

Biking in Manhattan: Connecting Campus to Downtown

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INTRODUCTION

Two major industrial revolutions in this country have led to an increase in fossil fuel use and a mass production of the automobile. Since that time, American cities have been designed to increase the speed and volume of automobile traffic. While the Industrial Revolution created many labor saving devices and has improved the standard of living in many countries, it has also created a new set of problems. An adverse side effect of the increase of fossil fuel use is both an increase in the cost of crude oil used to manufacture gasoline, and an increase in pollution from the combustion of gasoline. Across the country and around the world, communities are planning for and implementing infrastructure to encourage the use of bicycles as an inexpensive and pollution free solution to the problems generated by the increased use of automobiles.

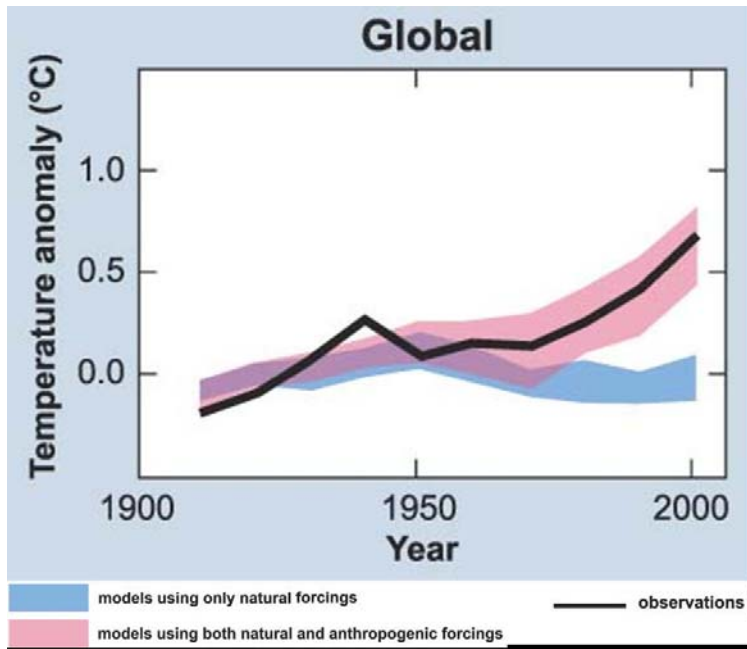
Our paper will detail both the problems and benefits involved with making Manhattan a safer and biker friendly community. We will highlight the reasons for encouraging bike use, and propose two optional bike routes that will connect Kansas State University campus with downtown Manhattan. Providing anchor points for cyclists with a safe path between the two areas will encourage the use of bicycles in Manhattan.

REASONS TO ENCOURAGE BIKING

There are two important reasons for urban planners to encourage cycling over other means of transportation: health and the environment. According to an editorial in the American Journal of Public Health, “Overweight and obesity rates have grown dramatically in recent decades, affecting all racial, ethnic, socioeconomic, and age groups” (Lavizzo-Mourey and McGinnis, 2003). While there are many reasons for this obesity epidemic in America, AJPH notes “the disappearance of sidewalks as one of many environmental barriers to active living” (Lavizzo-Mourey and McGinnis, 2003).

Many modern suburban communities are planned with the automobile in mind. Often there are either no sidewalks or are too far from destination points such as parks, shopping centers or office buildings. This lack of pedestrian/bicycling infrastructure makes driving not only more convenient, but necessary which has contributed to rising rates of obesity and heart disease. Heart disease is linked to obesity and continues to be the number one killer of Americans according to the Centers for Disease Control (CDC, 2009). In order to combat obesity and heart disease, the Surgeon General of the United States recommends adults receive 30 minutes of moderate exercise, five times per week (OSG, 2009). Having the infrastructure available to ride a bicycle would make it more convenient for people to stay active.

The second reason to encourage cycling over other means of transportation is because it benefits the environment by cutting down on pollution and greenhouse gases (GHGs). Certain amounts of GHGs are necessary and desirable because they trap longwave radiation emitted by the Earth, thereby retaining heat and making our planet habitable. “This extra heat retained by the greenhouse effect makes Earth’s surface temperature 31°C warmer than it would otherwise be” says one textbook on earth’s climate (Ruddiman, 2008). There is significant evidence that humans need to curb GHG emissions. A recent IPCC report noted that “the amount of carbon dioxide in the atmosphere has increased by about 35% in the industrial era, and this increase is known to be due to human activities, primarily the combustion of fossil fuels” (IPCC, 2007). It is likely that observed global temperature increases are due to increases in CO₂, methane, water vapor, and nitrous oxide (all GHGs) are brought about by human activity.



Comparison of observed global-scale changes in surface temperature with results simulated by climate models using natural and anthropogenic forcings. (Source: IPCC 2007, Figure SPM-1, p. 11)

Figure 1: Global Temperature Trends

To measure the influence of human activity on increases of CO₂, scientists have reconstructed paleoclimatic data going back 10,000 years by measuring CO₂ found in air bubbles trapped in glaciers. The graph below shows the results of the research. In explanation, the IPCC Fourth Assessment Report says that the increase in abundance of CO₂ and other GHGs “can be readily explained by anthropogenic emissions” (IPCC, 2007).

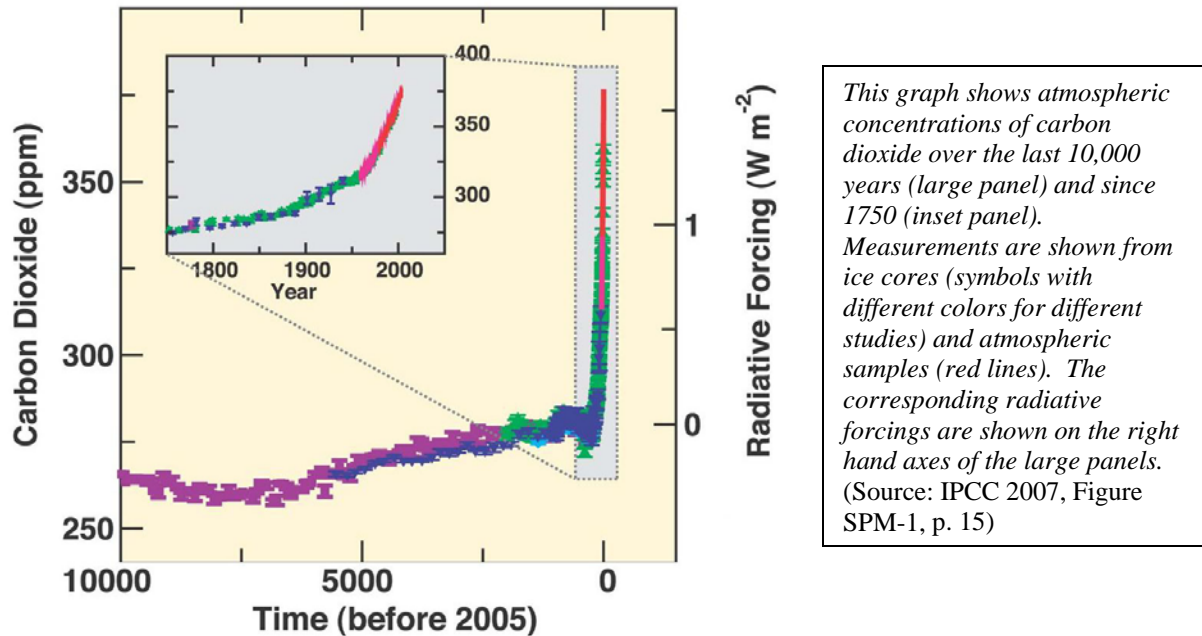


Figure 2: Changes in CO2 Concentrations

BENEFITS OF REDUCING GREENHOUSE GASES

The effect of an increase in GHGs can be seen now, through empirical evidence. The IPCC's *4th Assessment Report, Summary for Policy Makers* lists warming of oceans, glacial decline, and sea level rise as just a few direct effects of warming temperatures (IPCC, 2007). These things may not seem harmful in themselves, but they contribute to coastal flooding, death of coral reefs, more frequent and intense thunderstorms, tornadoes, and hurricanes as well as more intense and longer droughts, and more frequent heavy precipitation events. All these factors bring about loss of crops and cropland, loss of wildlife habitat, and loss of human life.

Benefits to decreasing emissions of greenhouse gases are dependent on the life span of the particular gas in the atmosphere. This means that if we as a society significantly reduce emissions today, there would be a lag-time for each type of gas. "Because of the slow removal

process, atmospheric CO₂ will continue to increase in the long term” says the IPCC report (IPCC, 2007). This is an important reason to begin reducing our emissions now.

HISTORY OF BIKING IN MANHATTAN

According to City of Manhattan Interim Bicycle Coordinator, Dan Oldehoft, it is the goal of both the University and the City to implement a bike plan for Manhattan that uses KSU campus as the central hub and Linear Trail as the outer limit. Metaphorically speaking, the bike plan will resemble a wheel with a hub, spokes, and a tire. Planning for cyclists is much different than planning for motorists and more complicated than simply putting up signage. University of Washington landscape architect Richard Untermann says that, people who cycle daily benefit from continuous, direct, safe routes, while recreational cyclists are in need of aesthetic appeal (Untermann, 1985). In order to encourage cycling, both types of objectives need to be taken into consideration.

In 1998, Manhattan began to develop a plan for a more balanced transportation system to develop a more livable and sustainable community. This would allow people to commute by walking, cycling, or driving. The City of Manhattan and Kansas State University worked together to create a Bicycle Master Plan. The plan called for the implementation of a bicycle coordinator, the completion of Linear Trail, and developing a network throughout the city for cyclists and pedestrians (Landplan). However, the plan has not been implemented until recently. From 1998 to 2008, only one project was proposed concerning cycling in Manhattan. A multi-use path along Marlatt Avenue from Browning Avenue to Walters Drive was proposed to complete Linear Trail in 2003, but the project did not move forward (Oldehoft).

In April 2008, Dan Oldehoft was named the Interim Bicycle Coordinator. To encourage community involvement, the Bike Manhattan website was also created. The website provides information for cyclists as well as a place to provide feedback to the city and voice concerns about cycling in Manhattan. A Bicycle Advisory Committee has also been created with representatives from the City, Kansas State University, USD 383, Riley County Police Department and other organizations. Recently, the City of Manhattan began to develop bike infrastructure and identify biking needs throughout the city. Several needs and possible projects have been identified and some bicycle infrastructure has been developed in newly developed areas of the city (Oldehoft).

In May/June 2008, the City of Manhattan completed a survey concerning bicycling in Manhattan. The survey was sent out with the water bill and approximately 1,000 were returned. The survey did not include the KSU student population, which includes a large population of cyclists. The survey revealed that many cyclists were biking for recreation and exercise, small trips, as well as commuting for work (Oldehoft). The survey and other feedback from the community have helped identify important anchor points within the city of Manhattan. These include but are not limited to the KSU campus, downtown Manhattan, Aggieville, and City Park.

The KSU Campus is an important anchor point because a large number of students, faculty, and staff use a bicycle to commute to campus. The residential neighborhood east of campus has a large student population who frequently walk or bike to campus. Because of the high volume of cyclists who travel to campus everyday it is necessary to provide a safe route to campus.

Downtown Manhattan is also a significant anchor point in the community. Downtown hosts a variety of businesses including banks, retail shops, restaurants, as well as churches, and

Manhattan Town Center. Many downtown businesses are frequent destinations for students as well as places of employment.

Currently downtown Manhattan is undergoing redevelopment at both its north and south ends. The North End Redevelopment will host a number of retail businesses and expand the downtown business district that includes Manhattan Town Center. Final plans for the South End Project are still pending, but may include the Flint Hills Discovery Center, a park, and a movie theater. As redevelopment continues and is completed, the downtown area will become a more frequented destination for cyclists, pedestrians, and automobiles.

Aggieville is another business district that is an important destination for bicycle traffic. Aggieville contains a wide variety of businesses including bars and restaurants, a bicycle shop, clothing and other retail stores. Aggieville is across the street from the KSU campus and is a frequent destination for students and the community at large.

The survey completed by the City of Manhattan revealed that most cyclists are using their bikes for recreation and exercise. With this in mind, parks become an important destination for cyclists. City Park, located south of Aggieville, is a frequent destination for many members of the community including KSU students. The park contains a range of recreation opportunities including an ice rink, tennis courts, baseball diamonds, and a multi-use path. A splash park is currently being constructed along with improvements to the current facilities. Another park of interest is Goodnow Park. The park is located east of the KSU campus at the northeast corner of Fifth and Thurston Streets. Goodnow Park does not see as much traffic from KSU as City Park but is used by residents of the neighborhood.

One of the problems facing cyclists is connectivity. Because many cyclists in Manhattan commute to school and work it is necessary to provide them with safe routes to travel. These

routes should connect anchor points that are frequent destinations for cyclists. Two anchor points the City of Manhattan would like to connect are downtown Manhattan and the KSU campus. After meeting with Dan Oldehoft in March, two corridors were identified as possible bike routes. Route one runs along 14th Street and Poyntz Avenue ending near the Beach Art Museum on campus and at Manhattan Town Center in downtown. Aggieville and City Park are additional anchor points along the proposed route. Route two runs along Thurston and Fifth Streets from the east side of campus to the Courthouse Plaza in downtown. Goodnow Park, located at the intersection of Thurston and Fifth Streets is also along this route.

ROUTE 1

It is our proposal to consider Poyntz Avenue and 14th Street as a corridor from the downtown shopping district to the K-State campus. This route features a variety of key anchor points and is within the goals of the Manhattan and Kansas State University Bicycle Master Plans. It will be helpful to highlight the major attractions and infrastructural features of both streets as well as potential danger zones in order to fully understand our proposed solutions. Both Poyntz Avenue and 14th Street have potential for accommodating bicyclists more safely and efficiently by addressing bicyclist danger zones with the installation of a minimal amount of new structural features. Upon installation, these features will help to eliminate the major bicycling danger zones and will complete the goal of making Poyntz Avenue and 14th Street a major bicycle corridor.

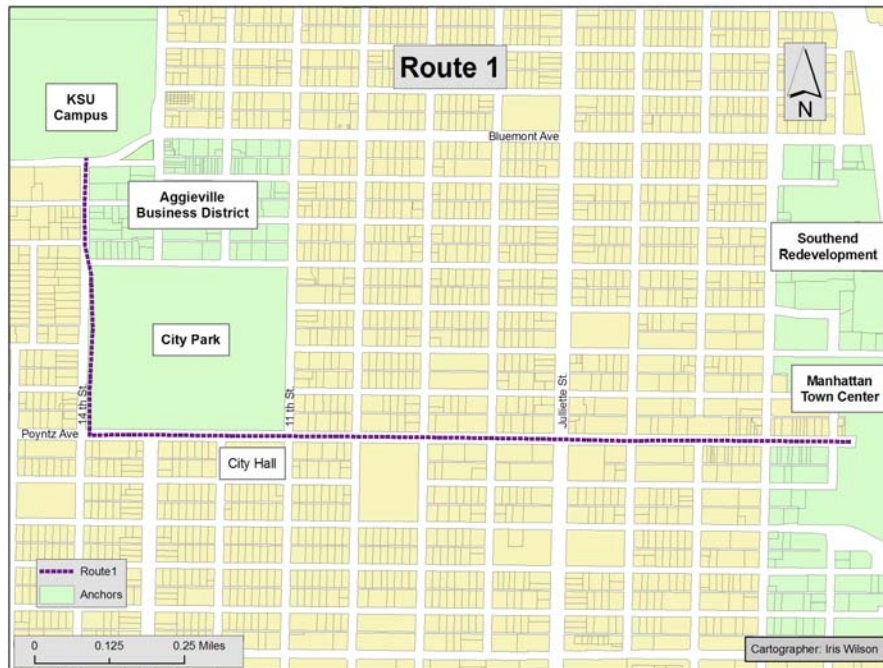


Figure 3: 14th Street and Poyntz Ave

POYNTZ AVENUE

The Poyntz Avenue corridor runs east to west from third street, where the avenue dead ends at the Town Center Shopping Mall to the western side of old Manhattan, where the avenue turns into Westwood Road at Manhattan High School. The corridor features Manhattan’s city hall, court house, City Park, arts center and library as well as a number of churches, restaurants and retail stores including a bicycle repair shop. East Poyntz is characterized by old, multi-storied urban buildings on either side, buffered by wide, tree-lined walkways. This historic section of the corridor is popular for shopping, eating out and strolling. Central Poyntz is characterized by churches, housing and City Park. All of these characteristics make Poyntz Avenue an important destination for students, families and visitors (Bowman 2006).

The infrastructural nature of Poyntz Avenue from 3rd Street to 14th Street is one that has great potential to accommodate bicyclists. Eastern Poyntz (3rd Street to 6th Street) is 100 feet

wide with one wide lane and diagonal parking on both sides and a speed limit of 20 miles per hour.

The section directly west of 6th Street ending at 11th Street is broken into four lanes with a center turn lane beginning at Juliette Avenue (7th Street), and temporary parallel and diagonal parking scattered throughout and on both sides with a speed limit of 30 miles per hour. The section from 11th Street to 14th Street features four lanes with a center turn lane and a speed limit of miles per hour.

Poyntz Avenue, from 3rd Street to 14th Street is currently fairly suitable to accommodate bicycle traffic safely and effectively. The wide lanes in the eastern-most part of the section and the double lanes and center turn lane in the western-most part of the section allow motorists to easily pass bicyclists riding with traffic. The road is in fairly good shape, without many pot holes, few overhanging branches and a lack of excess garbage and broken glass. The traffic counts for a 24-hour period for the intersections at 4th Street and 14th Street are 6,375 and 4,680, respectively (KDOT 2007). These counts are relatively similar to the intersection counts for the surrounding region, and much lower than traffic counts for major streets such as Anderson, Ft. Riley Boulevard and Tuttle Creek Boulevard.

POYNTZ AVENUE PROBLEMS

Potential danger zones for bicyclists include the diagonal and parallel parking sections scattered throughout the avenue as well as the merging of two lanes into one and vice versa near 6th Street. Additionally, there are some areas of the road, in particular the section directly east of 11th Street, which are heavily eroded and dangerous for bike tires. The parallel and diagonal parking sections are currently hazardous because the motorist must pull through or back into a

bike lane in order to access the parking space or the road. Also, most motorists do not know to look for bicyclists before pulling into or out of a parking spot. The merging/diverging of the lanes is hazardous because, again, most motorists do not think to look for bicyclists before merging into or out of a lane.

PROPOSED IMPROVEMENTS FOR POYNTZ AVENUE

The proposed improvements for the Poyntz Avenue corridor from 3rd Street to 14th Street will include installation of structural elements which will eliminate danger zones and advertise the avenue's bikeability to the public. Improvements will include signage, painted bike lanes, bike racks and a curb cut.

To begin, a 5 foot wide bike lane should be installed on both sides of Poyntz Avenue between the roadway and the diagonal parking from 3rd Street to 6th Street (Figure 3). The presence of diagonal parking is the biggest obstacle here as the bike lanes will be placed behind the parking spots. While diagonal parking may seem dangerous to bike around, according to a report from the city planning director of Norwood, Ohio, "diagonal parking reduces lane width and adds potential disruptions to moving traffic, slowing cars down" (Report from Planning Director 2000). This, in addition to the 20 miles per hour speed limit and the pedestrian-oriented nature (crosswalks at traffic lights and in the middle of the street) of the historic downtown area, helps to keep motorists slow and cautious, thus creating a safe environment for bicyclists despite the parking (PPS 2009).

Safety and efficiency can be improved even more if placement of the lanes includes a buffer zone. A buffer zone, as suggested by Michael Ronkin, Bicycle/Pedestrian Program Manager, Oregon DOT, could allow for a buffer between the bike lane and the parking spots so

that longer cars will have leeway, and average and shorter cars will have more room to spot bicyclists. Ronkin notes, “The road [a road in Portland, Oregon] is so wide, that there is room for large parked vehicles, a 3-foot "buffer," a six-foot bike lane and standard (12') travel lanes. There is an 8" stripe separating the bike lane from the diagonal parking” (Ronkin) (Figure 5). A 4 foot buffer zone could be implemented if the street dimensions for this section of the avenue were pared down under standard travel guidelines (AASHTO 1999) as follows: change travel lane from 17 feet (Riley County GIS 2008) to 12 feet, install bike lane of 5 feet, and change diagonal parking from 18 feet to 14 ft. These changes will not impair drivers significantly as 12 foot travel lanes are above the minimum requirements (AASHTO 1999) and the buffer zone will accommodate larger vehicles in parking stalls.



Figure 4: Bike lane adjacent to diagonal parking stalls.



Figure 5: Bike lane adjacent to diagonal parking stalls with additional buffer zone.

A recent installation of bike lanes in the city of New Orleans resulted in an average increase of cyclists by “57 percent from 2007 to 2008” (Hoffman 2009). The installation of bike lanes on either side of the Poyntz Avenue from 3rd Street to 6th Street will improve safety and encourage visitors to bike to the major anchor points of this area (shopping mall, restaurants, etc.).

The next section, westbound from 6th Street to 11th Street and eastbound from 11th Street to 6th Street requires a different approach, as the road diverges into two lanes west bound and converges into one lane east bound. A painted bike lane does not appear feasible, because with two narrow lanes, there is not enough width to install separate bike lanes without elimination of necessary driving space. Also, this section has scattered parallel and diagonal parking on both sides to accommodate weekend shoppers and churchgoers. While the presence of two narrow lanes rather than one wide lane seems like an obstacle, it can actually aid a cyclist in that motorists can easily pass a cyclist by merging into the separate left lane. The center turn lane also allows for leeway when a motorist is attempting to pass a bicyclist. Our proposal is to establish a bike route using minimal construction by installing signs on both sides of the Avenue which warn motorists to watch for bicyclists and direct bicyclists to ride with traffic (Figures 6 and 7). Additionally, the eroded nature of the right lane, westbound, between the First Lutheran Church and 11th Street would need to be repaired as it is unsafe for biking.



Figure 6: Sign indicating a bike route (Manual of Traffic Signs 2006).



Figure 7: Sign directing bicyclists to ride with traffic (Manual of Traffic Signs: 2006).

Eastbound Poyntz Avenue from 11th Street to 6th Street will require a unique solution to address the right lane conversion into a right turn only lane. A sign informing motorists to yield to bikers, will direct bikers who wish to continue eastbound into the lane (Figure 8). The route from this point would then meld into the lane which backs up to the diagonal parking from 6th Street to 3rd Street.



Figure 8: Sign directing motorists to yield to bicyclists.

The final section of the Poyntz Avenue corridor follows the 11th Street intersection to 14th Street and 14th Street to the 11th Street intersection on the opposite side. This section would again feature signs warning motorists to watch out for bicyclists and informing bicyclists to ride with traffic (Figures 5 & 6). The main obstacle in this section is funneling bicycle traffic onto the multi-use path on the perimeter of City Park on 14th Street. Our proposal is to add a significant curb cut and a short painted lane directing bicyclists onto the path (Figures 9 and 10). A sign would be placed before the curb cut to alert bicyclists of the option to either continue west on Poyntz or angle onto the path in order to turn north on 14th Street to approach the Kansas State University Campus (Figure 11).



Figure 9: Curb cut approach to diverting road traffic to a multi-use path (Source: Melbourne Bicycle User Group 2005).



Figure 10: Example of a painted bike lane (Naparstek 2007)



Figure 11: Sign indicating bicyclists may proceed right onto the multi-use path or straight to continue on road (Manual of Traffic Signs 2006).

Bicyclists heading southbound on the multi-use path will encounter a different situation when approaching Poyntz Avenue. Bicyclists will have to remain on the multi-use path until the pedestrian crosswalk signals permission to cross. A sign could be erected across the intersection informing bicyclists to use the pedestrian signs (Figure 12). At this point, the bicyclist will follow the crosswalk until he or she is able to make a left turn onto the far right lane of Poyntz Avenue. Another option is for the bicyclist to ride with traffic when traveling southbound on 14th Street in lieu of multi-use path. This option is relatively safe and efficient because parking has been limited on the west side of 14th Street.



Figure 12: Sign directing bicyclists to use pedestrian signal (Manual of Traffic Signs 2006).

14TH STREET

The 14th Street route that connects campus with Poyntz Avenue is a total of 4 blocks measuring a total of 2400 feet. The route begins at the intersection of Anderson Avenue and 14th Street. Here the bicyclist will travel through the 4 lane intersection at the traffic light. The bicyclist will continue on 14th Street until making a left turn onto Fremont Street. At this point, the route resumes on the multi-use path in City Park, where it connects with Poyntz Avenue. Traveling North from Poyntz towards campus, the bicyclists will ride on the multi-use path, merging onto 14th Street at the path's end. Fourteenth Street northbound then splits into two lanes, one for right turns only, and one for continuing straight or turning left. The bicyclist uses the left lane to continue straight to enter campus.

The multi-use path in City Park is 1500 ft in length from Poyntz Avenue to Fremont Street with a width of 8ft wide. Currently about half of this portion of the multi-use path is paved, while the other half is unpaved. However, future plans in the park, are to completely pave the path as funds become available (Loupe, 2009). The paved portion of the path is made of concrete and the unpaved portion is made of limestone screenings. Both surfaces are bikable. The multi-use path connects to the street by the use of a curb ramp that is 5 ft in width.

Fourteenth Street is in fairly good condition with few potholes, cracks or debris. Parallel parking is located on both sides of the street. There are three streets that intersect with 14th Street including Fremont Street, Fairchild Street, and Laramie Street. Three residences and two businesses also have drives that connect with 14th Street. Fourteenth Street has a speed limit is 30mph and a traffic count of 7945 within 24 hour period (KDOT, 2007).

The Wisconsin Bicycle Planning Guide suggests that when selecting a bicycle route, it important to consider the following factors: directness to destinations, continuity, accessibility, safety, and cost. The 14th Street bicycle route was selected because it shows great potential when considering these factors.

The 14th Street bicycle route is a direct and accessible route that leads to important destination points within the community. Not only does this route connect the community to campus, but it also connects the community with Aggieville and City Park, popular destinations for residents and visitors. With the construction of the new aquatic center in City Park, it is expected that visitation will increase. This will lead to a strain on vehicle parking in the area (Loupe, 2009). Encouraging bicycle use to the park would help reduce this strain. The increase in visitation also reinforces the idea that City Park is a great destination to link the community to.

One major concern that bicyclists have is safety, especially since they are very vulnerable to injury from an accident. Incorporating the multi-use path and the side walk will increase the safety of the bicyclist. This is because it separates the bicyclists from traffic and parked vehicles on the road. Parked vehicles are a safety concern, because it is possible for a bicyclist to be struck when a vehicle door is swung open. It is standard that multi-use paths meet the vertical and horizontal clearance requirements of a minimum of 2 ft horizontal and a minimum of 8ft vertical (National Center for Bicycling and Walking, 2003). The multi-use path in City Park

meets these requirements meaning there are no vertical or horizontal barriers that would restrict site or movement. A multi-use path should also be a minimum of 8ft wide to allow room for a variety of users (National Center for Bicycling and Walking, 2003). The City Park manager Curt Loupe stated that when completed, the path will be 8ft wide, but no wider. Loupe says that this is because if the multi-use path were any wider, it could encourage the prohibited use of motorized vehicles on the path.

When considering implementation of the plan for the 14th Street bicycle route, the question of time and money are a concern. Since the 14th Street bicycle route uses the existing infrastructure, it can help save both time and money. The multi-use path and the road are already in place, and require little modification. The unpaved portion of the City Park path on the bicycle route is already a part of the city park budget plan (Loupe, 2009).

PROBLEMS WITH 14TH STREET

Although the 14th Street route is proposed for its numerous benefits, there are still some concerns, especially regarding safety. According to the Wisconsin Bicycle Planning Guide problems can arise connecting a multi-use path to a road. The guide states that one disadvantage is that a bicyclist may have to travel across the flow of traffic to enter the path from the road. This situation occurs when a bicyclist traveling south on 14th Street must cross the street to reach the multi-use path in City Park. The guide also states that this could influence bicyclists to travel on the wrong side of the road before reaching the path. This could increase the risk of an accident. Another concern according to the Wisconsin Bicycle Planning Guide is that vehicles may not notice bicycles entering the road where path intersects the road. The multi-use path in City Park ends where Fremont Street connects with 14th Street. Vehicles turning onto 14th Street

from Fremont Street may not be expecting bikes to be entering the road. Most likely, the vehicles will be focused on watching for oncoming traffic from 14th Street, not the multi-use path. It is also a safety concern that motorists aware of bicyclists on the road. Drivers that are aware will be more likely to watch out for bicyclists, making the route safer.

The lack of a smooth transition between the multi-use path and road is another issue that needs to be addressed. Currently there is a small curb ramp that connects the multi-use path to the road. The ramp is fairly narrow measuring to be 5 feet. A wider ramp is necessary to allow multiple people to use it at one time. Currently if two bicyclists traveling in opposite directions needed to use the ramp at the same time, a collision is likely to occur. Therefore, it is necessary to provide a user-friendly curb ramp to make the transition both easier and safer.

The bicyclists are not the only people who are faced with challenges, but pedestrians on the multi-use path are also a concern. A multi-use path is open to a variety of users including walkers, joggers, skaters, baby strollers, and bicyclists. It is important that the safety of pedestrians is not over-looked in this plan. Pedestrians can be placed in danger when unaware of a bicyclist that is passing. A collision between a bicyclist and a pedestrian could lead to injury of both the people involved. Besides these safety concerns, conflict can come from other sources such as overcrowding, clashes between different skill levels and speeds, and attitude towards another user group (National Center for Bicycling and Walking, 2003). Designating the multi-use path as a bike route in City Park may affect the quality of the experience of the other users, who are seeking a recreational opportunity. It is important to realize these problems so that the proper steps can be taken to make the necessary improvements.

PROPOSED IMPROVEMENTS FOR 14TH STREET

To improve the condition of the bicycle route and to promote safety, there are many options to consider. There are two main issues concerning the safety of bicyclists. One is that cars may not notice bicycles entering or exiting the multi-use path. The other issue is that vehicles will be entering and exiting 14th Street through roads and entrances to businesses or residences. The solution to these problems is to place signs that warn vehicles that bicycles are common in the area. The following figures are examples of signs that would be used along the route or on the adjacent roadways.



Figure 13: indicates bicyclists ride with traffic (Source: Moeur, 2006)

A share the road sign, would be appropriate to warn motorists that bicycles will be riding with traffic. A sign such as this is not appropriate in all situations, however, it is appropriate when motorists enter a shared lane situation with bicyclists, and when stretches of road are used to connect to a shared use path (National Center for Bicycling and Walking, 2003). This sign would be placed on 14th Street so that it would be visible to vehicles traveling north and south. Since bicyclists will exit the campus and continue on 14th Street, the sign should be placed just south of W. Laramie Street. This way vehicles turning onto 14th Street from W. Laramie Street can see the sign. It is also close enough so that motorists turning from Anderson Ave will also

see the sign. This sign should also be placed visible to motorists traveling north, just south of Fremont Street. This is because bicyclists will be turning left on Fremont, crossing into the other lane.



Figure 14: Indicates bicycles may enter roadway (Source: Moeur, 2006)

According to The Vermont Pedestrian and Bicycle Facilities Planning and Design Manual this sign “alerts the road user to unexpected entries into the roadway by bicyclists, and other crossing activities that might cause conflict” (National Center for Bicycling and Walking, 2003). A sign such as this, would be appropriate to place on Fremont Street before vehicles reach the connection of multi-use path to 14th Street. It is important to notify motorists on Fremont because this is such a risky area for bicyclist. This sign is preferred to the share the road sign because bicyclists are only crossing in front of Fremont Street, not continuing on Fremont Street with traffic.



Figure 15: Indicates bicycle route (Source: Moeur, 2006)

To eliminate confusion of where the route continues, this sign would be useful. Exiting the multi-use path in City Park, bicyclists may need direction. Therefore, this sign should be placed just north of Fremont Street. Exiting campus and traveling south, bicyclists will also need direction. For this purpose, a sign should be placed just south of Anderson Ave on 14th Street. A

sign with a left turn arrow should also be placed near Fremont Street directing bicyclists to turn left onto the multi-use path. These signs will give motorists the knowledge that bicycles will be traveling this route, increasing safety

Providing access to the path is an important factor in creating a quality and easy to use bicycle route. In order for the bicyclist to enter and exit the path over the curb, it is necessary to construct a curb ramp or a curb cut. These are names for a ramp that allows smooth transition from path onto a road (Beneficial Designs, Inc, 2001). The design of the curb ramp is important because it needs to be an appropriate width and slope. It also must have the ability to drain water. This will ensure that it is user friendly. To provide enough room, the ramp needs to be the same width of the multi-use path, which is 8ft. The recommended maximum change of grade is 11 percent. (Beneficial Designs, Inc, 2001). To promote drainage of the curb ramp, the suggested gutter slope is between 0.5 percent and 2 percent (Beneficial Designs, Inc, 2001). This recommendation should be followed to reduce the undesired collection of water at the base of the curb ramp. Lack of water drainage would reduce the quality of the route, making it less inviting for use.

To improve the safety and quality of experience for pedestrians on the multi-use path in City Park, signs should be placed to promote awareness. According to the U.S. Department of Transportation (KDOT), signs should be placed at all entrances to a multi-use path. This way, users enter the path knowing what to expect upon entering. KDOT also state that signs should present the rights of way and passing rules in a clear and simple design. A great example of this type of sign is the one located on the KSU Pedestrian and Bicycle Path located on Denison Ave. The sign states the following rules: no motor vehicles, pedestrians have right of way, travel on

the right side of path, pass on the left side of path, and bicyclists notify pedestrians when passing. The sign is pictured below.



This sign is a great example to follow when creating one for the multi-use path in City Park. The only addition to the rules stated on the sign above, is that bicyclists should not travel at a speed faster than 15mph. The Wisconsin Bicycle Planning Guide states that multi-use paths can become congested with a variety of users making fast speeds of 15mph or more unsafe and undesirable for other users. Making the users of the path more aware of the rules will also enhance their recreational experience. This is because users will less likely place themselves in unsafe positions, reduces their frustration, increases their satisfaction, and they can make educated decisions on whether to enter the path, based on their skill level (Beneficial Designs, Inc, 2001). Therefore, a sign will reduce conflict among different user types of various skill levels, making it safer and more enjoyable for all users.

14TH STREET CONCLUSIONS

Establishment of a connection between the downtown Poyntz area to the Kansas State University campus via a Poyntz Avenue to 14th Street corridor would achieve our goal of encouraging students, families and visitors to use bikes for transportation between the two anchor points and, importantly, the goal of both the Kansas State University and City of

Manhattan bicycle master plans to create connections between the campus and surrounding areas.

The inclusion of Poyntz Avenue in our proposed corridor falls in line with the goals of the Manhattan Bicycle Master Plan. One goal is “Minimize the need for KSU students to have a car.” The Poyntz downtown area is a popular among students for shopping and dining. Establishing a safe bike route on Poyntz Avenue would help to accomplish this goal.

Additionally, Poyntz Avenue is already suggested as a proposed bike route (Master plan).

According to the map of the Kansas State University bike plan, 14th Street is already one of the many suggested bike routes. An objective of the university bike plan is to create links from campus to the community, including neighborhoods. Fourteenth Street is suitable for this objective because it runs through a residential area that includes houses and apartments where students live. This proposed route also connects the campus to other destinations in the community such as the Aggieville Business District and City Park. Both locations are popular areas for students to visit. Since the route links 14th Street to Poyntz Ave., it also connects campus to downtown Manhattan. The Kansas State University Bicycle Plan also states that bike routes should lead to the outer portion of campus with the intention of dismounting bikes within the campus core. Therefore, the bike plan calls for placing bike racks adjacent to the bike routes to discourage bicycle traffic in the core of the campus, where there are too many pedestrians. The 14th Street bike route is successful in achieving this goal because it connects the community to the outer edge of campus with bike racks near by (Campus Development and Planning Committee). Establishment of the Poyntz Avenue-14th Street bike route would help to achieve goals related to the City of Manhattan and Kansas State University bike plans.

ROUTE 2

A second option to connect downtown Manhattan and the KSU campus is creating a corridor along Fifth and Thurston Streets. This route connects to several anchor points in the area and has the potential to connect even more people and destinations with future improvements. Both Thurston and Fifth Streets can accommodate bicyclists currently but there are some causes for concern along both streets.

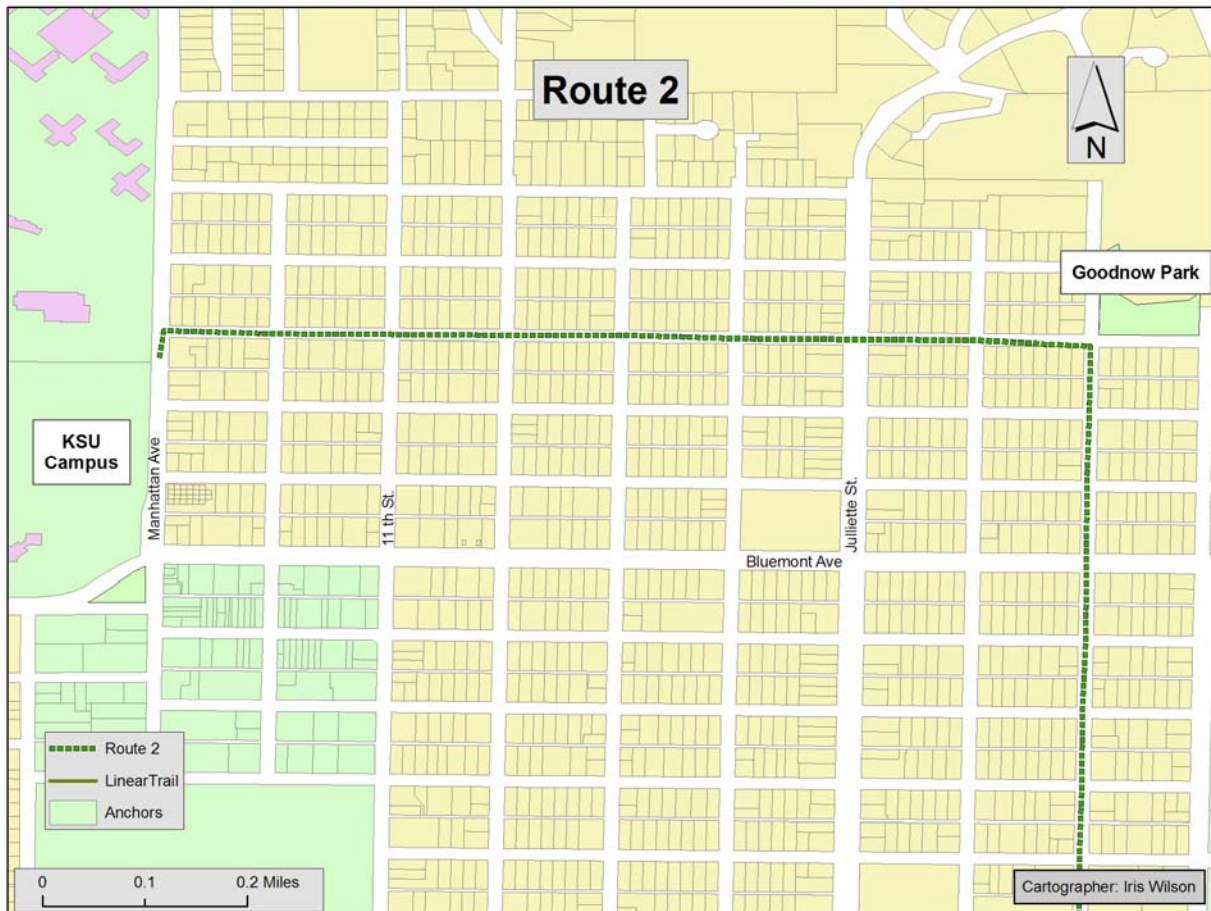


Figure 16: Thurston Street section of Route 2

THURSTON STREET

The Thurston St corridor runs east/west from the eastern edge of campus to Goodnow Park. The corridor is eight blocks long and travels through the residential neighborhood east of the KSU campus. The neighborhood is primarily composed of student housing but family residences are more common further from campus, especially east of Juliette Avenue. Sidewalks line both the north and south sides of Thurston but are only four foot wide and are need of repairs/replacement in some sections. Trees are also abundant in the neighborhood and line both sides of Thurston from the park to campus. Currently, Thurston carries two-way traffic and on-street parking is allowed on both sides of the street. On-street parking is only allowed on the north side of Thurston from Eleventh Street to Manhattan Avenue. The road is in good condition and automobile traffic is relatively low. The speed limit along the route is 30 mph but road conditions (dips and controlled intersections) and pedestrian traffic usually keep vehicle speeds below 30 mph.

THURSTON STREET PROBLEMS

While there are a number of benefits from the proposed Thurston and 5th Streets corridor, there are also a number of problems as well. The sidewalks along Thurston are not wide enough to support bicycle and pedestrian traffic during peak traffic times before and after classes. This would force bicycle traffic onto Thurston and could create another problem with on-street parking. Many of the side streets east of campus are used for parking by students who do not have parking passes or cannot find a parking spot on campus. This creates a considerable

amount of automobile traffic on these streets as well as Manhattan Avenue and may deter cyclists from the route. Trees in the neighborhood could also pose a problem. Many of the trees are quite large and have branches that hang over the street. Storm events may knock off limbs that could hinder both automobile and bicycle traffic. Storm events also present another problem that may deter cyclists, storm water runoff. The streets east of campus do not have storm drains and runoff is carried away from campus by a traditional curb and gutter system. During large storm events east/west streets, such as Thurston, are prone to flooding and it can take several days for all runoff to drain away or evaporate. This problem is most noticeable at intersections in the neighborhood.

Crossing Manhattan Avenue and entering campus could also pose a problem for cyclists. Manhattan Avenue is a major street and automobile traffic can be very heavy when many cyclists will be using the proposed route. Thurston Street and Lover's Lane do not line up directly which adds to the problem of crossing Manhattan Avenue. Currently, cyclists entering campus as a vehicle have to make a left turn onto Manhattan from Thurston followed by a quick right onto Lover's Lane. This is difficult to do when there is considerable automobile traffic. However, cyclists have the option of crossing as a pedestrian at a lighted crosswalk in between Thurston Street and Lover's Lane.



PROPOSED IMPROVEMENTS FOR THURSTON

Thurston is not wide enough to add bicycle lanes and on-street parking would have to be eliminated. On-street parking will also be a problem if Thurston is designated as a bike path. A large number of students use the side streets east of campus for parking and traffic on these streets could deter some cyclists. The intersection of Thurston Street, Manhattan Avenue, and Lover's Lane also poses a problem for cyclists. Thurston and Lover's Lane do not line up directly and crossing as a vehicle requires a left turn followed by a quick right turn onto campus. This can prove particularly difficult when there is automobile traffic. Tree limbs could also cause a problem along the route. Thurston is lined with large trees on both sides and downed limbs could litter the route after storm events.

Unterman has outlined several options for handling bicycle traffic on streets. Several of these options are viable for Thurston. One option is to convert Thurston from Manhattan Ave to 5th St. into a one-way street. The captured lane can then be designated as a bicycle route with enough room for two cyclists to pass each other going in opposite directions. This will still leave enough room on one side of the street for parallel parking. A second option would be to simply slow traffic to 20 miles an hour. The third and perhaps most feasible option would be to eliminate parking on one side of the street and convert it into a bike lane with striping on the road. This last option will require routine street maintenance to keep the gutters free of leaves and other debris that collect in the street.

THURSTON CONCLUSIONS

Thurston's main anchor points are KSU campus and Goodnow Park. Goodnow Park is desirable for the reasons outlined above. Campus is desirable as an anchor point because it is a

daily destination for thousands of Manhattan residents. Many students, faculty, and staff are already using bicycles as their main means of transportation to campus from their residence. It is the desire of city planners to use this anchor as it already exists to encourage campus cyclists to continue to ride off-campus. Thurston is also beneficial because of the fact that there are a significant number of students who live east of campus and could easily use Thurston to get to campus as well downtown.

Thurston is a safe street to use when exiting campus at Lover's Lane. Lighted crosswalks at Thurston and Manhattan Ave. make crossing the street safe because it is highly visible to motorists and is already heavily used by pedestrians. Most through-traffic in the area east of campus uses Bertrand as an east-west route which makes Thurston ideal for cyclists because it separates them somewhat from motorists.

5TH STREET

The Fifth Street corridor runs north/south from Goodnow Park through downtown Manhattan and ends at Linear Trail south of Fort Riley Boulevard. The corridor is ten blocks long and crosses three major four lane roads: Bluemont Avenue, Poyntz Avenue, and Fort Riley Boulevard (Highway 18). The corridor travels through a residential neighborhood until crossing Bluemont. South of Bluemont, the neighborhood transitions from a residential area to a commercial area. The corridor passes by the Post Office and connects to downtown Manhattan at Courthouse Plaza. It then crosses Poyntz Avenue and continues south towards Ft. Riley Boulevard. Crossing Ft. Riley Boulevard at 5th Street is an option, however, the proposed route recommends taking El Paso Lane east to 4th Street and using the stoplight at that intersection to

cross. Upon crossing Ft. Riley Boulevard, cyclists can ride back to 5th on Fair Lane and continue south to Linear Trail.

The street is in good condition and can accommodate cyclists. Trees are abundant in the area but there are fewer over-hanging branches in the road. Sidewalks are present along both sides of the street through most of the corridor except for a two block section between Moro and Vattier Streets. A sidewalk is present on the east side of the road along the entire route. Traffic on Fifth is currently two-way two-lane traffic with on-street parking allowed on both sides of the road. On-street parking is more prevalent in the downtown area than the rest of the corridor.

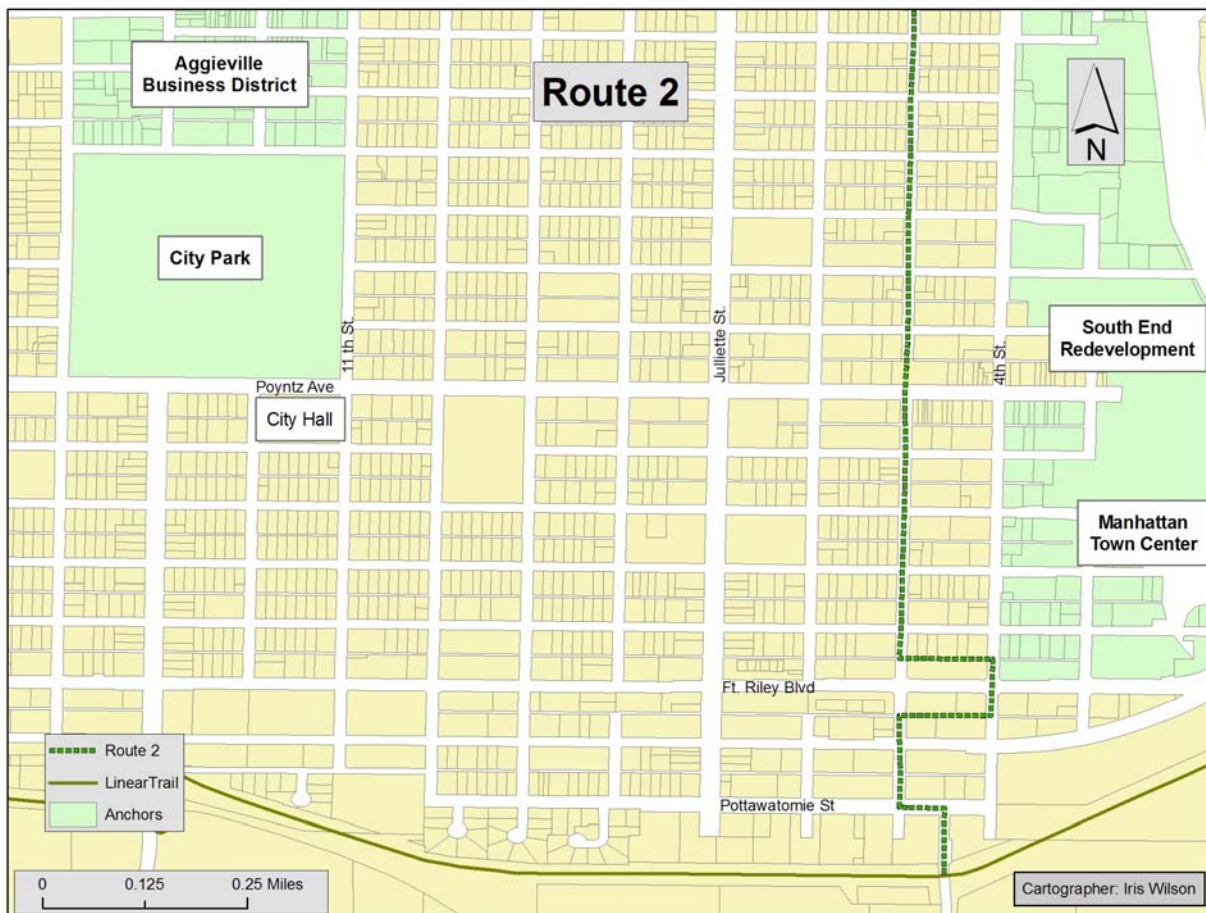


Figure 17: 5th Street section of Route 2

5TH STREET PROBLEMS

Once again sidewalk width poses a problem for this route. However, pedestrian traffic in the downtown area is not as concentrated as campus and cyclists can probably use them if needed. Storm water runoff will also be a problem along this route when crossing east/west streets that move water away from campus. The main problem seems to be crossing the major streets between Thurston and the end of the route at Linear Trail. The proposed route presents an option for crossing Fort Riley at 4th Street but another solution may prove better. Crossing Bluemont is the primary concern of the 5th Street corridor. The nearest traffic lights are at Juliette Avenue to the west and Third Street to the east. By moving the route to take advantage of the traffic lights Goodnow Park may be eliminated as an anchor point and place cyclists on major automobile routes.

PROPOSED IMPROVEMENTS FOR 5TH STREET

Problems encountered for cyclists crossing Bluemont on 5th Street have several options. One idea with a minimum of additional funds required is to install a traffic island. These have already been successfully used on several streets in Manhattan including the intersection at Vattier Street and Manhattan Ave. as well as 14th Street and Anderson. The island could be constructed in a way so as not to impede the flow of traffic.



Another option for crossing Bluemont at 5th St. is to install crosswalk signals similar to the ones along Manhattan Ave. This option may not be as desirable as it may slow the flow of traffic along Bluemont. Traffic flow along Bluemont has been a concern for quite some time. City officials have considered installing a traffic circle at 4th St. Traffic circles are generally hazardous for cyclists, and installing a crosswalk signal just one block from the traffic circle may cause congestion at the circle. The last option would be to treat 5th and Bluemont as a pedestrian crosswalk with no signal. This would mean painting reflective stripes across the Bluemont and installing signage to warn motorists of the potential for cyclists crossing the street.

5TH STREET CONCLUSIONS

Using 5th Street and Thurston as a pathway to connect campus to downtown is beneficial because of its anchor points and its safety. These are two aspects that are important both to city planners and cyclists. It is necessary to have anchor points because they encourage cycling by connecting heavily used portions of town. Cyclists are concerned with safety and will likely use routes that they perceive as being designed for use by bicycles. Richard Untermann says, “Bicycle riding in many American towns and cities, like walking, is neither enjoyable nor safe because of the dominance of the automobile” (Untermann, 13).

5th St. has two main anchor points, Linear Trail and Goodnow Park. Linear Trail is built on the top of a dike and borders Manhattan on the east and south sides. Many recreational cyclists already use Linear Trail for its scenic quality. Linear Trail is easily accessible to 5th St. via Pottawatomie St. without any major investment in infrastructure. Goodnow Park is the anchor point at the north end of 5th St. and is already a destination for families because it has a playground, covered picnic tables, and a large open grassy area. In between Linear Trail and

Goodnow Park, cyclist will also have access to Manhattan Town Center, new amenities associated with the South End Redevelopment and other businesses located downtown.

Cyclists can feel safe using 5th St as a thoroughfare. 5th St. is generally considered by motorists as a side street and therefore is not heavily used by cars. In order to cross Ft. Riley Blvd from Linear Trail one simply needs to ride one block east on Fair Lane and use the crosswalk at 4th and Ft. Riley Blvd. before cutting back over to 5th St. at El Paso Lane.

CONCLUSION

According to the U.S. Environmental Protection Agency, “In the U.S., our energy-related activities account for three-quarters of our human-generated greenhouse gas emissions, mostly in the form of carbon dioxide emissions from burning fossil fuels” ([EPA 2009](#)). Additionally, “about a third [of emissions] comes from transportation” (EPA 2009). One way to approach and correct this problem is to find a new source for transportation. Bicycling has gained worldwide popularity as a clean, safe and efficient means of travel. Our project seeks to increase bicycling popularity in the city of Manhattan and on the Kansas State University campus as a means to lower the carbon footprint of students and residents and accomplish the goals of already-in-place bicycle master plans.

According to the city of Manhattan, “The Bicycle Master Plan seeks to integrate bicycle use into the transportation infrastructure in a manner that will safely and efficiently accommodate cyclists” (Bicycle Master Plan 1990) Promotion of bicycling in the Kansas State University-Manhattan area is the primary goal of both the city and university bicycle master plans. The implementation of a viable route between campus and the downtown Poyntz Avenue shopping district will accomplish the goal of encouraging more students and visitors to bike in

that the route will provide a safe, efficient, healthy and cost-effective way to move people to destinations of interest. Both routes feature a number of important “anchor points,” or key points of interest that attract visitors. Establishing connections using bike lanes, bike route signs and other indicators will help to move people more safely through these corridors. Implementation of either of the proposed routes will connect these major points of interest with the result of less car traffic and a healthier, more environmentally friendly Manhattan.

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Appendix A

