

California & Foothill Tunnel Feasibility Project:

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Safety on and off campus while attending college is one of the fastest growing concerns around the country. Having a secure path to get to campus is also a large problem to a select number of students here at California Polytechnic State University. The "Rape" Tunnel at the corner of California and Foothill Boulevard is considered to many to be a danger because of its unpredictable accessibility and the stigma that surrounds it.

Key Words: Tunnel, Cal Poly, Pacific Union, City of San Luis Obispo, Remodel, Student Safety

Introduction

The California & Foothill Tunnel has impacted many people around me, myself included. I live in the quadrant that's subjected to its use and for 2 years I have had to use the tunnel on my way to class. In my experience I have injured myself twice and had many others say that they have slipped or in some manner hurt them. During my junior year at Cal Poly I made it my goal to do something about this issue. Initially, I was frustrated and wanted to do something about it immediately, I wanted to get my hands dirty and build something. As time went by my ideas about how to improve the tunnel became proposals to my roommates and neighbors, the vision that I had in my mind turned into sketches and drawings. I knew that this project was something that I was passionate about and should try to bring to fruition in some manner. When I started thinking about my Senior Project and what that would entail, my mind instantly went to this because I was knowledgeable enough on the area to create a plan but unsure about other aspects; like what the permit process would look like? Who the key players would be? What would it cost? How long it would take? And if it would really benefit the students that much?

Processes

Initially I went to the City of San Luis Obispo to track down some drawings of the tunnel or any type of measurements that I could get my hands on. After consulting with the director at the city I was informed that they had no drawings on the tunnel since it was built so long ago and was mainly just a drainage path. I decided that I should go out to the site and take measurements myself and build a computer model in Google Sketch-Up so that I could have a three dimensional tool to visualize the changes that I wanted to implement. Once that was complete I went back to the site and handed out surveys asking students how they were being impacted by using the tunnel and also counted the amount of students that went by in an hour. I took photographs and had a drone that was able to fly in and above the tunnel to give me good birds eye pictures and videos. I then contacted contractors to sit down with me to talk about pricing, labor requirements, and logistics about the site. By identifying all of the needs of students and the solutions that would alleviate those problems I devised a list of things that I should be taken into consideration when remodeling the tunnel.

Deliverables

In this assignment I put together a list of materials aimed at showcasing the problems that are apparent with the California and Foothill Tunnel, who is being affected, and a construction plan to fix those issues cited. Also included is an optimistic 3 week schedule that lays out every line item that I could see within the scope of the project. In the paper resources you will be able to see the corresponding visuals that go along with the explanations that I have laid out in the following paragraphs, they are formatted to progress chronologically as does the paper. The resources at the end of this paper should be used as a reference to help you visualize the project and gain a better understanding of the issues that need to be mitigated in this project.

Existing Problems

Located just south-west of the California Polytechnic State University campus is the tunnel, a 50' long by 12' wide path for students to get to and from campus. Originally a drainage way for runoff storm water from the campus, the tunnel has changed over time to act as a passageway for hundreds of students per day. An uneven walking path littered with branches, loose rocks, concrete masonry units, trash, and decaying 2x4's makes up the path that leads through the tunnel. With no source of lighting students are subjected to walk through the tunnel with flashlights from their phones dimly lighting the muddy path before them. Currently the tunnel is subjected to changing conditions in a matter of hours. Since the tunnel is at such a low point and the campus slopes down to the tunnel, the amount of water that flows through the tunnel can fluctuate greatly over a short period of time. The typical flow of water through the tunnel is quite weak, usually resulting in a stagnant pool with water overflowing the build-up of debris at the west side of the tunnel. On the other hand only hours after it has started raining, you can see that the water level will rise to almost a foot deep and 8 feet across with a swift current. Once you have crossed the water twice on your way through the tunnel you can expect to make your way up a steep hill that represents more of a muddy rock climbing challenge than a walking path. In a survey taken of 270 students, 80% of them said that they were uncomfortable using the tunnel, and a third of them have been hurt using it.

Area Impacted

The amount of people that use the tunnel fluctuates from day to day but it will typically act as a passageway for hundreds of students per day. These students all come from the surrounding apartment complexes and houses that line the streets up that lead up to the tunnel. Murray Avenue, Hathway Avenue, and Stenner Street are the main corridors that are within the impacted area, students that live on these streets are most likely to use the tunnel to get to school if they plan on walking. With the Cal Poly campus being under a mile away most students that live within the impacted area are likely to walk to campus, leaving them to deal with the tunnel on their way to and from school. As it stands the tunnel is an established path that anyone can use, and in reality it is the "suggested" path people should use. On google maps, if you want to travel to campus from anywhere in the impacted area it will draw you a path that leads you through the tunnel. This tunnel may not have been designed for human traffic initially but over time this has become an established path which should be taken care of and currently there are no efforts being put forth mostly because no one has said anything about it to the city of San Luis Obispo.

Research

After surveying 273 Cal poly students, I found that 41% of the students were daily users, over 80% were afraid to use the tunnel at night, 87% would feel more-safe if the tunnel was well lit and had a better walkway, and 31% have been injured in some fashion while using the tunnel. When students were asked if they have ever been unable to use the tunnel due to flooding? A staggering 75% responded "yes". Students spoke out on a free response section when asked what improvements they would most like to see. The most popular answer was an enhanced walking path, followed by an LED lighting system, and finally, a stair system on the east entrance. Other popular responses included a Blue Light Emergency tower at the entrance, handicap accessibility, and better drainage.

Interviews

In an unstructured format I sat down with three Cal Poly students who lived in the Cedar Creek Apartments and used the tunnel daily to find out more about the struggles that living near the tunnel entailed. All three interviewees agreed that they felt unsettled if they had to go through the tunnel alone at night and would often skip class if it was raining. These three students now live closer to campus and rarely ever use the tunnel but told me that their biggest issues with going through the tunnel, were that it smelt of sewage and was unsanitary, you were likely to have your shoes get wet for the rest of the day, and that the walking path was so poor that you could easily fall and hurt yourself if you weren't careful. Other minor inconveniences included not knowing whether you needed to wear rain boots to class, and having to make sure that your phone had battery at the end of the day otherwise you would have to walk through the tunnel in the dark.

Site Logistics Plan

This site is in a difficult place; it is stuck adjacent to three separate property owners. The actual land that the tunnel is placed in belongs to Union Pacific, the bike path that the City of San Luis Obispo implemented sits to the east entrance and the west entrance leads straight on the Cedar Creek Apartment Complex. The site plan presented needs to have all three players working together cooperatively, and since this project deems to benefit all the parties involved it should not be an issue to work out a deal that leaves everyone satisfied. The site logistics plan is designed with 2 staging areas, one on the west side for parking and equipment and another area on the east side of the tunnel that can be used for day-to-day materials. There are 2 loading zones, one through the cedar creek apartment complex drive and another off of California Ave which should allow for a concrete truck to enter and other large equipment to get close enough to the site. As for the equipment that's needed to dig out the trenches and clear debris, that will have to be delivered to the west side of the site as it is the only viable entrance option due to slope accessibility issues. There should be 2 dumpsters onsite one on each side of the tunnel as well as a material removal area where old concrete and organics waste can be disposed of properly.

Schedule

The major items that need to be addressed in this project include clearing out the parking lot of the Cedar Creek apartment complex, clearing the brush from the west side of the tunnel, draining the tunnel and prepping for excavation, breaking up the existing concrete, trenching, setting up rebar and formwork, pouring concrete, placing railing, implementing the lighting systems and solar panels, and lastly building the stairs. All of these line items are intermingled with smaller tasks that combined should take around three weeks to complete. (8 hour days, no weekends, not including concrete set time)

Key Players

The key players involved in this project are Union Pacific, the railroad company that owns the land that surrounds the tunnel. The city of San Luis Obispo which will most likely fund the project and provide permits and other legal paperwork. California Polytechnic State University should be a part of the planned solution as well as it is the students of this university who are the most affected and are the main concern. The university should raise awareness alongside the students to generate a buzz around this project, only then will it be seen as a worthwhile cause. Other parties that should be involved are an electrical contractor, for this project I picked Electricraft located in San Luis Obispo, they specialize in solar powered devices and should be able to provide an estimate on products and labor. Lastly there will be a need for a heavy civil contractor to fully execute the design, they will need to remove soil, trench, compact new soil, and remove debris from the site in order to properly pour concrete for the new walkway, and I chose Papich Construction Company for this scope of work.

Solutions

My proposal is to implement a new walking path, a better drainage system, stairs on the east side of the tunnel, and solar powered LEDs throughout the tunnel. For starters the debris at the west side of the tunnel needs to be removed and a new drainage path needs to be dug on the north side of the tunnel. This will alleviate any chance of flooding inside the tunnel. These changes should enhance the tunnels aesthetics and more importantly its safety.

Products

The main products that need to be implemented into this project are a stand-alone solar panel wired up to 2 LED outdoor flood lights that should be mounted to the ceiling of the tunnel. The lights that I run on 35 watts and has an output of 3500 lumens. The solar panel is a Renology Monocrystalline kit with should ideally be able to store 500Wh per day. With the clear skies and open site there should be no problem collecting enough solar to last throughout the night. A staircase on the east side of the tunnel needs to be constructed as well, the design and materials would be left up to the designer and contractor, I would suggest a steel frame with metal grating. There needs to be a railing system in place to protect pedestrians from falling into the water, and off of the stair case. The model I selected is an Atlantis system that is 36" tall and has a stainless steel components, since it is close to water.

What's Next?

One of the major problems that I ran into was finding any information on the tunnel in general. Since it was made so long ago and built by Union Pacific there are no drawings at the City of San Luis Obispo that are available to the public. I think that it would be wise for an Architecture major to team up with a Landscape Architecture major and an Architectural Engineering major to properly scale and model this project. With their abilities to produce as-builts, know what type of plants can be implemented into the design, and how to grade the new site they should be able to produce a set of plans that surpasses just my ideas put into a simple rendering. Secondly, this project more than anything needs to be presented to the city of San Luis Obispo and to the public relations department of Union Pacific. A Cal Poly student affairs chairman also needs to speak up about the issue and needs to create buzz about the tunnel and how it is unsafe. Without people talking about it and voicing their concerns nothing is going to happen, just like nothing has happened in the last decade.

Lessons Learned

I came into this project wanting to implement change immediately, I wanted to build something that would help people out the next day. I wanted to make it so that the next time it rained people could get to school without having to worry about the tunnel flooding. I learned that that kind of approach doesn't always work in the real world, and if I wanted to create change, to create something that would last; that I needed to do it right. I learned that a lot of resources that you may depend on for a project may not exist and you will have to create solutions on your own. Most importantly I learned that if you convince the right people that what is happening in the world today is unjustified you can change people's lives for the better.