EGRS 451 Capstone: Bridging the Gap Between Campus and Community

By: Jeffrey Beach, Max Huang, Fumi Ono, and Madeline Squarcia

Table of Contents

Introduction

There is not an accessible and safe way to walk, bike, or run to or from College Hill or the Lafayette campus to Downtown Easton or the Lafayette arts campus. It is dangerous and difficult to navigate the hill on the best of days, and it becomes exceedingly difficult to do so with poor weather conditions and reduced visibility. Our group's proposed solution is a trail revitalization and extension connecting to the Karl Stirner Arts Trail, as well as a bridge spanning College Ave or Bushkill Drive, which will help to develop a closer relationship between Lafayette College and the Easton community. While the physical design of the bridges are still in a preliminary stage,

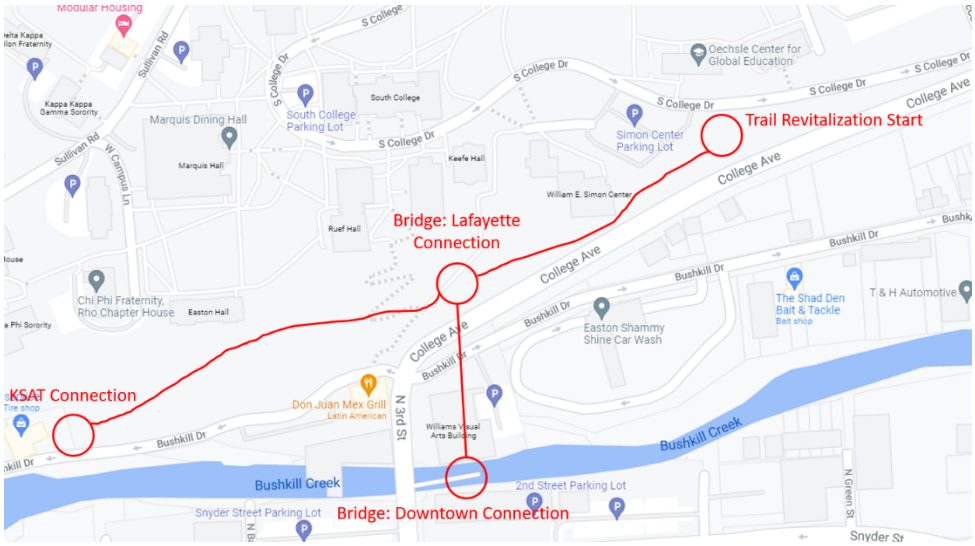


Figure 1: Trail and bridge system spanning College Ave

we have no shortage of ideas for them. We will incorporate the rich history of the area, from the converging rivers to the trolleys, and use those as inspiration to create something that will physically and socially connect the Lafayette and Easton communities. It is also extremely important to note that these designs are in no way final or meant to be wholly representative of what the finished product may look like in the

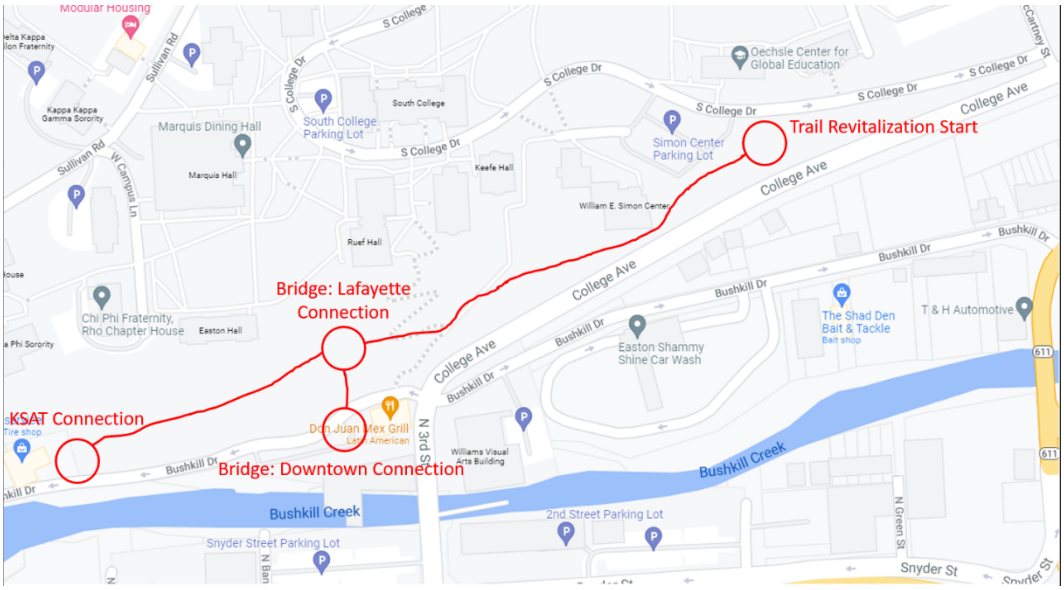


Figure 2: Trail and bridge system spanning Bushkill Drive

future. These are our thoughts on it before receiving input from the Easton community or the Lafayette student body, whose thoughts and feelings on the project will play an intrinsic role in its design and creation.

There is both a social and physical disconnect between Lafayette and the downtown Easton/Arts campus. This disconnect stems from many issues including physical barriers, college elitism, a technical mindset, and systemic racism/classism including redlining and gentrification. This proposal will improve this socio-technical relationship through a bridge design that

Figure 3: Our logo, bridging the gap between Easton and Lafayette

promotes accessibility and connectivity by addressing the current social barriers in place. Our proposal will create a framework for the school and community to continue in a collaborative design process that will meet the needs of all parties involved. Our design is a jumping-off point, addressing some of the major concerns such as bridge location, Americans with Disabilities Act (ADA) compliance, adaptive reuse of existing trails, budgeting, and more. We are presenting multiple options for locations as well, which will be talked about further on in our technical analysis.

There were many challenges we overcame in the design of a pedestrian bridge. We always kept the budget and the scope of this proposal in mind and constrained our design to be as affordable as we could reasonably make it. Safety and accessibility were two of the most important and most vital concerns for us to deal with. Scaling the hill without a car is incredibly difficult for anyone, whether they have a disability or not, so our design absolutely had to address this for it to be successful. Additionally, we had to keep the design appropriately sized to be able to achieve the goals in place but not be so large and gaudy as to be off-putting.

The aesthetics of the bridge are important as well and required a great deal of research into local history, as well as consulting with the art department and facilities planning to ensure that the design pays homage to Easton and the Bushkill Creek area, while also fitting in with the aesthetics of the school. This will be a vitally important area to later welcome opinions and ideas from Easton residents. They are a key group to consider, and this proposal must be beneficial to them along with Lafayette students. Ensuring that the entrances to the bridge are welcoming to residents was an important part of the aesthetic choices which we could not afford to overlook.

Going hand in hand with the aesthetics of the design is integrating the bridge into the existing terrain, which proved to be a challenge to our design proposal. As none of us are civil engineers, architects, or artists we cast a wide net and met with many members of the Lafayette faculty, Professor Mary Wilford-Hunt, the head of facilities operations, Professor David Mante, and Professor Mark McGuire from the Civil Engineering Department, Professor Nestor Gil from the art department, and Professor Kristen Sanford from the Engineering Studies department. These professors have expert knowledge in planning, school history, architecture, design, civil engineering, and transit and traffic planning to help us figure out potential solutions.

According to Professor Wilford-Hunt, making use of existing trails and unkempt infrastructure already in place is a great opportunity for the school to revamp and reuse some of the land which it already owns, and make the entrance to the college more inviting and exciting. There are of course more actors at play than just the college and Easton residents. We learned from Professor Sanford that College Ave, the road that leads directly up the hill to the school, is owned by the Pennsylvania Department of Transportation (PennDOT). In order to do anything that spans that road, we had to ensure that we understood what was required to have PennDOT allow us to construct something spanning College Ave. In our meeting with Professor McGuire, we learned that this road has been a catching point for previous capstone projects in the civil engineering

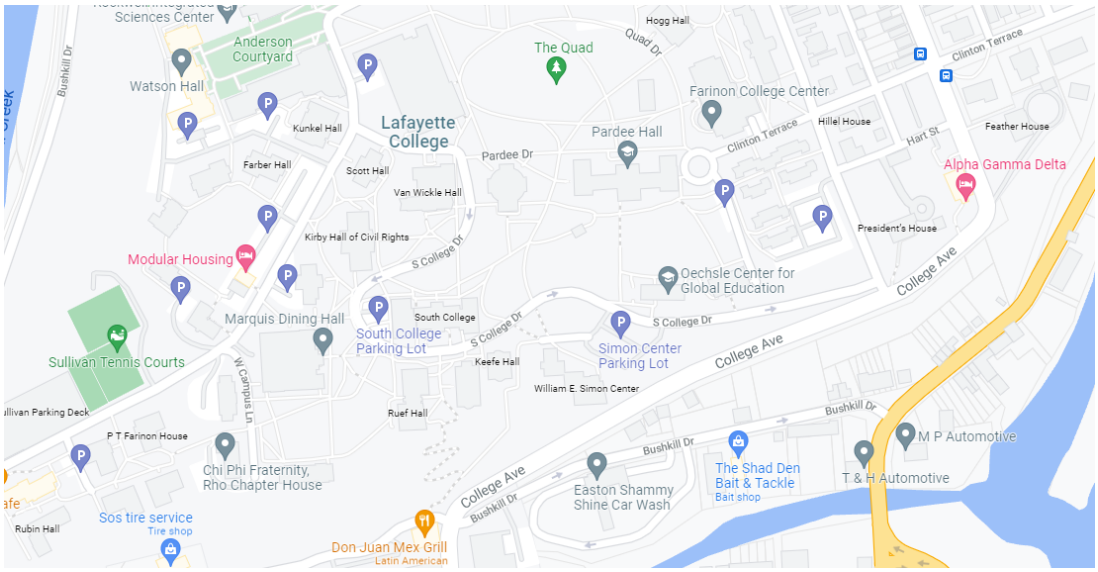


Figure 4: College Ave, located to the south of Lafayette's campus, has been a catching point for proposals in the past.

department, which made it vital for us to make sure any bridge design meets the proper clearance of the road to allow trucks and other large vehicles to pass through unhindered.

Research of the history of the area has been conducted by our group to get a good grasp on what the needs are and how we hope to address them. With so much vitriol between the college and local Eastonians in recent years regarding college expansionism (Gaffney, 2017), we wanted to prioritize and emphasize the community through this project and develop something that people can get behind. In order to accomplish this the community must be included in every step of the design process should the project take hold. Funding this project and keeping costs in check was of course one of the most important issues for us to address. Fortunately, the school has received grant money in the past for the infamous 'Skyway' project (Tatu, 2018), so we will have some money to work with. Professor Wilford-Hunt confirmed for us that the money granted towards the Skyway project is still available.

Balancing the needs of Lafayette students, staff, administration, and faculty with the greater Easton community is the crux of this issue. College expansionism has been generally looked down upon by the Easton community (Gaffney, 2017), so ensuring that the needs of all parties are addressed is vital. Balancing competing viewpoints will be key in the future of this project, as approval from many different groups must be granted to have this proposal succeed. Additionally, we made ourselves familiar with local ordinances and zoning, our plan will go nowhere if the dimensions of our designs are disallowed.

The construction of a pathway spanning College Avenue will be challenging due to the sheerness of the ground it will be built on. As of the submission of this proposal, the design for the bridge will cross College Avenue from Williams Visual Arts center directly north to the appropriate elevation on the hill. We selected our construction material based on the impact it will have on its environment, its sustainability, and aesthetic appeal. The function of this bridge will be to connect students and residents from McCartney Street and the Simon Center to Ahart Plaza. We will try to incorporate all forms of accessibility if possible.

Funding for this project will largely come from the College's resources itself with the inclusion of existing state and city contributions. Costs will include the construction of the bridge and all its aspects such as labor, materials, and equipment. Maintenance and possible revisions will require funds throughout the structure's lifespan as well. Currently, a concrete estimate is difficult to arrive at, but the project will be in the millions of dollars. While this is not a profit-minded project it will attract a greater image for Lafayette and may indirectly result in more financial contributions. The walking

bridge could also be a major draw for a potential donor, which could ease the financial burden greatly.

Social (non-technical) Context

Introduction

Currently, there are many systemic barriers that discourage relations between Easton residents and the Lafayette community. Our main goal is to create a bridge between these two entities that establishes a broader sense of community encompassing students, faculty, staff, and Easton residents all of whom are disconnected despite living in such proximity on College Hill. To ensure that this project moves forward in a just and resilient manner, we are engaged with campus leaders and developed the groundwork for future groups to continue this project with direct community outreach. We hope that this proposal establishes a framework for a bridge design, but more importantly, establishes the vitality of considering all sociotechnical (interconnections between people and technology) systems in problem-solving (Lucena et al, 2010). The problem we hope to address with this proposal is the lack of connection and relationships between the Lafayette and Easton communities. This section will focus on analyzing the social aspects that should be considered to ensure that community is central to the design and considerations of this project proposal. In order to do this in a thoughtful and just way, we first gathered general information about the historic issues that often arise between college institutions and the cities in which they reside, otherwise known as town-gown relationships (Chenoweth). We then use this information to develop our research and understanding of the relationship between Lafayette and Easton. After discussing the historic trends of town-gown relationships that are directly tied to this Lafayette focused project, we will discuss the social impacts of the current connection between Lafayette and Easton that lacks accessibility, safety, and community engagement. Finally, we will

address the previous proposals that attempted to address the poor connection and highlight the main takeaways from stakeholders that have helped us develop a more socially considerate and community-oriented design.

Figure 5: Williams Visual Arts Center

Lafayette College is built on a steep hill overlooking downtown Easton. For most of its lifespan, the school has existed entirely on this hill, maintaining its position overlooking the town. This changed in 2001, with the opening of the Williams Visual Arts Building, nestled at the bottom of the hill spanning over the Bushkill. This would mark the College's first major foray into expansion down the hill and in the direction of Downtown Easton. As a prestigious, well-funded, and highly regarded liberal institution, Lafayette College is in a privileged position allowing it to overlook issues of elitism. The school's continued expansion towards Cattell Street in the past few years with the McCartney Street housing project (see Figure 5) has been characterized by developing first and asking questions later, much to the chagrin of College Hill residents (Gaffney, 2017).

Figure 6: McCartney Street Dorms (Lafayette College, n.d.)

College Elitism

Elitism has many connotations but in nearly all cases represents the reinforcement of oppression due to an imbalance of power. Institutions like Lafayette College tend to assume an authoritative status that may silence other ways of thinking by trying to enforce ideas of educated or well-established individuals like professors and administrators. In the Journal of Higher Education, the author Harold J. Harris notes this tendency when identifying that it is less productive to enforce the hierarchy of knowledge by forcing ideas and concepts on others from a place of power or expertise. It is far more productive to explain why an idea has come to fruition and its contextual importance (Harris, 1966, p. 457). Top-down relationships, like those traditionally found within a

campus community, prevent the free flow of ideas between those that are in an authoritative position like faculty, administrators, and students. A focus on understanding the elitist tendency in college institutions and creating a more holistic approach to education and development is essential to productive solution seeking.

Elitism is not only found within a college institution, but perhaps more pronounced, between a college and the community in which it resides. This relationship is known as the town-gown relationship. Lafayette, both metaphorically and literally, positions itself above the Easton community, inhibiting an equitable flow of ideas, resources, and agency. This is especially true for members of the West Ward and Southside neighborhoods of Downtown Easton who face many injustices. These injustices stem from a long history of discrimination embedded in U.S. laws and regulations. This trend is known as systemic racism (Dove, n.d.). One of the most prominent forms of systemic racism that has continued to influence present day discrimination is known as redlining. Richard Rostein, the author of *The Color of Law,* examines redlining and its impact on the ways policy interacts with society. Rostein notes that "the Federal Housing Administration, which was established in 1934, furthered the segregation efforts by refusing to insure mortgages in and near African-American neighborhoods — a policy known as 'redlining'" (Gross, 2017).

Redlining, or real estate redlining, was a method of ranking the loan worthiness of neighborhoods through color coded maps. Unsurprisingly, most of the red or unworthy/high risk neighborhoods were largely populated by black and other marginalized individuals (Jackson, 2021). White, upper-class individuals were of course bright green suggesting worthy of investment (Jackson, 2021). This method of

segregation has continued to influence the geography and social impacts of neighborhoods today. Many of the same neighborhoods that were deemed red in the 1930s are today the ones who face countless environmental and social injustices including food deserts, concrete islands, placement of locally undesirable land uses (LULUs), lack of access to green space, less walkable and bikeable infrastructure, and lack of access to other basic resources. These trends are very prevalent in the city of Easton and can be witnessed by the stark differences in socioeconomic status (SES) of Lafayette College and College Hill versus the Downtown Easton, Westward, and Southside areas.

Figure 7 below identifies the clear geographical divide between communities that can be attributed to systemic racisms such as redlining. This image was taken from the ArcGIS database and shows the socioeconomic status (NSES Index) by Census Tract from 2011-2015 of the general Easton area (Socioeconomic Status (NSES Index) by Census Tract, 2011-2015, n.d.). SES is a useful tool in understanding the economic and social status of various areas as it considers "variables of educational attainment, income, housing, and employment variables or a composite of these variables" (David Wheeler et al., 2017). In Figure 7 below, areas that are colored in darker purple signify a higher SES status. The lighter purple and white areas mark a lower SES status.

Figure 7: Socioeconomic Status (NSES Index) by Census Tract, 2011-2015

More specifically, the Lafayette College area and the College Hill area have median household income and percent of households with income below the Federal Poverty Line of $78,018.0 and 5.9% respectively (Socioeconomic Status (NSES Index) by Census Tract, 2011-2015, n.d.). The West Ward area has a median household income and percent of households with income below the Federal Poverty Line of $25,645.0 and 37.5% respectively (Socioeconomic Status (NSES Index) by Census Tract, 2011-2015, n.d.). The Southside area has a median household income and percent of households with income below the Federal Poverty Line of $30,896.0 and 23.3% respectively (Socioeconomic Status (NSES Index) by Census Tract, 2011-2015, n.d.). Finally, the Downtown Easton area has a median household income and percent of households with income below the Federal Poverty Line of $21,845.0 and 32.9% respectively (Socioeconomic Status (NSES Index) by Census Tract, 2011-2015, n.d.). The above statistics highlight the disparities in economic well-being among members of the Easton

community and how Lafayette College takes an elite position overlooking lower SES areas of Easton. In addition to the systematically oppressed neighborhoods of West Ward and Southside Easton, residents of Downtown Easton and College Hill have expressed concerns about Lafayette's continued expansion into the surrounding areas (Gaffney, 2017). In any attempt to better connect the Lafayette community with the Easton community and improve town-gown relationships, one must first understand the political, social, and economic divides that prevent an equitable flow of resources, ideas, and impacts which can be witnessed at a simple level by Figure 7 and its associated statistics.

After gathering information and a preliminary understanding of these historic issues, solution seeking can be sought out by directly engaging with the communities to identify their needs and wants. The information gathered through this hands-on approach directly influenced the design considerations of the project. The subsequent sections outline the social, political, economic, and technical aspects of the problem we are trying to address through this project and offer some proposed solutions and considerations. While we were able to make a great deal of progress on this project in a short time, it is important to note that this proposal requires much more detailed research and community outreach going forward. Our team was careful to take the time to understand the many contexts of the issue first and to talk to faculty members that are well aware of the issues and some potential solutions to be considered. With that said, the following section goes into detail about how the lack of safe and accessible physical connections between Lafayette and Easton are directly related to the social disconnect between the two communities.

Physical Boundaries

Getting down the hill from Lafayette's campus to downtown Easton has always been difficult, with limited options available to pedestrians (Kelly, 2018). On the simplest level, it is tiresome to trek from the bottom of the hill to the top. This problem plagues both college students and college hill residents who wish to make their way downtown to enjoy the burgeoning restaurant scene and engage with the growing local economy. College Hill is a challenge on its own, but navigation issues are exacerbated by the extremely old and unkempt staircase cascading down the hill from between the Ruef and Keefe dormitories (as seen in Figure 8) as well as the dangerous trek that is College Ave.

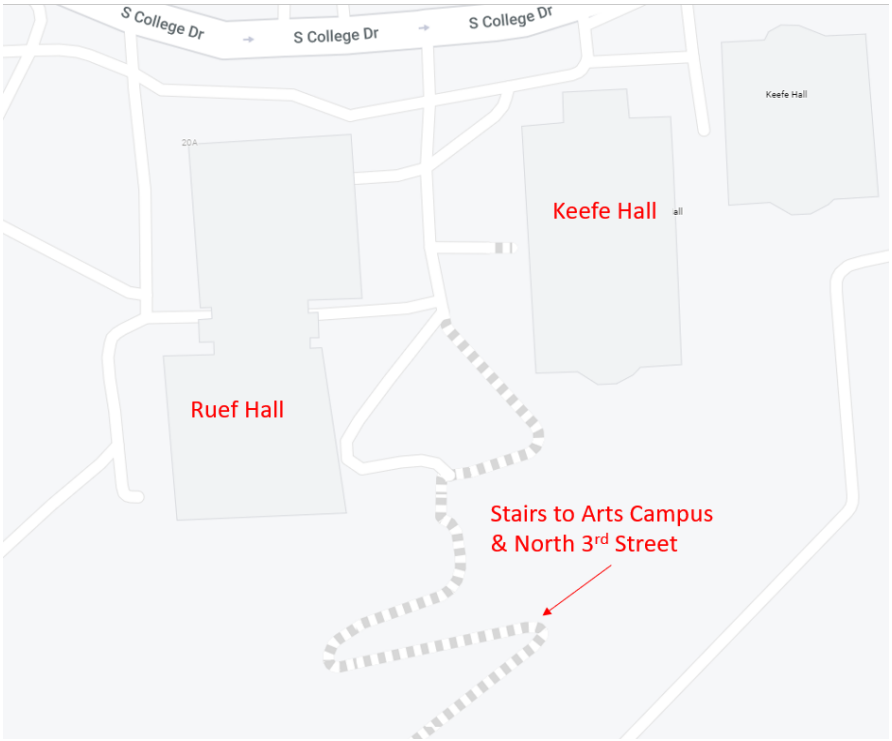


Figure 8: Ruef and Keefe dormitories, as well as the historic stairs leading down the hill

Figure 9: College Ave and McCartney Street Intersection. Note the sharp turn and lack of crosswalks.

Figure 10: Steep, unkempt stairs from College Hill to arts campus

Drivers are routinely speeding down the hill, and the tight curve from Cattell Street to College Ave gives drivers little to no time to react should a pedestrian cross the road from McCartney Street. Note in Figure 9 the lack of any crosswalk from the right side of College Ave to McCartney Street, as well as the sharp curve from Cattell Street into College Ave. Additionally, there is limited signage warning drivers of pedestrians or

encouraging them to slow down. There are no speed bumps, speed cameras, or other forms of barriers to slow down cars, and the road is extremely wide, which has the tendency to cause drivers to drive above the posted speed limit (Speck, 2018). The school has done some work to make this road a bit more walkable, but there is still much to be done.

These physical barriers create social barriers in their wake. The arts campus has been cut off from the main campus, and feels "...notably empty," according to students (Kelly, 2018). Students have difficulty getting to the arts campus, especially on snowy or rainy days. There are times where the stairs and sidewalks are not navigable, and the shuttle service is delayed as well, sometimes deep into the afternoon which unfairly prevents arts classes from meeting (Kelly, 2018). The stairs are of course only one part of the problem, with College Ave being incredibly dangerous to cross. One student, Noah Decker '19, was struck by a car in the area while crossing the street, fortunately he was not injured in the incident but there is a history of danger for pedestrians in the area (Kelly, 18).

We are not the first group to attempt to solve this issue of disconnection from the top of the hill to the bottom. There have been numerous projects in the past that have had limited success: A previous engineering studies proposal to revitalize the stairs through art (Gibbons et al, 2016), the infamous civil engineering glass elevator proposal (Figure 12), and the school's work to help create safer walkways for pedestrians at the bottom of the hill (Sigafoos, 2021). Of these projects only the minor improvements to the walkways

Figure 11: CAD Drawing of Arts Stairs Proposal (Gibbons et al, 2016)

have been seen through. All of these designs were well intentioned but have ultimately failed in one way or another.

Each of these projects provides us with important context on how to approach our design and proposal. The arts stairs, while not coming to fruition, showed us the importance of incorporating art into public spaces, and helped us home in our research a bit more. We were able to look at other successes and see how art spaces can help to create public life in a place currently devoid of it (Grodach, 2009). Incorporating art into the design and into the accouterments of the bridge will be a fantastic way to involve both members of the Easton community and the Lafayette arts community. It is important to note that the final design must go beyond just introducing art to the area haphazardly, but with purpose and intent in order to truly create an improved public space (Grodach, 2009). Purposeful art is something that Professor Gil of Lafayette's art department also

emphasized to us in our meeting. He suggested that the bridge should not only include displays for student or locally created art, but also be as creative and interesting in its design as possible. The improvements to the sidewalks and pedestrian crossings in the area are a good start and help to align the arts campus with the main campus aesthetically. They certainly improve the walkability of the area, but they do not address the concerns of getting down the hill. They do provide us with a helpful aesthetic profile for what our solution could look like, however.

Community Perception

To avoid reinforcing college elitism, our team has carefully considered community perception in each aspect of the design. To do this, we have met with members of the college community to discuss how our project design can influence a more equitable and meaningful connection between the Lafayette and Easton communities. From our meetings with faculty members, we gained insight pertaining to the social context from Professor Wilford-Hunt and Professor Gil. Their feedback and the feedback from other community members in response to Lafayette expansion efforts will be elaborated on in the following paragraphs.

Figure 12: Proposed site of 'Skyway' Project (Tatu, 2018)

Discussions with Professor Wilford-Hunt provided insight about the plans and financial savings Lafayette has made for the area related to our project proposal. We discussed the 170-foot-tall glass elevator, more commonly known as the "Skyway," that would carry up to 25 passengers from the intersection of Bushkill Drive and College Avenue (Tatu, 2018). All stakeholders, including the college and the Easton residents concluded that such a grand structure would be inappropriate in the context of its natural surroundings. Although it may be a very effective solution to getting people up and down College Hill, a giant elevator is merely a technical solution that does not take into consideration the needs of the community, the college, or the aesthetics of the area. According to Professor Wilford-Hunt, the elevator was designed entirely by an unnamed general contractor that was proposed to Lafayette College. This project, although technically sound, was designed without the input or consideration of any of the people involved in the community that would be directly impacted by its implementation. The

college immediately turned down the proposal, showing that there is more to creating infrastructure than just building. This is an important lesson for us in our process. We must come up with a proposal that fits appropriately in the area as well as one that properly engages with the relevant communities who will be affected by it.

From Professor Nestor Gil, a sculpture professor at Lafayette, we learned that the Arts Campus is underdeveloped and underserved. Professor Gil pointed out that, "students arriv[e] late because of the shuttle [...]. I have the experience of students not feeling as comfortable being in these buildings late at night as they would in buildings on the main campus because there aren't as many full-time personnel on site" (Kelly, 2018). There is a distinct lack of personnel on site in this area, something that most students at Lafayette might not be familiar with due to this physical disconnection between campuses. As of 2018, Joe Swartz was the lone custodian to take care of the buildings down the hill (Kelly, 2018). Whether it be during the day or late at night after a showing in the theater in Buck Hall, he was the only one to clean up after the place and keep things in order, which he described as taxing (Kelly, 2018).

The faculty experienced some similar issues. Technical Director Alex Owens routinely worked 60–80-hour weeks during the school year (Kelly, 2018). Owens had a wide range of responsibilities and spoke at length about how additional staff would greatly help to reduce his workload and grant him an improved work-life balance, as well as more time to spend with students rather than dealing with administrative tasks. The physical disconnection of the arts campus allows these issues to remain relatively unseen by the rest of the Lafayette community. Improving transportation and creating easier avenues to access these areas are key to helping the arts campus thrive at Lafayette. By

bridging the gap between these campuses, we can better call attention to the needs of the arts campus and hopefully to the downtown community as a whole. By better integrating Lafayette with Easton, we will be able to strengthen the bond between the two communities and improve the quality of life for members of each community.

According to the English professor Suzanne Westfall, improved transportation options also require an attitude change. Professor Westfall notes that students at Lafayette, "...drive to the gym and drive to pick up their mail" (Kelly, 2018). Improving walkability and reducing the need for car traffic in the area can have a great positive impact on the area. Fewer cars will lead to a lower potential for injury and will make the area quieter and more inviting to pedestrian traffic. Increasing walkability has been found to help small businesses and communities by allowing for increased pedestrian traffic. Pedestrians are much more likely to stop into local businesses and engage with the community compared to those moving in cars, who tend to drive to one destination and then leave, rather than meander (Speck, 2018). When designing our bridge proposal, walkability was one of the key factors in our design. Building the bridge is all well and good but making sure that it is easy to use and functional for those who will be most closely affected by it is much more nuanced. Easton, and the greater Lehigh Valley area have experienced a tremendous economic revitalization over the last decade (Bresswein, 2019). Leaning into this growth and revitalization of what was once considered a dying rustbelt region is key to making this bridge something desirable for the community at large. Advertising and incentivizing use of the bridge when it first opens could be a way to bring a great deal of attention to it. This could be done in a variety of ways, from

emails to art shows, and a whole host of other ways to positively engage with the affected communities.

Conclusion

As we discuss further in the conclusion of this report, we have primarily gathered feedback from the Lafayette community, however, as this project continues it is vital that the community is considered and effectively communicated with. To effectively communicate, project groups must listen to local community members (including those from the Southside and West Ward communities) feedback on the general framework of the project and use this feedback to adjust the design in an open-minded way. Surveys with open-ended questions can help to allow open communication between Lafayette project members and the Easton community.

Often, a college community and the surrounding urban community tend to work separately both in pursuit of their own wellbeing without considering the larger system they are a part of (Chenoweth, 2017). There is much evidence to suggest that improving town-gown relationships will be beneficial to both entities. Improving this relationship starts with recognizing the many ways these communities are interdependent. Some basic successes that could be found by working in unison and forming a stronger relationship include maximized capital and financial resources, attracting and retaining world-class talent, driving economic development, and elevating the level of both learning and life (Chenoweth, 2017).

Policy/Political Context

Introduction

With the social contexts of our proposal established, it is important to look at how these interconnections are influenced at the government level through a political context. Most infrastructural development involves political actors of all levels depending on the size and scope of the project. In order to move past the planning phase to the implementation phase, there are many actors to work with and legal applications and approvals are required. Understanding the government background of such projects can help determine the feasibility of implementation. The political context is especially important to town-gown relationships and plays a key role in both the successes and frustrations in sociotechnical systems. Capitalizing on existing assets and accentuating the benefits of new infrastructure can create a positive political climate. Within this political context, we have established the zoning ordinances and laws that are relevant to our project and the key political figures that have influence over the feasibility of our project's implementation.

Zoning and Laws to Consider

Zoning laws provided by the Easton city government offer guidelines and rules for any additional infrastructure that gets added to each specific zone. The arts campus downtown, which is made up of the Williams Visual Arts Center, Ahart Family Arts Plaza, Buck Hall, and Studio Theater are officially part of the River Corridor with Street Corridor Overlay District (City of Easton, 2021). This district is highlighted in green in Figure 13 and only includes the downtown arts campus that makes up the street corridor

overlay. The rest of the green area is simply referred to as the River Corridor district. Dimensional standards for the district are laid out and include regulations such as lot standards, setbacks and building separations. Land uses and the development standards of some of them are also provided like with educational services under the institutional category. Each color-coded area represents a different zone with slightly different regulations. The district description is provided below and hints at some of the

Figure 13: Individual zones taken from city of Easton interactive zoning map

considerations this project has also brought forth.

> The purpose of the River Corridors and Other Green Areas District is to accommodate appropriate development while providing for adequate protection and buffering of the City's waterways and other natural resources; assist in flood management; protection of environmentally sensitive areas; and meet the need for local and regional greenways, open space, and recreation within the city. The Street Corridor Enhancement Overlay District's purpose is to accommodate

> medium and high-intensity development at the gateways to the city and along the principal vehicular and pedestrian corridors, and to promote compact, walkable, mixed-use buildings with local and regional commercial services, compatibly scaled light industrial, and residential uses. (City of Easton, 2021)

The description emphasizes the need to promote effective local and regional greenways for recreation and to accommodate developments as a street corridor and gateway to the city. Our proposed addition to the side of the hill would meet this need effectively and help the gateway become a more accessible path for pedestrians and cyclists. The concern of flooding in the area has been addressed by Lafayette College's downtown arts campus in a multitude of ways. The elevated bridge structure will connect to the Ahart Arts plaza that is already raised significantly above Bushkill creek to account for flooding. Additional measures would then have to be taken to guarantee the reliability of new infrastructure like the stair and elevator combination under pressure from flooding. As will be elaborated further in the following sections, government stakeholders and regulations are quite intense, and need to be addressed directly in proposals and designs.

Our Political Scope & Stakeholders

The political scope of our project is on city and state levels as it will need approvals from the Easton city government and the Pennsylvania Department of Transportation (depending on the proposal chosen for implementation). Lafayette College's direct involvement as a private entity does indeed make the chance of a more expedient implementation of this new infrastructure possible if donors are interested.

With a few key actors in Lafayette's administration, the decision to dedicate funds to this project and hiring the necessary professionals can be done with regional approval being the most significant obstacle. Many of the political underpinnings for the political questions of this project have to do with this relationship between a private college and its surrounding municipality. There is indeed plenty of, "local political grudges and regulatory scrutiny," that can happen when a college seeks to expand as is described in *The New American College Town* (Martin, 2019). To maximize positive relations, the focus of this project is on establishing a better connection between Lafayette and Easton that has the potential to maximize capital and financial resources, attract and retain world-class talent, drive economic development, and elevate the level of both learning and life as established in the social context (Chenoweth, 2017). This research can be used to leverage the political approvals needed for the implementation of this project.

Easton city government will have to be consulted regarding policy and zoning laws. College Ave is owned by PennDOT, but Lafayette owns the green space around it. Therefore, the intricacies of working with both parties and consulting with PennDOT will need to be considered for this project to succeed. College Ave regularly sees heavy traffic from all types of vehicles, so the design will have to be compliant with standards regarding height clearance and the ability to construct without significantly disrupting the current flow of traffic. Additionally, the project proposal needs to be convincing in its positive impacts on the community in order to pass approval. If the proposal is successful in ensuring an equitable design that promotes a more beneficial relationship between Lafayette and Easton, it can serve as a strong example of how Lafayette will incorporate community centric sustainable designs in its future development endeavors. Additionally,

the bridge can incorporate artwork and designs from people outside of Lafayette College or professionals promoting an urban culture of functional, engaging, and aesthetically pleasing design.

From meeting with Professor Wilford-Hunt we learned that the project's prospective impact and prominence will likely open up a great avenue for a potential donor to purchase naming rights to the bridge. This financial backing would help to support the implementation of a future more finalized version of this proposal. According to Professor Wilford-Hunt, the approval process for such a project starts with senior administrators including the President and VP for Finance and Administration before a design firm is hired to evaluate the feasibility of the project. Finally, it is up to the Board of Trustees to approve any plans of this magnitude. Simply put, the Board of Trustees are a group of about 30-45 members who "uphold their fiduciary responsibility by working with the president and top administrators to approve major policies, make long range plans, and oversee the budget" (Columbia, 2009). Lafayette's relevant administrators and decision-makers will have to approve the funding and implementation for this project in order to initialize the core components of the project. Government officials on the city and state levels can provide part of the funding for this project, but it is safe to assume that most of the funding necessary will come from Lafayette College itself. Guiding their decision-making will be the growth of Lafayette's image and success and whether this proposed project will be enough of a priority to warrant its immediate execution. The design must be cost-efficient and clearly meet the goals of providing a more accessible and appealing physical connection while proving Lafayette's positive impact on its surrounding community.

Construction companies and design firms will be the ultimate stakeholders that help realize this project. Clear communication between the project proposal and the engineering design work already done will be necessary to ensure the result is as intended. How different companies operate and what rules and regulations they have with regards to such a project will need to be considered. The finalization of technical details rests in the hands of the professionals that will be hired for this project, and so work done by Lafayette members need to keep that in mind. It is vital that whatever construction company is chosen continues to keep the community in mind and does not alter plans in a way that could further damage the relationship between Easton and the college.

Multimodal Transportation Fund Grant

The Multimodal Transportation Fund (MTF) as part of the Commonwealth Financing Authority (CFA) of Pennsylvania and managed by the Department of Community and Economic Development (DCED) is a clear resource for funding as highlighted by the recent Lafayette College Escarpment Improvement Project. Lafayette has gotten funds in the past from this fund for projects such as the Skyway proposal and is continuing to seek funding through this organization in the new escarpment plan. The government website gives an overview of what it is and its uses: "The Multimodal Transportation Fund provides grants to encourage economic development and ensure that a safe and reliable system of transportation is available to the residents of the commonwealth. Funds may be used for the development, rehabilitation and enhancement of transportation assets to existing communities, streetscape, lighting, sidewalk enhancement, pedestrian safety, connectivity of transportation assets and transit-oriented development." Grants do not exceed $3,000,000 for any project. Additionally, there is a

reminder that PennDOT's own multimodal program is separate from the Commonwealth Financing Authority's fund that Lafayette is dealing with (PADCED, 2021). The PennDOT MTF seems to be very active, since in the 2021-2022 year alone, they provided grants of up to $3,000,000 for 43 different projects across the state (PennDOT, 2021). Lafayette has successfully applied for the CFA MTF, but guidelines for the PennDOT do suggest that Lafayette's plans as a non-profit organization would also be eligible. Regardless, the two MTFs are important ways for projects to receive public funding and that applies to our project and Lafayette College.

Lafayette applied to the MTF detailing the escarpment improvements proposal and cost estimates with Lafayette College itself, the Vice President of Finance and Administration, and the Executive Director of Government Relations from Lafayette as the applicant. This application and report, which was submitted July 24, 2021, went in-depth about how the new infrastructure reflects Easton's needs as a whole with good background information and projected impacts. It brings together all the stakeholders including Lafayette and its administration, the community of Easton, and the government overseeing this project and most of its funding. The application points to the diversity of Easton's four main neighborhoods and the physical challenges of College Hill for pedestrians and cyclists that we have also highlighted here. The application talks about the needs and benefits of transportation improvements that will promote equity and justice and encourage environmental conservation and preservation. These new additions of alternative transportation will also align with Easton's 2035 plan as highlighted by the report. Positive economic impact as a result of this new proposal's ability to integrate College Hill and Downtown Easton is also emphasized in this report. Professional

engineers were consulted to arrive at the cost estimates provided in this report. To conclude, the Lafayette MTF proposal is a good example of stakeholders' needs being expressed and met to help secure approval and funding from a public entity.

Technical Context

Introduction

Now that the social and political constraints have been discussed, understanding the technical components of the project will help to establish the feasibility of this project and areas that may need to be further examined. Within this technical context, we will establish the overarching framework, systems, dimensions, ADA considerations, structural challenges, design, and materials of the Bridging the Gap project. All these determinations were made from peer-reviewed resources and conversations with Lafayette faculty members. This proposal is meant to provide a framework for future work to develop over time. Our mission is a design that focuses on the local Easton community while providing a more accessible and safe way of connecting the two communities. In other words, though the specifics of the design itself and technical considerations may shift, we hope that this proposal can provide a framework for establishing a more just and resilient connection between the Lafayette and Easton communities.

The Four Components

This project is composed of four main components. There are many regions to consider in the area between the main campus and the Williams Visual Arts Building, making room for many creative ways to envision the pedestrian bridge placement. The four components include the trail revitalization, the trail extension, the Ahart connection, and the Bushkill connection.

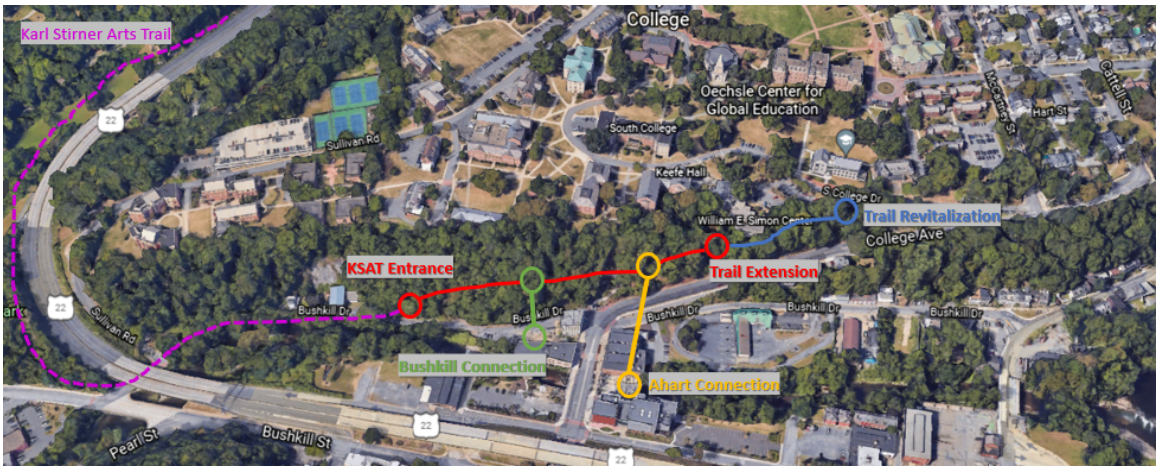


Figure 14: The Four Components

When discussing where the four components of the project will be implemented, we were careful to think about whether the community may feel welcome to access the infrastructure. Previous proposals for connections have been perceived as exclusively based on their purpose, presentation, and procedures. For example, the "Skyway" elevator proposed in 2016 was viewed as a frivolous project that would seem uninviting to the Easton community as it connected to the center of the Lafayette campus. Professor Wilford-Hunt has also described a situation in which a local firm created a design for a bridge without consulting anyone including Lafayette and Easton residents. From Professor Wilford-Hunt's example, we have realized that establishing a rigid design of this project would only lead to its failure. The ultimate design establishes a trail network that connects to the Karl Stirner Arts Trail (KSAT) and ventures further into the campus allowing public access to green spaces and a natural atmosphere. This is something that is highly lacking in lower socio-economic status (SES) neighborhoods. Separating the framework of the project into these four focus areas has helped us to manage research and development for the feasibility of each constraint.

Trail Overview

One of the most valuable aspects of the bridge project is the trail network. The trail network includes the trail revitalization and the trail extension. The trail revitalization involves the reworking of the path that branches out from S. College Drive just south of the Oechsle Center for Global Education and the Zeta Psi Fraternity house. This trail goes west for an estimated 320ft until it reaches the southern end of the William E. Simon Center. The approximate, average width of this trail is 15ft. The current purpose of this trail is for facilities operations workers to access the back side of the William E. Simon Center.

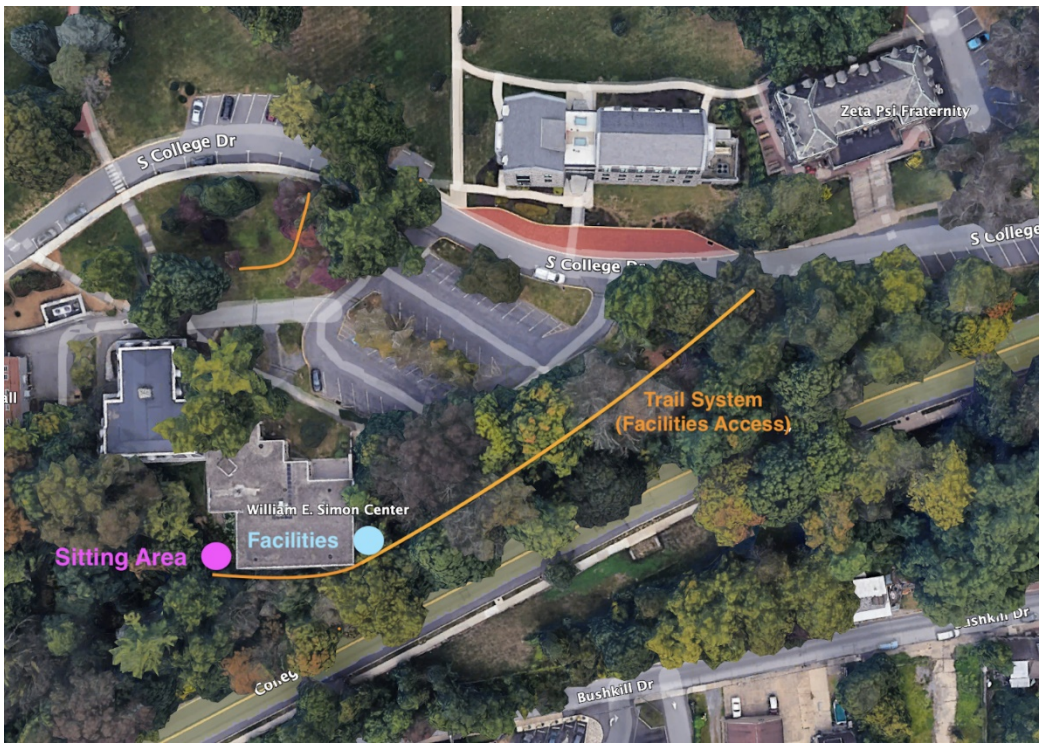


Figure 15: Preliminary outline of trail behind Simon Econ building

Although there is a way to exit the trail on the southwestern corner of the William E. Simon Center through a sitting area, the current state of the trail along the southern wall of the building is too narrow, overgrown with plants and dangerous. Therefore, the

very first proposal is to make this existing trail fully accessible. That would involve either paving or generally flattening the path so that it can be walked on comfortably. Also, as the path approaches the William E. Simon Center, much of the vegetation must be cleared out. If the path right behind the building remains too narrow even after clearing it out, there may be a need to construct a walkway to supplement the path width. By completing these steps, this trail should become safely accessible. The overall reason to revitalize this trail is to lead into the creation of the trail extension.

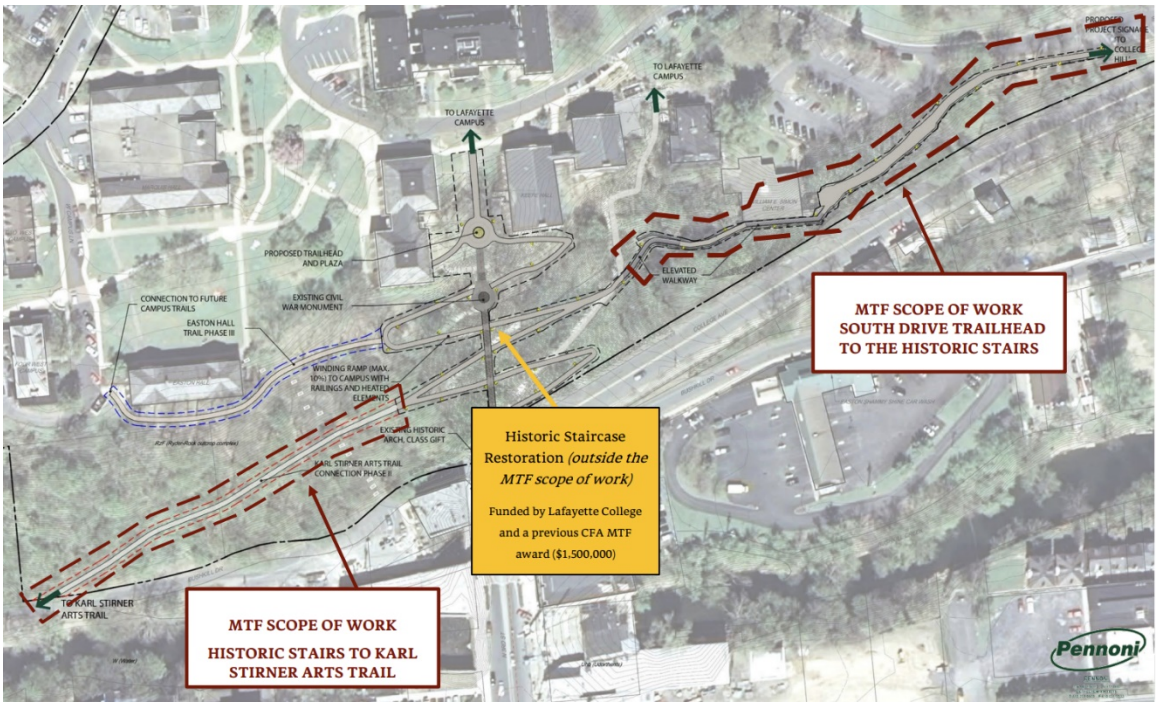


Figure 16: Trail revitalization and trail extension

The trail extension will serve as a continuation of the trail that ends at the William E. Simon Center. By constructing an elevated boardwalk, the trail can extend west all the way to the east side of the stone steps. Because the ground along the hill between the William E. Simon Center and the stone steps is not even, an elevated boardwalk can make a safe and smooth pathway. This section of the elevated boardwalk will be

approximately 320ft in length. Once the trail extension reaches the stone steps, it will connect with the stone steps at the location shown in Figure 16. By using the stone steps as a connection point, the trail extension will be able to continue on the west side of the stone steps. This section will once again be an elevated boardwalk that runs along the hill until it reaches the Karl Stirner Arts Trail. This section of the elevated boardwalk will be approximately 500ft in length.

Putting this all together, this trail network will connect S. College Drive from near the Oechsle Center for Global Education, all the way to the Karl Stirner Arts Trail on Bushkill Drive through the revitalization of the existing trail and the construction of the elevated boardwalks that will be connected by the stone steps. We are happy to see that this trail network is a part of Lafayette College's proposal submitted on July 24, 2021, to the Multimodal Transportation Fund in Pennsylvania. As part of the Easton/College Hill Escarpment Multimodal Improvements Project, this trail network is likely to come to fruition. We would now like to discuss the ways in which we can expand on this existing idea.

Bridge Systems

The trail network connecting S. College Drive and Bushkill Drive has the potential to serve as a starting point for a way to provide benefits that are still currently lacking. One of the main issues present between the main campus and the arts campus is the difficulty of crossing College Avenue as a pedestrian. Secondly, the ascension and the descension of this hill is unnecessarily challenging, especially when using the stone steps. The stone steps can also become a hazard in harsh weather conditions. By using the trail network as a starting point for a pedestrian bridge, some of these issues can be resolved

while also creating a tangible representation of the growing connection between the city of Easton and Lafayette College. The first proposal is the Ahart Arts Plaza Connection, which will connect the elevated boardwalk on the right side of the stone steps to the Ahart Arts Plaza. The second proposal is the Bushkill Connection, which will connect the elevated boardwalk on the left of the side of the stone steps to the Don Juan parking lot area. These two proposals will be described in detail below.

Design A: Ahart Arts Plaza Connection

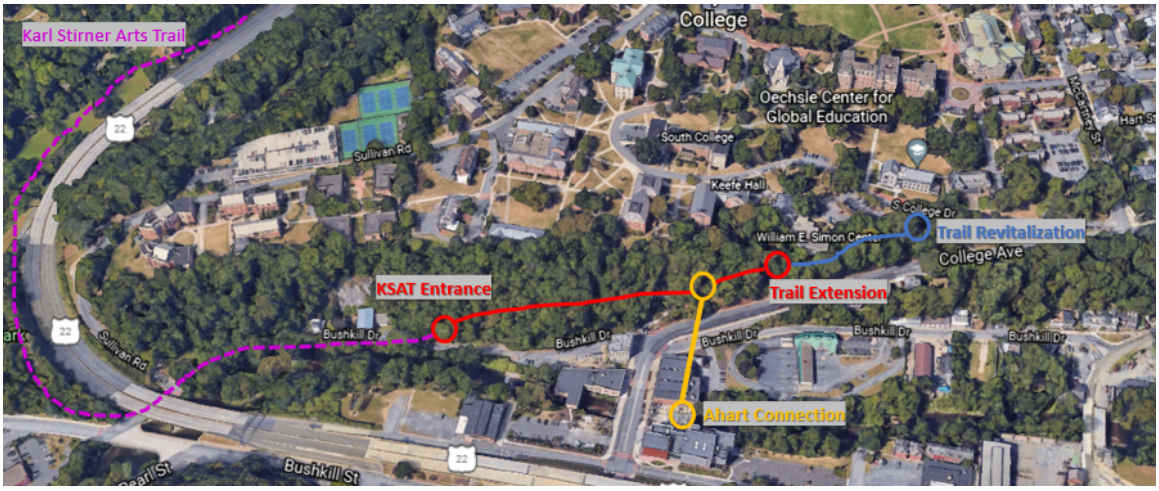


Figure 17: Ahart Connection shown in yellow.

The Ahart Arts Plaza Connection is a pedestrian bridge that will begin near the connection point of the east side of the stone steps and the connecting trail extension. Specifically, this starting point should be directly north of the Ahart Arts Plaza. Civil Engineering Professor David Mante stressed the importance of keeping the distance of the bridge as short as possible. If we are to connect the bridge to the Ahart Arts Plaza, the bridge must go directly north from the Ahart Arts Plaza and over College Avenue as depicted in Figure 17. Based on the exact location of the entry/exit point for the bridge on the Ahart Arts Plaza and on the hill over College Avenue, this bridge can span anywhere

between 310-350 feet. Because the elevated boardwalk will be roughly 50 to 60 feet above the Ahart Arts Plaza, the most straightforward way to lift or lower people is placing a vertical system at the Ahart Arts Plaza, such as a stair and/or elevator system.

The technical and design properties of this bridge will be influenced by many factors that would satisfy all factors previously outlined. Some major factors include the scale of the bridge (how it stands out in its context), its entry and exit points, its potential additional connections, and the presentation based on material and aesthetics. As mentioned, accessibility and inclusiveness are some of the most important characteristics of this project. This would mean creating a stable footing as well as maintaining a gentle slope compliant with ADA (see *ADA Considerations*). After completing this requirement, there may be other opportunities to make improvements to the safety and overall experience of pedestrians. Increasing the visibility between pedestrians and potential cars passing through S. College Drive is one such example.

Furthermore, after meeting with Professor Mante, we came to the same conclusion that the bridge portion should be over a location that can include ground supports every 50 feet. In this case, the bridge would span directly north from the eastern end of the Ahart Arts Plaza. To encourage the Easton community to make use of the bridge and its connected trail, the Easton Bridge landing is placed at the Ahart Arts Plaza as it is an open space and a nice meeting area that the community already makes use of. We had briefly considered connecting the bridge directly to the Visual Arts Building but decided against it, as it could feel exclusionary towards Easton residents by housing it inside a Lafayette building. According to Professor Gil, the plaza is a nice meeting area with much potential for growth, as it has benches and is above the Bushkill Creek which

can be incorporated in the design of the bridge. There is also parking on either side of the road further increasing accessibility for those that wish to drive, park, and walk around the area.

Although this design is one of the most ideal if not the most ideal form of an accessible footbridge coming off the hill of Lafayette College, it will have to overcome some major obstacles in order to come to fruition. One of the major challenges that this design will face is the construction of the bridge section over College Avenue, which is a road controlled by the Pennsylvania Department of Transportation. Because of the busyness of the street, it will be a challenge to receive approval for constructing over the road. We believe that there may be ways to make this process more feasible by using creative construction methods. For example, by using a modular construction method, the majority of this bridge's components can be built offsite and then quickly assembled onsite to cause as least disturbance possible to College Avenue as possible. Another obstacle is in making the elevated boardwalk and trail section of this pathway to be ADA compliant. We will elaborate on this in *ADA Considerations*.

ADA Considerations

One of the biggest challenges we will face on the technical front is to make this entire walkway compliant with the American with Disabilities Act of 1990 (ADA). First off, we will have to calculate the slope of the existing path behind the William E. Simon Center and the Oechsle Center for Global Education. This dirt pathway will require renovation for both aesthetic and general safety purposes to ensure those with disabilities (e.g., wheelchair users) can comfortably access the pathway.

The elevated boardwalk will curve out to College Avenue roughly at the same elevation as the path behind Simon in order to maintain a grade of 5% or less for ADA accessibility. Once this walkway has left the trees, then the bridge portion can be built over College Avenue. This bridge will span directly south until it reaches the back end of the Ahart Arts Plaza. Because the bridge slope cannot descend too much to conform to ADA, we suggest that an elevator and stair system be built on the Ahart Arts Plaza.

After meeting with Professor McGuire, we have realized that making the elevated boardwalk and trail portion of this pathway will be difficult to make ADA accessible. Based on rough readings, the elevation at the S College Drive entry point of the path is 60-70 feet above the point at which the bridge will meet the hill. The distance between these two points is roughly 670 feet, which means we only have an approximate allowance of 55 feet in the change of elevation. We are hopeful that we will be able to compensate for this by adding additional height to the bridge as it reaches the hill on College Avenue. Because the bridge will only need a rise of about 15 feet from the Ahart Plaza to the elevated boardwalk on the hill, we may be able to increase the slope of the bridge to ease the slope of the elevated boardwalk/trail portion.

Furthermore, according to Lafayette College's proposal to the Multimodal Transportation Fund, ADA compliance is not prioritized along the trail network. However, we believe that it is still worth considering when it comes to the final design stages especially because the bridges will have the capability with the help of an elevator and stair system.

Design B: Bushkill Connection

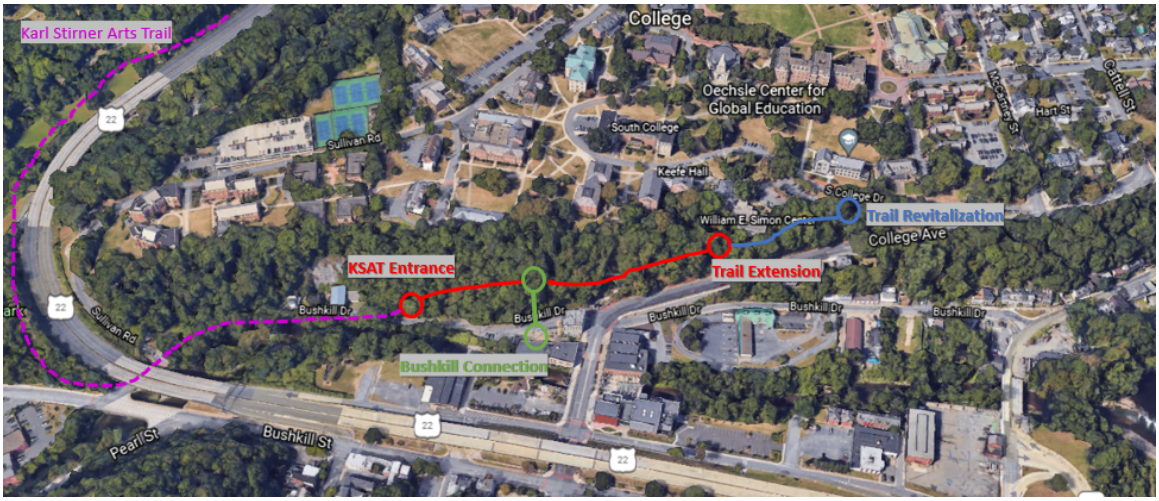


Figure 18: Bushill Connection shown in green.

The Bushkill Connection is an alternative solution to creating an accessible connection between the main campus and the arts campus. The connection will be a pedestrian bridge that begins along the trail extension on the west side of the stone steps. The bridge crosses over Bushkill Drive and will end at the Don Juan parking lot area, spanning a total of approximately 130ft in length. According to Professor Mante, this bridge would be much simpler, and ultimately more cost effective compared to the Ahart Connection bridge. This bridge bypasses the stone steps and creates a much smoother commute between College Hill and downtown Easton. Furthermore, by creating the entry/exit point near the Don Juan parking lot, those who would usually opt to cross College Avenue at McCartney Street instead of taking the stone steps can now cross the

road on the recently constructed crosswalk on North 3rd Street in front of the Williams Visual Arts Building.

Figure 18: Common College Avenue crossing zones for pedestrians.

Materials

Because the aesthetic presentation of this bridge is a key component of this project, we do not aim to limit any potential designs. However, we would like to recommend a few options as a starting point for consideration. The first recommendation would be to use stone as the dominant material for the bridge to complement the stone steps, as well as many of the buildings through Easton. The stone steps blend naturally into the green hillside of College Hill and thus can be a strong candidate. Stone is also structurally sound for this type of project where supports can be placed underneath most of the structure (Svrjcek). Brick and mortar could also be incorporated with stone, which could be a complement to many buildings on campus.

Steel is also a commonly used material for bridges. Steel is very sustainable in terms of its longevity and its limited impact on the environment which can be attractive (AISC). Much of the structures in the downhill arts campus incorporates steel in its

architecture, thus making steel an aesthetically matching candidate as well. The third recommendation is fiber reinforced polymer (FRP). Although this material is the most unconventional, its properties allow it to be structurally sound while being very adaptable to different styles of presentation (Smits, 2016). FRP design and production has been rapidly improving over the years as is being used for an increasing number of projects (Smits, 2016). The production of this material is especially friendly to the environment compared to other conventional materials, in the specific case that renewable materials are used. (Smits, 2016). This material can be modified in ways that resemble other materials so that it does not stand out in any unintended ways (Smits, 2016). The use of FRP can be a symbolic view moving towards more innovative and sustainable solutions to long unchanging methods of construction. After the consideration of cost and durability, another important factor to consider for the material is the ability to be 3D printed or constructed off site. If major sections such as the main structure and deck could be built offsite, on-site construction will be much faster than putting the bridge together piece by piece.

Economic Context

Introduction

Economic considerations underpin the feasibility of this project and highlights the effort and resources needed to complete it. The economics depend on the political and technical aspects of the project. If the local government and PennDOT are willing to fund this project, it can make it significantly more feasible by easing the load it would have on Lafayette College itself to implement it. The social context and input from stakeholders' help determine the parameters of the design and eventually the economic parameters. We were able to find good estimates through RS Means and the Federal Highway Administration and consulted with faculty to ensure our numbers were reasonable. The first plan to build a bridge crossing over from the Ahart Family Arts Plaza will be the more costly of the two but also what we believe to be the more distinguishable option.

The new Lafayette College escarpment improvement plan, mostly funded by the Multimodal Transportation Fund by the Commonwealth Financing Authority, brings a lot of economic data and support for the trail portions of our design we intend to develop. The fact that Lafayette College plans to set aside money for 30% of the $1,242,422 total cost for this plan has made this plan's approval easier. Precise breakdowns of the total cost of the plan will be provided in this report as a source of economic information.

The project's economic considerations begin with the design of the bridge and path itself. The design made use of existing infrastructure such as an old trail and chose a location for the bridge to cross that would minimize distance. Additionally, the Ahart arts plaza and Williams visual arts building are existing infrastructure that will be the foundation for the bridge on the Easton side. Raw materials and the design itself were

chosen to be a cost-effective solution, however, the actual cost of realizing this design will be decided by the relevant construction companies and professionals as well as the market price of the time.

Preliminary research has focused on more commonly accessible knowledge online. The designs have been broken down into their individual components and assessed by looking at ranged cost estimates and applying the projected dimensions when possible. Choosing the upper bracket allows us to gauge a worst-case scenario so that we can plan around what our limitations may be. In order to get a sense of how much our project may cost, we looked at other examples of complete projects. Numbers will become more precise as this project nears implementation and completion in the event it gains attention and approval. More research using more authoritative sources such as RS Means are provided against some of the earlier research done here.

Common Trail Portion Economic Considerations

Project Component	Cost
Demolition	$70,000
Site Construction	$728,165
Retaining Walls	$14,850
Site Improvements	$270,850
SUBTOTAL	**$1,083,866**
Contingency (5%)	$54,193
Legal and Administrative Costs (2%)	$17,394
Engineering (10%)	$86,970
TOTAL	**$1,242,422**

Figure 19: MTF Report Trail Revitalization and Extension Estimates

Figure 19 provides a more concise breakdown of the costs involved in Lafayette's new plan for the escarpment. It is our most accurate estimate of the cost with it having been vetted by professionals and agreed upon by the administration. It is clearly

comprehensive with its consideration of not just creating a safe and functional path, but also seeks to improve the site. The plan calls for an elevated boardwalk behind Simon's, which seems to be a necessary solution considering the terrain. This boardwalk is part of the site construction component which also includes the actual laying of the concrete path itself and necessities such as handrails, benches, trash receptacles and drainage. Demolition involves the removal of trees and existing paths. Site improvements involve lighting installation costs and radiant heating on the concrete path. Additionally, non-construction related costs are accounted for by the contingency, legal and administrative costs, and engineering. Contingency helps to account for unforeseen costs that could probably arise in the future. Engineering accounts for the labor costs of engineering expertise with this project (Lafayette, 2021). This plan aligns with our intention and design for the escarpment save the connections and foundations for the bridge, the bridge itself, and the connection with Easton down the hill. Therefore, the arrived cost of this report is a crucial number that contributes to our own report. Compared with estimates we were able to do alone, with the addition of site improvements and non-construction related costs, the $1.2 million total does expectedly exceed our own estimates. Certain estimates such as that of constructing the 6' width concrete path was $50 per ft in the MTF report but sources online suggested it to be just $28 per ft. The MTF report is unquestionably a more authoritative source and was signed off by a commonwealth registered professional engineer.

Ahart Connection and Bushkill Connection Estimates

A portion of both plans involves the stair and elevator infrastructure that brings people up onto the bridge behind Don Juan in the Bushkill connection or Ahart Arts plaza

from the Ahart connection. A freight elevator's cost can reach up to $150,000 and a smaller church elevator can range up to $50,000 according to Homeadvisor (Homeadvisor, 2021). Given something in between would be ideal, a $100,000 estimate is reasonable. This also matches an estimate by evstudio for hydraulic commercial two-stop elevators (Dalvit, 2014). Using a third source, RS Means data provides a total $72,525 estimate including overhead and profit for a 2,500lb capacity, 150 fpm, hydraulic 2-stop passenger elevator. The general contractor's overhead and profit is the markup on material, labor, equipment, and subcontractor costs. The standard markup percentage in the RS Means data book is 10%. Adding elevator controls and some custom finishes will increase the cost by around $10,000 according to RS Means data entries.

Accompanying the elevator will be an adjacent stair structure that will allow users to conserve power and enjoy exercise if they so desire. RS Means estimates that the most expensive decorative metal spiral stairs at 5' in diameter are $4,575 total per flight including O&P (Doheny, 2020). Considering a typical flight of stairs is around 10' high, and we anticipate the height clearance needed to be 50' for the Ahart connection, the expected number of flights should be 5. Thus, the total cost for the stairs is estimated to be $22,875. However, the supporting enclosing structure and a design possibly more elaborate than the one RS Means is based on also needs to be considered, so an additional cost of $15,000 will be added here as a buffer. Totaling the above estimates, we arrive at

$$\$4,575*(5 \text{ flights}/1 \text{ flight}) = \$22,875$$

$$\$72,525+\$10,000+\$22,875+\$15,000=\$120,400$$

The Federal Highway Administration estimates that pedestrian bridges range from $150 to $250 per square foot (UNC, 2016). According to Axcess, LLC, which is a bridge solutions company, the cost per square foot of installed bridges ranges from approximately $175 to $350 (Loff). Given our estimates of a 330ft by 10ft bridge, current estimates based on the highest bracket of the two ranges put the bridge's cost at $1,115,000.

$$330 \text{ ft} * 10 \text{ ft} *(\$350 / 1 \text{ sq ft}) = \$1,115,000$$

However, this does not include all the maintenance and many of the possible construction and legal fees, nor is it an accurate representation of what our unique design and additional lighting and more would cost. This does provide a minimum that we can expect. As the design of the bridge nears completion with the spans, type of superstructure and substructure, fabrication, transportation and more finalized, the better one can use resources like RS Means to estimate the final cost. Bridges vary in cost greatly depending on the design for their unique locations and also the unique costs that come with each location's region and time period. Nevertheless, in order to try and account for unforeseen costs we used Lafayette College's model of a percentage breakdown to account for contingency, administrative and legal fees, and engineering. With the total percentages of non-construction related costs adding up to 17%, we have the following calculation:

$$\$1,115,000 * (1+0.05+0.02+0.10) = \$1,304,550$$

With the Bushkill connection likely resulting in around 130 ft of bridge length needed, we can do the following calculations to arrive at an estimate with the method above. This will have our estimate at $532,350 for the Bushkill connection.

130 ft *10 ft*($350 / 1 sq ft) = $455,000

$455,000 * (1+0.05+0.02+0.10) = $532,350

One example of a bridge project that can help us gauge our own project is at Utah Valley University. The completed bridge spans 1,000 ft and is 15ft wide. It is complete with 125 security cameras, 18 lights and 15,000 square feet of heated concrete. Both ends of the bridge feature elevators to help pedestrians cross Interstate 15 and multiple rail lines. The project cost $30.7 million dollars with significant funding from the Utah Department of Transportation and the Utah Transit Authority upon its completion in February of 2021 (Lee, 2021). Our proposed design is smaller in terms of length and width and lacks the heated concrete feature. However, given its university setting that also involved the state DOT, crossing over road traffic, and its recent completion, we thought it would provide a useful point of reference. It is reasonable to assume that since our bridge surface area is roughly 22% of this proposal, lacking the heated concrete feature and stairs plus elevator combo on the other end, that $7 million should be a rough upper limit for our project.

(3300 ft / 15,000 ft) * $30,700,000 = $6,754,000

This estimate considers the fact that while some features may be lacking in our proposal, base costs such as design, and the fact that a bridge's total cost does not simply multiply precisely according to surface area would suggest that an estimate needs to be larger than that pure calculation.

Figure 20: UVU bridge

A summary of the estimated costs we have arrived at is provided below in Figure 21. Considering the potential for the bridge design to change and develop in the future and considering the possible range of costs for bridge construction in general, the below totals are best used as a lower estimate.

Connection	Component	Cost
Ahart	Trail	$1,242,422
	Bridge	$1,304,550
	Stairs/Elevator	$120,400
	Total	**$2,667,372**
Bushkill	Trail	$1,242,422
	Bridge	$532,350
	Stairs/Elevator	$120,400
	Total	**$1,895,172**

Figure 22: Costs Table

Financial Support and Final Considerations

As confirmed by Professor Wilford-Hunt and the MTF report, the College received $1,500,000 in grant money in the past for improving the escarpment situation. Lafayette has pledged 30% of the $1.2 million cost of the new plan for the trails. The money being provided by Lafayette here is in addition to the $1.5 million that was granted by the MTF for Lafayette's use in previous multimodal improvement efforts like the Skyway. In the now indefinitely delayed Skyway project, the College was promised $1.5 million in state aid for the $9.4 million project but asked for an additional $3 million in 2019. According to the new Lafayette MTF report, this $1.5 million will be used in the $2.5 million historic staircase restoration project (Lafayette, 2021). Unless our project proposals can get more support due to its own merits, it is uncertain how much money is readily available to implement our proposed additions. The ability of Lafayette's

administration as well as this project's appeal to garner more financial support from relevant public organizations or donors is uncertain right now.

This project does not serve as a profit-making initiative directly but can indirectly benefit Lafayette's financial situation. By solving issues of safety and accessibility as well as promoting an easier and more deliberate connection from Lafayette College to downtown Easton, Lafayette's attractiveness should be enhanced and draw more donations and interested students. As a whole, this should also benefit downtown Easton's economy. If more Lafayette community members can be encouraged to frequent downtown via an easier method, all the businesses downtown will benefit from more customers. In Lafayette's own report, this economic benefit is noted. "The Project will further physical and economic exchanges between Lafayette College and the City of Easton. As Easton's largest private employer, Lafayette College has a direct, significant impact on the local economy, drawing many visitors to the campus and City of Easton." (Lafayette, 2021) After the project's completion, more money will have to be dedicated to its upkeep and electricity bills.

Conclusion

Currently, the main Lafayette campus and the Downtown Arts Campus and Easton Community are connected by jagged steps and an unsafe street, making it both dangerous and inconvenient for pedestrians to navigate. This discourages these communities from actively engaging and, consequently, leads to many issues of safety, social justice, and resiliency. These issues include both a physical and social disconnection between the two entities, economic barriers, and technical barriers. To address these issues, a creative design that is community-centric and promotes the historical connection between the Lafayette area and the downtown area aesthetically will be beneficial to both communities. After considering the issues discussed in this paper and previous failed proposals, two new designs have been proposed. These designs involve sustainable materials and an overall theme that encourages accessibility and celebrates the history of the surrounding area.

This proposal as well as both design options proposed serve primarily as a jumping off point, and not a plan set in stone. Our goal is to change the way people think about the connection between College Hill and Downtown Easton. It is more than just a geometry problem, and one that shines a light on many instances of injustice in the community. Future works that focus on addressing the connection between Lafayette and Easton must engage the community in all stages of design and promote accessibility and sustainability.

Epilogue

Going forward we hope that this project will be continued by future capstone students, be they Engineering Studies students, Civil Engineering students, or any other members of the Lafayette campus and greater Easton community. We recommend that a design competition be presented to Easton residents as well as Lafayette students to help develop the aesthetics of the bridge. It was important and intentional of us to present aesthetic options that pay homage to the area, but do not set in stone what the design should look like. It will take several years to fully design and flesh out this project. We hope this proposal creates an outline for future students to use and iterate off of. We want this project to be challenged and combed over to find areas for improvement and for people to create concrete designs, begin community outreach, and determine the feasibility of the Ahart Connection or the Bushkill Connection. Our job was to lay the groundwork to help improve walkability, accessibility, and equity. We hope that future groups will build on this groundwork, both metaphorically and literally, to create something that tangibly improves the lives of Easton residents and Lafayette students, arts students, and faculty.

Future contributors to this project should consider the following issues in their objectives when they take over the reins. This is by no means an exhaustive list, but it should provide them with specific problems to engage with and tackle. One of the biggest hurdles for the Ahart Connection is PennDOT, should future groups prefer the Ahart Connection to the Bushkill Connection, they will need to figure out how to get PennDOT to allow them to build over College Ave. According to Professor McGuire, PennDOT has nixed similar proposals in the past, so overcoming that barrier is tantamount to success.

Continuing with the Ahart Connection, finding a way to be ADA compliant over the course of the whole bridge and trail will be difficult. The geometry of the area is challenging, as talked about in our technical analysis. Future teams will have to figure out if the Ahart Connection can realistically be ADA compliant.

Even more important than these design considerations are community outreach. As established earlier, Easton residents have been historically upset regarding Lafayette's expansion and outward development. Once more concrete dimensions of the proposals can be presented, Easton residents must be consulted to assist with the design itself, as well as having their concerns addressed and seriously considered. This project is designed to be as much for Easton residents as it is for Lafayette students. If they are vehemently opposed to the design, then it should not be continued. Groups must find good sources in the community to begin communicating with. They can also send out surveys and begin laying out plans for a design competition.

References

Bresswein, K. (2019, March 20). The Lehigh Valley is young, growing and has a record-breaking economy. lehighvalleylive. Retrieved December 16, 2021, from https://www.lehighvalleylive.com/news/2019/03/the-lehigh-valley-is-young-growing-and-has-a-record-breaking-economy.html

Chenoweth, H. (2017, December 6). *How can universities strengthen town-gown relations?* Higher Ed Facilities Forum. Retrieved October 13, 2021, from https://info.higheredfacilitiesforum.com/blog/how-universities-can-strengthen-town-gown-relations.

City of Easton - interactive map new. (n.d.). Retrieved December 16, 2021, from https://easton-pa.zoninghub.com/zoningmap.aspx

Construction and maintenance costs for trails. Construction and Maintenance Costs for Trails - American Trails. (n.d.). Retrieved November 10, 2021, from https://www.americantrails.org/resources/construction-and-maintenance-costs-for-trails.

Dalvit, D. (2014, October 4). *How much does a hydraulic 2-stop elevator cost?* EVstudio. Retrieved November 10, 2021, from https://evstudio.com/how-much-does-a-hydraulic-2-stop-elevator-cost/.

David Wheeler, Jenna Czarnota, & Resa Jones. (2017, June 8). *Estimating an area-level socioeconomic status index and its association with colonoscopy screening adherence*. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0179272

Doheny, M. (Ed.). (2020). *Building construction costs with Rsmeans data, 2021*. Gordian/RSMeans Data.

Dove, A. (n.d.). Is systemic racism literally built into our cities? - College of Engineering at Carnegie Mellon University. Retrieved November 15, 2021, from https://engineering.cmu.edu/news-events/news/2020/09/11-racial-inequity-infrastructure.html

Gaffney, J. (2017, September 15). Opinion: Easton resident urges college to better city with expansion. The Lafayette. Retrieved from: https://www.lafayettestudentnews.com/blog/2017/09/15/opinion-easton-resident-urges-college-to-better-easton-with-expansion/

Grodach, C. (2010). Art spaces, public space, and the link to community development. *Community Development Journal*, 45(4), 474-493.

Gross, T. (2017, May 3). A "Forgotten History" Of How The U.S. Government Segregated America: NPR. NPR. https://www.npr.org/2017/05/03/526655831/a-forgotten-history-of-how-the-u-s-government-segregated-america

Harris, H. J. (1966). Elitism and the Liberal-Arts College. *The Journal of Higher Education*, *37*(8), 457–459. https://doi.org/10.2307/1979159

Holst, M. J. (2013). Urban Sustainability Initiatives and their Application in a University Setting: Campus Pathways.

How Much Does it Cost to Build a Pedestrian Bridge. Spanthegap.com. (n.d.). Retrieved November 10, 2021, from https://spanthegap.com/how-much-does-it-cost-to-build-a-pedestrian-bridge/.

Idelberger, K. (2011). *The World of Footbridges: From the Utilitarian to the Spectacular.*

Berlin: Ernst & Sohn.

Jackson, C. (2021, August 17). *What Is Redlining? - The New York Times*. https://www.nytimes.com/2021/08/17/realestate/what-is-redlining.html

Kelly, K. (2018, February 27). Bridging the gap up and down the hill: The struggle to integrate the Arts Campus. *The Lafayette*. Retrieved October 6, 2021, from https://www.lafayettestudentnews.com/blog/2018/02/23/arts-campus-ignored/.

Kuttner, P. J., Byrne, K., Schmit, K., & Munro, S. (2018). *The Art of Convening: How Community Engagement Professionals Build Place-Based Community–University Partnerships for Systemic Change*. 30.

Lafayette College. (2021). *Commonwealth Financing Authority Multimodal Transportation Fund Application for Easton/College Hill Escarpment* (Fiscal Application No. 202107238519).

Learn how much it costs to build a disability ramp. HomeAdvisor. (n.d.). Retrieved November 10, 2021, from https://www.homeadvisor.com/cost/environmental-safety/build-a-disability-ramp/#factors

Learn how much it costs to clear land or prepare a construction site. HomeAdvisor. (2021, September 2). Retrieved November 10, 2021, from https://www.homeadvisor.com/cost/landscape/clear-land-or-prepare-a-construction-site/#:~:text=You%20will%20pay%20between%20%24500%20and%20%242%2C000%20per%20acre%20to,acre%20for%20heavily%20forested%20land.

Learn how much it costs to excavate land. HomeAdvisor. (n.d.). Retrieved November 10, 2021, from https://www.homeadvisor.com/cost/landscape/excavate-land/?zip=undefined#concrete.

Learn how much it costs to install a retaining wall. HomeAdvisor. (n.d.). Retrieved November 10, 2021, from https://www.homeadvisor.com/cost/landscape/install-a-retaining-wall/?zip=undefined.

Learn how much it costs to install an elevator. HomeAdvisor. (n.d.). Retrieved November 10, 2021, from https://www.homeadvisor.com/cost/disability-accommodation/install-an-elevator-or-chairlift/?zip=undefined#commercial.

Lee, J. (2021, January 15). *New Pedestrian Bridge will provide safety, save time for utah valley students*. Deseret News. Retrieved November 10, 2021, from https://www.deseret.com/utah/2021/1/14/22227398/new-pedestrian-bridge-will-provide-safety-save-time-for-utah-valley-students.

lehighvalleylive.com, R. M. | F. (2017, January 3). *Lafayette wants more state aid for huge outdoor elevator*. lehighvalleylive. Retrieved November 24, 2021, from https://www.lehighvalleylive.com/easton/2017/01/lafayette_seeks_more_state_aid.html.

lehighvalleylive.com, K. B. | F. (2021, September 23). *Easton redevelopment projects advance, after talk focuses on downtown parking, rents*. lehighvalleylive. Retrieved November 24, 2021, from https://www.lehighvalleylive.com/easton/2021/09/easton-redevelopment-projects-advance-after-talk-focuses-on-downtown-parking-rents.html.

Loff, A. (n.d.). *How Much Does it Cost to Build a Pedestrian Bridge?* Spanthegap.com. Retrieved December 15, 2021, from https://spanthegap.com/how-much-does-it-cost-to-build-a-pedestrian-bridge/

Lucena, J., Leydens, J. A., & Schneider, J. (2010). *Engineering and sustainable community development*. Morgan & Claypool Publishers.

Martin, J., Samels, J. E. (2019). The New American College Town: Designing More Effective Partnerships between campuses and their communities. Johns Hopkins University Press.

McCartney Street Residences. From College Hill to College Town. (n.d.). Retrieved December 16, 2021, from https://www.lafayette.edu/college-town/college-hill/college-hill-residence-halls/

McDonald, R. I. (2015). *Conservation for Cities: How to Plan and Build Natural Infrastructure*. Washington (D.C.): Island Press.

Miller, R. (2017, September 11). Lafayette's plan for huge outdoor elevator is grounded. *lehighvalleylive*. Retrieved October 6, 2021, from https://www.lehighvalleylive.com/easton/2017/09/lafayettes_plan_for_huge_outdo.html.

Multimodal Transportation Fund. PA Department of Community & Economic Development. (2021, October 4). Retrieved December 16, 2021, from https://dced.pa.gov/programs/multimodal-transportation-fund/#

Multimodal Transportation. Pennsylvania Department of Transportation. (n.d.). Retrieved December 16, 2021, from

https://www.penndot.gov/ProjectAndPrograms/MultimodalProgram/Pages/default.aspx#.Vfwm17HD-Uk

Press, A. (2021, May 3). World's longest pedestrian bridge opens in Portugal. WGN. Retrieved December 16, 2021, from https://wgntv.com/news/new-portuguese-bridge-not-for-the-faint-hearted/

Schmidt, M., Roman, S., Emery, T., & Gibbons, C. (n.d.). The Art Stairs. Engineering Studies 451 Capstone Projects Fall 2016. Retrieved December 16, 2021, from https://sites.lafayette.edu/egrs451-fa16/the-art-stairs/

Sigafoos, S. (2021, May 5). Smart connections. News. Retrieved December 16, 2021, from https://news.lafayette.edu/2021/05/05/smart-connections/

Smits, J. (2016). Fiber-Reinforced Polymer Bridge Design in the Netherlands: Architectural Challenges toward Innovative, Sustainable, and Durable Bridges. Engineering, 2(4), 518-527. doi:10.1016/j.eng.2016.04.004

Socioeconomic Status (NSES Index) by Census Tract, 2011-2015. (n.d.). Arcgis. Retrieved October 26, 2021, from https://www.arcgis.com/apps/mapviewer/index.html?webmap=c9fcad275db846838e747e417a66ca7a

Southworth, M. (2005). Designing the Walkable City. *Journal of urban planning and development*, *131*(4), 246-257.

Speck, J. (2018). Walkable City Rules: 101 Steps to Making Better Places. Island Press.

Stamp, E. (2015, October 5). *18 pedestrian bridges and footbridges with amazing designs*. Architectural Digest. Retrieved October 6, 2021, from https://www.architecturaldigest.com/gallery/worlds-best-pedestrian-bridges.

Students, C. E. D. P. I. &. (2016). *Pedestrian bridges: Connecting people with communities*. Community and Economic Development - Blog by UNC School of Government. Retrieved December 15, 2021, from https://ced.sog.unc.edu/2016/01/pedestrian-bridges-connecting-people-with-communities/

"Structural Steel Sustainability | American Institute of Steel Construction." *AISC Home | American Institute of Steel Construction*, American Institute of Steel Construction, https://www.aisc.org/why-steel/sustainability/. Accessed 2021.

Sustainable and Green Bridge Designs 101—Bridge Masters. (2017, September 1). https://bridgemastersinc.com/sustainable-green-bridge-designs/

Students, C. E. D. P. I. &. (n.d.). *Pedestrian bridges: Connecting people with communities*. Community and Economic Development - Blog by UNC School of Government. Retrieved November 10, 2021, from https://ced.sog.unc.edu/2016/01/pedestrian-bridges-connecting-people-with-communities/.

Svrjcek, D. C. (Ed.). (n.d.). Bridge Construction & Materials | Harford County, MD. Retrieved November 29, 2017, from http://www.harfordcountymd.gov/654/Bridge-Construction-Materials

Tatu, C. (2018, June 9). Lafayette gets $1.5 million for elevator linking main campus with downtown. mcall.com. Retrieved October 6, 2021, from https://www.mcall.com/news/local/easton/mc-easton--lafayette-skyway-grant-20161207-Story.html.

Tatu, C. (2019, July 21). Lafayette College to remove four more homes at the gateway to

Easton's College Hill. mcall.com. Retrieved October 6, 2021, from https://www.mcall.com/news/local/easton/mc-nws-easton-lafayette-removes-more-homes-20190722-63yp73h53rhwrcv572gossvcay-story.html.

Trawalter, S., Hoffman, K., & Palmer, L. (2021). Out of place: Socioeconomic status, use of public space, and belonging in higher education. *Journal of Personality and Social Psychology*, *120*(1), 131–144. https://doi.org/10.1037/pspi0000248

Ursula Baus, & Mike Schlaich. (2008). Footbridges : Construction, Design, History. Birkhäuser.

Ward, J. (2021, October 27). *Easton holds session for public feedback, the public stays home*. WFMZ.com. Retrieved November 24, 2021, from https://www.wfmz.com/news/area/lehighvalley/easton-holds-session-for-public-feedback-the-public-stays-home/article_f669c77a-1b40-11ec-b73a-3b5f6d3b737e.html.

What do trustees do? Teachers College - Columbia University. (2009, March 10). Retrieved December 16, 2021, from https://www.tc.columbia.edu/articles/2009/march/what-do-trustees-do/

Yoders, J. (2020, March 19). Project of the Year, Best Landscape, Urban Development: 41st Street Pedestrian Bridge Over Lake Shore Drive. Retrieved October 6, 2021, from Engineering News-Record | ENR website: https://www.enr.com/articles/48905-project-of-the-year-best-landscape-urban-development-41st-street-pedestrian-bridge-over-lake-shore-drive

Yu, S., Bryant, M., Messmer, E., Tsagronis, S., & amp; Link, S. (2018). “Is there a

bubble to burst?"-college students' spatial perception of campus and the city, a case study of Rhodes College in Memphis, TN. Urban Geography, 39(10), 1555–1575. https://doi.org/10.1080/02723638.2018.1481602

Appendix A

Key Takeaways from Lafayette Faculty Meetings

Professor Wilford-Hunt:

- Height over College Ave
- PennDOT road
- Donors
- Design competition

Professor Sanford:

- Constructability
- Community Engagement & Perception
- Safety

Professor Mante:

- Questioned bridge economic feasibility
- Distances between supports
- Slope
- Sustainability

Professor Nestor Gil:

- Experiential Design
  - Scale
  - Architecture
  - Perspective
- Approves Ahart community connection

Professor McGuire :

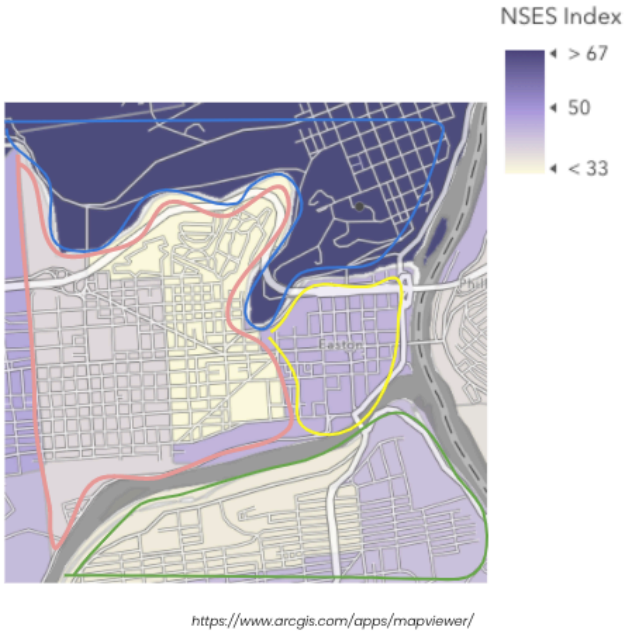
- Geometry + PennDot complications
- Potential pivot/rebrand
- Focus scope and determining audience

Professor Cohen:

- Sociotechnical systems
- Emphasize flexibility of design

Appendix B

Maps of the Easton Neighborhoods and associated SES



https://www.arcgis.com/apps/mapviewer/

Appendix C

Lafayette Media on MTF Grant for Pedestrian Trail

NOVEMBER 23, 2021

Lafayette Receives Funding to Create Pedestrian-Friendly Trail

LAFAYETTE NEWS – LAFAYETTE RECEIVES FUNDING TO...

Public pathway will provide a safe, accessible route linking College Hill and Lafayette's campus with downtown Easton

By Bryan Hay

Lafayette College has received state funding to build a public multimodal trail that will provide a safe, accessible route linking the College Hill neighborhood and Lafayette's hilltop campus with downtown Easton.

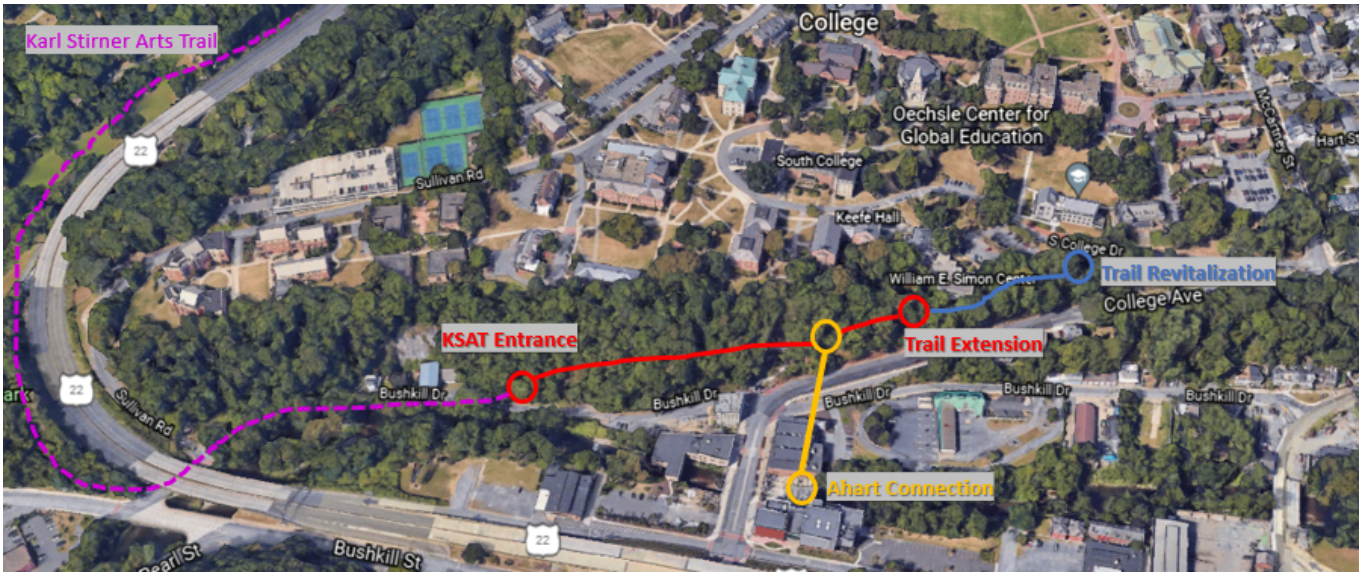
NEWS

- For the Media
- Alumni Stories
- Community Stories
- Innovation Stories
- Global Impact Stories
- Lecture Recaps

"This public-private partnership, working in close cooperation with the City of Easton and Mayor Salvatore J. Panto Jr., to create a trail connecting the College Hill neighborhood and Lafayette's campus with the Karl Stirner Arts Trail and the College's Williams Arts Campus will make it easier and safer for residents, visitors, and students to walk or bike between downtown and our hilltop campus," said Lafayette President **Nicole Farmer Hurd**.

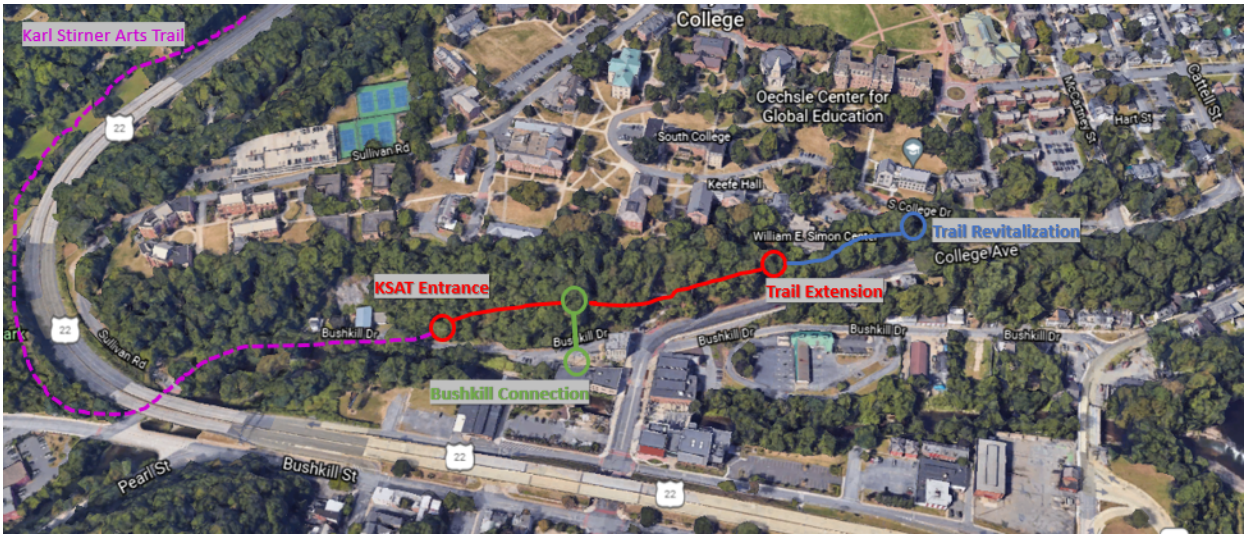
Appendix D

Ahart Connection Proposal



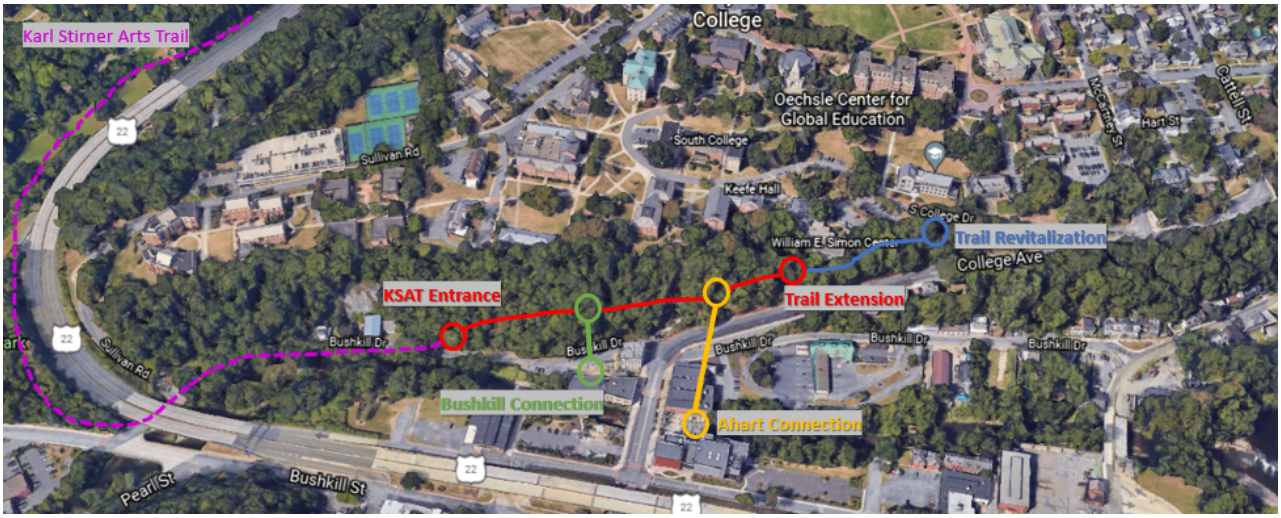
Appendix E

Bushkill Connection Proposal



Appendix F

Overlay of Two Trail and Bridge System Proposals: Ahart Connection and Bushkill Connection



Appendix G

Some Key Takeaways

- We have developed two proposals both of which have the same trail system but different bridge systems.
- Our first proposal, the Ahart bridge Connection shown in yellow on the map in Appendix F is more distinguishable with a longer bridge passing over College Ave (a PennDOT-owned road) and landing in the community gathering point of the Ahart Arts Plaza. The higher expense and restrictions of this proposal will likely make it less feasible for implementation.
- The Bushkill bridge Connection shown in the green on the map in Appendix F is likely more feasible as it is less pronounced than the Ahart bridge Connection with a shorter and less expensive bridge system.
- Throughout this project, we have engaged with the Lafayette community to discuss the contexts and impacts that should be considered.
- Moving forward, more direct communication with Easton community members is essential and can be done through surveys or fun programs like design competitions.
- In the future, we hope that the development Lafayette takes up (including our own) considers all these communities in design and strives to create more equitable, accessible, and just infrastructure.