The Yale Graduate Student Assembly presents

The Yale Bike Plan

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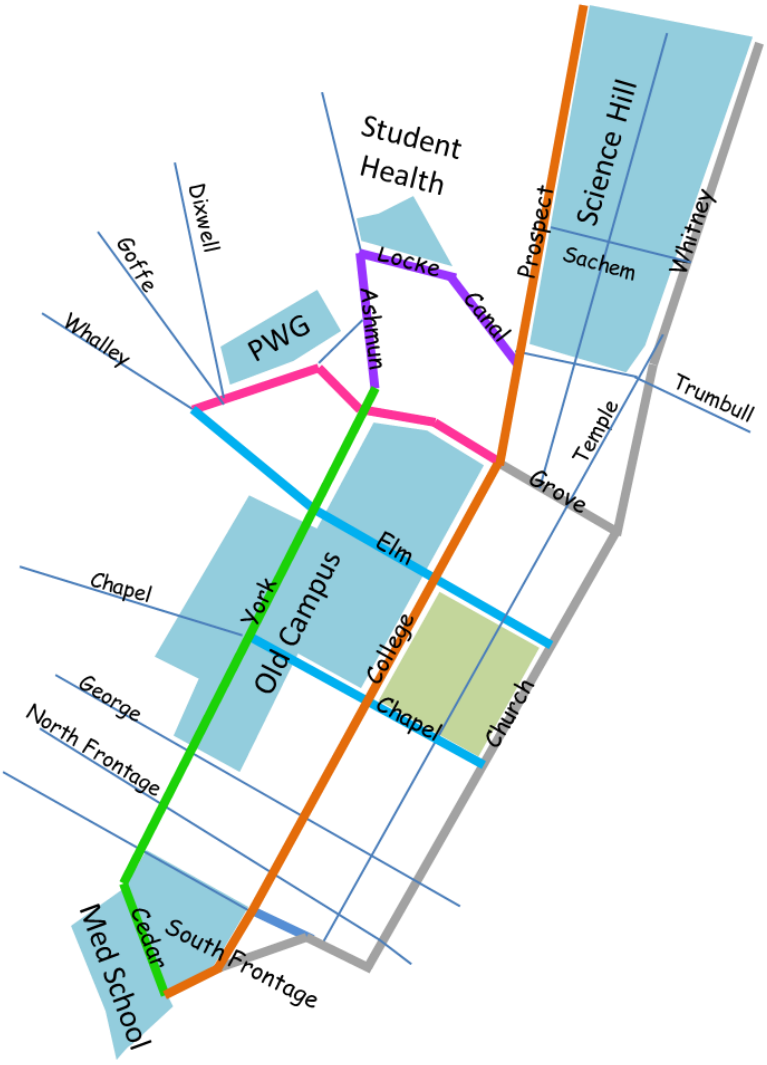
I. EXECUTIVE SUMMARY

The Yale Graduate Student Assembly, an elected body that represents the University's approximately 3000 graduate students, is interested in increasing the safety of transportation to and around the Yale campus for all road users. To this end, we propose the following infrastructure improvements to the streets that connect campus, focusing on road sharing for bicycles.

1. Creation of two cycletracks, generating a North to South connection on College/Prospect Streets and an East to West connection on Elm St.
2. Creation of bike lanes along York, Chapel and Grove Streets
3. Conversion of Chapel and Grove Streets to two-way travel for all road users
4. Addition of signage along Ashmun and Canal Streets

Yale Campus Map with Key Bicycle Corridors Highlighted



We submit that these improvements would benefit not only the large contingent of graduate students who commute by bicycle, but also all New Haven residents.

This report first provides the support for these improvements, and then summarizes the current state of cycling in New Haven, describing both the city's and Yale's current initiatives and providing detail on the existing conditions of the primary routes through the Yale Campus. Next, it suggests improvements to the existing routes and illustrates the proposed changes to the primary commuting routes from around New Haven to Yale. The report concludes with short-term recommendations that could increase the safety of road users immediately.

II. INTRODUCTION

Studies around the globe have indicated that bicycling infrastructure on roads with multi-modal travel increases the safety of all road users[1][2]. A recent study from the Yale Traffic Safety Committee identified the most dangerous intersections on the Yale campus, highlighting areas with high accident rates for cars, bicyclist and pedestrians[3]. The Graduate Student Assembly proposes increased cycling infrastructure as a means of increasing the safety in these intersections and throughout campus, by way of:

1. Traffic calming
2. Generating compliance
3. Increasing bicycle ridership

Traffic calming benefits cyclists and pedestrians by reducing motor vehicle speeds, which are most directly correlated with fatal accidents with pedestrians[4][5]. A reduction of motor vehicle speeds of 3 mph has been predicted to reduce such accidents by 30%[6], and the installment of bike lanes on some streets in New York City decreased average vehicle speeds by almost 10 mph in a posted 30 mph zone[7].

Infrastructure improvements have been demonstrated to increase compliance of road users, whether those improvements are painted lane demarcations for cars, bike lanes or separate traffic signals for pedestrians. For example, the presence of bike lanes has been shown to reduce riding on sidewalks by almost 60%[8].

The most universally observed correlate with the safety of cyclists is the total number of cyclists on roads[9]. Increased infrastructure has been shown to dramatically lower the perceived risk associated with cycling and increase ridership, though the increases vary significantly with the

[1] http://www.nyc.gov/html/dot/html/pr2011/pr11_102.shtml Retrieved 25 Oct 2012
[2] http://cycleto.ca/news/2012/05/03/bike-collision-rates-are-down-jarvis-street Retrieved 25 Oct 2012
[3] http://gsa.yale.edu/node/114/attachment
[4] Anderson, R.W.G., McLean, A.J., Farmer, M.J.B., Lee, B.H., and Brooks, G.B. Vehicle travel speeds and the incidence of fatal pedestrian crashes. Accident Analysis and Prevention, 29(5), pp. 667-674, 1997.
[5] Pasanen, E. Driving Speeds and Pedestrian Safety; a mathematical model. Technical Report No. REPT-77, and Nordisk Kabel- og Traadfabriker, Copenhagen, Denmark, 41 pp., 1992. Helsinki University of Technology, Laboratory of Traffic and Transportation Engineering, Espoo, Finland.
[6] Anderson, R.W.G., McLean, A.J., Farmer, M.J.B., Lee, B.H., and Brooks, G.B. Vehicle travel speeds and the incidence of fatal pedestrian crashes. Accident Analysis and Prevention, 29(5), pp. 667-674, 1997.
[7] http://transportationnation.org/wp-content/uploads/2010/10/Prospect-Park-West-Bike-Lane-Preliminary-Data.pdf
[8] http://transportationnation.org/wp-content/uploads/2010/10/Prospect-Park-West-Bike-Lane-Preliminary-Data.pdf
[9] Pucher, J. and Buehler, R. (2007). "At the frontiers of cycling: Policy innovations in the Netherlands, Denmark, and Germany". World Transp. Policy Pract. 13 (3): 8–57.

type of infrastructure improvement. For example, Chicago's department of transportation reported 86% of users felt safe after installing a particular cycletrack, whereas 17% felt safe previously, when the road had a bike lane. The same study reported an increase in ridership of 55%[10]. Though it is difficult to parse which of these variables plays a causal role in the safety of cyclists, many studies have associated infrastructure improvements with increased safety. Notably, a recent article cited a 90% reduction in accidents when cycletracks were installed, and a 50% reduction with bike lanes[11].

As advocates for a safer and more bike-friendly New Haven, the Yale Graduate Student Assembly sponsored a workshop on April 4, 2012, which was attended by approximately 30 members of the Graduate Student community. At this event the major routes used by graduate student bicycle commuters were identified and their concerns and opinions for road safety improvements were collected. This final report builds on the workshop's outcomes to propose an integrated set of recommendations.

The graduate student population has transportation needs that are different from those of undergraduates and staff. While we are approximately equal in size to the undergraduate population, the majority of us live off campus. In addition, we are much more likely than staff or faculty to live in New Haven, within a radius of Yale that makes us primary users of public transportation and short distance commuting options, such as biking. We therefore have a greater vested interest in improvements to city transportation infrastructure than anyone else at Yale.

More broadly, this report is grounded in a vision in which bicycling becomes a primary mode of transportation for a wide set of the Yale community, as they live, work, and play in New Haven. Our goal is to expand and improve the cycling infrastructure, so that riding a bicycle becomes an even more safe and efficient choice. To achieve this, the report puts forward a proposal to build a cycle track that connects the campus end-to-end, from North Science Hill area to the Southern Medical and Nursing School campus. Making this physical link between two major campus hubs would not only bring together these currently disparate parts of the Yale community, but it would also serve to improve cycling for the entire campus along the route's length.

Also informing this report is a list of measures that would promote bicycling and bicycling safety, as outlined by the Route 34 Health Impact Assessment report[12]:

- Increasing the perception of safety
- Providing specialized bicycle facilities (like cycle tracks or bike lanes) along streets where appropriate for road traffic volume
- Locating bicycle facilities along most desirable routes for cyclists

[10] http://www.chicagobikes.org/pdf/Cycle%20Tracks%20Overview_1&2.pdf

[11] Teschke, K. et al. Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study. American Journal of Public Health e1–e8 (2012).doi:10.2105/AJPH.2012.300762

[12] Filice, C., and G. Furie. 2012. Health Impact Assessment of Phase I of the Downtown Crossing Project: Promoting Pedestrian and Bicyclist Physical Activity and Safety.

- Maximizing connectivity of bicycle lanes and other bicycle facilities
- Increasing access to secure bicycle and shower facilities at destinations
- Implementing many cycling promotion strategies at the same time
- Minimizing cyclist-pedestrian crashes
- Minimizing cyclist-motor vehicle crashes along streets, near intersections, and at intersections

Biking as a form of transportation will be beneficial for the health of Yale community members. Shifting from driving to bicycling adds physical activity to one's day, lowering levels of obesity, cardiovascular risk, and other health dangers.[13] Further, bike commuters report lower stress levels and greater feelings of freedom, relaxation, and excitement than car commuters.[14]

More specifically to Yale, investment in cycling is becoming more important. Knitting together the campus with a coordinated cycling infrastructure will help integrate the two new residential colleges under construction toward the northern end of campus.

Increased cycling would also help Yale to reduce its transportation-related environmental impact. In fact, this role is recognized in the Yale University Sustainability Strategic Plan, which sets out a vision of "a campus in which it becomes an easy and obvious choice to travel by foot, bike, or public transportation." The improvements recommended in this report respond to goals in the Sustainability Strategic Plan, including: Have no net increase in parking spaces on University-owned or -leased property beyond those already planned from now until 2013; and Reduce reliance on single-occupancy vehicles for travel to and from campus by 1–3 percent by 2013.[15] Increasing infrastructure for cyclists around the Yale campus would therefore not only have a positive impact on the health of Yale community members and New Haven residents, but would also help the University simultaneously meet several important goals. Ultimately, instituting the changes outlined in this Plan will help to build a safer, healthier, and more unified Yale community.

Non-recreational biking as a means of traversing urban environments is increasing in popularity globally. This method of commuting has been shown to be fast, efficient, sustainable and healthful. By instituting the infrastructure changes we propose in this document, Yale has the potential to make cycling one of the safest, healthiest and preferred ways to get around campus.

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[13] Gordon-Larsen, P., J.E. Boone-Heinonen, S. Sidney, B. Sternfeld, D.R. Jacobs Jr., C.E. Lewis. 2009. Active commuting and cardiovascular disease risk: The CARDIA study. *Arch Intern Med*. 2009 July 13; 169(13): 1216–1223. doi:10.1001/archinternmed.2009.163; Pucher, J., R. Buehler, D.R. Bassett, and A.L. Dannenberg. 2010. Walking and Cycling to Health: A Comparative Analysis of City, State, and International Data. American Journal of Public Health 100 (10): 1986-1992.

[14] Anable, J. & Gatersleben, B. (2005). All work and no play? The role of instrumental and affective factors in work and leisure journeys by different travel modes. Transportation Research Part A 39, 163–181. As cited in Abdallah, S. et al. 20110. *Measuring our Progress: The Power of Well-Being.* London: The New Economics Foundation.

[15] The Yale Sustainability Strategic Plan 2010-2013. New Haven: Yale Office of Sustainability. Available at http://sustainability.yale.edu/sustainability-strategic-plan-0

Current State of Cycling

A. New Haven

The City of New Haven has invested significant time and resources into cycling infrastructure improvements over the last few years. In 2011 alone, twenty miles of sharrows and bike lanes were added to city streets. The City built a covered bicycle parking area at Union Station, with sixty spaces. Bike boxes (which allow bicycles to stop at stoplights ahead of the traffic) are making their debut in New Haven and are now under construction in conjunction with the new Gateway Community College campus downtown. These and other improvements reflect responsiveness by the New Haven Office of Transportation, Traffic and Parking to the requests and needs of the cycling community. This infrastructure makes New Haven safer and more inviting for cyclists; a meta-analysis of studies on bicycling injuries found that bike facilities (e.g. off-road paths, on-road marked bike lanes, and on-road bike routes) are where bicyclists are safest.[16]

Nevertheless, there is still significant opportunity for improvement. There are gaps that need to be resolved before the various sharrows and bike lanes can be integrated into a comprehensive cycling network. Certain intersections -- like Elm Street at York Street, and South Frontage Street at York Street -- are consistently the location of accidents, and must be addressed.[17] About one-third of cycling deaths nationwide in 2009 occurred at an intersection.[18]

More people are using bicycles to travel in New Haven. This is a good sign, as cyclists' safety tends to increase with more riders on the road; there is "safety in numbers."[19] For instance, from 2000 to 2009, bike crashes in Minneapolis, MN dropped 20 percent, while the number of city bicyclists increased 174 percent between 2003 and 2008.[20]

Another concern is the rate of bicycle thefts in New Haven. Data from the New Haven Police Department shows that 105 bicycle thefts were reported from January to June 2012 (see below).

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[16] Reynolds, C., M. Harris, K. Teschke, P. Cripton, and M. Winters. 2009. The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature. Environmental Health 8 (1): 47.

[17] Spakowicz, D.S., S. Reilly K.M. Heard, M. Abraham, A. Roth, and M. Francis. 2012. *Intersection Safety Report: Identifying the most dangerous intersections on the Yale Campus.*

[18] *U.S. Department of Transportation, 2010.*

[19] Jacobsen, P L. 2003. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. Injury Prevention 9 (3): 205-209.

[20] Flusche, D. 2011. *Ridership up, crashes down: safety in numbers in Minneapolis.* League of American Bicylclists. February 9, 2011. Available at http://blog.bikeleague.org/blog/2011/02/ridership-up-crashes-down-safety-in-numbers-in-minneapolis/

Month (2012)	Bike Thefts < $50	Bike Thefts > $50
January	2	8
February	3	4
March	4	11
April	3	12
May	5	21
June	10	22

Source: http://www.newhavencrimelog.org/

B. Yale

The segment of Yale students and employees who regularly bike as a form of transportation makes up a sizable proportion of the entire Yale population. Currently, many Yale students, particularly graduate students, bike as a form of transportation from their home to the Yale campus. The 2010 Yale University Commuter survey reports that 8 percent of the respondents (n=997) were bicycle commuters.[21] However, this figure is likely a substantial underestimate of the percentage of cycling commuters among graduate students, as the report aggregates data across faculty, staff, graduate and professional students.

Despite the fact that a sizable portion of the Yale community would like to use biking as a form of transportation, there are currently barriers to biking within the Yale campus and the broader New Haven area. There is a lack of biking facilities on the Yale campus and New Haven streets. Indeed, fear of injury and vehicle crashes prevents many Yale students who would otherwise like to bike at Yale from doing so. One of the goals of this report is to argue, based on evidence from other cities, that if Yale and New Haven improve their infrastructure for biking and promote a culture of biking, students and employees will increase their use of bicycling as their primary source of transportation. Such an increase would both decrease congestion on New Haven streets, as students switch from driving to biking, would decrease overcrowding on Yale shuttle lines, and would diminish Yale's environmental footprint.

Yale has already made important improvements to the on-campus cycling amenities and has demonstrated a commitment to a strong bicycling community. Particularly, over the last few years the University has invested in significant additional, high-quality bicycle racks, especially around central campus. In fact, Yale, has been recognized by the League of American Bicyclists

[21] "Latest survey of Yale commuters reveals greener trends." January 2010. *Working @ Yale.* Available at http://working.yale.edu/in-the-know/latest-survey-yale-commuters-reveals-greener-trends

with a recent bronze-level "Bike Friendly University" award. [22]. This makes Yale one of only two Universities in the Ivy League with that designation, and one of only 44 colleges and universities nationwide. Initiatives from the Yale Office of Transportation Options are to thank for much of the forward strides on campus bicycling infrastructure. The Office aims to increase the "car free" population on campus through services and education about cycling, shuttles, trains, and other modes of transport. Additional campus services outlined by the Office include a free shower pass for bike/pedestrian commuters and a Bike Buddies program. However, despite the important strides that Yale has already made towards promoting a bicycle-friendly culture, there is still a great deal that the University can do to improve bicycle infrastructure on campus. In the next section we outline actions that Yale can take to create a campus that is safer for bicyclists and to increase the uptake of cycling as a primary form of transportation.

II. EXISTING CONDITIONS AND RECOMMENDATIONS

a. CONNECTING CAMPUS

The Yale campus stretches North to South across downtown New Haven. With some buildings over a mile apart, many members of the Yale community choose to bike between campus sites. However, little bike infrastructure exists in key corridors used for bicycle commuting across campus, resulting in many bicyclists breaking laws (i.e. riding on sidewalks or the wrong way on a one way street), riding unpredictably, and, as a result, having negative interactions with motorists. The aim of this section is to highlight the existing bike infrastructure on these main Yale campus bike commuter corridors (Fig. 1) and give our recommendations for making commuting in downtown New Haven more amiable for all road users. A review of New Haven's most dangerous intersections shows that several are on the main Yale campus bike corridors[23]. We believe that the implementation of our recommendations will make bike commuting across campus safer and help encourage other members of our community to choose biking as their healthy, environmentally friendly transportation option.

There is mounting evidence that cycling infrastructure that includes physical separation from motor vehicles is significantly safer than non-separated. These so-called "cycletracks" have been found to have a relative risk ratio of 0.72 over on-street cycling while increasing the number of cyclists using that corridor 2.5 times[24]. We therefore believe that building a network of protected bike lanes is a necessary step towards making cycling more accessible to more of the New Haven population, and so chose to use a cycletrack as the central connecting route that unites many of the routes through campus.

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[22] http://blog.bikeleague.org/blog/2012/10/ivy-league-goes-green-with-bicycle-friendly-universities/ Retrieved 25 Oct 2012

[23] Spakowicz, D.S., S. Reilly K.M. Heard, M. Abraham, A. Roth, and M. Francis. 2012. *Intersection Safety Report: Identifying the most dangerous intersections on the Yale Campus.*

[24] Lusk, A. C. et al. Risk of injury for bicycling on cycle tracks versus in the street. Inj Prev 17, 131–135 (2011).

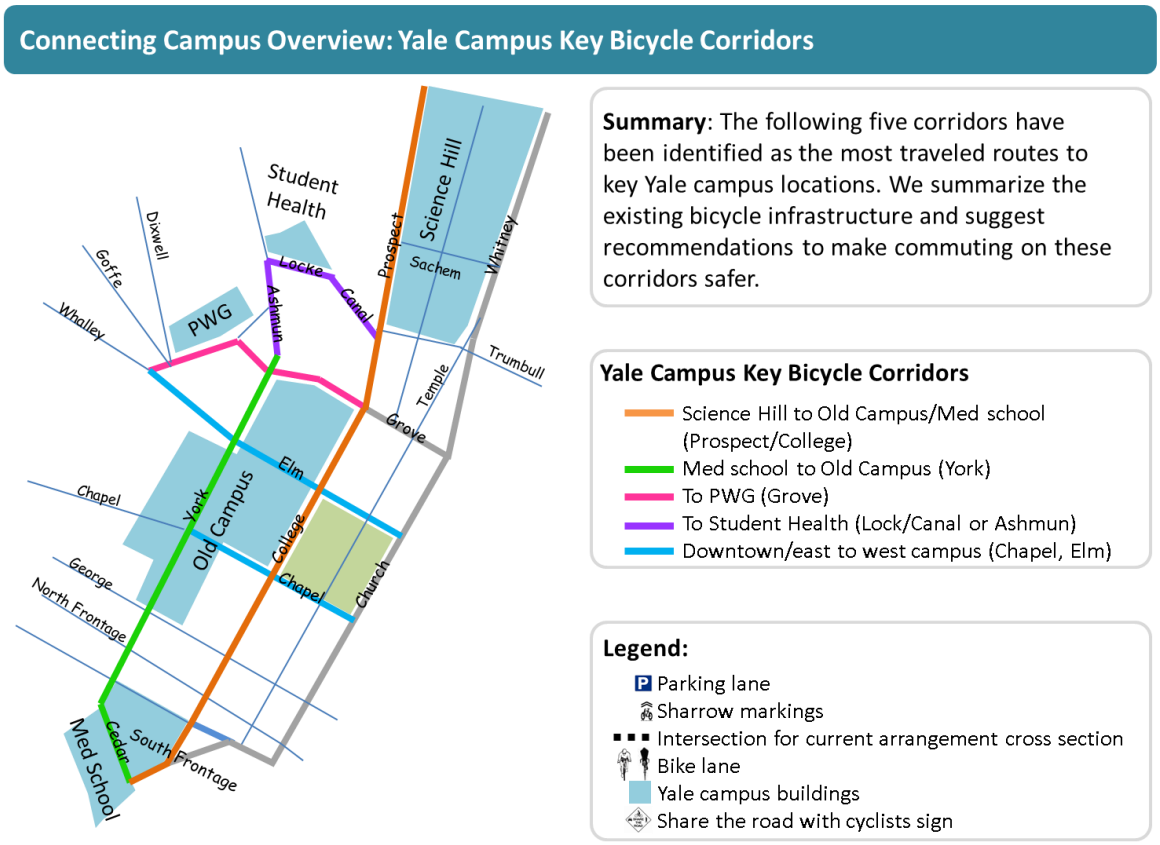


Figure 1: Overview map of most traveled bicycle routes across Yale Campus and downtown New Haven.

We are not the first to suggest such changes. In 2009 the city of New Haven commissioned a report by the consulting group Nelson/Nygaard (NN) to identify gaps in the current pedestrian and cycling infrastructure. NN suggested that cycletracks be placed on in both directions on State Street between Union Station and Grove Street, eastbound on Elm and Westbound on Grove. However, the plans were made before the Downtown Crossings plans and did not provide access to the medical district or new development at 100 College St. While these plans would successfully connect Downtown with Union Station, the same can be accomplished while linking these other vital aspects of New Haven by moving the cycletrack west to Congress/College/Prospect.

This suggested change is consistent with many of the improvements suggested in a recent report commissioned by the City of New Haven to the consulting group NBBJ. This “Bike Network Study” identified College St as a “connective opportunity” and a “gap in need”. In addition, the report identified the need for two-way bike traffic on College St. All three of these points would be solved by the creation of a two-way cycletrack on College St. College/Prospect/Congress is the only street that runs the entire length of campus. We believe that using this street to place the most progressive, safest infrastructure will provide a valuable artery that will instigate responsible road use throughout campus.

While the cost of a cycletrack is significantly higher than a bike lane, a recent cost-benefit analysis has concluded that the benefit of safer biking infrastructure is 4-5 times the cost when taking into account effects on health[25].

The following figures identify the most used travel routes through campus, existing conditions and suggested improvements.

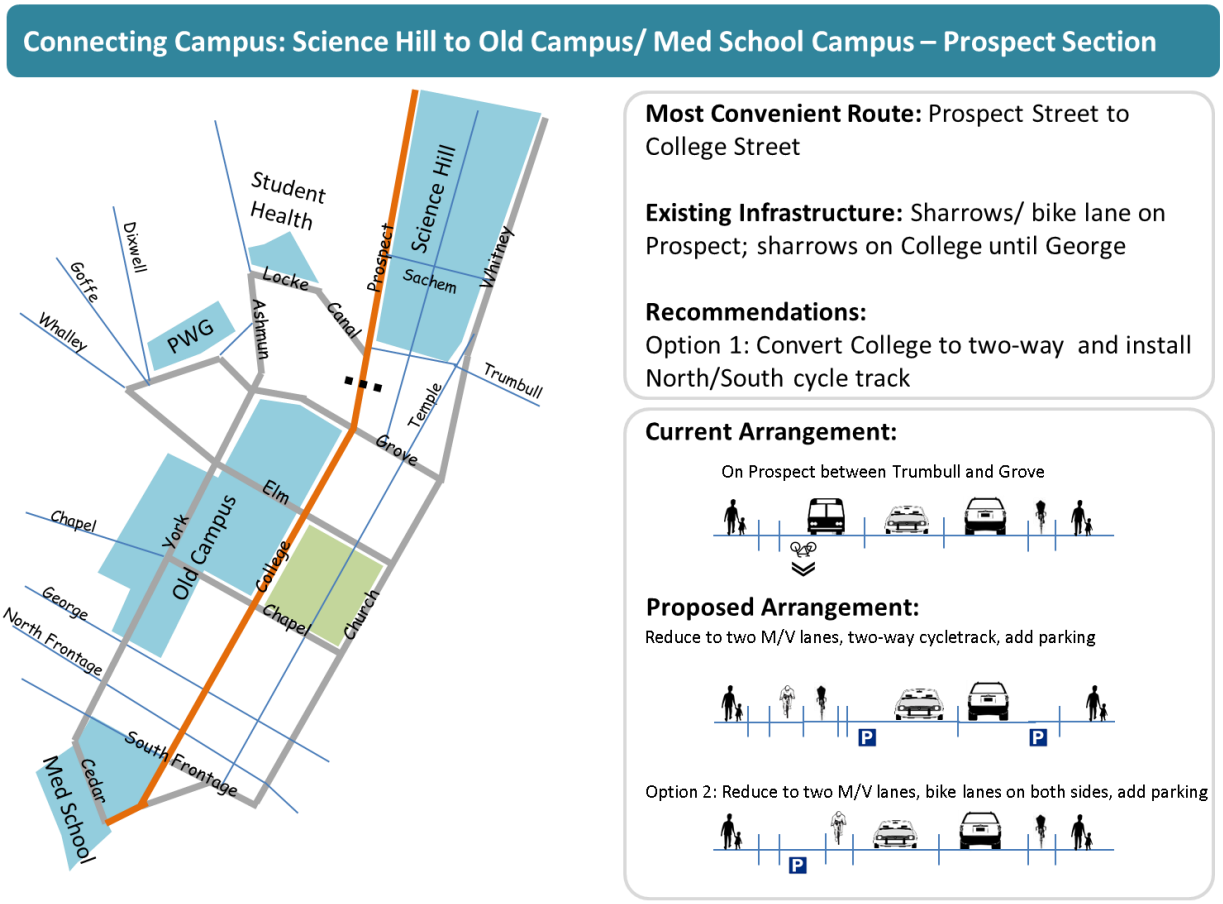
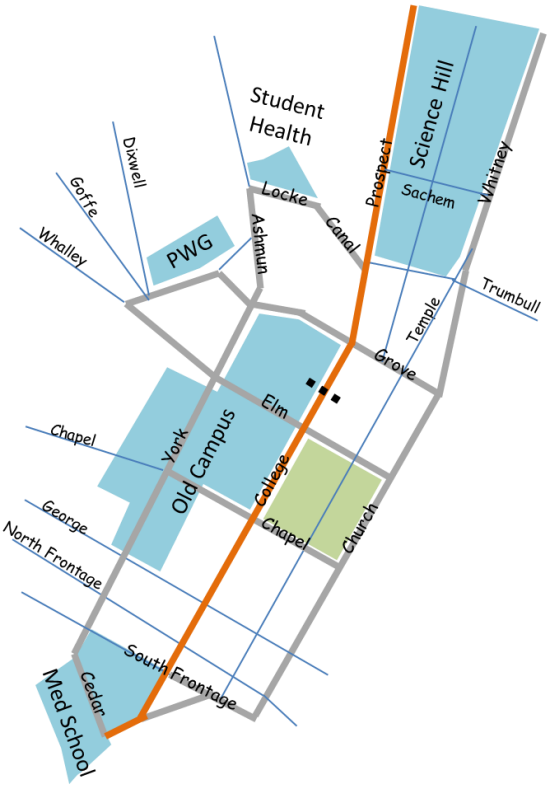


Figure 2a: The most commonly used route from Science Hill to the Med School Campus has minimal bicycle infrastructure in place. The block between Trumbull and Grove on Prospect is the only section on this main artery that has a dedicated bike lane. We recommend converting the bike lane to a two-way cycletrack on this section of Prospect. See Figure 1 for descriptions of symbols.

[25] Sælensminde, K. Cost–benefit analyses of walking and cycling track networks taking into account insecurity, health effects and external costs of motorized traffic. Transportation Research Part A: Policy and Practice 38, 593–606 (2004).

Connecting Campus: Science Hill to Old Campus/ Med School Campus – North College



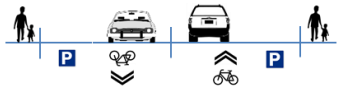
Most Convenient Route: Prospect to College

Existing Infrastructure: Sharrows on Prospect; sharrows on College until George

Recommendations:
Option 1: Install North/South cycle track

Current Arrangement:

On College to Chapel

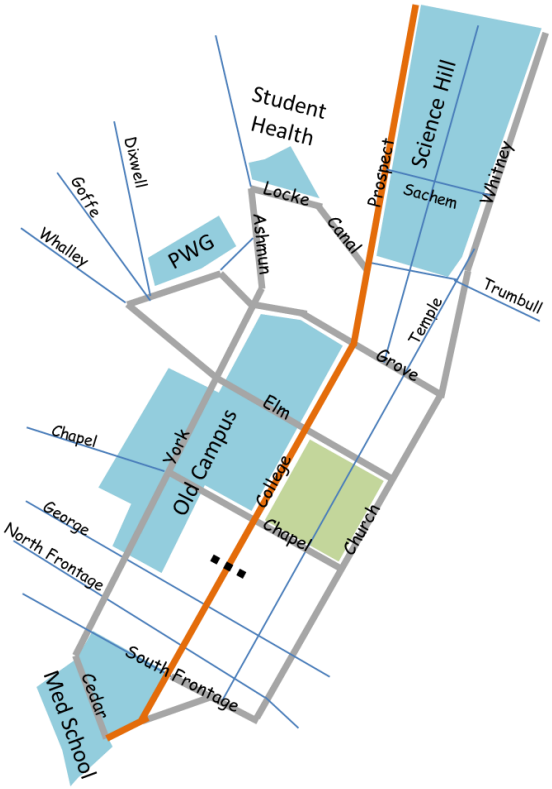


Proposed Arrangement:

Continue two-way cycletrack, remove parking on west side of street

Figure 2b: The most commonly used route from Science Hill to the Med School Campus has minimal bicycle infrastructure in place. We recommend replacing parking on the West side with two-way cycletrack on North College. See Figure 1 for descriptions of symbols.

Connecting Campus: Science Hill to Old Campus/ Med School Campus – Mid College



Most Convenient Route: Prospect to College

Existing Infrastructure: Sharrows on Prospect; sharrows on College until George

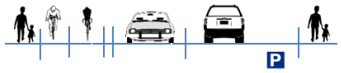
Recommendations:
Option 1: Conversionto two-way & install North/South cycle track
Option 2: Conversion to two-way & add sharrows

Current Arrangement:

On College to Cedar

Proposed Arrangement:

Convert to two-way traffic with cycletrack



Option 2: Convert to two-way with sharrows

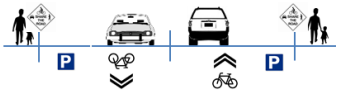
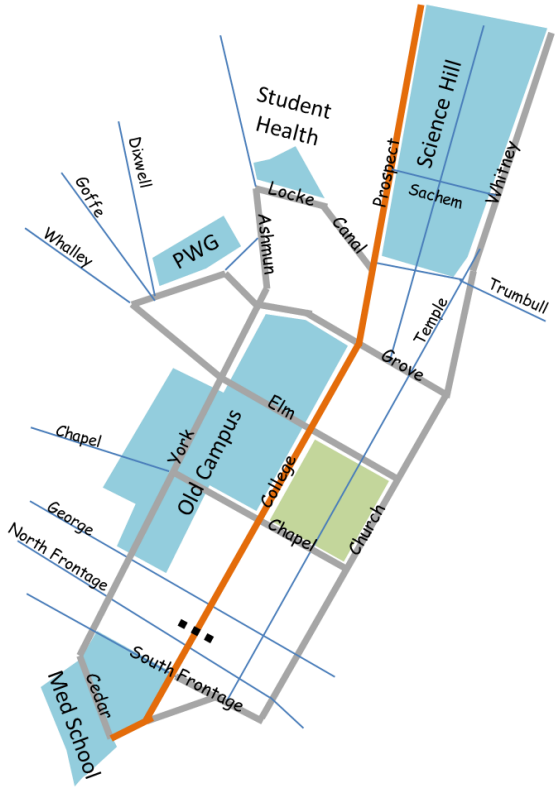


Figure 2c: The most commonly used route from Science Hill to the Med School Campus has minimal bicycle infrastructure in place. We recommend converting College to a two-way street and replacing parking on the West side with two-way cycletrack on the middle section of College. Alternatively we suggest converting College to a two-way street and adding sharrow markings and signage. See Figure 1 for descriptions of symbols.

Connecting Campus: Science Hill to Old Campus/ Med School Campus – South College



Most Convenient Route: Prospect to College

Existing Infrastructure: Sharrows on Prospect; sharrows on College until George

Recommendations:
Option 1: Conversion to two-way & install North/South cycle track
Option 2: Conversion to two-way & add bike lanes

Current Arrangement:

On College between George and Cedar

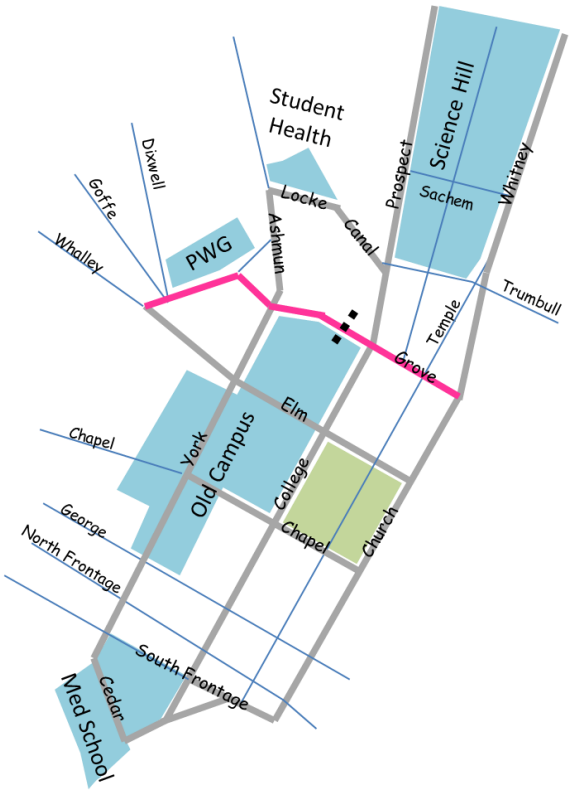
Proposed Arrangement:

Option 1: Convert to two-way with cycletrack

Option 2: Convert to two-way with bike lanes

Figure 2d: The most commonly used route from Science Hill to the Med School Campus has minimal bicycle infrastructure in place. We recommend converting College to a two-way street and adding a two-way cycletrack on the South section of College. Alternatively we suggest converting College to a two-way street and dedicated bike lanes in each direction. See Figure 1 for descriptions of symbols.

Connecting Campus: Payne Whitney Gym



Most Convenient Route: Grove

Existing Infrastructure: Sharrows on Grove

Recommendation:
Option 1: Conversion to two-way street with dedicated bike lanes
Option 2: Dedicated bike lane

Current Arrangement:

On Grove

Proposed Arrangement:

Convert to 2 way traffic with paint-buffered 6' bike lanes in both directions

Option 1: Two-way traffic with bike lanes in both directions

Option 2: Dedicated bike lane

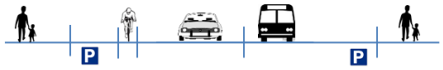
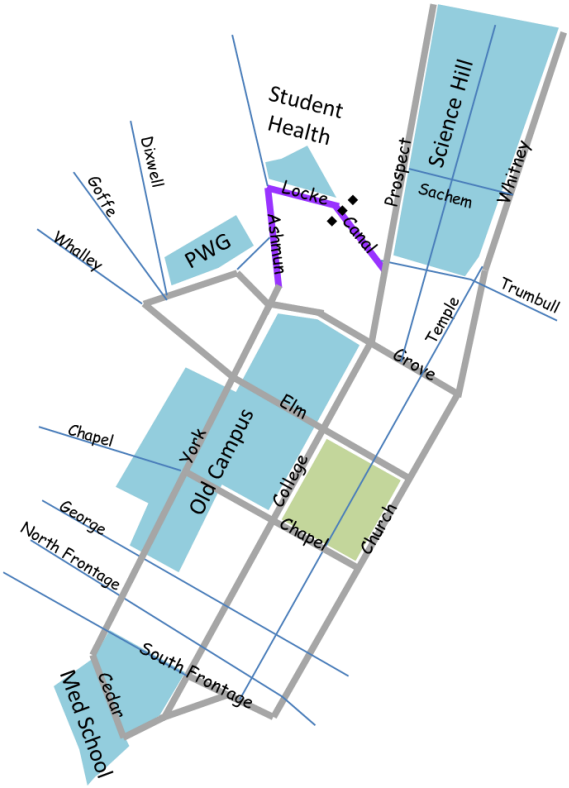


Figure 3: The most commonly used route to travel to Payne Whitney Gym has minimal bicycle infrastructure in place. We recommend converting Grove to a two-way street and add bike lanes in both directions. Alternatively we suggest adding a dedicated bike lane. See Figure 1 for descriptions of symbols.

Connecting Campus: Student Health



Most Convenient Route: Canal/Locke Street or Ashmun

Existing Infrastructure: None

Recommendation:
Option 1: Sharrow markings, signage

Current Arrangement:

On Canal

Proposed Arrangement:
Add sharrow markings in both directions

Option 1: Sharrow markings with signs

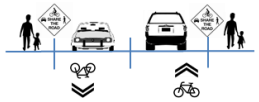
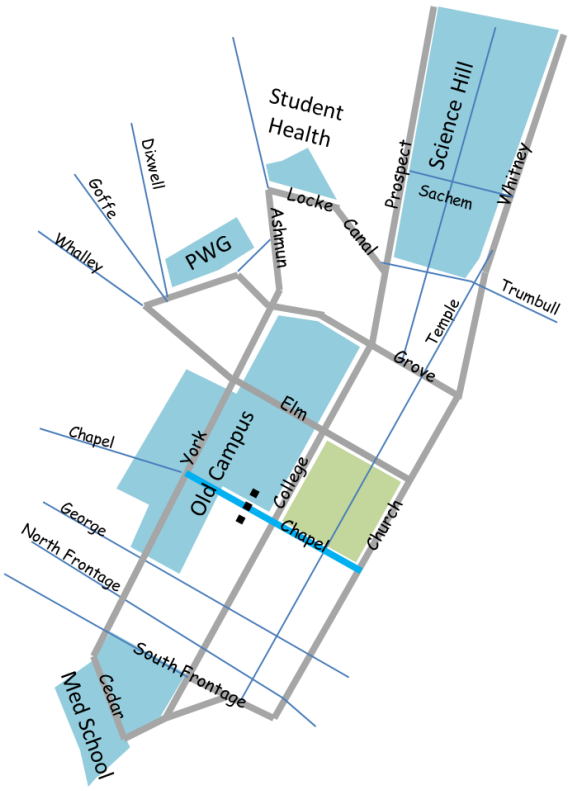


Figure 4: The most commonly used route to travel to the Student Health Center has no bicycle infrastructure in place. We recommend adding sharrow markings and signage to Ashmun and Locke/Canal streets. See Figure 1 for descriptions of symbols.

Connecting Campus: Downtown/ Commuting West



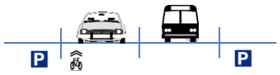
Most Convenient Route: Chapel

Existing Infrastructure: Sharrows on Chapel

Recommendations:
Option 1: Remove parking & add buffered bike lane

Current Arrangement:

On Chapel between College & York

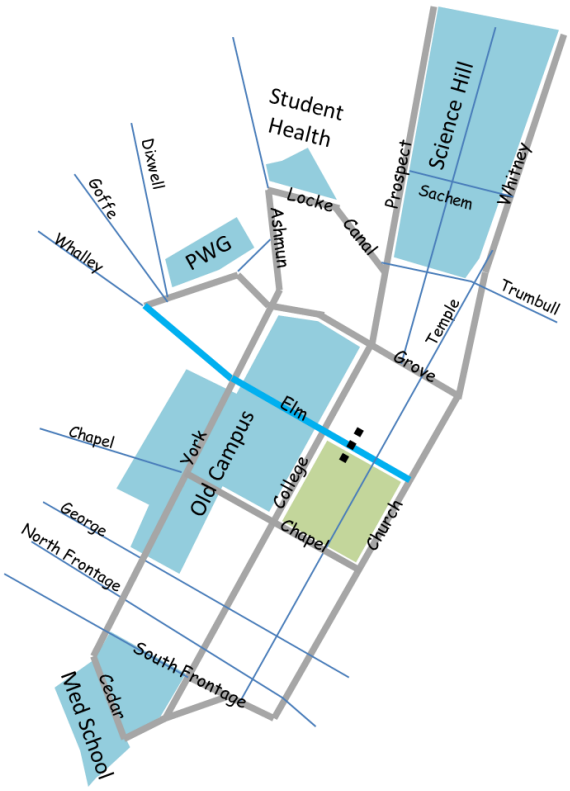


Recommendations:

Option 1: Remove parking and add paint-buffered bike lane

Figure 5a: A commonly used route to travel West in Downtown New Haven has minimal infrastructure in place. We recommend removing one travel lane, converting Elm to a two-way street and installing dedicated buffered bike lanes in both directions. Alternatively we suggest removing one travel lane and adding a two-way cycle track on Elm. See Figure 1 for descriptions of symbols.

Connecting Campus: Downtown/ Commuting East



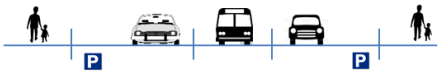
Most Convenient Route: Elm

Existing Infrastructure: Sharrows on Chapel

Recommendations:
Option 1: Conversion to two-way & add buffered bike lanes
Option 2: Two-way cycletrack on Elm

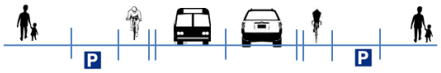
Current Arrangement:

On Elm between College & Church



Proposed Arrangement:

Option 1: Reduce to two M/V lanes, change to two-way with bike lanes



Option 2: Reduce to two M/V lanes, add 2-way cycletrack

Figure 5b: A commonly used route to travel East in Downtown New Haven has no bicycle infrastructure in place. We recommend removing one travel lane, converting Elm to a two-way street and installing dedicated buffered bike lanes in both directions. Alternatively we suggest removing one travel lane and adding a two-way cycle track on Elm. See Figure 1 for descriptions of symbols.

b. COMMUNITY TO CAMPUS

The following map shows the routes commonly used graduate students to commute to Yale from surrounding neighborhoods. While we do not make specific road alteration recommendations for these routes, these roads face the same safety challenges, if not more, than those within campus. Some of the routes designated here utilize existing infrastructure, such as along Orange St., Humphrey St. and Howard Ave., while others purposefully avoid roads that are considered too dangerous, such as routing on Goffe St. instead of Whalley Avenue.

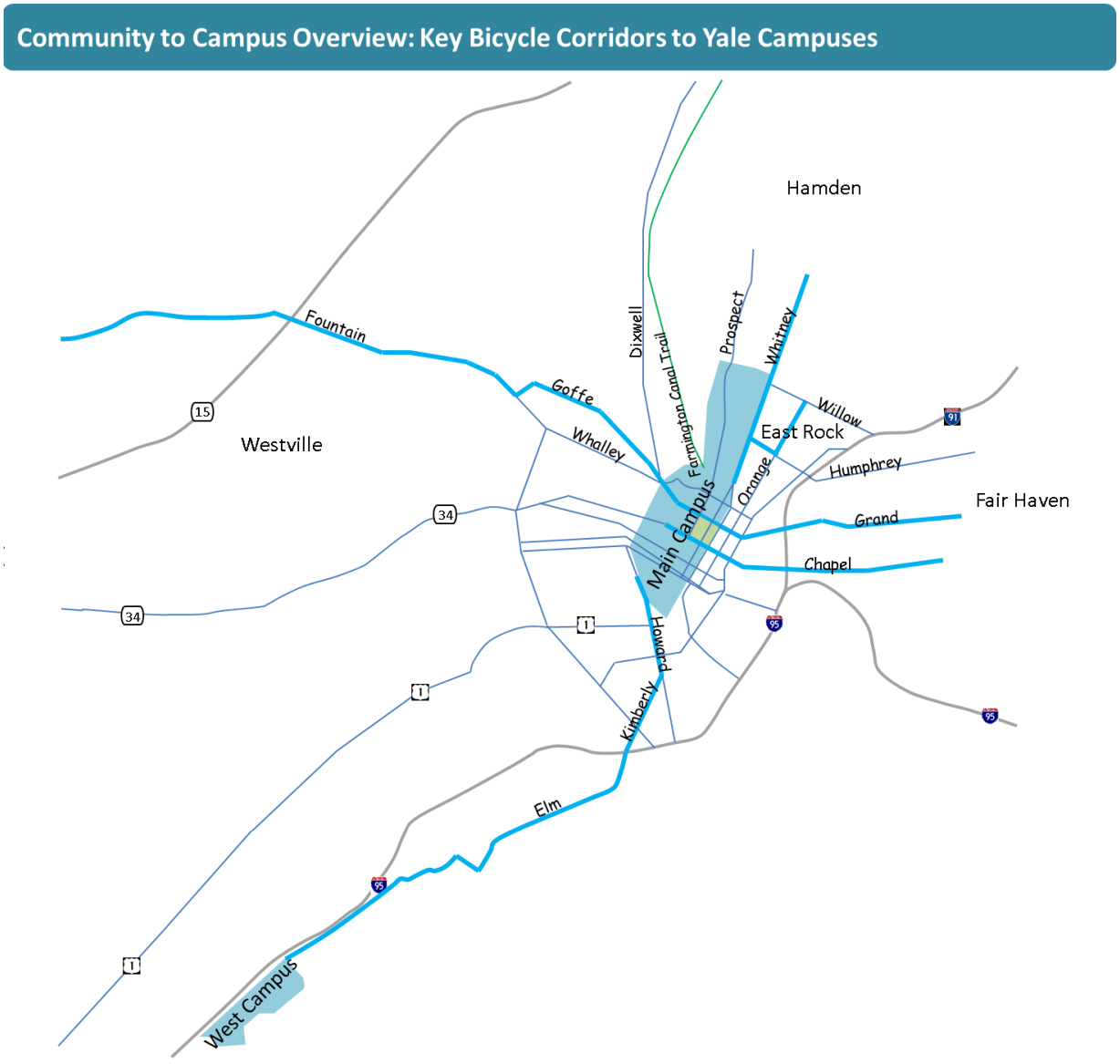


Figure 6: Overview map highlighting bike routes (blue) from the greater New Haven area to Yale Campuses.

c. Short-term recommendations

There are short-term steps that the City can take to cycling safety in New Haven. These steps range from addressing potholes and low lighting on popular bike routes, to installing additional cycling-related signage.

Signs

Strategic signs help communicate important information about cycling – to new students and residents who are unfamiliar with the city's layout and cycling laws, and to drivers not yet accustomed to sharing the road with cyclists.

As recommended by the Bicycle Technical Committee of the National Committee on Uniform Traffic Control Devices, a "Bicycles May Use Full Lane" message on a rectangular white regulatory sign is a good option in areas where the road is too narrow (less than 14' wide) for a bicyclist and motorist to safely share at the same time.

We recommend the following signage installments:

- On North-bound State Street by the I-91 entrance, a sign that says "Bicycles May Use Full Lane" sign. In the longer term, on-road infrastructure would further increase safety at this onramp area.
- Sharrow/signed route showing a route to leave Payne Whitney gym (York Square to Ashmun St., through the health center to Sachem St.). Many people do not know about this alternative to Grove St (which is one-way in the opposite direction).
- More bike signs along narrow the road, e.g. "Bicycles May Use Full Lane"
- "Watch your door" signs alongside the Orange St. bike lane in East Rock
- Signs on Humphrey St. at the intersection with Whitney Ave., alerting cars of the bike lane. (Cars often create a right-turn lane inside of the bicycle lane.)

Potholes and Streetlights

Regular road repair makes cycling safer and more inviting. Prioritizing heavily trafficked cycling routes would maximize the short-term benefit of these actions.

We recommend fixing potholes at:

- Elm St. between York St. and Church St.
- Division St. between Prospect St. and Winchester St.
- Church St. between Elm St. and Grove St.
- Temple St. between Trumbull St. and Elm St.
- College St. between Chapel St. and Elm St.

We recommend addressing streetlight issues at:

- Edwards St.
- Whitney Ave. between Trumbull St. and Bradley St.
- Lincoln St. near Pearl St.
- Division St.
- Prospect St. north of Division St.
- Mansfield St. north of Munson St.

Other infrastructure:

- From the bike path along the Peabody Museum/ Environmental Science Center onto Sachem St. requires an awkward zig-zag along the sidewalk to get to the street. We recommend installing a curb ramp in the sidewalk directly in front of the bike path. We also recommend signs warning cyclists to slow down when crossing the sidewalk and entering the road, as well as signs alerting vehicles that bicycles will "share the road."
- Increase safety at the intersection of Chapel and State by installing a bike box
- Install a bike corral (bicycle parking which replaces one car parking space) on campus
- Repair the broken bicycle lockers at the Medical School (behind Boyer Center for Molecular Medicine).
- Increase bicycle parking in areas with high graduate student traffic, including the Hall of Graduate Studies, the Kroon/OML courtyard, and Payne Whitney Gym.

Other recommendations:

- Use brightly colored bike lanes to increase visibility. For instance, New York City uses green paint rather than white.
- Recognizing that both car drivers and cyclists need to be aware of how to share the road safely, we recommend a public awareness and education campaign for both drivers and cyclists to understand their rights and responsibilities, as was recently introduced in New York City[26].

[26] http://www.nytimes.com/2012/07/24/nyregion/manhattan-court-sends-erring-cyclists-to-remedial-class.html?_r=0 Retrieved 25 Oct 2012

A cyclist uses the bike lane on Stevens Creek Blvd. and Lawrence Expressway in Santa Clara, Calif. which displays the new bright green safety paint on Monday, May 7, 2012. (Gary Reyes/ Staff) (Gary Reyes)
http://www.mercurynews.com/traffic/ci_20567909