Engineering Studies Capstone, Fall 2017

ANALYZING THE FEASIBILITY OF A NEW FOOTBRIDGE AT KARL STIRNER ARTS TRAIL

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Section 1

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Introduction

"In what ways would a new artistic footbridge at the Karl Stirner Arts Trail enhance Easton's community?"

The Karl Stirner Arts Trail (KSAT), running 1.75 miles along the Bushkill Creek in Easton, PA, is a trail designed to be a quiet recreational space for members of the community. Named after Karl Stirner, a World War II Veteran who was a key player in the revitalization of Downtown Easton's art culture, the trail is also a space to showcase various pieces of art, mainly in the form of sculpture. Currently, the main one-mile stretch along the Bushkill Creek, which showcases most of the art, has only two access points at either end. The KSAT Board has envisioned another access point- a bridge at the corner of Bushkill Dr and Detrich Rd (see Figure 1), serving as a gateway to the Lafayette College campus and the College Hill neighborhood.

As a real asset to the community, we believe that the Arts Trail could be utilized and recognized more than it currently is, and we believe that an additional footbridge would help to do this. At its proposed location, this footbridge has the potential to better connect various Easton neighborhoods, foster a better relationship between Easton and Lafayette College, and improve the social capital and economic growth of the city. Currently, growth is already occurring in this area in the form of new sculpture additions, a winding mulch path branching off of the KSAT toward the river dubbed the "KSAT Nature Trail", the nearby redeveloping Simon Silk Mill, and the upcoming installation of an interactive "Musical Playground", as studied in and made possible in part by a previous capstone report studying the feasibility of a KSAT Musical Playground (found here), completed during the Fall of 2015. This recreation space is being shaped for an appealing, beautiful, interconnected one- the only thing missing being an accessible entryway to the KSAT for about 10,000 of Easton's residents that reside in the College Hill neighborhood (College Hill, 2015), and an additional 2,500 students at Lafayette College during about ¾ of the year.

Figure 1: Proposed Footbridge location on map.

This report serves as a feasibility study for this vision; in other words- an analysis of the benefits and possible drawbacks of constructing such a bridge, as well as how this project fits into the larger narrative of downtown Easton and the Karl Stirner Arts Trail. Undertaken by four senior capstone students from the Engineering Studies department at Lafayette College, this study takes a comprehensive look at the Social, Political, Economic, and Technical contexts surrounding the project. It is designed to serve as the first of potentially many iterations of this project, which will eventually deepen in complexity and technicality. At this stage, our goal was to take a big picture approach and lay the groundwork for future project teams.
The following is a brief overview of each section, which you can read more about on their respective pages.

Social

The Social Context section of this report focuses on the non-technical benefits that could be realized by implementing the footbridge. Special attention is given to how an additional footbridge at the Karl Stirner Arts trail could positively influence the Recreation and Public Health of Easton, its prevalent art culture, and the relationships within the community. By functioning as an additional KSAT art piece and as part of a new gateway between Easton and College Hill, this bridge has the potential to foster a more positive and productive relationship between Lafayette and Easton, increase the recreational possibilities in Easton, and contribute to Easton's thriving art culture. Another focus in this section is the importance of usability, safety, and connectivity in public recreation spaces, and how that can positively influence the physical, mental, and emotional health of community members.

Additionally, in this section, we touch on Environmental concerns. This differs from the previous parts of this section as it describes more cautionary considerations regarding the environment rather than direct benefits. Things to be aware of, which are elaborated on at the end of the Social Context, are the delicacy of the Bushkill Creek environment and how adding a new

footbridge might disrupt this, directly via the construction and physical existence of this bridge, or through increased human usage in this area.

Political

Our analysis of political context surrounding this footbridge chiefly involved personal contact with those who played a role in the project's inception as well those who have insight into the process of engineering projects such as this. Jim Toia, The Chair of Karl Stirner Arts Trail Board of Governance and Dave Hopkins, the Director of Public Works for the City of Easton, were the most valuable of our contacts- both of who we were able to speak to in person. Toia provided insight into how the decision to design this bridge agreed upon and what purposes this bridge was intended to serve. Hopkins, currently doing work on a similar footbridge to be constructed adjacent to the Simon Silk Mill, was able to provide very valuable insight to the process that must be undertaken to successfully implement an engineering project such as this footbridge that we want to see become a reality. The principal challenges that face this footbridge is funding and its long permitting process. In our "Political Context" section, these concerns are explored in more detail, such as who needs to be appealed to for the purpose of acquiring such funding.

Technical

The technical context offers a brief overview of the space in which the bridge would be located, the potential design considerations for the bridge including inspirations from other places, a summary of materials that this bridge could be made up of, and special handicap considerations outlined by the Americans with Disabilities Act and the United States Access Board.

The purpose of this bridge goes beyond utilitarian. As an additional art form and a connection between the communities of Lafayette and Easton, the bridge needs to be designed in a way to make the bridge impart a certain experience and make people want to walk on the bridge. Creative use of materials (the ones analyzed in this report are Stone, glass reinforced plastic, and weathering steel) and art forms could help garner community interest for the bridge. Lastly, this bridge should be accessible to everyone in the community, including the handicap, which comes with a set of specific design requirements to ensure that individuals who struggle with mobility can maneuver the bridge and use the KSAT.

Economic

To understand the overall context surrounding this project, an economic analysis is important. This analysis can be used to highlight a core purpose of this report– to assess the potential value of the proposed footbridge. Ideally, the economic context will shape the ways in which the bridge can add to the trail, which is an asset for the Easton community. To do this, benefit/cost analysis is used so that subsequent steps, such as funding, construction, and maintenance, can be completed effectively.

While this project will accrue various costs, this section is intended to highlight the ways in which the bridge will enhance the overall social connectivity within Easton and its surrounding communities. This is relevant to the economic analysis because as community members utilize the trail and visit the area, social capital will increase. Essentially, this is the idea that walkability will ultimately lead to economic benefits because of the direct relationship people have with economic entities. This section seeks to emphasize how this affects the overall

value of the bridge and the ways in which long term benefits can be created through enhanced social capital.

Challenges

The installation of this footbridge comes with a number of unique challenges, limitations, and obstacles. On the more logistical and technical side, issues of funding, location, and design need to be addressed. This project would come with considerable costs to design, build, and install, requiring multiple funding sources, or one of a large sum. Given the nature of city funded projects as ones focused more on utility and necessity, the source would likely need to be by grant or private Lafayette alumni donors. It may come to be that the limitations in funding in turn determine how this bridge could be designed, as more elaborate designs are likely to involve more material, design time, and therefore higher costs. We discuss these issues of funding more in the Political and Economic sections.

Currently, the proposed location was determined by the KSAT Board and given to us to analyze. While this is the corner that the bridge would be placed for its easy access from College Hill, the exact location within this corner is determined in part by the existence of the IAS Car Dealership This limits the possibility that the corner could turn into a true gateway for Lafayette and the College Hill area, however, the social and economic benefits realized by the bridge are not altered significantly by this fact.

On the more social side of things, any project like this faces the possibility of community opposition. As we elaborate on in the Social Context, we are currently in a moment of tension between the College Hill Neighborhood and Lafayette College, as Lafayette intends to expand into College Hill territory. Given that this bridge is intended to bring those communities together and intermingle them further, it is bound to be the subject of some criticism.

Social Context

The creation of a bridge, any bridge, involves far more than just connecting two points. Likewise, the addition of a bridge to the KSAT concerns a variety of "social", or non-technical, contexts. These contexts can be framed as arguments in support of developing this bridge. We will focus on 3 major contexts: a Recreation and Public Health Context, a Historical and Cultural Context, and a Community Context. In addition, we will focus some attention to environmental considerations as an important area to consider when considering the feasibility and benefits/disbenefits of this project.

Recreation and Public Health

Increasing the Connectivity and Usability of the Karl Stirner Arts Trail

The first and most obvious argument for proposing another footbridge on the Karl Stirner Arts Trail (KSAT) is to increase the connectivity and usability of the trail, a currently underutilized and underappreciated space. When we refer to the trail, we specifically mean the 1-mile section of the trail that lies on the western bank of Bushkill Creek (technically, the KSAT follows the river for 1.75 miles- see dotted red line on *Figure 1*). Currently, the trail has two entrances, at the blue bridge and 13th street. An additional proposed bridge would be placed approximately halfway between these two points (see *Figure 1)*. We would argue that this bridge

would create a more cohesive experience and more opportunities for usage of the trail. Additionally, it would have the opportunity to enhance and be enhanced by additional developments in the works for the KSAT.

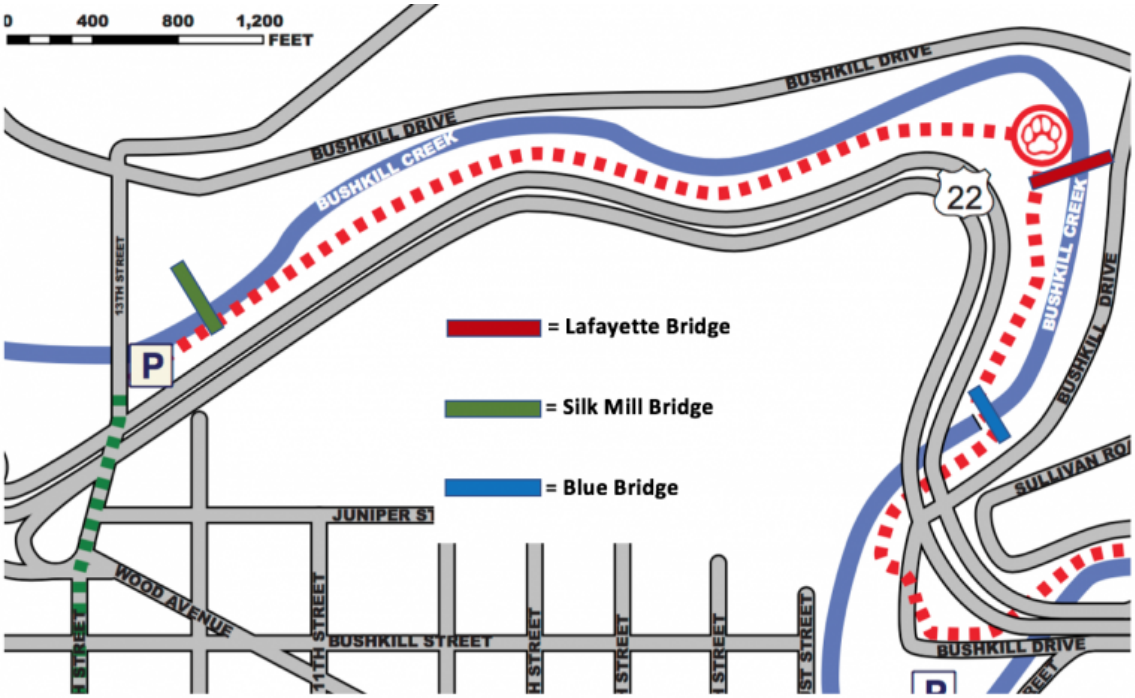

Figure 1: Map of the Karl Stirner Arts Trail, with current and potential future access points shown

The trail as it exists may appear inaccessible to users because of its lack of access points. Those who want to access the KSAT by car can park at the 13th street entrance parking lot, or at a small parking area about halfway between the blue bridge and our proposed bridge (we'll call this the "Lafayette Bridge", for clarity's sake) (*see Figure 1)*, then walk back and enter through the blue bridge. Both of these areas could also be accessed by foot, but the 13th street area is not currently pedestrian-friendly, and the blue bridge is only accessed by snaking through up to a third of a mile of other paths to get to it.

Our proposed bridge would provide an access point that would bring pedestrians directly from Bushkill Drive to the trail, arriving adjacent to the trail's Dog Park. Another project occurring at the trail is a bridge about a quarter of a mile from the 13th street entrance, designed to connect the KSAT with the newly rehabilitated and developed Simon Silk Mill area (D. Hopkins, personal communication, November 2, 2017) (We'll call this the "Silk Mill Bridge"- This bridge has funding and plans, and is expected to be complete during the Fall of 2018). The Technology Clinic, a course at Lafayette College in which teams of students from each academic division work together on imaginative solutions to real-world problems for clients (https://techclinic.lafayette.edu) is working to rehabilitate a train trestle that currently crosses the creek for pedestrian use, creating yet another access point, but we will discuss benefits of our proposed bridge as if this portion was not occurring (The addition of the train trestle rehabilitation would only strengthen our points, and since there is no anticipated start or end date for this project, we cannot consider it as an addition to our argument). The implementation of all

of these access points will turn an out-and-back trail into a connected system of paths, with our proposed footbridge being key in providing variety and increasing the usability of this area.

The benefits of more connected and usable trails are numerous, especially with regards to the wellbeing of the community. A mixed methods research project conducted in Western Australia, published in *EcoHealth,* identified "significant relationships found between perceptions of green space and self-reported health" (Carter & Horwitz, 2014). Community members in this study who had access to green spaces that were perceived as being connected and usable quantifiably reported better mental and physical well-being and used the trails more often than community members who perceived the spaces near then as inaccessible. This shows that merely providing green space for a community is not enough; the space is only as good as the way to get there. Clearly, the perceptions of the residents of how usable, safe, and accessible a space seemed was valuable enough to significantly increase their feelings of mental and physical well-being. In another study, Michael Southworth discussed the value of city planning and design as it could help foster a greater sense of walkability. *Designing the Walkable City* looked at how a more walkable city could increase mental and physical health in the community. One issue that the study mentioned was the issue of obesity and how designing a more walkable community could potentially mitigate high obesity rates. As "walking is the most accessible and affordable way to get exercise" (Southworth, 2005, pg 248), community members would have equal opportunity and availability to exercise. Along these lines was another study done in Los Angeles to address the value of recreation in regards to physical health, which found that areas with more usable parks and nearby green space had kids with lower BMI's (McDonald, p.180). Similarly, green space use has been connected to improved mental health. Rob McDonald dedicated an entire chapter of his book *Conservation for Cities: How to Plan and Build Natural Infrastructure* to Parks and Mental Health, where exposure to nature was credited with providing opportunities for socialization and recreation as well as decreased levels of anxiety, thereby improving the mental health states of users.

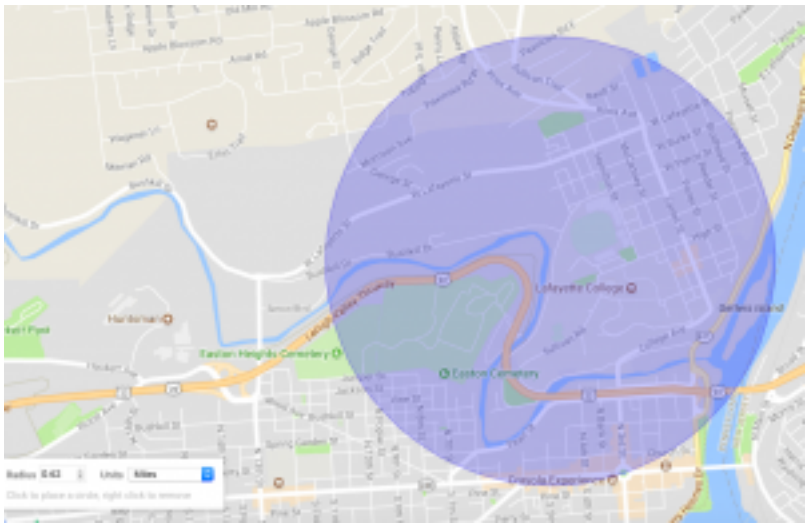

Figure 2: 0.62 Mile Radius from new bridge location

While these physical and mental health benefits can be realized with the use of the Karl Stirner Arts Trail, increasing the usability and connectivity of this space is key to provide the full potential of such benefits. Connected and usable spaces are defined as being in good condition, having visible access points, a clear pathway, and are perceived by users as safe and pedestrian

friendly (Carter & Horwitz, 2014). Further, McDonald found that the majority of park users came from within 0.62 miles, about a 10-minute walk, and living 0.25 miles or less from the parks increased the likelihood of attendance even more. Our proposed footbridge would further both of these ends. Providing another access point would increase connectivity of the KSAT, providing more options for where to walk and more possible opportunities for recreation, provide another visible access point, portray the KSAT as more well-kept, and allow the KSAT to have a further reach of potential users. [Figures 2 and 3 show a 0.62-mile radius from the proposed footbridge and a 0.62-mile radius from the two current entrances and the proposed entrance, respectively. Figure 4 shows a 0.25-mile radius from these same 3 entrances.] In creating a more connected and cohesive environment at the KSAT, users of the trail from many Easton neighborhoods, who currently lie within this 0.25 or 0.62 access range, would benefit. Additionally, having a footbridge near an entrance to both the Lafayette Campus and College Hill neighborhoods makes them more a part of the KSAT narrative, with the bridge serving as an artistic gateway to this section of Easton.

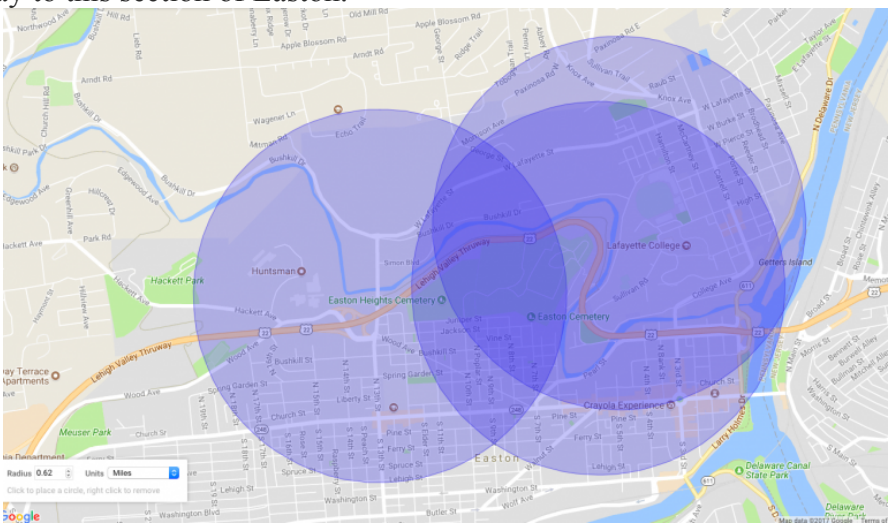

Figure 3: 0.62 Mile radius from 3 access points: 13th street, blue bridge, and proposed new bridge. Users within 0.62 miles of a park are more likely to use it, according to Conservation for Cities: How to Plan and Build Natural Infrastructure by Rob McDonald.

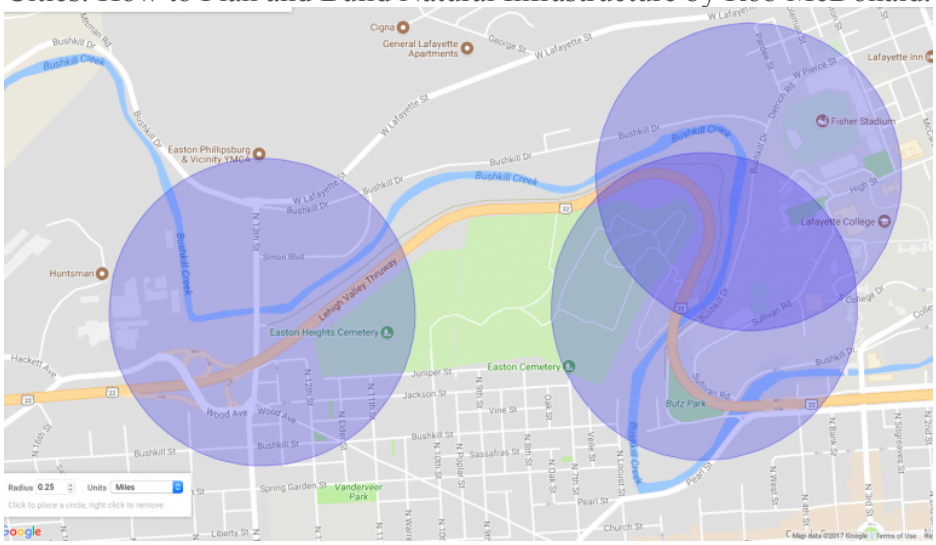

Figure 4: 0.25 Mile radius from all access points. Living within 0.25 miles of a park increases likelihood of attendance (McDonald)

Historical and Cultural Context

Contributing to Easton's Art Culture

The history and culture of Easton also inform the desire for a new footbridge. Easton has a very rich and present art culture, partially to the credit of Karl Stirner himself. Karl Stirner was considered a pioneer of the arts in Easton. Following his service in WWII, Stirner moved to Easton and converted an old factory, located in Downtown Easton on Ferry Street, into the Easton Art Studio. Here, he worked and taught, inspiring artists in the area. In the 1980's, he held art showcases at the studio and encouraged artists to move to Easton. This flourishing of art and creation in the downtown area was a significant spark to the downtown revitalization that followed, and this art culture, largely started by Stirner, has prevailed. (Karl Stirner, 2015) Today, you can see artists set up to paint by the intersection of the Delaware and Lehigh Rivers on a sunny day, or buy the work of local artists at Easton's Annual Riverside Festival of the Arts. The existence of the KSAT itself is an exemplification of this culture, and deserves to be further celebrated and recognized, as it was this culture that helped make Easton what it is today. By acting as an additional art piece to the Karl Stirner Arts trail, our footbridge would further showcase Easton's art environment. Further, the implementation and celebration of art in urban spaces has the ability to contribute to an area's social and economic revitalization, and Easton is no exception.

The importance of art in public spaces is undervalued. The existence of this bridge as an art piece in conjunction with the other KSAT sculptures would create an even stronger public art space and enhance the Easton art culture. In *Art Spaces, Public Space, and the Link to Community Development,* Carl Grodach argues that community art spaces can "enhance social interaction and engagement" (Grodach, 2010) and generate economic activity, as Karl Stirner's studio did in the 1980's. Further, Grodach explains that "the ability of art spaces to realize these outcomes is linked to their role as public spaces", and "their community development potential can be expanded with greater attention to this role". In other words, recognizing an art space as a public space, defined as a "common ground where people carry out the functional and ritual activities that bind a community (Carr, Francis and Rivlin, 1992, p. xi)" (Grodach, 2010), can enhance its ability to enhance the community it is in and generate beneficial activity. The Karl Stirner Arts Trail by nature is the intersection of art space and public space, and our footbridge would be designed to enhance this art space, potentially involving local artists, and furthering these means.

By implementing art in public spaces, surrounding areas have the potential to realize significant benefits. Within the past few decades, the introduction of "the arts" in cities has been recognized as a successful strategy in "revitalizing America's urban centers" (Rosenberg, 2005, p.6). An excellent example of this phenomenon in practice is the construction of Lincoln Center in New York City's Upper West Side. Lincoln Square was chosen as a site of urban renewal in 1955, where the construction of the Lincoln Center of the Performing Arts would occur. In barely a decade, this Lincoln Square transformed from a piece of a rough neighborhood, the same neighborhood depicted in Leonard Bernstein's "West Side Story" (Rosenberg, 2005, p.7), to a cultural hub. In the years following, crime rates reduced, activity and investment in the area increased dramatically, and as a result, "Taxable property in the Lincoln Square area appreciated

1,724 percent between 1963 and 1999-a growth rate three times that of Manhattan" (Rosenberg, 2005, p.7). This is just one example of the many times art has driven social and economic change. The nature of revitalization spurred by art is strong; such that its effects are capable of completely transforming an area, and numerous following generations can benefit from the effects of that transformation. As Easton desires to and makes strides towards becoming an increasingly friendly, walkable, and desirable city, the usage of art can only assist in this endeavor.

Community Context

Enhancing Community Relations: Looking at the Lafayette College- Easton Town-Gown Relationship

Our third relevant context to be considered focuses on the community surrounding the trail, specifically Lafayette College and Easton, which are problematically viewed as separate communities. The current relations between Lafayette and Easton are not operating at their full potential, especially now as the College attempts to march forward with its expansion plans and is met with resistance from College Hill residents. *(see Figure 5).* We will argue that the proposed footbridge at KSAT could be a tool to help enhance this relationship.

Figure 5: College Hill Neighborhood Resident displays signs protesting Lafayette's expansion. Photo courtesy of team member.

The relationship between a university and the area which it is in is often referred to as a town-gown relationship. This relationship has been likened to an arranged marriage that can not be ended, no matter how the respective partners feel about each other. As with any kind of relationship, there are some very successful relationships between towns and universities, and others that are not so much. As Gavazzi and Fox argue, the most desirable and fruitful type of town-gown relationship is a *harmonious* one- or one that involved high levels of effort and comfort on both the town and school's part (Gavazzi & Fox, 2015, p.190). It lends itself to the greatest potential benefits, as opposed to relationships where effort or comfort levels are low. The Lafayette- Easton relationship could currently not be described as harmonious- however if

this could be reached, both Easton and the College could benefit greatly.

The Lafayette-Easton town-gown relationship has a lot of room for growth. Aside from the unwanted expansion, Lafayette may be perceived poorly by members of the community for a variety of reasons. This is not uncommon among many universities and their "gowns"; historically, town-gown relationships have been tense. Part of this stemmed from the adoption of the campus model, when colleges and universities transitioned to being self-sufficient spaces where students could eat, sleep, be educated, and be entertained without leaving the confines of their campus. This created an invisible barrier (Bruning, McGrew, & Cooper, 2006) around campuses, making them appear closed off to community members. This same phenomenon occurs on College Hill. There is a feeling among community members that the neighborhood is divided into Lafayette and then everything else, so when Lafayette threatens to expand, it is natural that the community would feel threatened. Additionally, many university towns, especially those that have tight budgets, "have grown wary of providing services to institutions that are immune to local zoning regulations and absolved from paying taxes (Steinkamp, 1998, p. 24)" (Bruning, et al., 2006), deepening the town-gown divide.

At its location on the fringes of both Lafayette's campus and downtown Easton, the KSAT exists in this in-between space, which has potential to foster interaction between residents of College Hill, Lafayette College, and Downtown Easton. Arguably, Easton's communities may have a poor perception of the College because they are not familiar enough with it, don't spend any time on campus, and have little interaction with the students. The footbridge we are proposing has the potential to be a common space for Easton and the Lafayette community. With a bridge that backs up to campus, students, as well as residents of the College Hill neighborhood, would have a closer, more direct, and safer access to the trail. Considering that the Simon Silk Mill, near the end of KSAT off of Bushkill Dr, is in the process of being redeveloped, there is a potential for the proposed bridge to serve as an easier way to access the Silk Mill, as well as the Silk Mill's existence to encourage more people to use the trail.

The benefits of more interactions between the college and the community extend to both parties, however we would like to acknowledge that an important perspective that is often lost when looking at town-gown relationships is that of the community member. Instead, the focus is often on how to further engage colleges, which provides more immediate benefits to the universities and its students. To turn it around, the benefits of a more engaged community can benefit those community's members, the town-gown relationship itself, and the colleges. A study done by Bruning, et al. looked at these benefits that could be realized when community members took advantage of campus benefits, such as attending cultural, intellectual, and athletic events. The study, which surveyed community members in one town, found that engaged community members tended to view the school more positively and as more of an asset to the town than a nuisance, as they often benefited and felt enriched by their involvement with the school and attendance at events. The universities that are engaged benefit from this as well, as they are better able to deflect criticism from the community, and integrate the teaching, research, and service missions of their college. (Bruning, et al., 2006)

Often, in order to engage universities and towns, the strategy that is often employed is to provide students with access. Instead, "supporting efforts that link the town and the college/university to a common destiny by enhancing the physical assets of the institution while concurrently preserving the heritage of the community" (Bruning, et al., 2006) can better connect towns and universities. When a common interacting space and a common goal is established, the natural thing that follows is a better engaged and positive town-gown relationship. The new

KSAT footbridge could further this goal, as it could connect the two, showcase the heritage of Easton, and contribute to its cultural development.

Environmental Considerations

Environmental considerations also help to frame the motivations for a footbridge. The Bushkill Creek is a known spot for trout fishing, making it a unique ecosystem that we would not wish to interrupt. In addition, the trail area itself functions as part of a delicate and specific environment, and any man-made addition has the potential to impact this. While the KSAT has room for more visitors and is currently underutilized, it is important to keep in mind that introducing too many people to this area is not a good idea either. With an increased amount of people on the trail, it could ultimately have negative effects on the surrounding area due to the increase of foot traffic. Potential issues to consider could be associated with the maintenance of the trail as well as the possibility of increased littering along the trail. With further research which extends beyond the scope of this project, an ideal range of people that could be users of this trail without interrupting the ethos of the area, and an estimate of how many more people might use the trail as a result of implementing this bridge could be found.

The benefits of having such a bridge could also help reduce automobile use in this area. As a new access point, creating greater connectivity and providing more pedestrian-friendly routes to access the trail, the bridge makes travel to the arts trail by car unnecessary for members of the surrounding neighborhoods. As discussed in Michael Southworth's *Designing the Walkable City*, having a more walkable community could lead to a more sustainable community where people feel more inclined to walk rather than drive. This bridge has the potential to encourage people to use "greener' modes of transportation such as walking, biking, etc. and stave away from the use of vehicles. "Walkability is the foundation for the sustainable city; without it, meaningful resource conservation will not be possible" (Southworth, 2005, pg 248). The bridge has the potential to reduce the amount of vehicles on the road and promote a healthier and more environmentally friendly way of transport for community members. Going further, with a decrease in vehicle usage, Easton could also reduce its overall fuel consumption. It would also limit the amount of noise pollution from vehicles on the road which would be supported by nearby community members. This bridge could help transform Easton into a more sustainable city that will improve the well-being of the community.

Political Context

Approach

When approaching the creation of a new footbridge, an engineering project that is supposed to give social benefits to the community of Easton, it is imperative to avoid the pitfalls of similar projects in which such projects have failed. Among the most prominent of these pitfalls is the fact that many of the engineering teams in these projects didn't involve the community earlier on in the projects' development, which has lead to instances of not understanding the community's true needs (Lucena, Juan C., 2010, p. 97). It is also important to place a lot of emphasis on listening to those who are involved with the collaboration (Lucena, Juan C., 2010, p. 117) and a lot can be learned about the decision-making process through listening to the perspectives of those who represent the community and also have different levels of power in the decision-making process. Success in this regard requires engaging with

community contacts immediately and learn as much about their thought-processes and how they represented the community's interests and desires.

In understanding the political context surrounding this project, we developed a strategic list of community contacts that we felt could provide relevant information. Jim Toia was the first name given to us. Our list of community contacts grew larger as Jim Toia suggested we contact Dave Hopkins (Dir. of Public Works for the City of Easton), Mark Mulligan and/or Gretchen Rice. It was apparent that these figures, together, would efficiently lead us in the correct direction in terms of finding information. Both Mr. Mulligan and Ms. Rice work for VM Development group, which is a realty group that focuses on urban redevelopment in the Lehigh Valley. Most importantly, however, this list of contacts should give us a diverse set of information that will allow for us to understand different viewpoints, attitudes, and goals surrounding this project.

As we developed a list of contacts, it is important to note that people who seemed as though they would be a part of the process of making this bridge were not involved. Originally, it would seem that Dawn Hart, Easton's Director of Community and Economic Development, would be able to provide us with the core information surrounding this project. This led to the impression that the arts footbridge was being considered as a development project in Easton. Ms. Hart shared that she had no part in the project and would be unable to provide valuable information. This encounter showed us that simply "engaging the community" might not be enough, and for us to acquire significant information we would need to dig deeper and understand not only who we should contact but why they have a role. Not only will these community members have different perspectives, but they will also have different levels of knowledge, which is dictated but the status of the project.

Conversations with Community Contacts

Jim Toia is being considered the representative of not just the KSAT, but of the art community as well, given his passion and artistic background. According to Toia (personal contact), the idea for the footbridge originated internally during a meeting of the KSAT Board of Governance. This conversation was critical for our problem definition, a crucial component of any policy analysis. The KSAT wants to keep people off the street that runs along the trail (Bushkill Dr.) since the street near the KSAT has fast and heavy traffic, and he also explained that the trail needs more accessibility. Toia explained that the KSAT believes that a new footbridge would be a suitable policy alternative (the action taken to solve the defined problem). The policy analysis would typically involve discussing multiple alternatives and evaluating all of their strengths and weaknesses, but this entire process seems have either been done internally with the Board of Governance or the first idea they had was constructing a new bridge and set that plan into motion. Since this footbridge will be part of an arts trail, the Board also wants the bridge to act as an artistic contribution to the trail. The bridge is also to serve the purpose of giving Lafayette College students greater access to the KSAT, which is meant to foster increased interaction between the Lafayette College community and the Easton community. While this is discussed more in our analysis of the Social Context of the project, it is worth highlighting here that this one of the goals the Board of Governance has in mind when they express desire for this footbridge.

Jim Toia also explained how footbridge contributes to a greater plan for not just for the KSAT, but for several trails and parks along the Lehigh Valley. This push to increase accessibility to the trail is part of a plan to connect several parks and trails to make large

interconnected system that extends all the way across the Lehigh Valley. This is valuable information because it contributes to the focus on connectivity and the ways in which our project can enhance the relationships between different parts of Easton. By taking this larger scale project into account, this project will contribute to larger goal of connecting trails throughout the Lehigh Valley.

Hopkins (personal contact), a major decision maker in the City of Easton, claims that a separate bridge that is being planned as of this report's writing. The bridge our group will be proposing (which we shall refer to as the "Lafayette Bridge") would lie between the bridge Dave Hopkins was talking about ("Silk Mill Bridge", named for the bridge's intent to connect the Silk Mill to the KSAT) and the "Blue Bridge" that already exists perpendicular to Bushkill Dr. (*Figure 1)* In addition to having no idea that the Lafayette Bridge was a plan that the KSAT Board of Governance was discussing, he commented that the Lafayette Bridge would be impractical and costly because the bridge would be in-between two bridges that he considered close enough together on their own to offer an appreciable level of accessibility. In essence, Dave believed that a new access point on the trail was unnecessary and would inevitably fail to receive funding and support.

Figure 1: Current and future potential bridge locations.

Challenges

This information is relevant to our discussion of political context in many ways. It revealed that two very important decision-makers in this process have very different levels of knowledge concerning this project. Understandably, Jim Toia explained that this idea for the "Lafayette Bridge" was still only internal to the Board of Governance, so with that information, the fact that Dave Hopkins did not know about the "Lafayette Bridge" is not surprising. Hopkins' perspective on the footbridge brought awareness of a challenge the "Lafayette Bridge". The challenge, from a fund-acquiring perspective, is the possibility that others could share Hopkins' perspective. The Commonwealth of Pennsylvania (the source of funding for the "Silk Mill Bridge" among other projects) and Lafayette College (the intended primary source of the "Lafayette Bridge" funding) will not be likely to contribute to the funding of a project that they

would perceive as having no reason for being. Granted, the "Lafayette Bridge" is not meant to function for purely for utility's sake – it is also meant to be an artistic contribution to the KSAT. However, the bridge does have to simultaneously serve the functions of being both an artistic contribution and being a useful bridge. If people don't believe it can serve both of these functions, the project likely will not receive the funding it needs. The challenge, then, is to prove that this bridge can serve these purposes and truly is a valuable asset to the trail. These concerns are to be to addressed by adding value through components like art, community connectivity, and public health.

In addition to the social value of the "Lafayette Bridge", it worth noting that the "Silk Mill Bridge" does not fully solve the problem that Jim Toia presented to us. He wanted to give the Lafayette community greater access to the trail while giving people a safe place to walk that is not near the street (personal contact). The "Silk Mill Bridge" will accomplish these things, but for the community that will live in and around the Silk Mill, not the Lafayette community. The "Lafayette Bridge" can work in tandem with the "Silk Mill Bridge" to provide benefits to both the Silk Mill community and Lafayette community alike. Both the KSAT, and Lafayette College, on a fundamental level, share the same goal, so Lafayette College will hopefully be very receptive of the "Lafayette Bridge."

Hopkins also explained that the largest hurdle in the process of making the "Silk Mill Bridge" being the permitting process. It is worth noting that getting the proper permits to construct the "Lafayette Bridge" could also prove to be a hurdle for whatever team ends up continuing the work on the "Lafayette Bridge". Hopkins (personal contact) explained that, for the "Silk Mill" bridge, E&S Permit from the Northampton County Conservation District and a Chapter 106 PADEP Floodplain Management Permit must be completed and approved. Hopkins emphasized that this process takes a long time to complete, stating that the whole process is expected to take about a year. Since the "Lafayette Bridge" and "Silk Mill Bridge" are very similar in terms of location and size, the same process can reasonably be expected to be undertaken for the "Lafayette Bridge" as well.

Community Involvement

Though it was mentioned earlier that we regarded Jim Toia and Dave Hopkins to be our connections to the Easton community, it should be made clear that their thoughts about this project do not necessarily reflect the opinions of all members of the community of the city of Easton. As mentioned earlier, Jim Toia stated that the idea for the bridge has been kept internal and no one outside of the Board of Governance has been consulted. While this is not technically true because Professor Benjamin Cohen (Lafayette College Engineering Studies Department), who is a member of the Lafayette College Board of Advisors to the KSAT, has also been consulted, the takeaway from what Toia said is that the citizens outside the KSAT have not been consulted about the plans to add the "Lafayette Bridge". This is not necessarily a bad thing. The "Lafayette Bridge" is incredibly early in its development so it makes sense that the plans have not been publicly announced. However, it is possible that revealing this plan to the Easton Community in the near future could be helpful for acquiring funds, because if the "Lafayette Bridge" project has a chance to gather public approval, then Lafayette College or donors may want to fund a popular project. It is important to understand that while the community outside of the KSAT and the elected City Government of Easton do not have direct decision-making power in the process of making the "Lafayette Bridge" a reality, their voice still has power and influence in the decision making process given the fact that they are constituents of the City

Government or Lafayette College Students.

Economic Context

Introduction

In order for us to understand Social, Political, and Technical contexts cohesively, it is important to complete an economic analysis so that the footbridge project can provide value to its users moving forward. With projects containing similar scopes, it is crucial that constituencies are able to grasp the contributions that the final product can make to the community. To gain a better understanding of the underlying context, research and community engagement became the most relevant resources. Ideally, information discovered through these two methods will reveal appropriate project "phases" and ultimately shape the ways in which the economics will play a role. Specifically, for this footbridge to come to fruition, city government must be convinced that a "Lafayette Bridge" can bring legitimate benefit to the city of Easton and its surrounding communities. This means that although the bridge will not necessarily bring in direct revenue to firms within Easton, it will connect communities in a way that can leave long-term positive impacts. As a group we felt that simply pricing different materials and construction costs would be an invaluable method in developing future of this project. As we read throughout this course, creating cost estimates and avoiding community involvement would prevent us, and anyone who works on this project in the future, to overlook crucial information. Constituencies will be much more interested in the benefits of this bridge, more so from a non-monetary standpoint, and thus be more inclined to support it if the bridge can be considered to have high value. In addition, if community figures value this bridge, it is more likely to be considered holistically and the final product can be developed to its full potential.

Initial findings

In the initial stages of this project it was clear that relevant background information would set up the subsequent steps of this young project. Through research, the economic context will naturally be shaped in a way that surpasses basic financial analysis (costs, funding, etc). By taking that research and analyzing similar projects, understanding the surrounding financial aspects can be clarified. According to the Commonwealth Financing Agency, Lafayette College was granted state grants that can be used for development projects like the footbridge. A portion of this grant was devoted to building a pedestrian bridge on the Karl Stirner Arts Trail (Lewis, 2016). This information became a basis for which possible funding information and recommendations could build upon. However, before funding can be considered, the surrounding contexts must be developed and the value of the bridge must have the capacity to outweigh specific costs regarding the bridge.

Additional external sources served as valuable tools that contributed to how our economic context will be shaped. In a place like Easton, where there is a natural divide between different communities, it is important that inhabitants have accessible walkways. If our bridge can facilitate the connection between College Hill, The West Ward, and Downtown Easton the possibility for economic growth can be substantial, creating pedestrian traffic into these places. That being said, neighborhood walkability is created internally meaning that community members are the ones that ultimately decide how enhance this connection (Leyden, 2003, p.

1546). Moving forward this is important for us to consider because this bridge not only needs to be approved by city government, but it needs to be accepted by the surrounding environment and its inhabitants for any sort of benefit to be produced. Users must be able to envision this bridge in a way that will create engagement between different communities, so that the overall perception of Easton becomes more positive.

For projects that involve two main entities, such as city government Lafayette College, engaging with important constituents helps ensure that subsequent steps are completed efficiently. Understanding how Jim Toia and Dave Hopkins conceptualize this project revealed the specific type of funding the footbridge might entail. Jim Toia's economic vision provides potential alternatives, while Dave Hopkins' ideas cater more towards feasibility and how this project might compare to others that he has been a part of. Most importantly, however, gathering information from community contacts helps expose the potential pushback this project might encounter from additional constituents. In *Economic Development for Cities*, John M. Leavy explains that the main strategy to combat conflict is by engaging opposition early in the process and to acquaint yourself with them in a way that expresses the purpose of the project. Again, this project is very young so the initial emphasis should intrigue community members and Lafayette students. The foundation of our analysis, from an economic standpoint, mirrors Leavy's idea that economic growth promotes change– physically, socially, and politically (Leavy, 1990, p. 14). While economic context typically includes financial breakdowns, this analysis highlights the potential for growth within Easton and the opportunity to enhance community connectivity. The bridge can attract students to its new cafe and brewery and also facilitate traffic from The Westward into the College Hill community. All entities involved in this project must understand the value this bridge in order for them to support it and believe in its long term success.

In order to show constituencies, and any opposition, why and how this project should be completed, it is important to present an economic plan so that they can develop their own personal value. In *The Economics of Planning*, Eric John Heikkila lays out a generic layout of phases: define the project, determine who and what has standing, catalog changes to surroundings, and asses the value associated with those changes. While this project will likely expand on this outline, it is notable because decision makers will want to see long term effects that will follow the implementation of a footbridge. A concrete plan of execution is a method that can be used in persuading decision makers that the footbridge is needed and can add value. Jim Toia emphasized that there is large potential regarding the ways in which the new bridge can incorporate art. He repeatedly suggested that the bridge engage users in a way that differs from normal utilitarian use (Toia, personal contact). Long term, this project will not only serve as a connective tool, but it will allow for students to have unique educational experiences. In later steps of this project, contexts will shape around the ways in which the bridge can enhance Lafayette education artistically, within engineering disciplines, and even through geological studies. If contributors are opposed to this bridge initially, then a long term vision, like Professor Toia's, will ideally create support, which ultimately can expedite the funding and construction phases.

Cost Benefit

When trying to think of the "Lafayette Bridge" in the context of a cost/benefit analysis, it becomes difficult because there are very few, indirect monetary benefits that can come from the implementation of a pedestrian footbridge. This means that this project's must be considered in the sense of how well it will accomplish the goals of the KSAT, the City of Easton, and

Lafayette College. The goal of the KSAT is to attract increased traffic to the trail. This will be accomplished by granting easier access to the trail for Lafayette students, which will entice them to perhaps use the trail more often. This could potentially build a greater appreciation for the KSAT among the Lafayette Student body, which could potentially lead to alumni generously contributing to the trail later on. This is not something that can be guaranteed or predicted in a quantitative manner, but it is a possible means of the KSAT deriving an indirect monetary benefit from the implementation of the "Lafayette Bridge".

The "Lafayette Bridge" can also serve to make the community of Easton more walkable. Having a walkable city is very important because walkability adds social capital ("the social networks and interactions that inspire trust and reciprocity among citizens") which enables a city to grow economically (Leyden, 2003, p.1546). Leyden has also discussed "empirical linkages have been found among social capital, the proper functioning of democracy, the prevention of crime, and enhanced economic development" (Leyden, 2003, p. 1546). Though the monetary value of this is not quantitatively countable, the inherent value of these benefits is very apparent and could serve to make the "Lafayette Bridge" a powerful tool in the development of this social capital.

While the costs are more easily quantifiable and can seem quite foreboding when considering a project that will not earn any direct revenue. However, that is no reason to believe that the "Lafayette Bridge" will not be able to offer any value to the City of Easton or Lafayette College. On the contrary, there are several social benefits (refer to "Social Context") as well as potential for economic growth that possibly offset the monetary costs.

Funding

For projects that involve both City Government and College institutions, specific funding is usually needed. This step, however, is usually completed after the surrounding context is fully developed. As mentioned earlier, state public funding had already been provided to Easton for similar development work, and a portion of that funding had been set aside for the Karl Stirner Arts Trail. Moving farther into the research process revealed that all alternatives must be considered with a project as young as the footbridge. Specifically, private funding emerged as an option. Initial conversations with Professor Toia reiterated the potential for pushback, especially pertaining to funding. This confirmed that paying for the bridge is a process that will be dictated largely by how the preceding context develops. On the contrary, he made a point that the "need" for the bridge will outweigh any cost burdens, leaving the potential for private donors to consider providing the funds needed.

Dave Hopkins, on the other hand, accentuated the bridge's ability to connect the community and engage its users. He shared with us relevant numbers and figures, and shared with us what he thinks the bridge will cost financially. While he spoke of another bridge, closer to the silk mill bridge, he believed that the utilitarian purpose resembled our vision of the Lafayette Bridge. The grand total of the silk mill bridge would total $250,000– half of which was accrued from the bridges foundation alone. Other costs came from activities such as mobilization, site restoration, and the repaving of the surrounding pedestrian paths (refer to figure 1). Unfortunately, similar funding to the silk mill bridge is a rather unlikely possibility for the Lafayette Bridge, in terms of state funding. These costs, however, provide a reference for which the range of costs for the new footbridge might be.

Jim Toia's reaction to this new information confirmed Eric John Heikkila's idea that changes must be cataloged and the value of the assets will adapt. By expressing the concerns

regarding the information Dave Hopkins' provided us, it was interesting to see how Jim Toia confronted that conflict. As this project is developed in the future, one step will be finding Lafayette alumni that are willing to donate upwards of $500,000 to fund a bridge that can tie a utilitarian bridge to art, athletics, and education (Toia, personal contact). The various components of this economic analysis need to be utilized strategically to ensure that donors understand the bridge's value. In addition, we highlighted various materials in our technical section help people visualize a final product. This message needs to be conveyed at a large scale so that potential donors will value the potential of enhanced community engagement and ultimately provide the necessary funding for this to come to fruition.

Materials/Arts

MATERIAL	COST (per foot)
Glass Reinforced Plastic	$100-$120
Stone or Brick	$8-26
Self Oxidizing Steel	$70-90 (for pre-fabricated)

Understanding the actual costs of this bridge is an important next step. While there is no design for this bridge, three potential materials have been proposed. These alternatives possess qualities that can make the bridge attractive to users and donors and potentially mitigate costs. Unfortunately, the base costs of these materials range, which makes decisions tough as it pertains to incorporating an artistic component. As mentioned in the technical sections, we analyzed three materials: glass reinforced plastic, stone/brick, and self-oxidizing steel. Glass reinforced plastic would be economically efficient in terms of installation and maintenance but would likely limit artistic value. Stone or brick would provide artists with a unique "canvas" that will be long lasting and become stronger with additional load. Unfortunately, however, installing stone or brick usually takes a long time, which might be undesirable to donors that want to see this project erected quickly. The last alternative is self-oxidizing steel, which is the material Dave Hopkins chose for the silk mill bridge. This material is easily shipped and installed and also is a very cost effective choice. The cost per foot for each of the three materials can be referred to in the Figure below.

In addition to materials, there will be additional costs accrued that must be considered before funding can be solidified. Most of these costs will likely come from labor, construction, consulting services and maintenance. For a pedestrian bridge project with this scope, the process of precasting the structure, shipping, and installation can be done in a rather quick time period. The reason that Dave Hopkins chose weathering steel for the silk mill bridge was due to the convenience of the construction. With that project, consulting services and geotechnical analysis contributed to a large portion of the costs. Implementing the bridge's foundation is the most cost burdening component, because once this is developed it is then a matter of getting the structure on sight. That being said, incorporating an artistically aesthetic structure has the potential to elongate this process. In the future, creating design proposals and collaborating with Easton's local artists will dictate how effectively we can mitigate this auxiliary costs.

Technical Context

Introduction

The ultimate goal of this project is to provide an initial proposal for a footbridge that creates an additional access point to the Karl Stirner Arts Trail. The physical desired product of this project and its successors is a footbridge crossing the Bushkill Creek, connecting the Karl Stirner Arts Trail to Bushkill Dr. (see *Figure 1*). While the scope of this project will not focus so much on the actual design of the bridge and each piece that would be incorporated, we are theorizing the potential of such a bridge. In this section, we will propose design ideas, material options, and identify important technical limitations and considerations. As we are in the initial phases of this project, we hope that the successors of this project will be able to take our ideas and make them into reality.

Figure 1: Approximate distance of proposed footbridge, determined with Google Maps Measuring Tool.

The Space

First to consider is the area where this footbridge would be placed. At the proposed location of the bridge, adjacent to the Easton Dog Park, the river's width would require a bridge spanning approximately 120 feet (See *Figure 1*). The area is comprised of a wide, shallow, flowing river and sloping banks. Because of this, a single span bridge, with footings at either end, would be ideal. This space is also near where Lafayette College Public Safety and Plant Operations have moved to, and is near some of Lafayette College's Living Learning Communities. Given this, a bridge here would do very much to grant increased accessibility since many students may be turned off by the possible inconvenience have having to walk along Bushkill Dr. to get to the "Blue Bridge", a distance of about 1500 ft. (see *Figure 2*).

Figure 2: Distance from proposed new bridge to existing "Blue Bridge" entrance.

The Design

One of the main functions of this bridge would be to serve as an art piece that acts as an extension of the KSAT as a way to draw more people to using the trail. The idea behind this bridge proposal is to use the bridge as a way to garner more people to use the trail while also connecting the Lafayette College community with the community of Easton. As this is the case, the design of the bridge is important to create a sense of interest to walk on the bridge. We have considered a variety of themes and features for the bridge that could help create interest of the bridge.

One of the main priorities of this bridge, from a design point-of-view, is to have a bridge that people want to walk on. Combining art with strong aesthetic value with a design that provides safety and equal accessibility for all is at the forefront of our design priorities. We must consider students and community members as our audience, as this bridge is meant to attract them to the trail. This means that the design has to have something that can attract students from different majors and backgrounds.

One thing that can likely appeal to anyone who would walk the KSAT is the appreciation for the environment. According to Lafayette College Sustainability Director, Marie Fechik-Kirk, students are very active in engaging in sustainability at Lafayette (Gray, 2017). With students interest in preserving the environment, having the bridge embrace environmental education in some way could give whoever is on the bridge comfort that Lafayette College and the KSAT are working together to promote environmental awareness. Also, if any children are on the trail and they use the bridge, it can be very valuable to instill an appreciation of nature in them early on in their development. The bridge would provide an experience for both Lafayette students and members of the community in ways that could foster a positive learning experience about Easton's historical background or STEM education.

Another way to approach the design of the "Lafayette Bridge" from an artistic standpoint is trying to incorporate history of the city of Easton. Easton, like many cities in the United States, has a very rich history. Incorporating this history somehow into the bridge can serve to educate

students and Easton citizens alike about their city's history. Better yet, the "Lafayette Bridge" can also incorporate art representing Lafayette College's history, which can give both communities an appreciation to the history and culture of the other.

It is too early in this project's development to be going as far as making graphic designs for the bridge, but rather we intend on giving ideas and possible avenues for those who inherit this project to explore. In a meeting with Jim Toia, he mutually agreed that this stage of the project is too early to discuss design ideas and concepts for the bridge, but rather think about the purpose of the bridge. As this project will most likely be privately funded, the ideas would most likely be influenced by the funder. (Toia, Personal Contact). We believe that making the act of traversing the "Lafayette Bridge" enjoyable will increase the amount of users on the arts trail. With strong aesthetic value that does not compromise accessibility, especially to those who may suffer from a disability, and has a strong artistic focus (exploring historical aspects of both Lafayette and Easton communities and/or exploring environmental education), the "Lafayette Bridge" can become an educational and aesthetically pleasing experience for Lafayette and Easton community members alike.

Figure 3: Artistic Footbridge in Lake District National Park (UK).

In thinking about what this bridge might look like, it is helpful to look to examples of artistic footbridges in other parts of the world. These inspirations are helpful in creating excitement surrounding a potential new footbridge in Easton. Artistic footbridges such as the ones in Figures 3 and 4 create more than just a utilitarian bridge, but an experience whose design elements allude to the culture and characteristics of a place. These 3 footbridges were designed with the surrounding area in mind, and give users a specific feeling and experience as they walk across this bridge.

Figure 4: Artistic Footbridge in Kyoto, Japan.

For example, the Irene Hixon Whitney bridge (Figure 5) in Minneapolis serves as the epitome of what an artistic footbridge can be. It exists as a continuation of nearby Walker Art Center Sculpture garden (Figure 6), matching the intentions and ethos of this area. With its creatively placed poetry adorned on the sides of the bridge (Figure 7), users can read a poem as they cross the blue and yellow steel bridge, walking through what feels like a tunnel, which contained enough to feel separate from the I-35 traffic rushing underneath you, but still open. It gives the feeling of crossing over on a piece of artwork, not just a bridge. We want the KSAT Footbridge to impart users with these same feelings. It should reflect aspects of what Easton is and what its citizens identify with, while creating an experience for users, and matching the tone set by the Karl Stirner Arts Trail and its various sculptures.

Figure 5: The Irene Hixon Whitney bridge in Minneapolis, MN.


Figure 6: *Spoonbridge and Cherry*, in the Walker Art Center Sculpture Garden (Minneapolis, MN).

Figure 7: Poetry on the Irene Hixon Whitney bridge.

The Materials

We have researched many possible materials that could be used for the bridge and will

recommend three different options that we have determined to be the most feasible. The recommended materials were considered to be the most appropriate material for the surrounding environment, structurally sound material, and economically feasible for a bridge of this scale. We recommend considering multiple materials when determining the most appropriate, structurally sound, and economic makeup of this bridge. For possible structural materials, we compared the advantages and disadvantages of Stone, Glass Reinforced Plastic, and Self-Oxidizing Steel (Weathering Steel).

Stone

One option of interest is stone , which is commonly used for the substructure – the part of the bridge that supports the loads on the bridge (Svrjcek). Using stone provides many advantages, chief among them being strength and longevity. As with any bridge,

Figure 8: Stone footbridge.

strength is an important thing to consider, and stone arches are "immensely strong structures and generally become stronger as they are loaded due to the ability of stone and brick to sustain very large compressive forces." (Dublin City Council). With the "Lafayette Bridge" made for the purpose of increasing accessibility and traffic on the trail, it seems imperative to have a material that is strong enough to handle large quantities of people. Another favorable characteristic of stone structures is how long they can last, one example being one of the gates discovered in Saudi Arabia that are estimated to be about 7,000 years old (Jarus, 2017). Stone structures can last a very long time without needing any maintenance, which would make the costs stop at the construction of the bridge. However, stone is not a perfect solution. Something that could hold stone back from being a fool-proof solution include how heavy it is compared to something like glass-reinforced plastic which could add to transportation costs of the material. Another thing worth noting is the fact that the price of dressed dimension marble and other stone has been trending upward in price in recent years (U.S. Bureau of Labor Statistics), which could mean that the cost of several types of stone could possibly continue to become more expensive in coming years. On the basis of stone being a very strong, durable, low-maintenance, and long-lasting, stone is indeed a viable material to possibly use, at least partially, to construct the "Lafayette Bridge".

Glass-Reinforced Plastic

Next, we chose to look into the possibility of using glass-reinforced plastic (GRP), also known as fiber-reinforced polymer. GRP is a highly versatile composite material that began being used fairly recently in the engineering design world, beginning with Henry Ford in the 1940s using this sort of material for his cars (Smits, 2016). Since then, this material has been used in a variety of pedestrian and bicycle bridges, with a strong

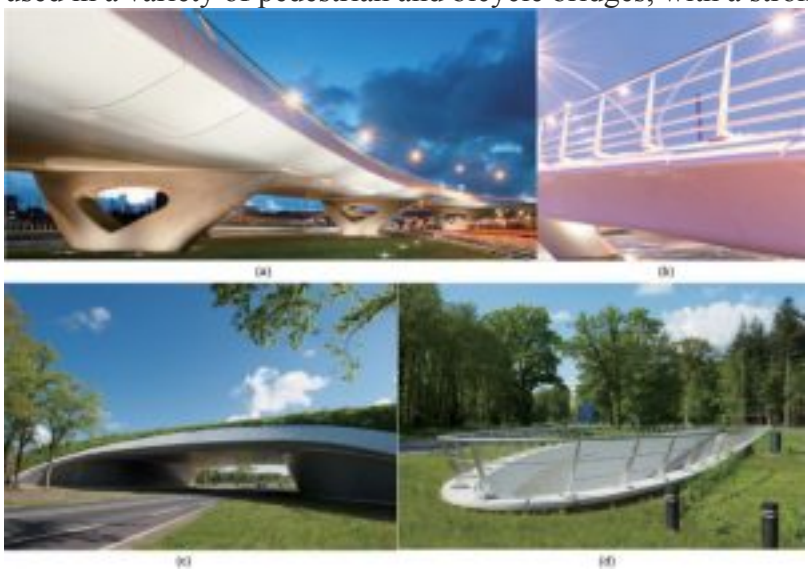

Figure 9: Glass Reinforced Plastic possibilities.

showing in the Netherlands. One of GRP's key benefits which distinguish it from other materials is its extremely light weight. It is "about half the weight of a steel bridge, with the same performance; and it is five times lighter than its concrete equivalent" (Smits,7 2016). This low weight translates to lower transportation costs, lowering its carbon footprint, as well as ease in construction. Additionally, this material is strong, durable, and has a high resistance to corrosion, requiring little maintenance. The benefits of GRP make it an ideal material for remote locations, places near water, and difficult to access sites, making this a fitting option for the Karl Stirner Arts Trail.

In its use, GRP is generally not employed for artistic and architecturally challenging designs, but in fact its properties make it an ideal candidate to be an innovative design material. Because the process of its creation involves heat, it can be formed into nearly any shape (for example, it can be poured into a mold for a variety of camber). *"Fiber-Reinforced Polymer Bridge Design in the Netherlands: Architectural Challenges toward Innovative, Sustainable, and Durable Bridges"* uses a number of examples in the Netherlands as a gateway to describing a number of ways GRP can be used to create bridge designs that may not be feasible with other materials (see Figure 9). Due to its high moldability and ability to be colored, the possibilities for GRP as a structural or artistic material (for addition to a bridge) are far-reaching. (Smits, 2016). As with any material, GRP does have its disadvantages. GRP is more deflective than steel and there is the possibility for this material to weaken at very high temperatures. As far as temperature goes, the climate of Easton, PA is not accustomed to such temperatures so this would likely not be an issue. This flexibility may limit potential designs, but the potential for innovative design, as discussed above, would likely outweigh these limitations.

Self-Oxidizing Steel (Weathering Steel)

Weathering steel is one of the most commonly used material for bridge construction, and it was a material that Dave Hopkins had recommended for this project when we spoke to him (D. Hopkins, personal communication, November 2, 2017). The natural properties of the steel offer a variety of benefits when using it for bridge construction. One of the main benefits of using weathering steel is its high strength and durability. This would be ideal to use because of its long usable life, and it would reduce the amount of time and money used for maintenance of the bridge. One unique property of weathering steel is that is forms a layer of rust (or 'patina') on its surface as it ages. As this provides a protective layer for the steel, many people consider the rust to provide an artistic quality to it that blends in with the surrounding environment. A further benefit to using weathering steel is its environmental friendliness due to its low corrosion rate. Since the rust serves as a protective layer for the steel, this omits the need to paint the bridge with a protective coating to prevent corrosion. The paints that are generally used for bridges of this type contain Volatile Organic Compounds (VOC) which are hazardous to the environment, so eliminating the use for the paints creates environmental benefits as well as cost reduction.

Figure 10: Self- Oxidizing Steel.

While there are many benefits to implementing a weathering steel bridge for the proposed area, there are a couple disadvantages to using this material. One issue surrounds the role of salts as it could be present in water systems or de-icing salts used in the winter. Depending on the concentration and exposure to salts, it could have potential effects on the rusting process of the steel which would increase the level of corrosion and undermine the durability of the structure. Considering the advantages and disadvantages of using weathering steel for our proposed bridge, it remains a strong option (Steel Construction, n.d.). Many of these concerns are negligible as the environment that the proposed bridge would be in do not contain them.

ADA Considerations

While developing a design for this footbridge, ADA(Americans with Disabilities Act)/USAB (United States Access Board) considerations for the handicapped shouldn't be overlooked, as this bridge should be handicap accessible.

Chapter R3 in the USAB Guidelines and Standards discusses many technical provisions which are required in Pedestrian Access Routes. Relevant provisions: a required continuous and unobstructed width of 4.0 ft, a maximum 2% cross slope, and a firm, stable, and slip resistant surface. If stairs of any sort are incorporated, ADA has requirements for ramps that would be an alternative path to these stairs for handicapped individuals. These ramp requirements include: a required slope ratio must be 1:12 (meaning one foot of ramp for every inch of rise), a minimum width of 36 inches, and handrails between 34" and 38" in height on both sides (Express Ramps,

LLC).

Developing an ADA compliant design only requires a bit of extra attention, awareness, and consideration, and would go a long way in increasing the accessibility of Karl Stirner Arts Trail for everybody, including those who are handicapped.

Conclusion

Summary

Because this project is in its initial stages, it is important to reiterate the benefits this project can provide moving forward. The original intention of this project was to create a plan with a footbridge design as the final product. The core purpose of this study, however, is to analyze the feasibility of adding another access point to the Karl Stirner Arts Trail to Bushkill Drive, and to prove that implementing a footbridge will increase the social connectivity within the community and provide an opportunity to portray Easton's rich art culture. In our project, we follow the the principles that guide the Engineering Studies curriculum at Lafayette, which focuses on taking a holistic view of community development projects, contributes to the success of a project, and limits conflict in early stages. Within the scope of this project, understanding social, political, and economic contexts is a mechanism for which the technical components can be completed to its full potential.

Next Steps

To give an idea of the future potential of this project, and to provide knowledge to project groups that may continue this work, we take this section to discuss next steps. Ideally, this will allow for there to be conversations about the bridge that incorporates opinions from multiple parties, including the KSAT Board, Lafayette College, the City of Easton government, and Easton community members. Conversations with Easton's local artists is also crucial in developing a design, which will increase potential for an inventive creation that showcases Easton's rich art culture and fits in with the KSAT ethos. This will distinguish this bridge from the other KSAT access points in the sense that it goes beyond basic utilitarian purpose and has the potential to be folded into a future vision for a sort of Lafayette "Welcome Center" and gateway between Easton and the College at the corner where the current IAS Dealership stands.

With information from community figures and local artists, it will then be appropriate to begin developing designs and focus on targeting potential donors and other sources of funding. To make this possible and to develop an accurate cost estimate, more specifics must be determined such as material, exact dimensions, and so on . When deciding on materials, there will need to be a balance between cost efficiency and the impact it has aesthetically. This differs from more utilitarian, basic pedestrian bridges because designers will typically select the

material that gives the biggest bang for your buck. While that is important, the aesthetic experience is key with this proposal as one of its purposes is to create a bridge that users can engage with upon entering the KSAT. Connecting surrounding communities will lead to social benefits that are currently lacking in Easton. Funding will likely be acquired more easily when the social benefits, as discussed in depth in our Social Context , are highlighted, as they necessitate the existence of an additional footbridge for reasons that go far beyond just a third access point.

Challenges

The challenges that were most prevalent in our research process involved navigating the political construction surrounding this project (read more about this in our Political Context). With the KSAT Board, Lafayette Faculty acting as advisors, and the City of Easton all involved, there are many voices that have input into what happens at the Karl Stirner Arts Trail. The City of Easton often funds more fundamentally necessary projects or ones that they receive grants for, such as the new footbridge to be installed near the Simon Silk Mill, so their first response to our proposal was not overwhelmingly positive. The KSAT Board, on the other hand, has artistic and elaborate visions for the trail, so obviously they want to see this project be implemented. At first, it was challenging to hear these two polar opposite points of view and find some way to square ourselves with continuing on with the project, but we eventually learned to balance input from all of the involved voices.

We anticipate potential future challenges regarding additional development from Lafayette College, as this bridge may be funded by Lafayette, especially given the current tensions between Lafayette and the College Hill community. While this may end up being a hindrance to this project, we actually use this tension as another reason to support a new footbridge, as it may work to enhance community relations, as discussed further in the Social Context.

Recommendations

We support the addition of this bridge as it will serve as a great space for community members to experience. From the analyses mentioned above, this bridge would provide many benefits to the community such as a higher usage rate of the KSAT, an increased sense of public health, learning opportunities, and much more. This idea of a project is still in its initial phases and has not realized yet. Moving forward with this proposal, we would pass on this research as well as recommend future groups to look into further ways to promote the placement of this bridge.

Moving forward, we would recommend that the next group should include an analysis of purchasing the property where the IAS dealership is located. Interest has been expressed by Lafayette to purchase this property to use for further expansion of its campus. However, there has been resistance to sell the property because the owner wants to ensure the job security of his employees. As previously mentioned, the location of this bridge was determined, in part, because of the presence of the IAS dealership. With the ownership of this property, the bridge could be

placed in the corner where Bushkill Dr meets Detrich Road and act as a true gateway between Lafayette and Easton.

We hope that this study provides a good basis for future groups that would propose this bridge. With these findings, future groups will be able to further build upon this proposal so that the Karl Stirner Arts Trail can successfully connect the Lafayette College and Easton communities.

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