (s)	3.2			18.1	59.3	
Approach LOS	A			B	E	
Intersection Summary						
HCM Average Control Delay			14.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			64.4%		ICU Level of Service	B
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Division Street & 26th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.99			0.97			0.98	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1424			1650			1799			1828	
Flt Permitted		0.99			0.91			0.91			0.96	
Satd. Flow (perm)		1409			1515			1655			1768	
Volume (vph)	14	545	73	41	377	27	58	120	62	13	95	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	574	77	43	397	28	61	126	65	14	100	25
Lane Group Flow (vph)	0	666	0	0	468	0	0	252	0	0	139	0
Confl. Peds. (#/hr)			5			10			11			13
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		44.0			44.0			17.5			17.5	
Effective Green, g (s)		44.5			44.5			17.5			17.5	
Actuated g/C Ratio		0.64			0.64			0.25			0.25	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		896			963			414			442	
v/s Ratio Prot												
v/s Ratio Perm		c0.47			0.31			c0.15			0.08	
v/c Ratio		0.74			0.49			0.61			0.31	
Uniform Delay, d1		8.8			6.7			23.2			21.4	
Progression Factor		0.86			0.24			1.00			1.00	
Incremental Delay, d2		3.9			1.5			6.5			1.9	
Delay (s)		11.5			3.2			29.7			23.2	
Level of Service		B			A			C			C	
Approach Delay (s)		11.5			3.2			29.7			23.2	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM Average Control Delay			13.0			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			100.9%			ICU Level of Service			F			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Division Street & 34th Avenue

6/30/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.96			0.96	
Flt Protected		1.00			1.00			1.00			0.98	
Satd. Flow (prot)		1448			1446			1788			1781	
Flt Permitted		0.97			0.97			0.99			0.90	
Satd. Flow (perm)		1408			1400			1777			1638	
Volume (vph)	30	663	8	19	416	32	2	27	12	33	39	27
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	698	8	20	438	34	2	28	13	35	41	28
Lane Group Flow (vph)	0	738	0	0	492	0	0	43	0	0	104	0
Confl. Peds. (#/hr)			8			5			14			8
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5				0		
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		44.5			44.5			16.5			16.5	
Effective Green, g (s)		45.0			45.0			17.0			17.0	
Actuated g/C Ratio		0.64			0.64			0.24			0.24	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		905			900			432			398	
v/s Ratio Prot												
v/s Ratio Perm		c0.52			0.35			0.02			c0.06	
v/c Ratio		0.82			0.55			0.10			0.26	
Uniform Delay, d1		9.4			6.9			20.6			21.4	
Progression Factor		1.01			1.00			1.00			1.00	
Incremental Delay, d2		6.3			2.4			0.5			1.6	
Delay (s)		15.8			9.3			21.0			23.0	
Level of Service		B			A			C			C	
Approach Delay (s)		15.8			9.3			21.0			23.0	
Approach LOS		B			A			C			C	

Intersection Summary


















HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	D

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Division Street & 39th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		0.99			1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.98		1.00	0.98		1.00	0.98	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1617			1613		1769	3000		1769	3000	
Flt Permitted		0.87			0.80		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1418			1299		1769	3463		1769	3466	
Volume (vph)	84	477	68	67	283	74	80	696	111	172	861	104
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	88	497	71	70	295	77	83	725	116	179	897	108
Lane Group Flow (vph)	0	656	0	0	442	0	83	841	0	179	1005	0
Confl. Peds. (#/hr)			28			4			14			37
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	5	5	5	5	5	5
Turn Type	Perm		Perm			Prot			Prot			
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		45.7			45.7		6.8	28.5		13.9	35.6	
Effective Green, g (s)		46.0			46.0		5.8	29.1		12.9	36.2	
Actuated g/C Ratio		0.46			0.46		0.06	0.29		0.13	0.36	
Clearance Time (s)		4.3			4.3		3.0	4.6		3.0	4.6	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		652			598		103	873		228	1086	
v/s Ratio Prot							0.05	0.28		c0.10	c0.34	
v/s Ratio Perm		c0.46			0.34							
v/c Ratio		1.01			0.74		0.81	0.96		0.79	0.93	
Uniform Delay, d1		27.0			22.1		46.5	34.9		42.2	30.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		36.8			8.0		35.2	22.8		16.1	14.4	
Delay (s)		63.8			30.1		81.7	57.7		58.3	45.0	
Level of Service		E			C		F	E		E	D	
Approach Delay (s)		63.8			30.1			59.8			47.0	
Approach LOS		E			C			E			D	
Intersection Summary												
HCM Average Control Delay		51.8			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.93										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		106.9%			ICU Level of Service			F				
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Division Street & 20th Avenue

6/30/2009



Movement	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SBR2	SEL2	SEL	SER
Lane Configurations			↶	↶			↷	↷			↷	↷
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)			4.0	4.0			4.0				4.0	
Lane Util. Factor			1.00	1.00			1.00				1.00	
Frt			1.00	0.95			0.97				1.00	
Flt Protected			1.00	1.00			0.96				0.95	
Satd. Flow (prot)			1659	1595			1775				1734	
Flt Permitted			0.98	1.00			0.96				0.95	
Satd. Flow (perm)			1627	1595			1775				1734	
Volume (vph)	2	17	569	292	54	109	157	43	1	15	105	0
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	2	18	612	314	58	117	169	46	1	16	113	0
Lane Group Flow (vph)	0	0	632	489	0	0	216	0	0	0	129	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Turn Type	Perm	Perm								Perm		
Protected Phases			2	6			4				3	
Permitted Phases	2	2								3		
Actuated Green, G (s)			25.9	38.0			12.0				7.0	
Effective Green, g (s)			26.6	39.0			12.0				7.0	
Actuated g/C Ratio			0.38	0.56			0.17				0.10	
Clearance Time (s)			4.7	5.0			4.0				4.0	
Vehicle Extension (s)			3.0	3.0			3.0				3.0	
Lane Grp Cap (vph)			618	889			304				173	
v/s Ratio Prot				c0.31			c0.12					
v/s Ratio Perm			c0.39								c0.07	
v/c Ratio			1.02	0.55			0.71				0.75	
Uniform Delay, d1			21.7	9.9			27.4				30.6	
Progression Factor			0.55	0.22			1.00				1.00	
Incremental Delay, d2			39.6	1.9			7.6				16.0	
Delay (s)			51.5	4.1			35.0				46.6	
Level of Service			D	A			C				D	
Approach Delay (s)			51.5	4.1			35.0				46.6	
Approach LOS			D	A			C				D	

Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	C

c Critical Lane Group

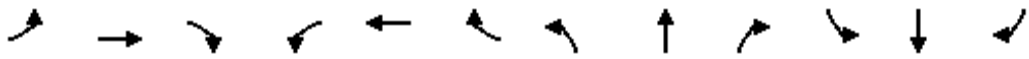
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Appendix E
Synchro Analysis
One-Lane Optimized Timings

HCM Signalized Intersection Capacity Analysis

1: Division Street & 11th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰						↰↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		1.00			1.00						0.95	
Frpb, ped/bikes		0.99			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.92			1.00						1.00	
Flt Protected		1.00			0.98						1.00	
Satd. Flow (prot)		1490			1626						3482	
Flt Permitted		1.00			0.75						1.00	
Satd. Flow (perm)		1490			1242						3482	
Volume (vph)	0	105	158	316	569	0	0	0	0	46	453	8
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	0	118	178	355	639	0	0	0	0	52	509	9
Lane Group Flow (vph)	0	296	0	0	994	0	0	0	0	0	570	0
Confl. Peds. (#/hr)			12			2				5		10
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	2%	0%
Bus Blockages (#/hr)	0	5	5	8	8	0	0	0	0	0	5	5
Turn Type	Perm						Perm					
Protected Phases		8			4						2	
Permitted Phases				4						2		
Actuated Green, G (s)		45.4			45.6						15.4	
Effective Green, g (s)		46.0			46.0						16.0	
Actuated g/C Ratio		0.66			0.66						0.23	
Clearance Time (s)		4.6			4.4						4.6	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		979			816						796	
v/s Ratio Prot		0.20										
v/s Ratio Perm					c0.80						c0.16	
v/c Ratio		0.30			1.22						0.72	
Uniform Delay, d1		5.1			12.0						24.9	
Progression Factor		1.00			0.90						1.00	
Incremental Delay, d2		0.8			99.3						5.5	
Delay (s)		5.9			110.1						30.4	
Level of Service		A			F						C	
Approach Delay (s)		5.9			110.1			0.0			30.4	
Approach LOS		A			F			A			C	
Intersection Summary												
HCM Average Control Delay		69.1			HCM Level of Service			E				
HCM Volume to Capacity ratio		1.09										
Actuated Cycle Length (s)		70.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		97.0%			ICU Level of Service			E				
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Division Street & 12th Avenue

6/30/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↱			↰↱				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			0.99				
Frt		1.00			0.97			0.99				
Flt Protected		1.00			1.00			0.99				
Satd. Flow (prot)		1648			1588			3449				
Flt Permitted		0.82			1.00			0.99				
Satd. Flow (perm)		1352			1588			3449				
Volume (vph)	10	141	0	0	706	238	179	695	31	0	0	0
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	155	0	0	776	262	197	764	34	0	0	0
Lane Group Flow (vph)	0	166	0	0	1038	0	0	995	0	0	0	0
Confl. Peds. (#/hr)			8			8	19		7			
Heavy Vehicles (%)	20%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	0	0	8	8	0	5	5	0	0	0
Turn Type	Perm					Perm						
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		42.5			42.5			18.7				
Effective Green, g (s)		42.9			42.9			19.1				
Actuated g/C Ratio		0.61			0.61			0.27				
Clearance Time (s)		4.4			4.4			4.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		829			973			941				
v/s Ratio Prot					c0.65							
v/s Ratio Perm		0.12						c0.29				
v/c Ratio		0.20			1.07			1.06				
Uniform Delay, d1		6.0			13.6			25.4				
Progression Factor		1.01			0.50			1.00				
Incremental Delay, d2		0.5			44.3			45.7				
Delay (s)		6.5			51.0			71.2				
Level of Service		A			D			E				
Approach Delay (s)		6.5			51.0			71.2			0.0	
Approach LOS		A			D			E			A	
Intersection Summary												
HCM Average Control Delay		56.8			HCM Level of Service			E				
HCM Volume to Capacity ratio		1.06										
Actuated Cycle Length (s)		70.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		91.6%			ICU Level of Service			E				
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Division Street & 17th Avenue

6/30/2009

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	↩
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.98			1.00	0.99	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1407			1655	1795	
Flt Permitted	1.00			1.00	0.96	
Satd. Flow (perm)	1407			1652	1795	
Volume (vph)	147	25	6	761	183	12
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	162	27	7	836	201	13
Lane Group Flow (vph)	189	0	0	843	214	0
Confl. Peds. (#/hr)		4				9
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Parking (#/hr)	5	5				
Turn Type	Perm					
Protected Phases	2			2	4	
Permitted Phases			2			
Actuated Green, G (s)	48.7			48.7	12.8	
Effective Green, g (s)	49.2			49.2	12.8	
Actuated g/C Ratio	0.70			0.70	0.18	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	989			1161	328	
v/s Ratio Prot	0.13				c0.12	
v/s Ratio Perm				c0.51		
v/c Ratio	0.19			0.73	0.65	
Uniform Delay, d1	3.6			6.3	26.5	
Progression Factor	0.72			0.93	1.00	
Incremental Delay, d2	0.4			1.4	4.6	
Delay (s)	3.0			7.3	31.1	
Level of Service	A			A	C	
Approach Delay (s)	3.0			7.3	31.1	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			10.7		HCM Level of Service	B
HCM Volume to Capacity ratio			0.71			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			68.2%		ICU Level of Service	B
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

5: Division Street & 21st Avenue

















6/30/2009

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↘	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.96			1.00	0.99	
Flt Protected	1.00			1.00	0.96	
Satd. Flow (prot)	1569			1654	1792	
Flt Permitted	1.00			0.99	0.96	
Satd. Flow (perm)	1569			1645	1792	
Volume (vph)	185	84	12	768	108	13
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	199	90	13	826	116	14
Lane Group Flow (vph)	289	0	0	839	130	0
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	8	8	0	0
Turn Type	Perm					
Protected Phases	2 7			2	1	
Permitted Phases			2			
Actuated Green, G (s)	53.0			26.9	10.0	
Effective Green, g (s)	53.0			27.6	9.0	
Actuated g/C Ratio	0.76			0.39	0.13	
Clearance Time (s)				4.7	3.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)	1188			649	230	
v/s Ratio Prot	c0.18				c0.07	
v/s Ratio Perm				c0.51		
v/c Ratio	0.24			1.29	0.57	
Uniform Delay, d1	2.5			21.2	28.7	
Progression Factor	0.62			0.75	1.00	
Incremental Delay, d2	0.5			139.9	9.7	
Delay (s)	2.0			155.7	38.4	
Level of Service	A			F	D	
Approach Delay (s)	2.0			155.7	38.4	
Approach LOS	A			F	D	
Intersection Summary						
HCM Average Control Delay		108.3		HCM Level of Service		F
HCM Volume to Capacity ratio		0.75				
Actuated Cycle Length (s)		70.0		Sum of lost time (s)		8.0
Intersection Capacity Utilization		69.3%		ICU Level of Service		B
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Division Street & 26th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.98			0.98	
Flt Protected		1.00			1.00			0.98			1.00	
Satd. Flow (prot)		1376			1644			1814			1847	
Flt Permitted		0.98			0.97			0.85			0.98	
Satd. Flow (perm)		1346			1603			1567			1811	
Volume (vph)	8	150	40	47	676	12	90	91	31	7	77	14
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	158	42	49	712	13	95	96	33	7	81	15
Lane Group Flow (vph)	0	208	0	0	774	0	0	224	0	0	103	0
Confl. Peds. (#/hr)			23			19			7			7
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		45.5			45.5			16.0			16.0	
Effective Green, g (s)		46.0			46.0			16.0			16.0	
Actuated g/C Ratio		0.66			0.66			0.23			0.23	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		885			1053			358			414	
v/s Ratio Prot												
v/s Ratio Perm		0.15			0.48			0.14			0.06	
v/c Ratio		0.24			0.74			0.63			0.25	
Uniform Delay, d1		4.9			8.0			24.3			22.1	
Progression Factor		0.52			0.79			1.00			1.00	
Incremental Delay, d2		0.6			3.2			8.0			1.4	
Delay (s)		3.1			9.5			32.3			23.5	
Level of Service		A			A			C			C	
Approach Delay (s)		3.1			9.5			32.3			23.5	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM Average Control Delay		13.5					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.71										
Actuated Cycle Length (s)		70.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		81.8%					ICU Level of Service		D			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Division Street & 34th Avenue

6/30/2009



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			0.99			0.96	
Flt Protected		1.00			1.00			0.98			0.98	
Satd. Flow (prot)		1430			1444			1843			1768	
Flt Permitted		0.95			1.00			0.87			0.86	
Satd. Flow (perm)		1367			1444			1643			1560	
Volume (vph)	13	171	4	1	682	12	29	39	5	32	19	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	180	4	1	718	13	31	41	5	34	20	25
Lane Group Flow (vph)	0	198	0	0	732	0	0	77	0	0	79	0
Confl. Peds. (#/hr)			4			8			1			1
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5						
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		47.0			47.0			14.0			14.0	
Effective Green, g (s)		47.5			47.5			14.5			14.5	
Actuated g/C Ratio		0.68			0.68			0.21			0.21	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		928			980			340			323	
v/s Ratio Prot												
v/s Ratio Perm		0.14			0.51			0.05			0.05	
v/c Ratio		0.21			0.75			0.23			0.24	
Uniform Delay, d1		4.2			7.3			23.1			23.2	
Progression Factor		0.82			1.52			1.00			1.00	
Incremental Delay, d2		0.5			2.6			1.5			1.8	
Delay (s)		4.0			13.8			24.6			25.0	
Level of Service		A			B			C			C	
Approach Delay (s)		4.0			13.8			24.6			25.0	
Approach LOS		A			B			C			C	

Intersection Summary



















HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	A

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Division Street & 39th Avenue

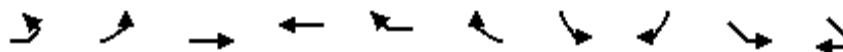
6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.99		1.00	0.99		1.00	0.97	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1611			1000		1769	3000		1717	3000	
Flt Permitted		0.90			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1455			1559		1769	3520		1717	3412	
Volume (vph)	30	143	35	53	480	47	110	852	79	86	498	104
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	152	37	56	511	50	117	906	84	91	530	111
Lane Group Flow (vph)	0	221	0	0	617	0	117	990	0	91	641	0
Confl. Peds. (#/hr)			4			8			4			22
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	3%	1%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	5	5	5	5	5	5
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		28.7			28.7		6.4	24.4		5.0	23.0	
Effective Green, g (s)		29.0			29.0		5.4	25.0		4.0	23.6	
Actuated g/C Ratio		0.41			0.41		0.08	0.36		0.06	0.34	
Clearance Time (s)		4.3			4.3		3.0	4.6		3.0	4.6	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		603			646		136	1071		98	1011	
v/s Ratio Prot							c0.07	c0.33		0.05	0.21	
v/s Ratio Perm		0.15			c0.40							
v/c Ratio		0.37			0.96		0.86	0.92		0.93	0.63	
Uniform Delay, d1		14.2			19.9		31.9	21.6		32.9	19.6	
Progression Factor		0.49			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7			25.9		39.0	14.4		67.3	3.0	
Delay (s)		8.6			45.8		71.0	36.0		100.2	22.6	
Level of Service		A			D		E	D		F	C	
Approach Delay (s)		8.6			45.8			39.7			32.2	
Approach LOS		A			D			D			C	
Intersection Summary												
HCM Average Control Delay		36.5					HCM Level of Service			D		
HCM Volume to Capacity ratio		0.89										
Actuated Cycle Length (s)		70.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		95.1%					ICU Level of Service		E			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Division Street & 20th Avenue

6/30/2009

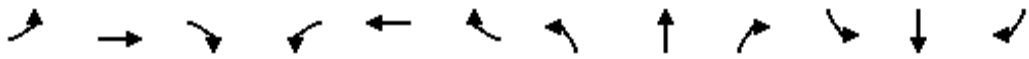


Movement	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SEL	SER
Lane Configurations			↕	↕			↕		↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12
Total Lost time (s)			4.0	4.0			4.0		4.0	
Lane Util. Factor			1.00	1.00			1.00		1.00	
Frt			1.00	0.98			0.96		0.97	
Flt Protected			1.00	1.00			0.96		0.96	
Satd. Flow (prot)			1606	1617			1767		1773	
Flt Permitted			0.90	1.00			0.96		0.96	
Satd. Flow (perm)			1453	1617			1767		1773	
Volume (vph)	3	5	145	725	77	74	97	35	27	8
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	3	6	161	806	86	82	108	39	30	9
Lane Group Flow (vph)	0	0	170	974	0	0	147	0	39	0
Heavy Vehicles (%)	0%	8%	4%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	5	5	5	8	8	8	0	0	0	0
Turn Type	Perm	Perm								
Protected Phases			2	6			4		3	
Permitted Phases	2	2								
Actuated Green, G (s)			26.9	39.9			14.1		3.3	
Effective Green, g (s)			27.6	40.6			14.1		3.3	
Actuated g/C Ratio			0.39	0.58			0.20		0.05	
Clearance Time (s)			4.7	4.7			4.0		4.0	
Vehicle Extension (s)			3.0	3.0			3.0		3.0	
Lane Grp Cap (vph)			573	938			356		84	
v/s Ratio Prot			c0.60				c0.08		c0.02	
v/s Ratio Perm			0.12							
v/c Ratio			0.30	1.04			0.41		0.46	
Uniform Delay, d1			14.5	14.7			24.3		32.5	
Progression Factor			1.15	0.81			1.00		1.00	
Incremental Delay, d2			1.3	21.1			0.8		4.0	
Delay (s)			18.1	33.0			25.1		36.5	
Level of Service			B	C			C		D	
Approach Delay (s)			18.1	33.0			25.1		36.5	
Approach LOS			B	C			C		D	
Intersection Summary										
HCM Average Control Delay			30.3	HCM Level of Service			C			
HCM Volume to Capacity ratio			0.85							
Actuated Cycle Length (s)			70.0	Sum of lost time (s)			12.0			
Intersection Capacity Utilization			74.3%	ICU Level of Service			C			
c Critical Lane Group										

HCM Signalized Intersection Capacity Analysis

1: Division Street & 11th Avenue
















6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶			↷						↶↷	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0						4.0	
Lane Util. Factor		1.00			1.00						0.95	
Frpb, ped/bikes		0.99			1.00						1.00	
Flpb, ped/bikes		1.00			1.00						1.00	
Frt		0.94			1.00						1.00	
Flt Protected		1.00			0.98						0.99	
Satd. Flow (prot)		2500			1646						3492	
Flt Permitted		1.00			0.44						0.99	
Satd. Flow (perm)		2500			730						3492	
Volume (vph)	0	385	292	94	169	0	0	0	0	216	765	8
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	414	314	101	182	0	0	0	0	232	823	9
Lane Group Flow (vph)	0	728	0	0	283	0	0	0	0	0	1064	0
Confl. Peds. (#/hr)			10			7				6		4
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	7	7	5	5	0	0	0	0	0	5	5
Turn Type		Perm								Perm		
Protected Phases		8			4						2	
Permitted Phases				4						2		
Actuated Green, G (s)		35.4			35.6						25.4	
Effective Green, g (s)		36.0			36.0						26.0	
Actuated g/C Ratio		0.51			0.51						0.37	
Clearance Time (s)		4.6			4.4						4.6	
Vehicle Extension (s)		3.0			3.0						3.0	
Lane Grp Cap (vph)		1286			375						1297	
v/s Ratio Prot		0.29										
v/s Ratio Perm					c0.39						c0.30	
v/c Ratio		0.57			0.75						0.82	
Uniform Delay, d1		11.6			13.5						19.9	
Progression Factor		1.00			1.19						1.00	
Incremental Delay, d2		1.8			12.3						5.9	
Delay (s)		13.5			28.3						25.8	
Level of Service		B			C						C	
Approach Delay (s)		13.5			28.3			0.0			25.8	
Approach LOS		B			C			A			C	
Intersection Summary												
HCM Average Control Delay			21.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			70.0			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			107.8%			ICU Level of Service			F			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Division Street & 12th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0				
Lane Util. Factor		1.00			1.00			0.95				
Frpb, ped/bikes		1.00			0.99			1.00				
Flpb, ped/bikes		1.00			1.00			1.00				
Frt		1.00			0.95			0.98				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		1658			1590			3455				
Flt Permitted		0.97			1.00			1.00				
Satd. Flow (perm)		1618			1590			3455				
Volume (vph)	30	571	0	0	211	106	47	632	92	0	0	0
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	601	0	0	222	112	49	665	97	0	0	0
Lane Group Flow (vph)	0	633	0	0	334	0	0	811	0	0	0	0
Confl. Peds. (#/hr)			20			4	7		8			
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	1%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	0	0	5	5	0	5	5	0	0	0
Turn Type	Perm						Perm					
Protected Phases		2			2			4				
Permitted Phases	2						4					
Actuated Green, G (s)		39.6			39.6			21.6				
Effective Green, g (s)		40.0			40.0			22.0				
Actuated g/C Ratio		0.57			0.57			0.31				
Clearance Time (s)		4.4			4.4			4.4				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		925			909			1086				
v/s Ratio Prot					0.21							
v/s Ratio Perm		c0.39						c0.23				
v/c Ratio		0.68			0.37			0.75				
Uniform Delay, d1		10.6			8.1			21.5				
Progression Factor		0.66			0.33			1.00				
Incremental Delay, d2		3.1			1.1			4.7				
Delay (s)		10.1			3.8			26.2				
Level of Service		B			A			C				
Approach Delay (s)		10.1			3.8			26.2			0.0	
Approach LOS		B			A			C			A	
Intersection Summary												
HCM Average Control Delay		16.2					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.71										
Actuated Cycle Length (s)		70.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		85.0%					ICU Level of Service		D			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: Division Street & 17th Avenue

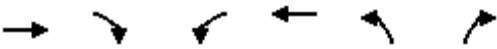
6/30/2009

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	↩
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	1.00			1.00	0.99	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.99			1.00	0.96	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1443			1674	1745	
Flt Permitted	1.00			0.99	0.97	
Satd. Flow (perm)	1443			1656	1745	
Volume (vph)	630	33	7	280	35	15
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	663	35	7	295	37	16
Lane Group Flow (vph)	698	0	0	302	53	0
Confl. Peds. (#/hr)		1				14
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Parking (#/hr)	5	5				
Turn Type	Perm					
Protected Phases	2			2	4	
Permitted Phases			2			
Actuated Green, G (s)	55.5			55.5	6.0	
Effective Green, g (s)	56.0			56.0	6.0	
Actuated g/C Ratio	0.80			0.80	0.09	
Clearance Time (s)	4.5			4.5	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1154			1325	150	
v/s Ratio Prot	c0.48				c0.03	
v/s Ratio Perm				0.18		
v/c Ratio	0.60			0.23	0.35	
Uniform Delay, d1	2.7			1.7	30.2	
Progression Factor	0.35			0.61	1.00	
Incremental Delay, d2	1.7			0.3	1.4	
Delay (s)	2.6			1.4	31.6	
Level of Service	A			A	C	
Approach Delay (s)	2.6			1.4	31.6	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			3.7		HCM Level of Service	A
HCM Volume to Capacity ratio			0.58			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			53.6%		ICU Level of Service	A
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

5: Division Street & 21st Avenue

















6/30/2009

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↷	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	12	12
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.97			1.00	0.95	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1619			1672	1756	
Flt Permitted	1.00			0.95	0.97	
Satd. Flow (perm)	1619			1600	1756	
Volume (vph)	663	157	15	337	115	57
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	705	167	16	359	122	61
Lane Group Flow (vph)	872	0	0	375	183	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	5	5	0	0
Turn Type	Perm					
Protected Phases	2 7			2	1	
Permitted Phases			2			
Actuated Green, G (s)	53.6			25.9	9.4	
Effective Green, g (s)	53.6			26.6	8.4	
Actuated g/C Ratio	0.77			0.38	0.12	
Clearance Time (s)				4.7	3.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)	1240			608	211	
v/s Ratio Prot	c0.54				c0.10	
v/s Ratio Perm				0.23		
v/c Ratio	0.70			0.62	0.87	
Uniform Delay, d1	4.2			17.6	30.3	
Progression Factor	0.51			0.79	1.00	
Incremental Delay, d2	1.1			4.1	29.1	
Delay (s)	3.2			18.1	59.3	
Level of Service	A			B	E	
Approach Delay (s)	3.2			18.1	59.3	
Approach LOS	A			B	E	
Intersection Summary						
HCM Average Control Delay			14.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			70.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			64.4%		ICU Level of Service	B
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

6: Division Street & 26th Avenue

















6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.98			0.99			0.97			0.98	
Flt Protected		1.00			1.00			0.99			0.99	
Satd. Flow (prot)		1424			1650			1799			1828	
Flt Permitted		0.99			0.91			0.91			0.96	
Satd. Flow (perm)		1409			1515			1655			1768	
Volume (vph)	14	545	73	41	377	27	58	120	62	13	95	24
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	574	77	43	397	28	61	126	65	14	100	25
Lane Group Flow (vph)	0	666	0	0	468	0	0	252	0	0	139	0
Confl. Peds. (#/hr)			5			10			11			13
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	0	5	5									
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		44.0			44.0			17.5			17.5	
Effective Green, g (s)		44.5			44.5			17.5			17.5	
Actuated g/C Ratio		0.64			0.64			0.25			0.25	
Clearance Time (s)		4.5			4.5			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		896			963			414			442	
v/s Ratio Prot												
v/s Ratio Perm		c0.47			0.31			c0.15			0.08	
v/c Ratio		0.74			0.49			0.61			0.31	
Uniform Delay, d1		8.8			6.7			23.2			21.4	
Progression Factor		0.86			0.43			1.00			1.00	
Incremental Delay, d2		3.9			1.5			6.5			1.9	
Delay (s)		11.5			4.4			29.7			23.2	
Level of Service		B			A			C			C	
Approach Delay (s)		11.5			4.4			29.7			23.2	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM Average Control Delay		13.4					HCM Level of Service		B			
HCM Volume to Capacity ratio		0.71										
Actuated Cycle Length (s)		70.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		100.9%					ICU Level of Service		F			
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Division Street & 34th Avenue



















6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.98			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.96			0.96	
Flt Protected		1.00			1.00			1.00			0.98	
Satd. Flow (prot)		1448			1446			1788			1781	
Flt Permitted		0.97			0.97			0.99			0.90	
Satd. Flow (perm)		1409			1400			1775			1628	
Volume (vph)	30	663	8	19	416	32	2	27	12	33	39	27
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	698	8	20	438	34	2	28	13	35	41	28
Lane Group Flow (vph)	0	738	0	0	492	0	0	43	0	0	104	0
Confl. Peds. (#/hr)			8			5			14			8
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Parking (#/hr)	5	5	5	5	5	5				0		
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)		47.0			47.0			14.0			14.0	
Effective Green, g (s)		47.5			47.5			14.5			14.5	
Actuated g/C Ratio		0.68			0.68			0.21			0.21	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		956			950			368			337	
v/s Ratio Prot												
v/s Ratio Perm		c0.52			0.35			0.02			c0.06	
v/c Ratio		0.77			0.52			0.12			0.31	
Uniform Delay, d1		7.6			5.6			22.5			23.5	
Progression Factor		1.04			1.00			1.00			1.00	
Incremental Delay, d2		4.7			2.0			0.6			2.4	
Delay (s)		12.6			7.6			23.2			25.9	
Level of Service		B			A			C			C	
Approach Delay (s)		12.6			7.6			23.2			25.9	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM Average Control Delay		12.1			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.66										
Actuated Cycle Length (s)		70.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		86.9%			ICU Level of Service			D				
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

8: Division Street & 39th Avenue

6/30/2009

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		0.99			1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.98		1.00	0.98		1.00	0.98	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1617			1613		1769	3000		1769	3000	
Flt Permitted		0.87			0.81		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1424			1309		1769	3463		1769	3466	
Volume (vph)	84	477	68	67	283	74	80	696	111	172	861	104
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	88	497	71	70	295	77	83	725	116	179	897	108
Lane Group Flow (vph)	0	656	0	0	442	0	83	841	0	179	1005	0
Confl. Peds. (#/hr)			28			4			14			37
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	5	5	5	5	5	5
Turn Type	Perm		Perm			Prot			Prot			
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		46.7			46.7		6.0	29.4		12.0	35.4	
Effective Green, g (s)		47.0			47.0		5.0	30.0		11.0	36.0	
Actuated g/C Ratio		0.47			0.47		0.05	0.30		0.11	0.36	
Clearance Time (s)		4.3			4.3		3.0	4.6		3.0	4.6	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		669			615		88	900		195	1080	
v/s Ratio Prot							0.05	0.28		c0.10	c0.34	
v/s Ratio Perm		c0.46			0.34							
v/c Ratio		0.98			0.72		0.94	0.93		0.92	0.93	
Uniform Delay, d1		26.1			21.2		47.4	34.0		44.1	30.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		30.4			7.1		76.7	17.8		41.6	15.1	
Delay (s)		56.4			28.3		124.1	51.8		85.6	45.9	
Level of Service		E			C		F	D		F	D	
Approach Delay (s)		56.4			28.3			58.3			51.9	
Approach LOS		E			C			E			D	
Intersection Summary												
HCM Average Control Delay		51.4			HCM Level of Service					D		
HCM Volume to Capacity ratio		0.94										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)					8.0		
Intersection Capacity Utilization		106.9%			ICU Level of Service					F		
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

9: Division Street & 20th Avenue

6/30/2009



Movement	EBL2	EBL	EBT	WBT	WBR	WBR2	SBL	SBR	SBR2	SEL2	SEL	SER
Lane Configurations			↕	↕			↕				↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	9	9	9	9	9	12	12	12	12	12	12
Total Lost time (s)			4.0	4.0			4.0				4.0	
Lane Util. Factor			1.00	1.00			1.00				1.00	
Frt			1.00	0.95			0.97				1.00	
Flt Protected			1.00	1.00			0.96				0.95	
Satd. Flow (prot)			1659	1595			1775				1734	
Flt Permitted			0.98	1.00			0.96				0.95	
Satd. Flow (perm)			1627	1595			1775				1734	
Volume (vph)	2	17	569	292	54	109	157	43	1	15	105	0
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	2	18	612	314	58	117	169	46	1	16	113	0
Lane Group Flow (vph)	0	0	632	489	0	0	216	0	0	0	129	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	0%	0%
Bus Blockages (#/hr)	7	7	7	5	5	5	0	0	0	0	0	0
Turn Type	Perm	Perm								Perm		
Protected Phases			2	6			4				3	
Permitted Phases	2	2								3		
Actuated Green, G (s)			25.9	38.0			12.0				7.0	
Effective Green, g (s)			26.6	39.0			12.0				7.0	
Actuated g/C Ratio			0.38	0.56			0.17				0.10	
Clearance Time (s)			4.7	5.0			4.0				4.0	
Vehicle Extension (s)			3.0	3.0			3.0				3.0	
Lane Grp Cap (vph)			618	889			304				173	
v/s Ratio Prot				c0.31			c0.12					
v/s Ratio Perm			c0.39								c0.07	
v/c Ratio			1.02	0.55			0.71				0.75	
Uniform Delay, d1			21.7	9.9			27.4				30.6	
Progression Factor			0.62	0.22			1.00				1.00	
Incremental Delay, d2			39.6	1.9			7.6				16.0	
Delay (s)			53.0	4.1			35.0				46.6	
Level of Service			D	A			C				D	
Approach Delay (s)			53.0	4.1			35.0				46.6	
Approach LOS			D	A			C				D	

Intersection Summary

HCM Average Control Delay	33.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	C

c Critical Lane Group