

State Street Area Bicycle and Pedestrian Plan

Prepared for:



City of Ann Arbor Downtown Development Authority

Prepared by:



THE GREENWAY COLLABORATIVE, INC.

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Contents

1. Project Context	Page 1
2. Bicycle Accommodations	Page 7
2.1 Recommended Improvements	
2.2 Supplemental Measures	
3. Pedestrian Improvements	Page 13
3.1 Bicycle Restrictions on the Sidewalk	
3.2 In-street Stop for Pedestrian Signs	
3.3 Crosswalk Markings	
3.4 Creation of State Street bulb-outs by Angel Hall	
4. Signalized “T” Intersection Improvements	Page 19
4.1 Leading Pedestrian Phase Signal Cycle Recommendation	
4.2 Supplemental Measures	
5. Bicycle Parking	Page 23
5.1 Additional Short term Parking	
5.2 Additional Long-term Parking	
6. Education and Enforcement	Page 26
6.1 Targeted Educational Campaigns	
6.2 Enforcement Measures	
7. Next Steps	Page 30
7.1 Non-motorized Traffic Counts	
7.2 Bike Lanes	
7.3 Testing and Evaluation	
7.4 University Involvement	

Appendix

The thirty-page Appendix is published as a separate report. It may be downloaded from the project website at <http://www.greenwaycollab.com/SSLSBPP.htm>

1. Project Introduction

The State Street area can be seen as an amalgamation of the downtown and the university campus. Because of its location adjacent to the University, it draws in a large number of students, the majority of which are on foot or on bikes. But unlike an area such as South University, which is mainly businesses that cater to students, the State Street Area has a thriving population of businesses which result in a large number of visits by the lunchtime professional crowd, families, and visitors from out of town.

This mix of people makes it a lively, interesting and successful downtown area. This also, however, concentrates a lot of people on bikes, on foot and in cars into a tiny bustling space. To make matters more complicated, many people are operating on differing sets of understandings and expectations as to how they and others should act as pedestrians, bicyclists and motorists. These differences can lead to conflicts, particularly between bicyclists and pedestrians on the crowded sidewalks. These conflicts are not to be trivialized as they can result in serious injury and discourage highly valued non-motorized travel.

Project History

In the fall of 2002, several members of the DDA citizens' advisory council whom had grown increasingly frustrated and alarmed at the amount of bicycle and pedestrian conflicts in the State Street Area, approached the DDA about initiating a study to address these conflicts. At the same time, the switch to two-way streets in the area was being planned. The DDA saw the planned change from one-way streets to two-way streets in the State Street business district as an opportunity to also address long standing pedestrian concerns and expand on recent non-motorized transportation planning efforts. The DDA recognized the need for a study to improve conditions for pedestrians and bicyclists in the area. The Greenway Collaborative was hired in April 2003 to begin the study.

The Non-motorized Component of the Northeast Ann Arbor Transportation Plan, which will be completed in late 2003, had already examined in detail how to best handle bicycle and pedestrian travel. The conclusions, based on research and level of service modeling, are that bicyclists are best accommodated on the road, generally within designated bicycle lanes on the major roads. Pedestrians and young cyclists are best accommodated on sidewalks separated from the roadway. The State Street Area plan was designed to build off the results of the Northeast Area Plan.



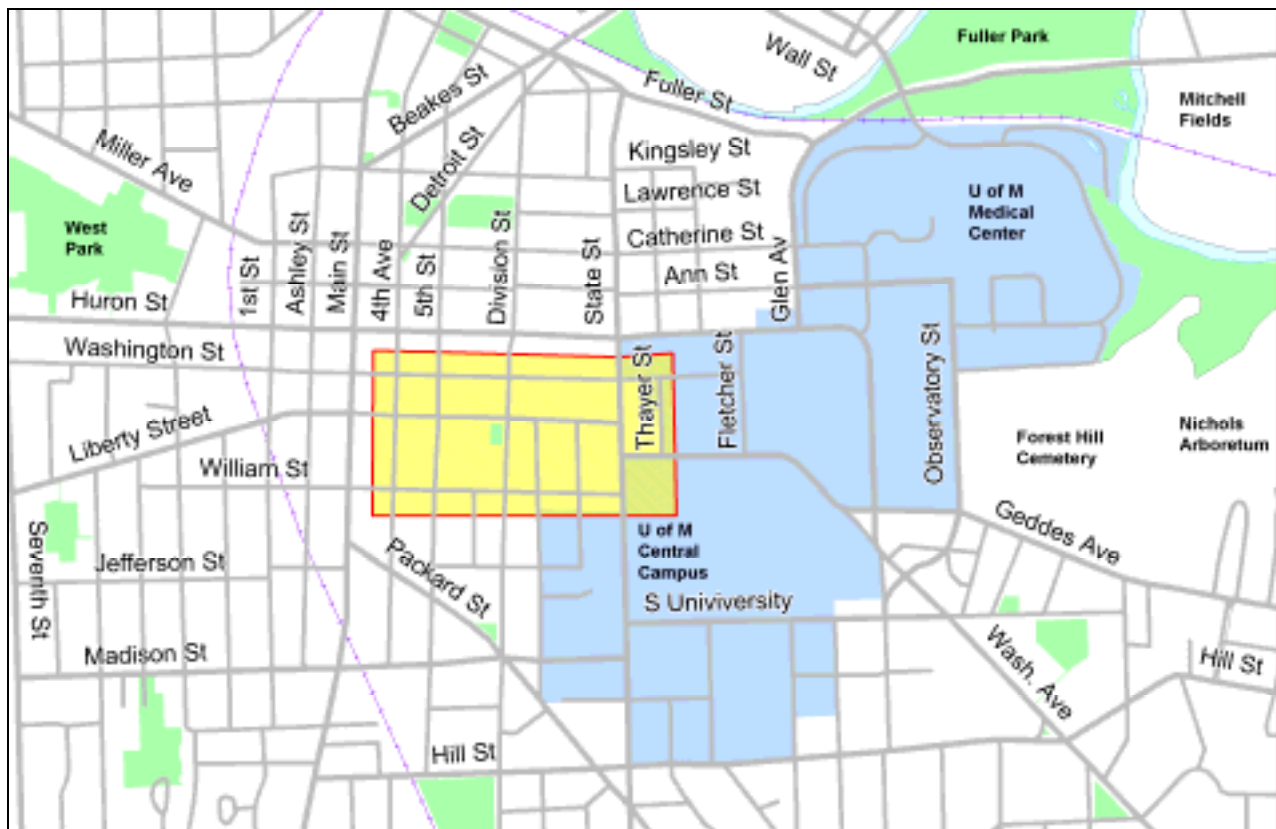
The study area for this plan (Fig.1a) provided a new set of circumstances to be addressed. Its composition of short blocks, frequent traffic signals, severe limitations on roadway widths, high demand for on-street parking, and lower speeds are quite different than the more suburban northeast area of Ann Arbor. This plan seeks to define how the principles established in the Northeast Ann Arbor Transportation Plan could be applied and integrated with non-motorized patterns in the downtown area.

In addition, development of a comprehensive non-motorized plan for the entire City will commence in January of 2004. The State Street Area Bicycle and Pedestrian plan is designed to ultimately become an important supplement to the citywide plan. The citywide plan will also support the efforts of the Ann Arbor Alternative Transportation Program that has been charged by City Council in May 2003 with implementing a downtown commuter bicycle system.

Project Goals

Guiding the development of the plan were two principles and one overriding goal. First, non-motorized transportation is to be encouraged as it provides numerous environmental and financial benefits to the downtown and the City as a whole. Second, there needs to be a balance struck between the needs of all roadway users: private motorists, transit, bicycles, pedestrians and those with disabilities. The overriding goal is the continued vitality of the downtown and its people.

Fig. 1a. Project Context



The yellow box defines the project boundaries.

Fig. 1b. Project Area



The project area is shown in orange

Recent Improvements

Continuous progress is being made to improve the conditions for walking and biking. Changes in the downtown area have improved accessibility for pedestrians. For example, the city is in the process of implementing detectable warning strips at many of the curb cuts in the area. The warning strips provide a visual and tactile reminder that the sidewalk is ending and the street is beginning. Detectable warning strips greatly improve the safety of intersections for people with sight limitations.



In addition, the simple white outlines of crosswalks are being replaced by more visible white ladder crosswalk markings in the downtown areas and other areas of Ann Arbor. These recent improvements of the streetscape are important steps towards design that functions well for all types of users.

Early indications are that the transition to two-way traffic that occurred in August 2003 will improve functionality of the area and improve pedestrian and bicycle conditions in the long run. Some of the issues identified by analyzing crash data for the area in the past 10 years are no longer applicable. For example, the changeover has drastically reduced the incidents of wrong-way riding by cyclists. Some new issues have arisen as a part of the transition to two-way streets and this report strives to address them.

Further plans to expand pedestrians and bike improvements around the city are underway. As mentioned earlier, the citywide comprehensive non-motorized plan will start at the beginning of 2004. The DDA has also initiated a study to look at improvements to Division, 5th and Huron Streets. Addressing the bicycle and pedestrian conditions for those roadways is a priority of the project.

At the same time, the significant recent changes to the downtown have taxed merchants and residents of downtown and the area is still trying to shake off a layer of construction dust. The two-way change over and the State Street Area streetscape improvements have had the area in upheaval for the past year. Therefore, proposing any major changes in conjunction with the study that would involve curb-restructuring or parking removal was deemed not practical at this time. Likewise, with larger projects such as the Huron, 5th and Division improvements still pending, any long-term decisions about bike lane locations would be subject to change in the very near future.

Instead, the approach this project takes is an incremental phasing where small improvements are made and tested for their effectiveness before implementing them on a larger scale throughout the downtown. In this way, the project can be “fine tuned” and success ensured before expanding and applying the recommendations to other areas.

Neighborhood Accessibility

The State Street Area is full of life and vitality, so much so that conflicts are happening between different types of users. The problem of an abundance of users and user types is a problem that many downtown areas would love to have.

A successful downtown area that promotes non-motorized transportation can be summed up in three words: density, diversity and design. Because of the short distance of most non-motorized trips, development that is dense and with a diversity of land uses makes non-motorized modes of transportation feasible and convenient. At the same time, design that allows pedestrians and bicycles to travel safely and comfortably will encourage people to take short trips to the multiple destinations within their reach.

Fig. 1c. Neighborhood Accessibility Index

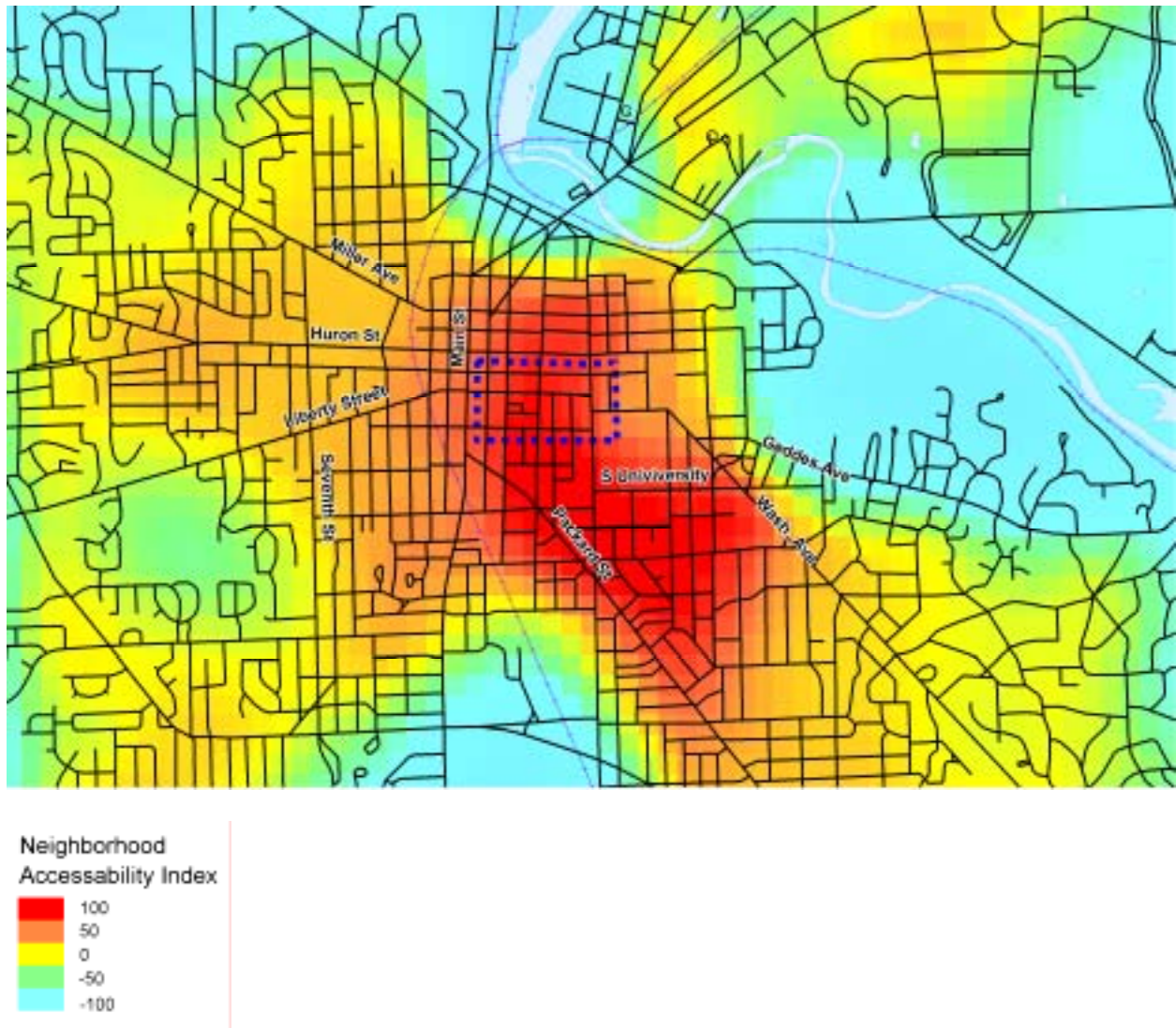


Fig 1c. shows the results of a model to measure neighborhood accessibility, or the potential for non-motorized trips, based on the work of Kevin J. Krizek of the University of Minnesota. The model is the composite of three key indexes: population density, underlying urban form, and land use diversity. The red areas indicate the highest ranking of accessibility, or where there is a high potential for non-motorized trips to occur. The project area, outlined in dark blue, ranks very high on the index.

Public Input

The State Street Area project was driven by public input. Two workshops were conducted during the process. The first one, on May 21st, presented the issues and alternatives that were developed during the Inventory and Analysis phase of the project. This included a discussion of the problems and challenges from the pedestrian standpoint, bicyclist standpoint and motorist standpoint. The workshop included a discussion of bike lane placement in the downtown. The major issues that arose from the workshop included:

- Sidewalk conflicts between bikes and pedestrians
- The need to improve conditions for biking in the roadway
- The need for education and enforcement for all stakeholders: pedestrians, cyclists, motorists, and law enforcement officials
- Accessible design issues
- The disconnect between campus and town
- The need for additional bike parking

At the second workshop, on Oct. 15, the Greenway Collaborative presented the preliminary plan for the State Street Area. The plan was designed to respond specifically to the issues brought up at the first workshop. The workshop presentation featured the elements included in this report. These proposed solutions were received very favorably and valuable input for given. Specifically, it was made very clear that restricting bicycle usage on the sidewalks with a “Walk Your Bike” sign was the favored solution.

Complete documentation of all of the verbal and written input received during the two meeting is included in the Appendix.

2. *Bicycle Accommodations*

The sidewalks in the State Street Area are some of the busiest in the City. The café tables, limited sidewalk width, and the mixing of pedestrians and bicycles can result in crashes and/or unease of pedestrians caused by bicycles that rapidly overtake them. The desire of many pedestrians is to have bicyclists use the roadway to avoid conflicts on the sidewalk. This is dramatically different than how bicycles are typically used around campus where they share (albeit not very well) the pathway/sidewalk system.

Currently, there are no signs that explain city codes regarding bicycle use on the sidewalks or the roadway. There is also very limited public education on the subject and scant enforcement. Given the divergent backgrounds of the people who use the area, basic information on how the city would like bicycles to operate in the downtown area would be valuable.

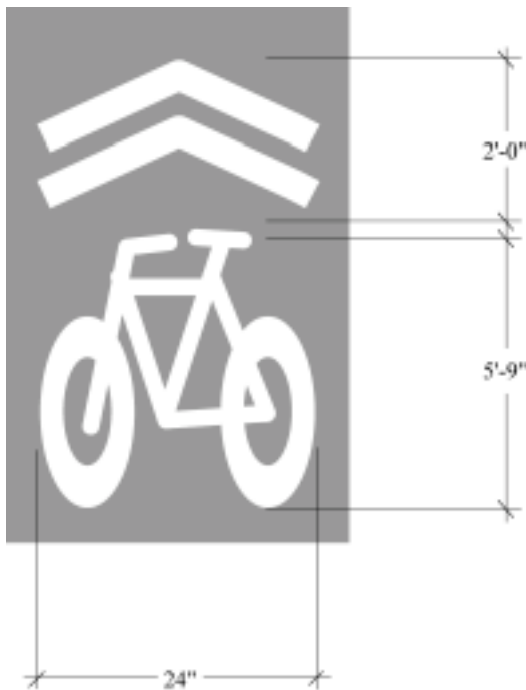
Bicycles cannot be effectively restricted from the sidewalks without improved conditions for bicycling in the roadway. While signage and education can have some impact on the behavior of bicyclists, it will most likely be limited. If it is the desire to have bicyclists restricted from the sidewalk, then the most effective means to do such is to make bicycling in the roadway more attractive than bicycling on the sidewalk. Any attempt to do otherwise will likely result in poor compliance with sidewalk bicycling restrictions accompanied by a political backlash against regulations that discourage a mode of travel that is beneficial to the community.

At the outset of the project, a matched set of sidewalk bicycling restrictions and in-street bicycling improvements were analyzed and proposed to the public for feedback. The various options explored can be found in detail in the Appendix. Based on that analysis and the public input received, a combination of the original options is recommended. This section outlines the final recommendations for reducing bicycle and pedestrian conflicts in the State Street Area in detail.

Shared-use Arrow Pavement Marking

It is recommended that installing the Shared-use Arrow be pursued as a one-year long test in the State Street Area to determine how effective such a treatment is. Currently, no signage or pavement markings exist indicating that bicycles are to be preferably ridden in the roadway and operated in the manner of a motor vehicle. Given the incidence of riding against traffic flow and the general unfamiliarity with the rules of the road by both motorists and bicyclists, basic pavement markings and signage are proposed. The *San Francisco Shared Lane Pavement Markings Study, Phase I: Background and Methodology* has an excellent review of existing installations and issues regarding the Shared-use Arrow and discusses San Francisco's tests of these markings. The following is from the report prepared by Alta Planning +Design:

Fig. 2a. Shared- use Arrow Pavement Marking



Shared-use Arrow markings are intended to have the following effects:

- Inform motorists to expect bicyclists on the roadway
- Inform motorists that bicyclists may indeed ride further to the left in the travel lane
- Inform bicyclists how to position themselves in the lane with respect to the curb or parked cars to avoid hazards
- Reinforce to bicyclists the correct direction of travel
- Reinforce to bicyclists that riding on the roadway as opposed to the sidewalk is correct behavior.

The use of the "Bike with Chevron" (Fig. 2a) pavement marking as a Shared-use Arrow is preferred due to its differentiation from the bike lane symbol, similarity to the W-11 sign, potential application in other similar situations, and simplicity of the pavement markings.

Fig. 2b. Shared-use Arrow Placement

Longitudinal: The marking should be installed at the beginning and ending of each block within 20 feet of the crosswalk or extension of the sidewalk. It should also be installed every 200 feet or in the middle of the block.

Lateral: The centerline of the marking should be placed a minimum of 9.5' from the edge of the roadway where there is parallel parking, and a minimum of 2' from the edge of the roadway where there is no parking. Where space allows, a minimum of 12' from the centerline is desirable to allow motor vehicles to pass bicyclists.

Bicycle Warning Sign

It is recommended that a warning sign be used in the study in conjunction with the Shared-use Arrow pavement markings. The lane width of most of the area roadways does not allow for a motor vehicle to pass a bicyclist riding outside of the door zone without leaving their lane (i.e. crossing the double yellow line). The use of the warning sign in addition to the Shared-use Arrow pavement markings reinforces:

- The message of the pavement markings
- The bicyclists' right to be in the road
- The preference that the bicyclist be in the roadway rather than on the sidewalk

The standard bicycle caution sign (W-11) does not specifically address the issue that the lane is shared by the bicyclist and the motorist. As many motorists assume they have the right-of-way in the road, the alternative sign shown in Fig. 3c underscores the bicyclists' rights in the roadway. This sign incorporates shared lane text into a W-11 sign.

Fig. 2c. Recommended Bicycle Warning Sign



The disadvantage of using a sign like this is being able to place it prominently. Parallel parking often requires that the sign be placed quite a distance to the side of the travel way. In addition, in some cases vegetation may obscure the sign. Fig. 2d indicates the proposed locations of the signs.

Fig. 2d. Proposed General Location of Pavement Marking and Signs

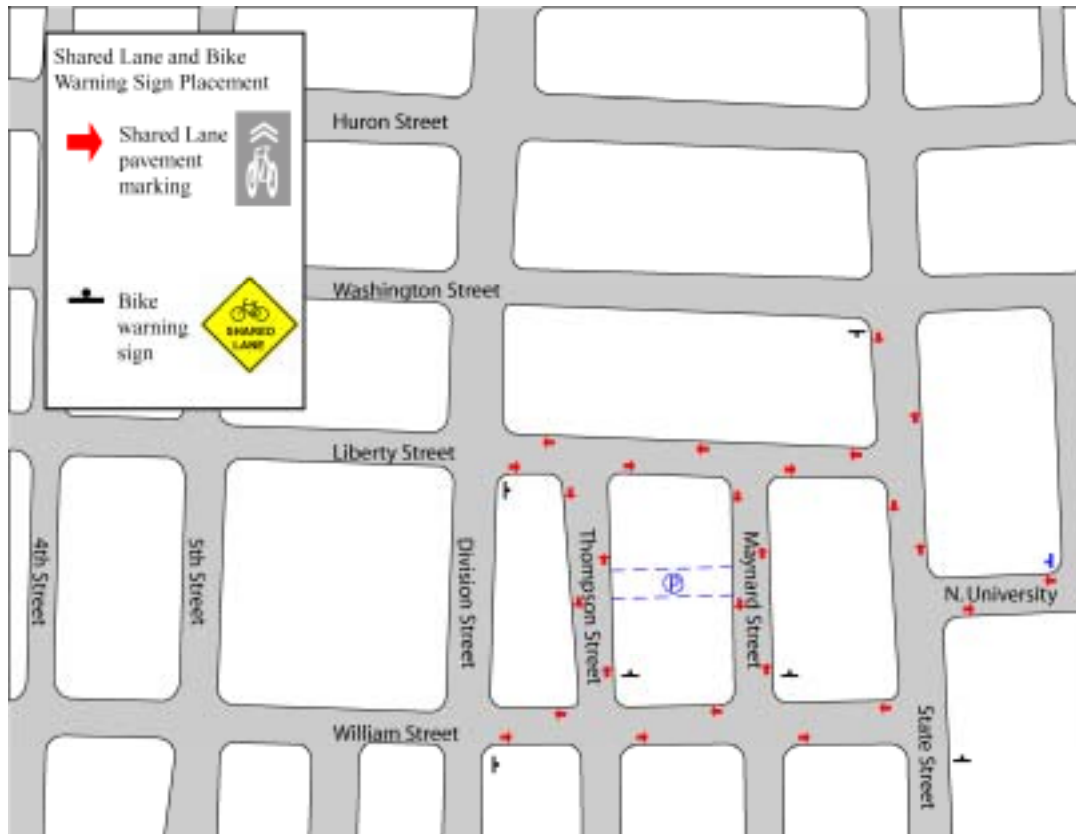
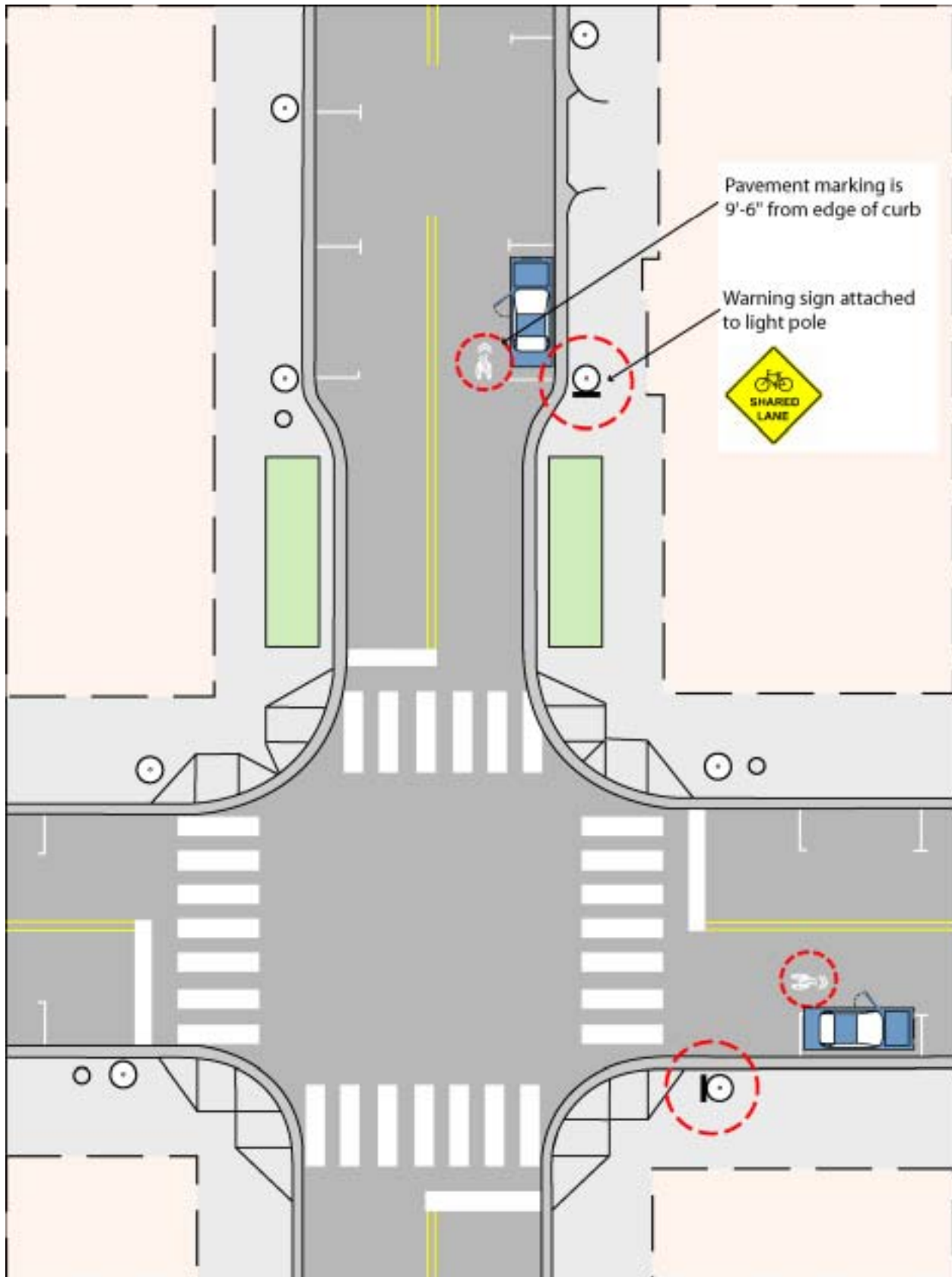


Fig. 2e. Proposed Detail Sign and Pavement Marking Placement



Shared-Use Arrow and Warning Sign Summary

In the presentation of the Preliminary Plan to the public on October 2, the Shared-use Arrow and bike warning signage received very positive feedback. Participants clearly felt that the solution was an excellent way to mediate the conflicts of bikes on the sidewalk and the lack of room for traditional bike lanes in this area. The solution has several advantages. First, the pavement markings and warning signs are easy to implement and require no new construction or loss of parking spaces. Second, the pavement markings and signs themselves will raise awareness and legitimacy of bikes in the street, thereby improving conditions for bikers all over the city. They are particularly suited to this area on a trial basis because of the slower moving traffic in this area.

The solution does, however, have several disadvantages. The Shared-use Arrow, while shown to be effective in other cities, is still not standard and is considered an experimental marking. Inherent in the trial period for the pavement markings is the potential confusion that goes along with newly implemented signage. Another disadvantage is that while the arrows will improve conditions for bikes in the street, they still do not give bikes their own space in the roadway. In addition, during the winter, snow may obscure visibility of pavement markings. While they are a step in the right direction, the city should continue to pursue a goal of a long-term and comprehensive system of bike lanes throughout the city.

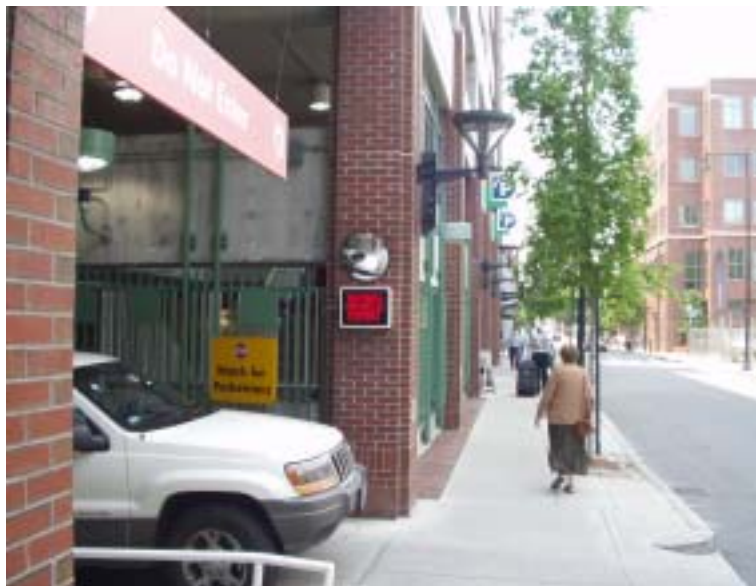
2.1 Supplemental Measures

In addition to the improvements indicated above, there are other measures that may be helpful.

Signage of “Bicycle and Pedestrian Zone” at key entrances to the downtown

Traffic patterns, block size, road width and number of pedestrians and bicycles all change significantly from other areas of the city upon entering the downtown zone. Signage identifying this special zone and its unique set of regulations should be posted at key entrances to the downtown. This will help alert motorists to changing patterns of pedestrian and bike traffic, as well as identify the downtown as someplace unique with an emphasis on bikes and pedestrians. This approach would be best implemented where bike lanes that enter the downtown end.

Fig. 2f. Vehicle Exiting Sign



Vehicle Exiting Signs

Cars exiting parking decks often have trouble seeing oncoming pedestrians and bicycles. To increase pedestrian and bike safety at these blind intersections, it is recommended that automated signs inform people passing by of the presence of cars exiting from the deck (Fig. 2f). These signs have been used successfully in Cambridge, MA and other areas of the country.

In addition “fisheye” mirrors allow both motor vehicles and pedestrians to better spot each other. The automated sign should also be used conjunction with “Yield to Pedestrians” postings so

motorists do not misinterpret the automated sign to mean that cars have the right-of-way.

3. *Pedestrian Improvements*

The following measures are recommended for improving the pedestrian facilities in the Downtown area.

3.1 Bicycle Restrictions on the Sidewalk

**Fig. 3a. Standard R9-6a
“Walk Your Bike”**



The public input received during this project process made it abundantly clear that pedestrian-bicycle conflicts in the State Street Area are perceived as a serious problem. Many people at the public meetings gave testimonials to the dangerous collisions they have been involved in or the countless close calls they have had as pedestrians avoiding bikes on the sidewalk. Particularly significant are the complaints from people with hearing or sight limitations about the danger they feel due to reckless bike behavior. While it seems the majority of bikers on the sidewalks act in a responsible manner, the few who do not strongly impact the perception of safety for pedestrians in this area.

To reduce the numbers of bicycle-pedestrian conflicts that occur in the State Street Area, a “Walk Your Bike” policy is recommended for bicycles on the sidewalks in this area. The policy should be tested initially throughout the project area. If it proves successful, the policy should be expanded to include a larger area of downtown.

A trial “Walk Your Bike” policy in this area would be beneficial in several ways. First, if enforced properly, it would minimize the pedestrian-bicycle conflicts in the area, and increase the accessibility of the sidewalks for disabled and older pedestrians who feel particularly vulnerable to these collisions. Secondly, the policy could serve to improve the legitimacy of bikers in the street by increasing their numbers and therefore the visibility of bikers in the street.

On a cautionary note, because this policy could potentially lead to many more people biking in the streets, it should not be implemented independently of the other recommendations in this report. The “Walk Your Bike” signs should be posted only after the Shared-use Arrows, warning signs, and accompanying promotional materials mentioned in Chapter 2 have been in place for a period of at least a week. To implement and enforce the “Walk Your Bike” policy without improving conditions for riding in the street is strongly discouraged.

Fig. 3b. Trial “Walk Your Bike” Zone

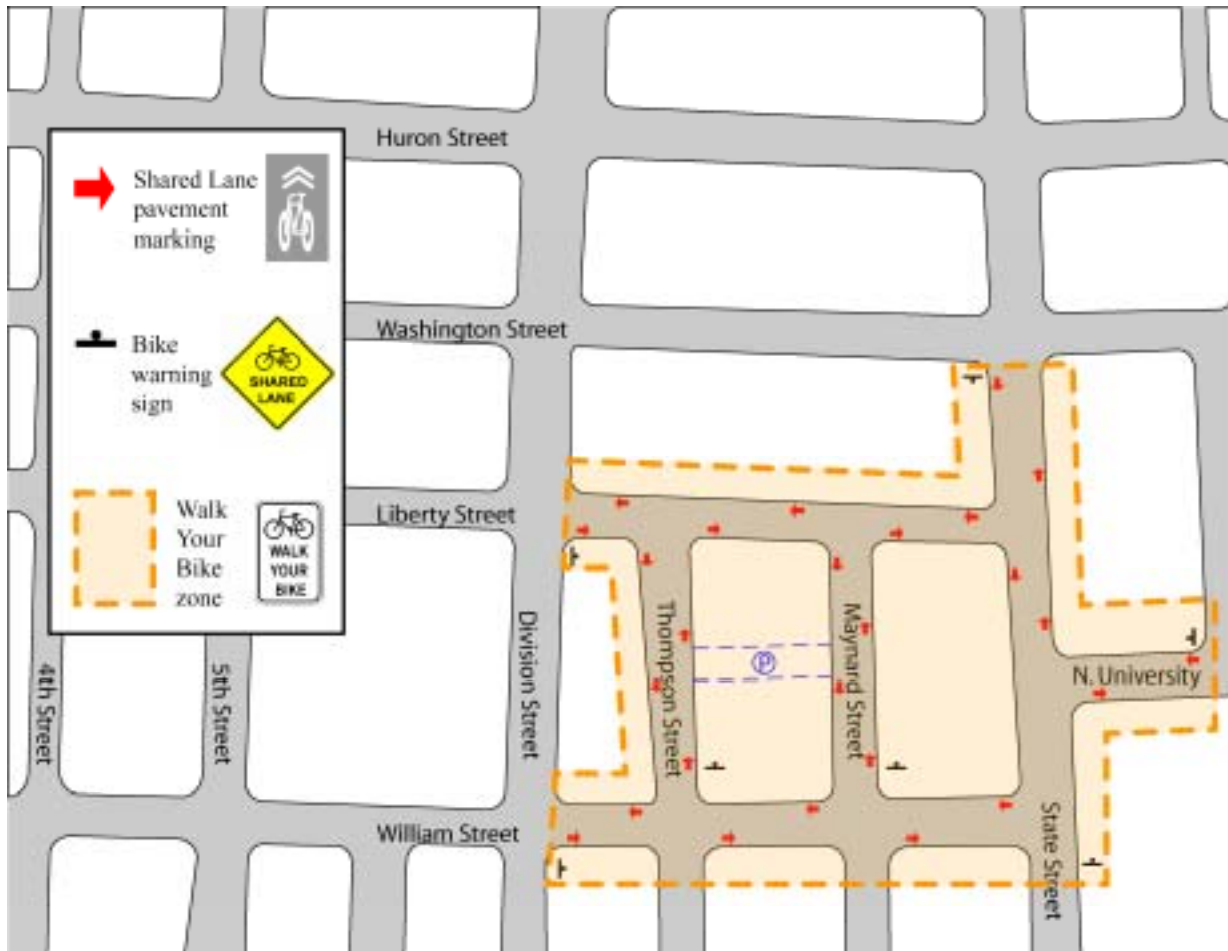
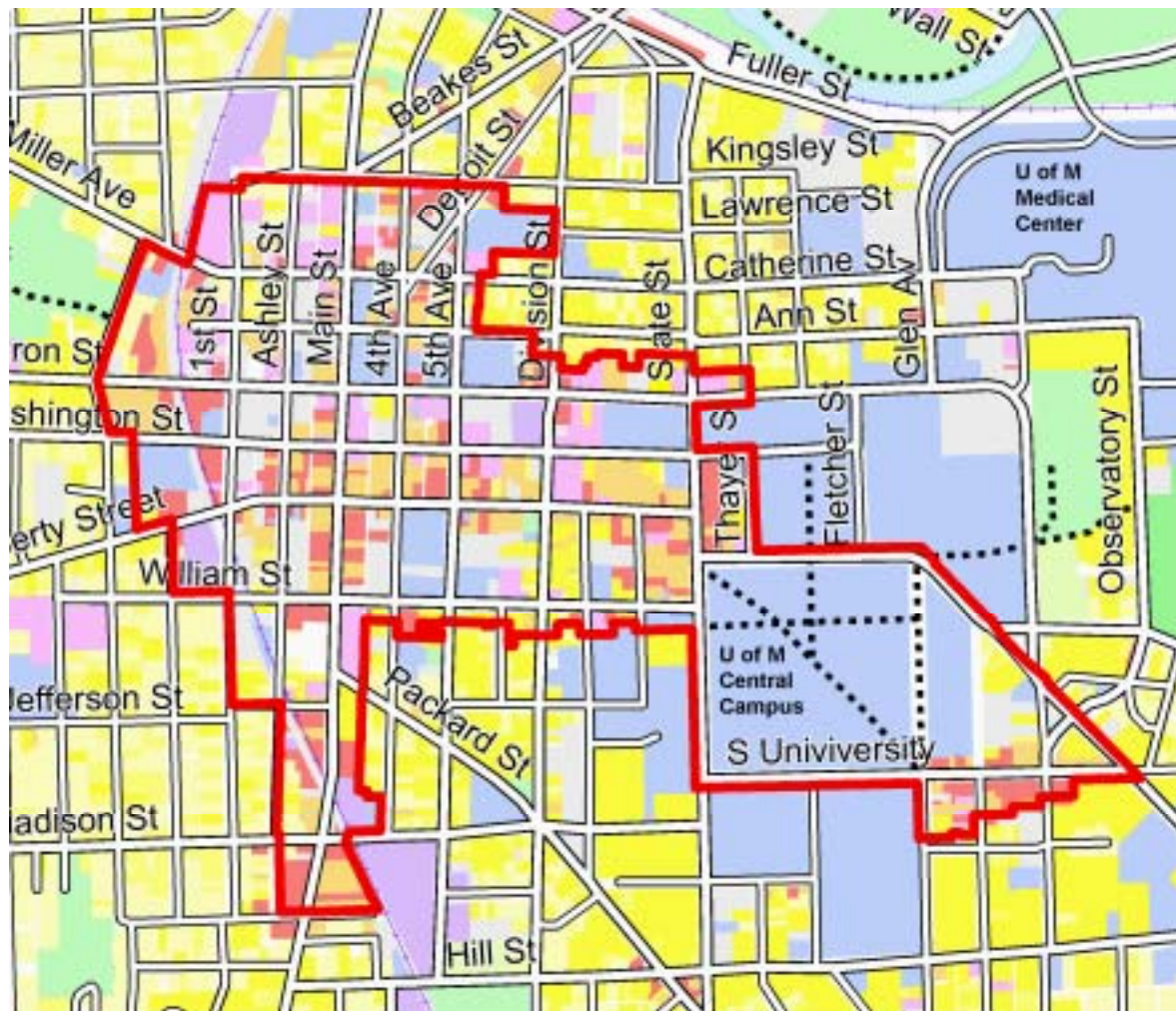


Fig. 3b. indicates the trial “Walk Your Bike” zone in conjunction with the Shared-use Arrow pavement markings.

If the “Walk Your Bike” zone proves to be successful for minimizing pedestrian and bike conflicts in the trial area, it is recommended that the zone be expanded to include the entire DDA area. While the pedestrian/bike traffic on every street within the DDA boundary may not be significant enough to warrant the restriction of bikes from the sidewalk, it is recommended that the entire area implement a consistent policy to reduce confusion and to support the goal of encouraging biking in the street. Fig. 3c shows the DDA boundary. Again, this policy should not be implemented without the first step of implementing Shared-use Arrows or bike lanes, where feasible.

Fig. 3c. Expanded “Walk Your Bike” zone



Legend:

 DDA Boundary / Potential Long-term Walk Your Bike Zone

Land Use / Land Cover:

-  Residential
-  Lodging
-  Office
-  Commercial
-  Industrial/Research
-  Institutional
-  Recreation

3.2 Liberty and Maynard Improvements

The adherence to the stop signs at the intersection of Maynard Street and Liberty Street, particularly from westbound traffic on Liberty Street, has been inconsistent and has been observed to be particularly low at times. Compliance with the stop signs has not been an issue for northbound vehicles on Maynard. The low compliance has resulted in “near-misses” between westbound traffic and left-turning motorists and bicyclists from Maynard as well as “near-misses” with pedestrians crossing Liberty.

The root cause of the non-compliance is unknown; speculation has included the poor visibility of the stop signs and motorists rushing to beat the light at Thompson and Liberty. The stop sign is generally quite visible when there are no buses or other vehicles parked or stopped in front of the Michigan Theater. While there is no parking permitted in front of the Michigan Theater, delivery trucks and cars frequently park there.

While compliance has seemed to increase since the two-way conversion, it is recommended that the city perform a detailed traffic study of the intersection to further evaluate the existing conditions and examine whether more aggressive measures to improve compliance are needed.

Five options are outlined that would likely increase compliance with the stop signs if it is determined to be necessary. They are listed in increasing complexity and cost. The potential improvements include:

1. Move bus stop location
2. Double post the stop signs
3. Shielding the Thompson/Liberty signal
4. Overhead flashing light
5. Create bulb-outs

Move Bus Stop Location

The bus stop on the north side of Liberty Street adjacent to the stop sign in front of the Michigan Theater should be moved east away from the intersection to improve the visibility of the stop sign when a bus is on or off-loading passengers. The bus stop is for two routes, one being the “Link” which has frequent service.

Double Post Stop Signs

Stop signs may be added on the left side of the road on Liberty Street. This may increase stop sign visibility when a bus or illegally parked vehicle is obstructing the view of the stop sign.

Shielding the Thompson/Liberty Signal

If the traffic study finds a correlation between a green signal on the Thompson/Liberty Signal and the compliance with the stop signs, the lights may be shielded from view until after a motorist has traveled through the Liberty/Maynard intersection.

Overhead Flashing Light

As the stop signs are placed far to the right (and potentially to the left) of the traveled way, placing a flashing red directly over the lane may increase awareness of the stop sign. This option is both costly to install and maintain and adds visual clutter to the downtown area especially if mast arms are used.

Create Pedestrian Bulb-outs

The pedestrian bulb-out option would likely be the most effective option for increasing visibility of pedestrians and ensuring increased compliance. The pedestrian bulb-outs would have the advantages for both motorists and pedestrians including:

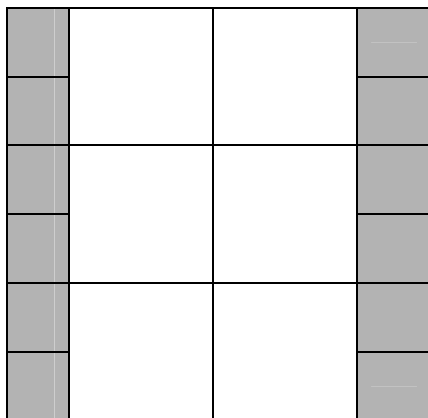
- Eliminating the space where motor vehicles illegally park which obstructs the views of the stop signs.
- Placing the stop sign immediately adjacent to the traveled way.
- Reducing crossing distance for pedestrians, which would result in improved pedestrian safety and minimized traffic disruption.
- Providing an area where pedestrians would clearly be waiting to cross the road – providing a clearer pedestrian intent that the current configuration permits. The drainage implications of this solution should be investigated.

3.3 Crosswalk Markings

In the State Street Area, the contrast of the existing concrete crosswalks and the adjacent pavement is poor, especially during cloudy days, evening, and during the winter. This is illustrated by the photograph to the right that shows half of the street with a concrete crosswalk and the other half asphalt. The continuing fading of the asphalt surface and darkening of the concrete surface will further diminish the distinction between of the two paving materials.



Fig. 3d. Crosswalk Marking option



To increase visibility of the crosswalk, thermoplastic white pavement markings should be added to make the crosswalk appear closer to standard crosswalk markings (Fig. 3d). It is recommended that the outside band of the concrete crosswalks receive thermoplastic pavement markings. This is an exaggeration of the standard parallel bar that would accomplish the goal of increasing the crosswalks visibility to that similar of a traditional ladder style crossing.

3.4 Creation of State Street Bulb-outs by Angel Hall

Pedestrian traffic crossing State Street in front of Angel Hall is extremely high. Most of the people crossing are darting out in front of traffic in what is known as a mid-block dash, or crossing where no mid-block crosswalks occur. It is recommended that this area be redesigned in conjunction with the project that will be undertaken at the Art Museum to improve crossing conditions in this area.



Pedestrian improvements along this stretch should include the addition of pedestrian bump-outs at regular intervals along the stretch of State Street between South University and William. Bump-outs help pedestrians crossing the road see and be seen by motorists. Bump-outs shorten the distance of crossing that is necessary. They also have the added benefit of calming traffic. Mid-block crosswalks at the bump-out locations should use white ladder crosswalk markings to maximize visibility and signage directing motorists to yield to pedestrians.

4. Signalized “T” Intersection Improvements

The exclusive pedestrian phase utilized in the signalized “T” intersection in the State Street Area provides a poor level of service to both pedestrians and automobiles as they are currently functioning. Pedestrians in the crosswalk who are crossing during the “Don’t Walk” phase frequently block turning vehicles from completing their turns. This reduces the useable interval, and at times of high pedestrian use, has a cascading effect that significantly drops the motor vehicle level of service. Pedestrians feel the Walk phase is extremely limited and the wait between the Walk phased too long.



The exclusive pedestrian phase appears to be poorly understood by many pedestrians in the State Street Area. This may be attributed to the fact that exclusive pedestrian phases are atypical for Ann Arbor and Michigan in general. While there were exclusive pedestrian signals used in this area prior to the conversion, they were in conjunction with one-way roads. Casual inquiries of how these functioned in the past indicate that the exclusive pedestrian phase was not well understood even then.

The lack of signage and/or audible signals that distinguishes exclusive pedestrian signals from a typical signalized intersection compounds the problem. The poor understanding of how the signal phasing works causes problems when a pedestrian approaches the intersection as they would a typically signalized intersection to make a two-part cross of the road. They cross the first street on the Walk signal and turn to cross a second street expecting the Walk signal to begin shortly. When the Walk signal does not appear, they consult the traffic signal, seeing a red signal halting traffic approaching the crosswalk, they cross the street assuming it is safe to do so. While in theory, there is no need to make a two-part crossing at a “T” intersection, most people do not prepare an elaborate mental plan of their walking trip that takes into account such factors.

The pedestrian delay of up to 1 minute and 15 seconds is too long from the perspective of most pedestrians. The excessive delay is primarily the result of a very limited Walk phase of 5 seconds. A pedestrian may approach an intersection and wait well over a minute for a Walk Signal. Often a

pedestrian becomes impatient and frequently crosses at any perceived gap in traffic. Most signals downtown have 20 to 30 seconds of a Walk Phase and generally a pedestrian is not delayed over a minute. The perceived lack of accommodation to pedestrians breeds a general contempt for the pedestrian signals and they cease to be a functional traffic control device.

To address the problem, alternative signal cycles were analyzed along with supplemental measures that may be employed with any of the options. These included incorporating an additional exclusive pedestrian phase at times of peak pedestrian usage and permitting diagonal crossing. A further analysis of these options can be found in the Appendix. The use of a leading pedestrian phase option was determined to be the most promising.

Leading Pedestrian Phase

A leading pedestrian interval works similar to a conventional (concurrent) traffic signal with the exception that the pedestrian Walk light comes on in advance of the Motor Vehicles “Green Ball”. This “leading phase” is typically a minimum of three seconds.

The leading pedestrian interval has the advantage of the keeping the cycle time as it is currently and being the most familiar type of crossing for pedestrians. From a motor vehicle standpoint, the leading pedestrian interval is about the same as an existing cycle. However, it is anticipated that an increase in pedestrian accommodation will result in a reduction of jaywalking and resulting motor vehicle congestion. It is recommended that a leading pedestrian interval be modeled to test its effectiveness.

Lagging Motor Vehicle Phase

Because the turning movements may be blocked by pedestrians and these turning movements are critical for the intersection functioning from a motor vehicle’s standpoint, it is recommended that a lagging exclusive motor vehicle phase be used after the concurrent phase.

Modifying Safety Clearance Cycle

Currently, there is a 5-second Walk interval and a 15-second Don’t Walk interval. Many pedestrians perceive the 5-second Walk interval as extremely short. The intersection geometry has been looked at and it appears that the Walk interval may be extended from between 7 to 10 seconds and the clearance interval (flashing Don’t Walk) may be reduced to 9 to 13 seconds.

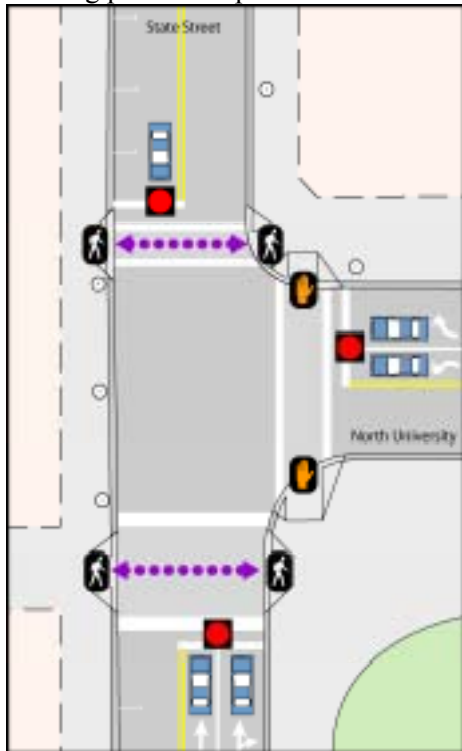
Audible Signal

The signals need to be made accessible for those with vision impairments. If pedestrian activated audible signals are to be used with a locator tone, then the activation buttons should be clearly marked that the button is only to activate an audible signal. To do otherwise suggests that pedestrians must push the button in order to trigger the signal. Such abuse of the pedestrian activated signals invites disregard for their use in other installations.

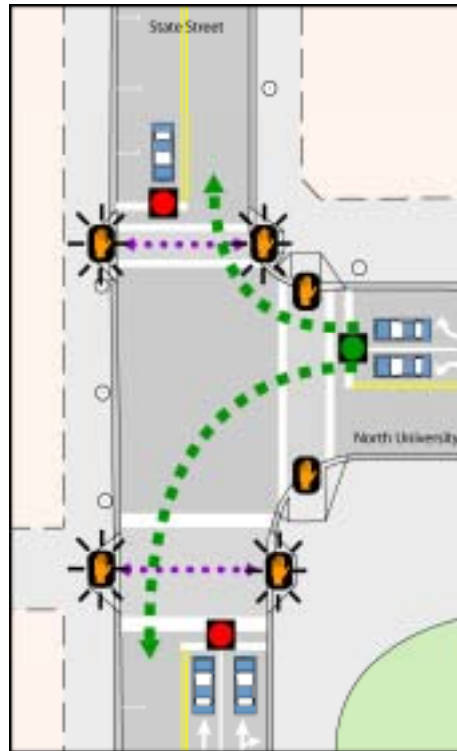
Suggested Phasing

The following pages provide an illustration of the suggested signal phasing.

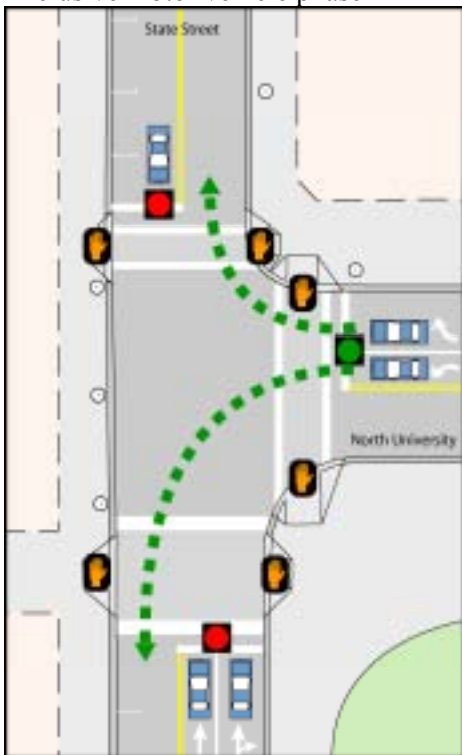
Phase 1 – 8 seconds
Leading pedestrian phase



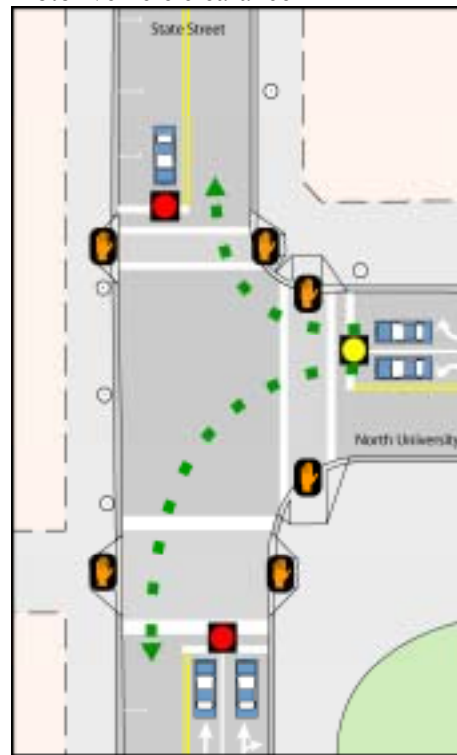
Phase 2 – 12 seconds
Pedestrian clearance concurrent motor vehicle green



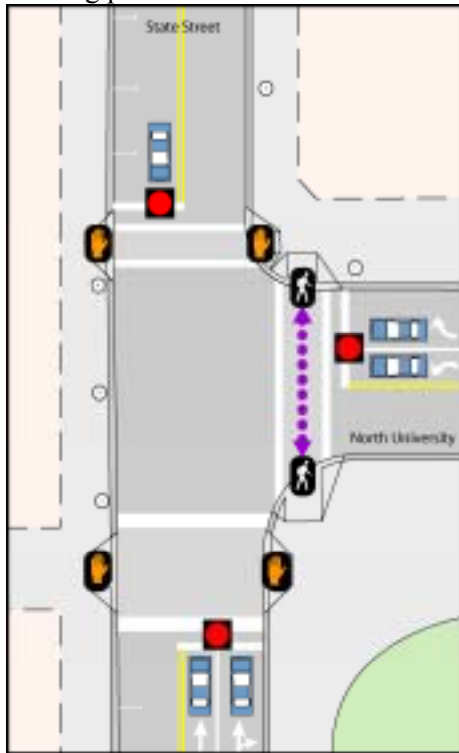
Phase 3 – 10 seconds
Exclusive motor vehicle phase



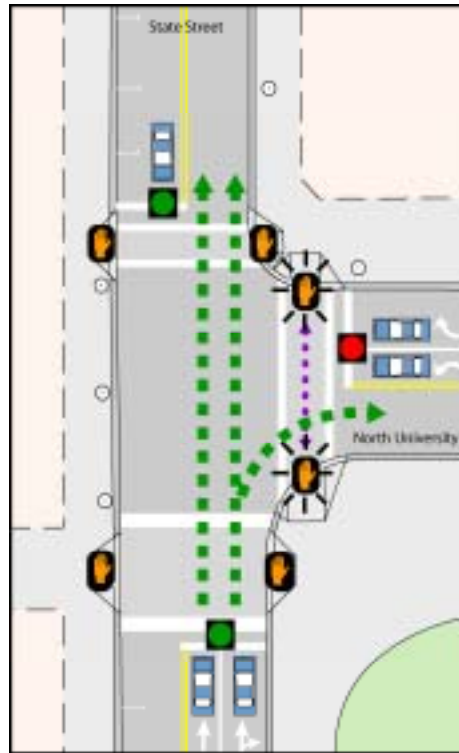
Phase 4 – 3 seconds
Motor vehicle clearance



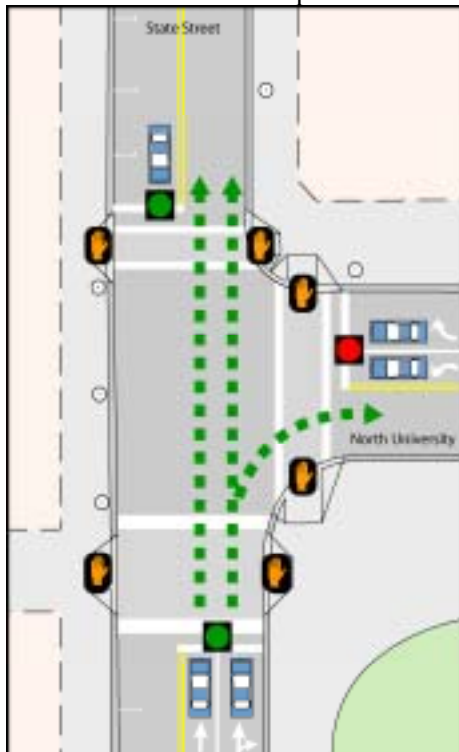
Phase 5 – 8 seconds
Leading pedestrian interval



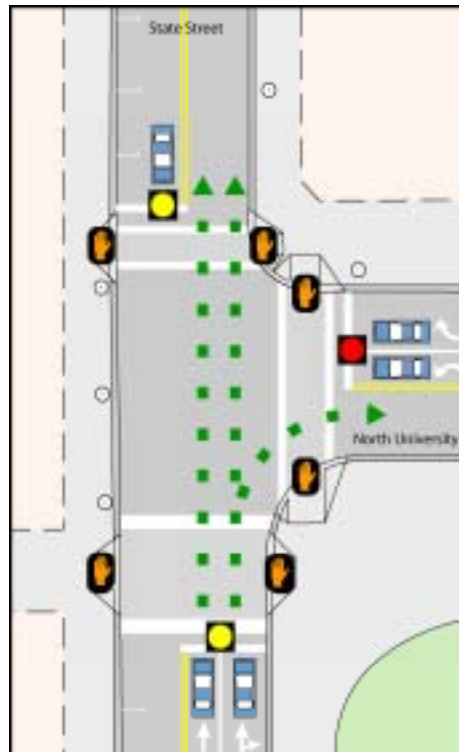
Phase 6 – 12 seconds
Pedestrian clearance concurrent motor vehicle green



Phase 7 – 24 seconds
Exclusive motor vehicle phase



Phase 8 – 3 seconds
Motor vehicle clearance



5. *Bicycle Parking*

The covered bike parking at the entrance of the Maynard Street parking deck is ideally located. It is well-lit, covered from the elements, and located between the police station and a parking attendant who is there late into the night. It is also convenient to many retail establishments and places of work. Consequently, the demand for the limited spots there is high. Unfortunately, many of the spots are taken up by bikes or mopeds that are left there for days and sometimes months, taking up valuable spots from use by daily commuters. There are times where these racks are completely full.

5.1 Additional Short-term Parking

The original design of the Maynard Street improvements included additional bike racks across the street from the parking attendant booths on Maynard Street, under the cover of the deck roof. However, these were removed shortly after they were installed because of conflicts with the doorway to the offices at 311 Maynard. There was also concern that fixed racks would conflict with artists' booths during the art fair.

There is room, however, for portable loop racks slightly to the south of the original placement where the sidewalk is still wide enough to accommodate bike racks. The portable racks could be easily moved during art fair week. Providing this additional short-term parking for bikes in the vicinity of the Maynard

Parking deck will alleviate some of the

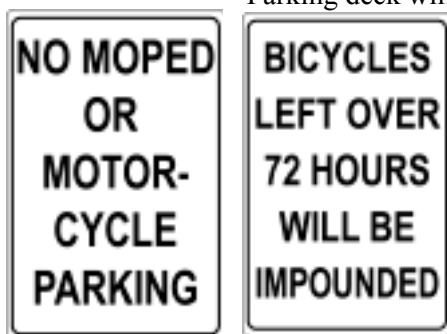


Fig. 5b. Short-term bike parking signage

Both the new portable racks and the existing bike parking should be posted with a sign warning users that bikes left for more than 72 hours will be impounded. Current city code states that bikes may be impounded after 48 hours. It is recommended that the City Council change the ordinance to allow bike parking for 72 hours. A 72 hour period provides more flexibility for those bikers wishing to park their bikes over the weekend. The new ordinance and signage should be combined with increased



Fig. 5a. Vertical Bike Parking

pressure on the spots in the deck. If it is determined that additional bike parking is needed after the placement of hoop racks along Maynard Street, vertical bike parking is an option that may be used in the deck for space efficiency. Vertical bike parking is illustrated in Fig. 5a, taken from the Oregon DEQ's End-of-Trip Facilities Design program publication. Vertically staggered bikes can be placed 17" on center.

enforcement. In addition, a sign prohibiting motor vehicles such as mopeds and motorcycles should be posted (Fig. 5b).

A transition period should take place before bikes are cleaned regularly from racks. Sufficient notice should be given of impending impoundment to allow owners an opportunity to remove their bikes. The first collection of bikes after the regular sweeping is implemented should be kept for an extended period of time so owners can claim their bikes before they are auctioned off. The notification process of tagging bikes to announce the upcoming impoundment can be used as an opportunity to distribute information on bike registration, safety issues, and education.

5.2 Additional Long-term Parking

In addition to increased short-term parking and enforcement of current laws, longer-term parking should be provided in this same area. Long-term bike parking should be shielded from the damaging effects of weather and in a highly visible spot to deter crime.

The DDA, in conjunction with the Get-Downtown program is in the process of purchasing a number of bike lockers for longer-term storage downtown. The bike lockers will rent for about \$50 a year. They provide long-term, covered and secure storage for people who regularly commute to work on their bikes.

The bike lockers should be located along the east wall across from the parking attendants booths on Maynard Street. The recessed area along the street will accommodate bike lockers without obstructing the sidewalk (see Fig. 5c.)

These pictures and the diagram below illustrate the location of the proposed long-term bike parking and addition of new short-term bike parking.

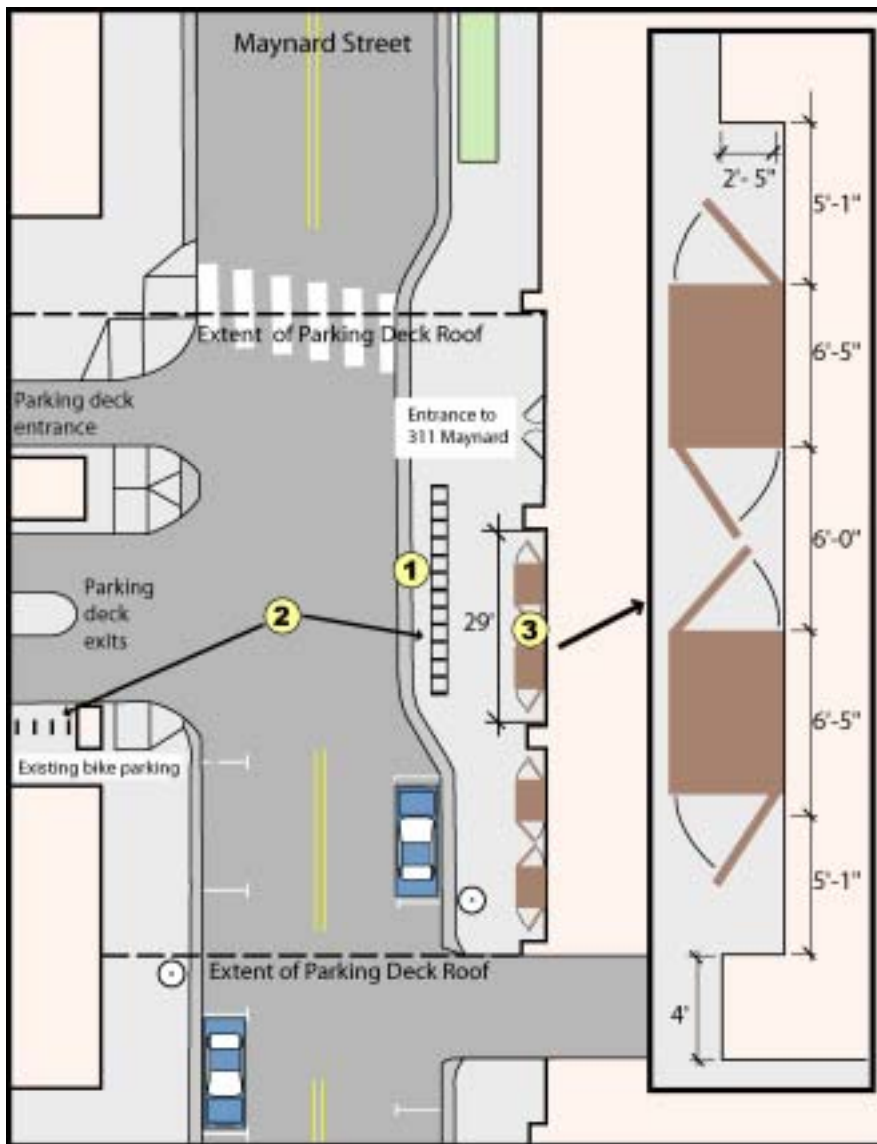


Fig. 5c. Location of Maynard Street additional bike parking



Fig. 5d. Example of bike lockers

Fig. 5e. Proposed location of new bike hoops and lockers



Recommended location for approximately 23 new hoop bike racks. These hoops should be movable to allow for booth placement during art fair.

1. Short-term bike parking in these locations should be posted "Bikes left for more than 72 hours will be impounded".
2. Cubby used for new bike lockers.

6. Education and Enforcement

6.1 Targeted Educational Campaigns

On-going community education and awareness programs are an important component of a successful non-motorized transportation plan. As mentioned in the previous section, currently little to no education exists that informs bicycles, pedestrians and motorists of the proper and safe behavior when sharing the road and sidewalks. A general campaign to inform people of their rights and responsibilities is much needed.

Coupling public education campaigns with the development of new facilities is a timely and effective way to raise people’s awareness of the new facilities and non-motorized transportation issues in general. Effective public awareness campaigns should include transitional signage at the new facility location as well as posters, flyers, and newspaper articles. Especially important are changes to existing facilities that may not be readily perceptible to users such as the change in curb cut locations.

Several of the proposed solutions for the State Street Area such as Shared-use Arrows and “Walk Your Bike” signs encourage changes in behavior by bicycles, motorists, and pedestrians alike. The increased signage and pavement markings instructing bicyclists and pedestrians how to behave will be an improvement in the level of attention surrounding around these issues.

However, without further educational efforts coinciding with the implementation measures recommended, these new changes are likely to fail. The following supplemental educational measures are an essential component of the proposed bicycle and pedestrian recommendations for the State Street Area.

Bike Safety Posters

Posters that outline the fundamental principles of bicycle safety should be posted near covered bike parking facilities such as the Maynard Parking deck lots and appropriate places around the University campus. These posters can be modeled after the set of guidelines used on the back of the SEMCOG and Ann Arbor bike maps. An example is shown in Fig. 6a.

Fig. 6a. Bike Safety Poster



Banners

This banner, modeled from a similar bumper sticker produced by the League of Michigan Bicyclists can be strung across streets in the downtown area to alert motorists and bicyclists to their responsibilities in the roadway. The city allows banners to be up in one place for no longer two weeks. The banner should be rotated around to different streets to increase its effectiveness and reach a wider audience.

Fig. 6b. Sample Banner



Shared Use Arrow Flyer and Poster

A general informational flyer (Fig. 6c) should accompany the Shared-use Arrow pavement markings. As the markings are not standard or widely used, they will be new to the vast majority of people. A simple flyer alerting bicyclists, pedestrians, and motorists of the meaning of the shared-use arrow should be posted around the study area. The flyer should inform people that:

- Bikes are encouraged to bike in the road as opposed to the sidewalk
- The arrow indicates where bikes should be placed in the roadway to avoid door swings
- Motorists should share the road and respect bikes in the roadway

In addition to the flyer, a poster with the same information in a very simple readable format should be posted in the parking decks. Examples of effective posting locations include in or outside the parking deck elevators, in a location near the ticket booths where the poster could be seen as cars cue up to exit, or in the parking deck stairwells.

PR Pieces

The proposed recommendations should be accompanied by a series of PR pieces in the newspapers, and on the radio.



Fig. 6c. Informational flyer for motorists

6.2 Enforcement

Increased enforcement of several policies and regulations, both existing and proposed, will vastly increase their chances of being successful and therefore improve the conditions for biking and walking in the State Street Area. As the level of education and awareness surrounding these issues increases through increased signage and flyers, so too will the opportunities for officers to step in and enforce the ordinances when they see they are being broken.



Ticketing reckless bikers

The large majority of bikers on the sidewalk are respectful of pedestrians and traveling at reasonable speeds. However, without a doubt, there are bicyclists who are reckless and are an endangerment to people traveling on the sidewalk. Bike and pedestrian crashes can and have resulted in serious injury in this area, and those people found to not be obeying the “Walk Your Bike” sign should receive a ticket as a deterrent to this behavior in the future. While the police cannot be expected to provide 24-hour surveillance of these minor disobediences, short-term targeted enforcement in this area will reduce and hopefully eliminate the incidence of reckless biking in this area.

Street furniture regulations

Right now, conditions on the sidewalks in the State Street Area are extremely crowded with pedestrians and bikers. Added to the mix is the café tables and street furniture put out by the merchants in the area. While the outdoor dining definitely adds to the vitality and unique atmosphere of the area, it should not be at the expense of safety and accessibility of the sidewalks. Requiring strict adherence to street furniture regulations and maintaining a minimum width of 48” is left as a travel lane will help ensure that the sidewalks are passable and safe for pedestrian and bike traffic.

Law Enforcement Guide

Educating police officers on the rules and regulations of cycling is key to the success of many of the recommended measures. The Florida Bicycle Law Enforcement Guide (Fig. 6d) is a pocket guidebook that provides guidelines on bicyclists’ rights and responsibilities in the roadway. Encouraging officers to carry the guidelines and review the bicycle safety laws will not only help ensure the success of the new enforcement programs, but also improve crash reporting for future data analysis.

Other Enforcement Programs

One enforcement approach that has been utilized successfully in other university towns is an optional bicycle education class in lieu of a fine. Upon receiving a ticket the offender has three options: pay the ticket, contest the ticket, or attend a class on bicycle safety and laws that is given periodically. This option is typically only available for the first offence.

The current registration program, while helpful in finding a bicyclist's owner has limitations. A recent case of a thief registering a stolen bicycle illustrates one of the limitations of registration without proof of purchase. In addition, many bicycle stores do not register bicycles or promote the program. The result

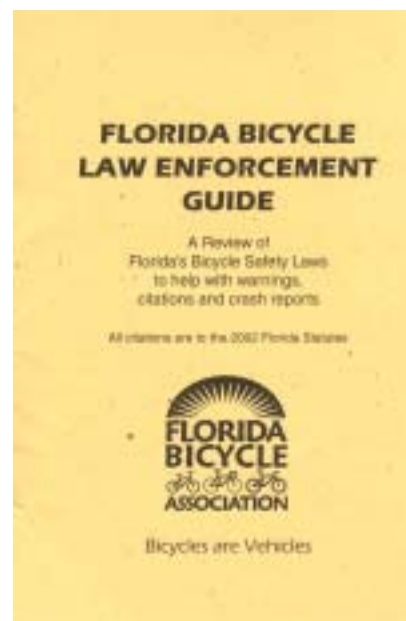


Fig. 6d.
Pocket enforcement guide

is many law-abiding citizens may purchase a bicycle in town and be completely unaware of the registration program.

Bicycle theft can be a deterrent to bicycle use especially to users with higher-end bicycles. One program that has been used to track down bicycle theft rings is a sting operation using a homing device. An attractive bicycle with a homing device placed in the frame is placed in a location where numerous bicycles have been stolen with minimal protection. The bicycle once stolen can be tracked.

7. *Next Steps*

7.1 Non-motorized Traffic Counts

It is recommended that data be collected on bicycle and pedestrian usage for key locations downtown and roads approaching the downtown to gain a better understanding of the non-motorized needs of the city. This data will be used to further evaluate the appropriateness of the alternatives such as the location of bike lanes in the downtown area. The counts should be made by means of an electronic or mechanical count board and include the following:

- a) 16 calibration counts for a 14-hour duration that will be used to determine peak hours and extrapolate data from peak hour counts at other locations. Counts should be made by means of an electronic or mechanical count board.
- b) 70 peak hour counts for a 4-hour duration
- c) Extrapolation of the peak hour counts to 12 and 24-hour projections based on the calibration counts.

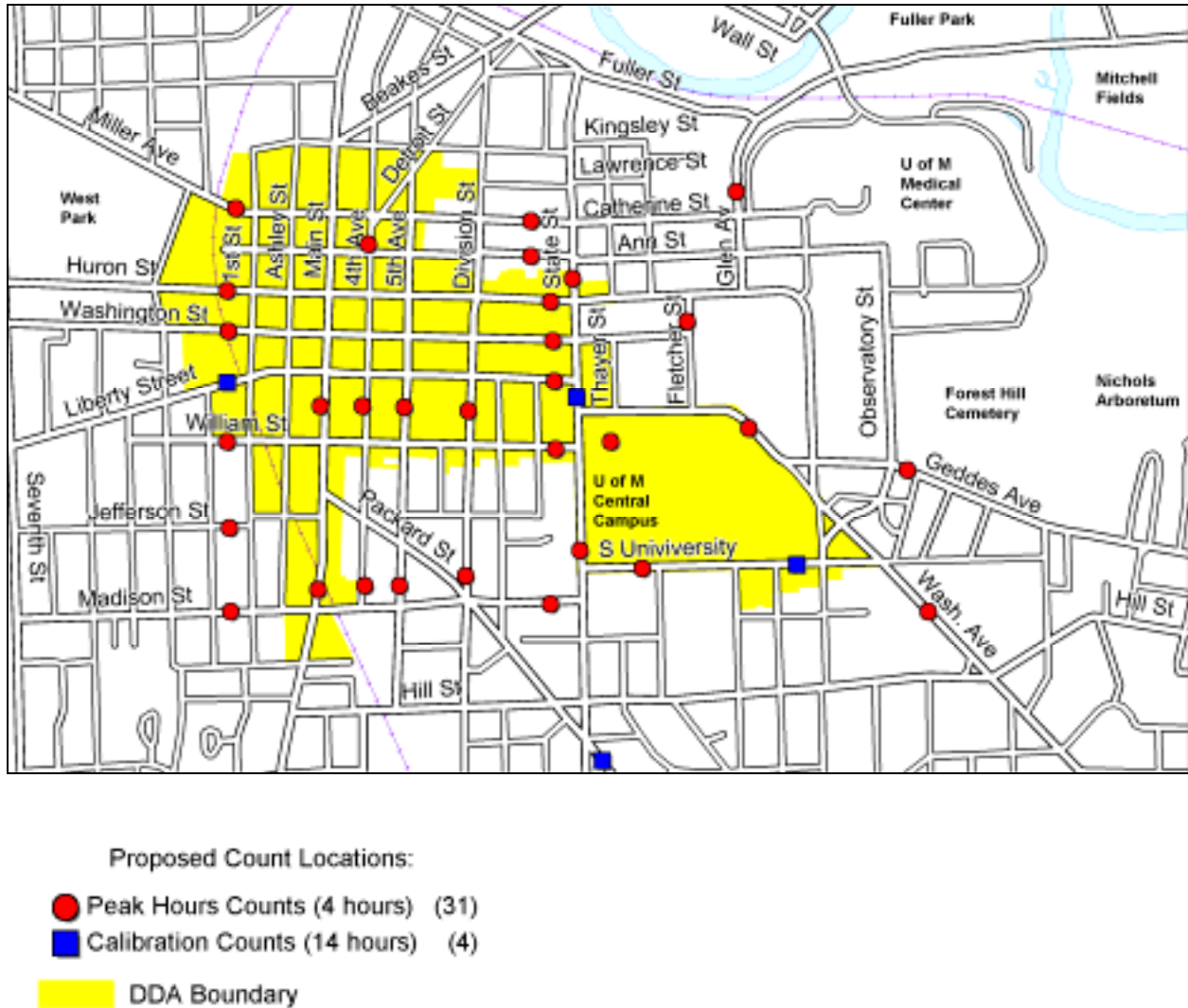
Each count should include the following variables by associated time periods:

- i. In-bound pedestrian on right sidewalk
- ii. In-bound bike on right sidewalk traveling same direction as traffic
- iii. In-bound bike in road with traffic
- iv. In-bound bike in road against traffic
- v. In-bound bike on left sidewalk traveling opposite direction of traffic
- vi. In-bound pedestrian on left sidewalk
- vii. Out-bound pedestrian on right sidewalk
- viii. Out -bike on right sidewalk traveling same direction as traffic
- ix. Out -bound bike in road with traffic
- x. Out -bound bike in road against traffic
- xi. Out -bound bike on left sidewalk traveling opposite direction of traffic
- xii. Out-bound pedestrian on left sidewalk

Table 7a. Proposed Count Locations

	Fall	Winter	Spring	Summer
East-West Flow on West Edge of Downtown:				
Miller Avenue, just west of 1st Street	Peak		Peak	
Huron Street, just west of 1st Street	Peak		Peak	
Washington Street, just west of 1st Street	Peak		Peak	
Liberty Street, just west of 1st Street	Calibration	Calib.	Calib.	Calib.
William Street, just west of 1st Street	Peak		Peak	
Jefferson Street, just west of 1st Street	Peak		Peak	
Madison Street, just west of 1st Street	Peak		Peak	
East-West Flow in Center of Downtown:				
Catherine Street, just west of State Street	Peak		Peak	
Ann Street, just west of State Street	Peak		Peak	
Huron Street, just west of State Street	Peak		Peak	
Washington Street, just west of State Street	Peak	Peak	Peak	Peak
Liberty Street, just west of State Street	Peak	Peak	Peak	Peak
William Street, just west of State Street	Peak	Peak	Peak	Peak
Madison Street, just west of State Street	Peak		Peak	
South University, just west of East University	Peak		Peak	
Diag just east of State Street	Peak	Peak	Peak	Peak
East-West Flow on East Edge of Downtown:				
North University by old East University	Peak		Peak	
Geddes Avenue, just east of Observatory Street	Peak		Peak	
Washtenaw Avenue, just east of South University	Peak		Peak	
South University, just west of Forest Ave	Calibration	Calib.	Calib.	Calib.
North-South Flow on South Edge of Downtown:				
Main Street, just north of Madison Street	Peak		Peak	
4th Avenue, just north of Madison Street	Peak		Peak	
5th Avenue, just north of Madison Street	Peak		Peak	
Division Street, just north of Madison Street	Peak		Peak	
State Street, just north of South University	Peak		Peak	
Packard Street, just southeast of State Street	Calibration	Calib.	Calib.	Calib.
North-South Flow in Center of Downtown:				
Main Street, just south of Liberty Street	Peak		Peak	
4th Avenue, just south of Liberty Street	Peak		Peak	
5th Avenue, just south of Liberty Street	Peak		Peak	
Division Street, just south of Liberty Street	Peak		Peak	
State Street, just south of Liberty Street	Calibration	Calib.	Calib.	Calib.
North-South Flow on North Edge of Downtown:				
4th Avenue, just north of Ann Street	Peak		Peak	
State Street, just north of Huron Street	Peak		Peak	
Fletcher Street, just north of Washington St.	Peak		Peak	
Glen Avenue, just north of Catherine Street	Peak		Peak	
Calibration Counts (14 hours)	4	4	4	4
Peak Hours Counts (4 hours)	31	4	31	4

Fig. 7a. Proposed Count Locations



The use of existing traffic cameras should be explored to establish calibration counts and peak hour counts where applicable.

7.2 Bike Lanes

A study conducted by Cadwell and Parker in 2001 showed that the bicycle mode share spilt in Ann Arbor was significantly less than Madison, WI and Boulder, CO, college towns with many similar features to Ann Arbor. The difference in mode-share spilt is most likely due to lack of adequate bike facilities in Ann Arbor. Even without current bicycle count numbers, analysis and public input for the project shows that there is a demand and a need for bike lanes leading into the downtown area, and at least one bike lane through the downtown from east to west and north to south to aid bicycle commuting.

The bike lane vs. parking spaces is a central issue in the debate for bike lanes downtown. Installing bike lanes on many streets downtown is not possible without the loss of parking in key retail locations. It has been noted that more data is needed to determine the economic impact of loss of parking to a retailer. However, the true cost of such a thing is very hard to calculate. What is important is the *perceived* loss of income to retailers in the area, many of whom would move elsewhere were they to lose adjacent on-street parking spots. Therefore, it is not possible to remove retail parking spots in great numbers at this time, regardless of the actual cost.

Fig. 7b. Potential Road Conversions

The following illustration shows the road configurations needed to accommodate bike lanes in the downtown area. The majority of the streets could accommodate bike lanes by the removal of parking from one side of the street. On Liberty Street between 5th and Division, parking would have to be removed on both sides of the street to accommodate bike lanes. On William Street between Main Street and 4th Avenue, parking spaces could be *added* while still accommodating bike lanes. Currently, both Fifth and Division Streets could accommodate bike lanes with three lanes of through traffic.



East-West Bike Lane Options

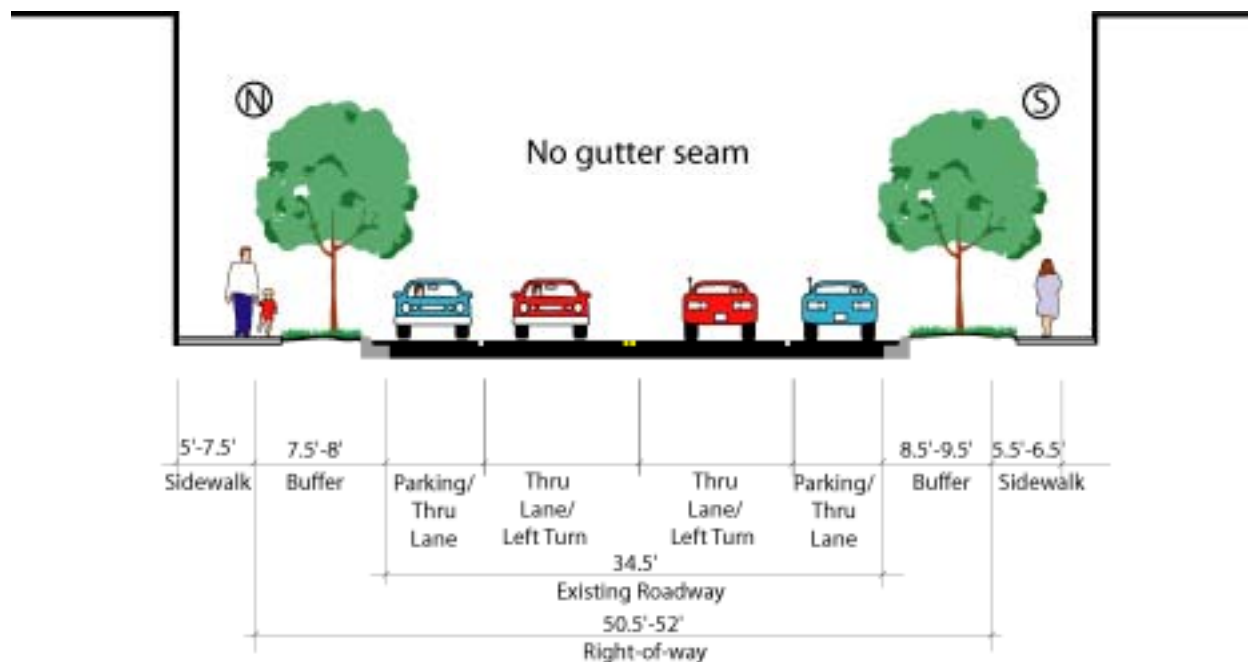
The only existing bike lanes coming into Ann Arbor from the west are along portions of Miller and Liberty Streets. This is an area of town with heavy commuting potential, high-density residential neighborhoods, and many students and staff of the University that either already commute by bike or might shift to biking were there adequate facilities to do so.

The three most appropriate options for east-west bike lanes through downtown are Washington Street, Liberty Street and William Street. William Street was determined to be the most desirable in terms of feasibility and the number of retail parking spots that would have to be removed. Below is a summary of the analysis for each street.

Washington Street

The existing roadway varies from 34.5-35 ft. from Main Street to State Street. Installing bike lanes on this street would mean removing parking from one side of the street, preferably the north side where there are fewer retail storefronts. The loss of retail parking would be considerable. The Bike Q/LOS would be improved from what is currently a D to a C and even a B in some places. In comparing the three options, putting in bike lanes on Washington Street is more preferable than Liberty Street, but not as preferable as William because of the increased number of spots that would be lost.

Fig 7c. Washington Street: Existing Conditions from 5th Ave. to State Street



Liberty Street

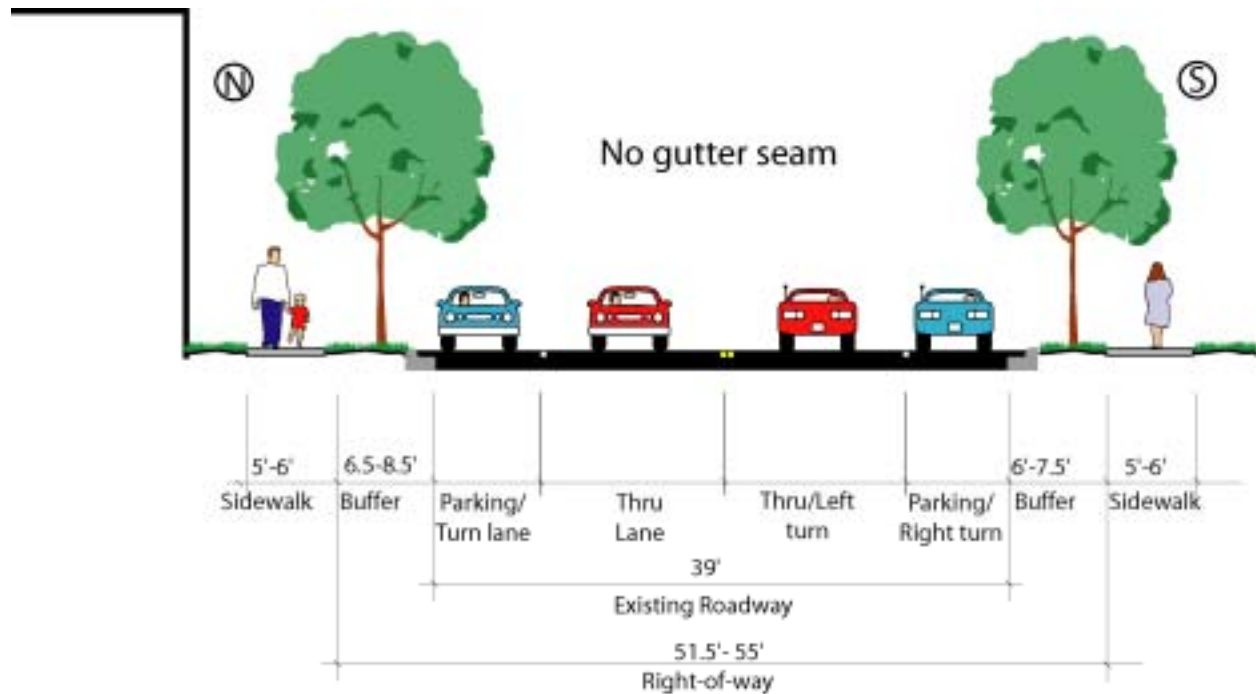
The existing roadway varies from 30'-37.5' wide from Main Street to State Street. Due to the heavy bus traffic, the high amount of retail parking that would have to be removed, and the already narrow existing lane widths, Liberty Street is the least desirable option for a bike lane. In order to accommodate bike lanes, parking would have to be removed from both sides of the street between Division and 5th.

William Street

William Street is the most advantageous option for accommodating an east-west bike lane because few retail parking spots would be lost and, as the bike lane would be serving mainly traffic coming and going from the campus of the University of Michigan, the connection to the campus from William Street is very strong. The Bike Q/LOS would be improved from what is currently a D to a C or a B in some places by the addition of a bike lane.

The existing roadway varies from 35' - 46' wide. Bike lanes could be accommodated along William Street by removing parking along the south side of the road.

Fig. 7d. William Street: Existing Conditions from 4th Street to Thompson Street



In the following schematic illustrations, the existing conditions and proposed solution for accommodating a bike lane on William Street is shown. Parking lanes are indicated with the red cars, and retail storefronts are shown in light orange.

Fig. 7e. William Street: Existing Conditions

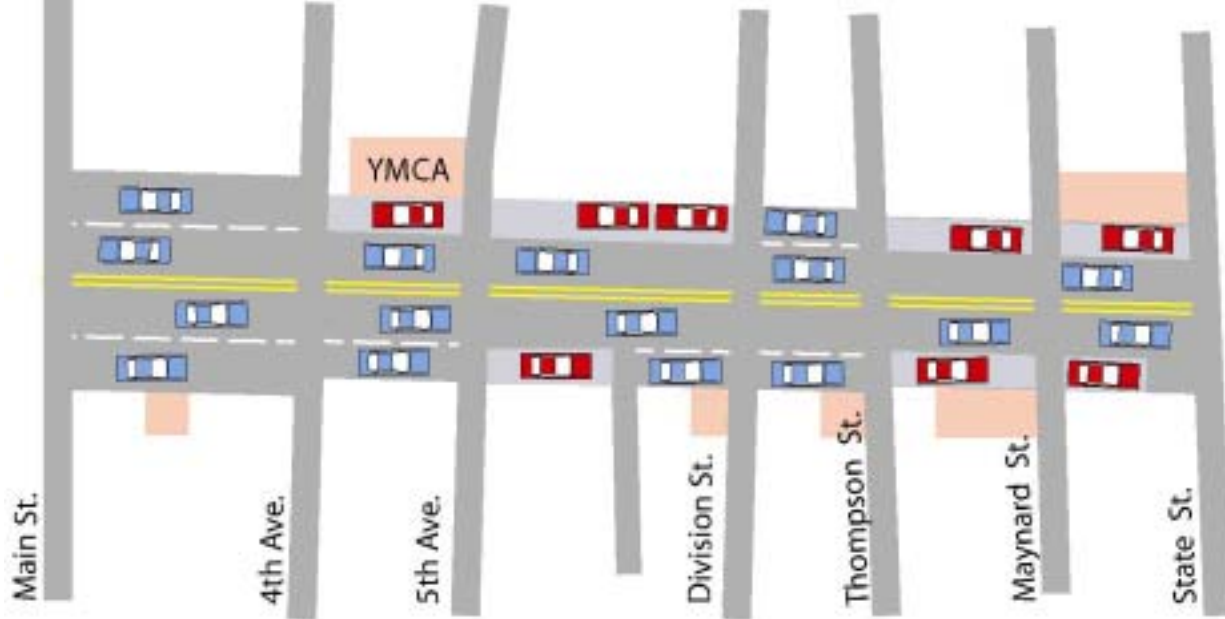
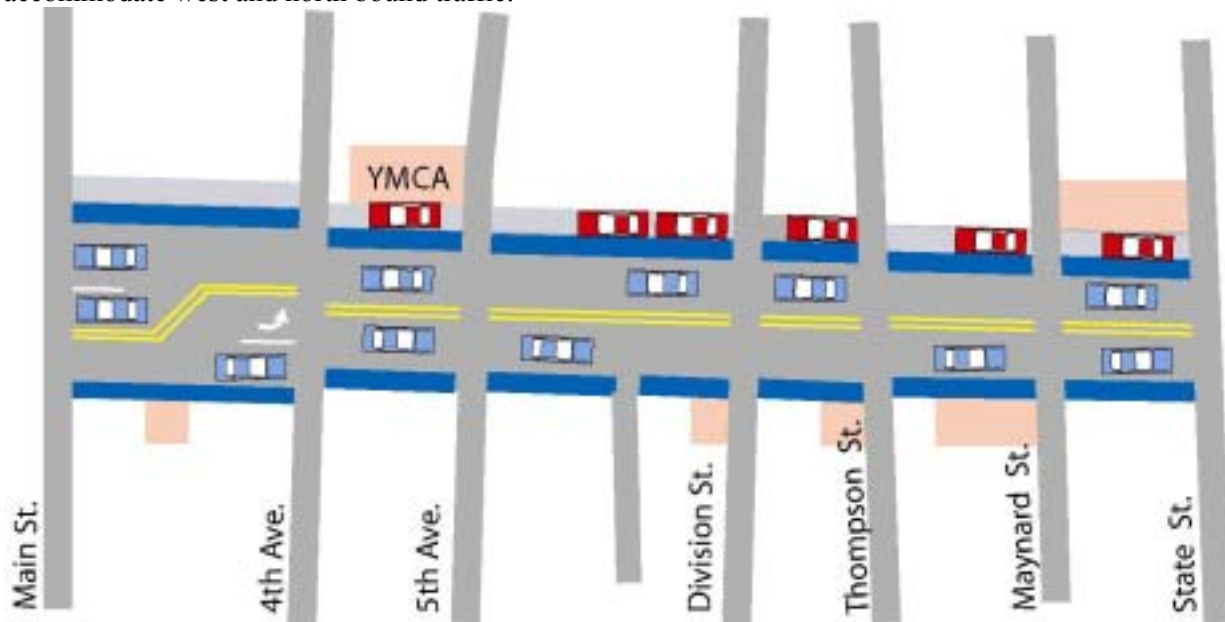


Fig. 7f. William Street: Proposed Bike Lane

In this illustration, the proposed bike lane is shown in blue. The bike lane on the north side of the street is slightly wider than the south side because it is between a row of parked cars and a through lane of moving traffic. Parking would be lost on three blocks: between 5th Ave. and Hamilton Place, between Thompson Street and Maynard Street, and between Maynard Street and State Street. Parking spots in front of retail locations are lost on two blocks. Parking could be added on the block between Main and 4th while still incorporating a bike lane. A designated left turn lane onto Division may need to be added to accommodate west and north bound traffic.



North-South Bike Lanes

Although there is a need for a north-south bike lane in the downtown area, discussion of its location is dependant on the decisions made in the upcoming improvement projects along Fifth and Division Streets. Earlier analysis ruled out both Division and Fifth Streets as options for a N-S connector because of the heavy traffic and high speeds of these thoroughfares. Likewise, it was concluded that Fourth Street is not as feasible because it has a large amount of bus traffic. Therefore, State Street was proposed in the presentation as the best possibility of a N-S bike lane connector. This would mean the removal of parking along Angel Hall and the east side of the block between Liberty and Washington.

However, the nature and character of these streets could change drastically depending on the results of the project, which makes any projections now premature. That said, the project should definitely incorporate a study of the feasibility of including bike lanes as part of the new streetscape.

7.2 Testing and Evaluation

Many of the proposals in this project are based on signs and pavement markings that are not yet standard. Applications for use of the non-standard signs and markings will have to be submitted to the Federal Highway Administration for their approval. The application should include a description of the existing conditions, proposed testing locations and regiments for the signs and markings, and both short-term and long-term objectives for measuring the success of the newly implemented measures. Before testing begins for the effectiveness of the Shared-use Arrow, baseline counts should be conducted during good weather and when students are in town.

Non-signs and pavement markings mentioned in this report include:

- Shared-use arrow pavement marking options (page 8)
- Custom sign based on the standard W-11 “Bike Warning” sign (page 10)
- In-Street “Stop for Pedestrian” sign (page 15)- while not currently standard, this sign is included in the Millenium MUTCD manual pending approval this month.

7.3 University Involvement

As the city continues to move in the direction of separate facilities for bikes and pedestrians, the gap between what is expected behavior from bikes and pedestrians on campus as opposed to what is expected in town will continue to widen. This will cause conflicts at the interface points between campus and city streets. To alleviate this problem, it is recommended that the University pursue a policy of separation of facilities, not only to provide continuity between the City and the University, but for the safety of bicyclists and pedestrians on campus as well.

In addition, there are several areas on the eastern portion of campus that could serve as important links to the non-motorized system of the city as it continues to evolve around the campus. Particularly relevant to the State Street Area Plan is the need for a N-S connection through the campus near the Power Center and Dental School. The design and location of this proposed pathway could have a large effect on the location of non-motorized facilities such as bike lanes in the State Street Area.

Non-motorized systems cannot function effectively if they stop or change nature all together at the borders of different jurisdictions, agencies or institutions. Much as the City coordinates its non-motorized efforts with the larger plans of the County, it should also ensure coordination with the University of Michigan’s non-motorized systems. The city should work closely with the University in ensuring continuity in the non-motorized facilities that span across the campus and city boundaries.