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NYDOT

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Video Submission:
https://vimeo.com/390702534/ac8692de3c

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Abstract

The objective of this project was to design a master plan on an existing department of transportation site that is in the process of being moved to a new location. The site was to include passive design strategies, Personal Rapid Transit System (PRT), and a mix of building types including residential, commercial, offices, and a transportation center. It was decided that cars would be eliminated from the site to take full advantage of the PRT system that would travel through the site.

The PRT follows the existing railway path. Looking at the city grid, it was decided to continue the grid with large pathways instead of roads. Giving the street back to pedestrians and bicyclists allows them to easily travel through the site and shop at multiple retail stores. These large paths are designed to be an active pathway of pedestrian travel. The design of these paths will allow emergency vehicles and delivery trucks to use it when needed. Having close access to the PRT allows for pedestrians to easily travel to and from the site to all the main spots in town and gives a ¼ mile or less walk to most of the city from a PRT station. The site is oriented to take full advantage of passive design while maintaining views and emphasis on Cayuga Lake and the surrounding mountains.

Project and Purpose Description

The purpose of this project was to create an environment that not only helped solve the traffic congestion in Ithaca but also provided some relief to the housing market. The site needed to be a place people would like to live and travel to for their retail needs. It needed to not only incorporate the PRT system but encourage people to use it as a mode of transportation. Figure 1 shows the master plan of the site and designations of building types.

Figure 1: Master Plan of Site (Image by NYDOT team).

Motivation: Why This Project Was Chosen

This project was chosen because Ithaca has an issue with commuter traffic. Due to a housing shortage within Ithaca, housing costs have risen and pushed people outside of the city to find affordable housing. These people then commute into the city causing a high influx in traffic during the week. Figure 4 shows the number of commuters within Tompkins county. It also shows the number of commuters who come into the county compared to the number of commuters who leave the county for work. Implementation of the PRT may also reduce the number of cars per household shown in Figure 2. Ithaca also has many nodes that would benefit from a transit connection between them. Such nodes include Cornell University, Ithaca College, Cayuga Medical Center, Downtown, College Town and Chainworks. These nodes are shown in relation to the site in Figure 3.

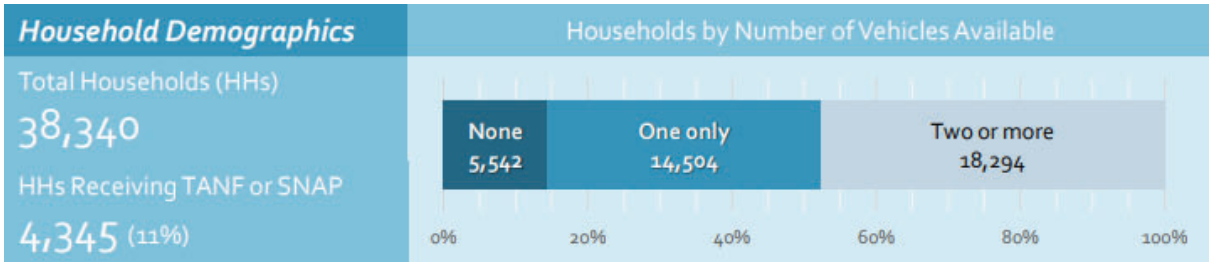

Figure 2: Household Demographics (Pulver 2017).

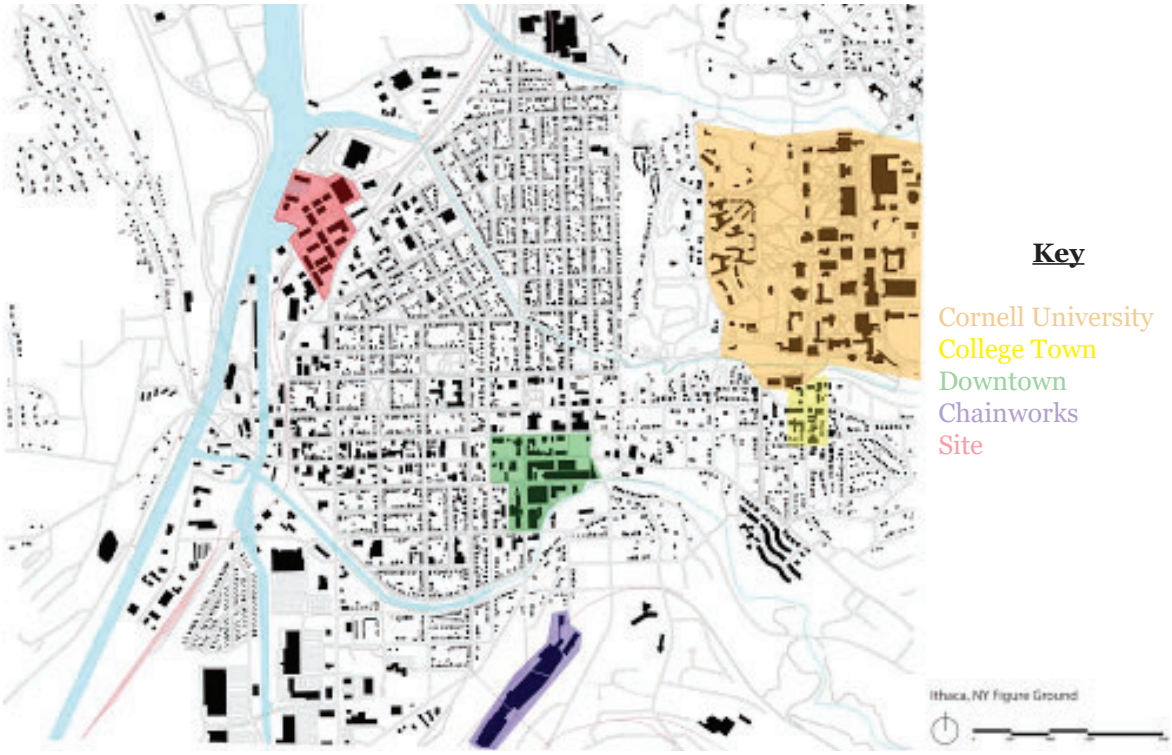

Figure 3: Figure-Ground of Ithaca, NY (Image by Komperda).

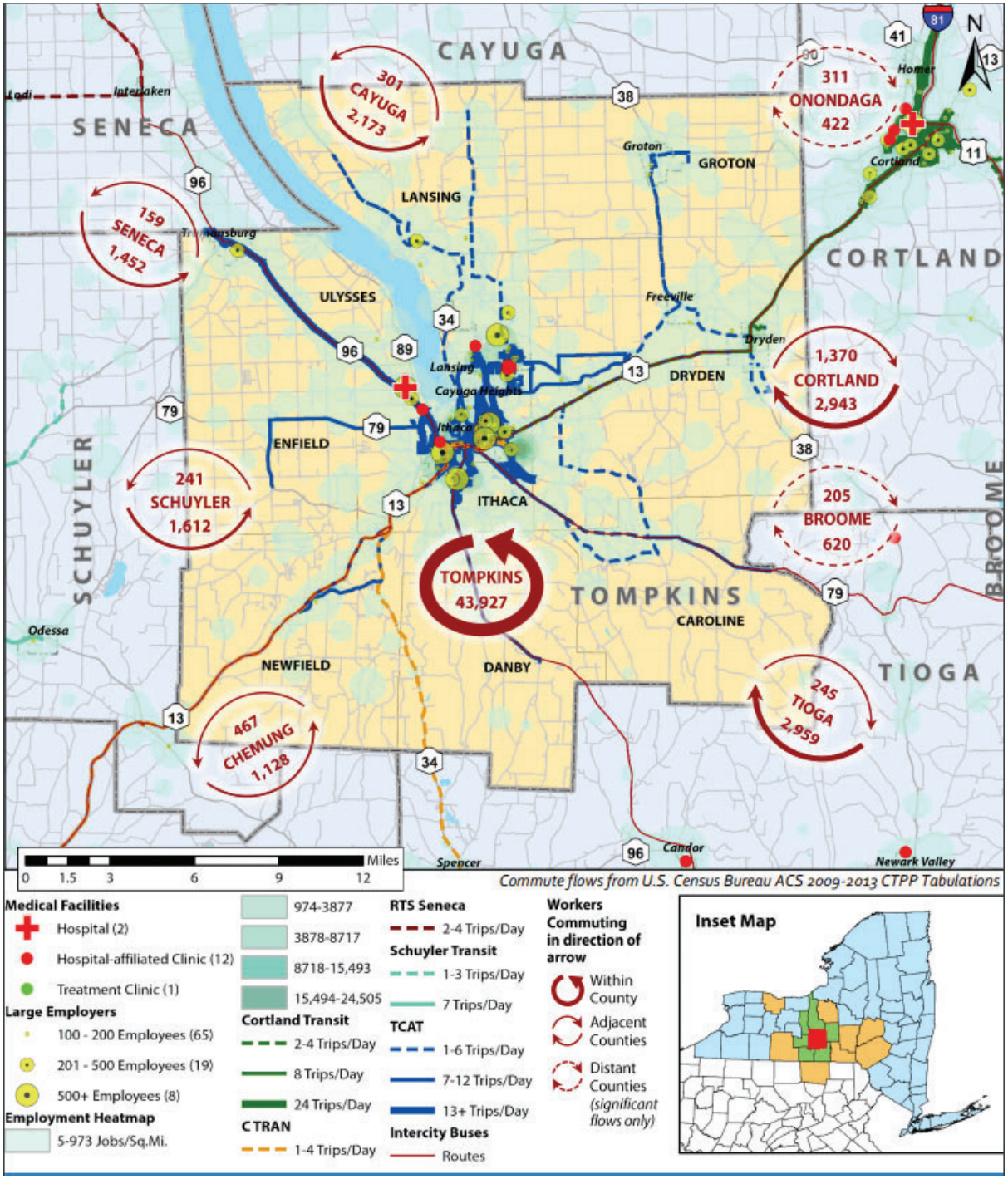

Figure 4: Commute flow diagram of Tompkins County (Pulver 2017).

Effects on the Built Environment

The PRT system not only connects through our site but throughout all of Ithaca's key nodes in the city. The PRT also goes above the existing train tracks and roadways in order to prevent any infringement upon existing structure. An example of this is shown if Figure 6. This mode of transportation will allow residents of Ithaca to travel around easier without the need for cars reducing the amount of stress

on roads and parking spaces. The PRT system connects directly to some of the larger buildings on the site such as the hotel shown in Figures 5 and 7. The hotel is set up to be a conference hotel where people can come and learn about the PRT system as well as the sustainable design of the hotel building. The system can be used to move horizontally between the different wings of the hotel via the two stations integrated into the design of the hotel. The PRT system connects the hotel to the larger city network allowing out of town guests to move through Ithaca without relying on cars or buses. The PRT system has also been implemented to reduce the number of service vehicles needed on the walkways by allowing the PRT to be used as a waste removal system. With the PRT able to remove waste, trash trucks will not have to impede the walking space of pedestrians.

Figure 5: Rendering of Hotel PRT Station (Image by Hefler).

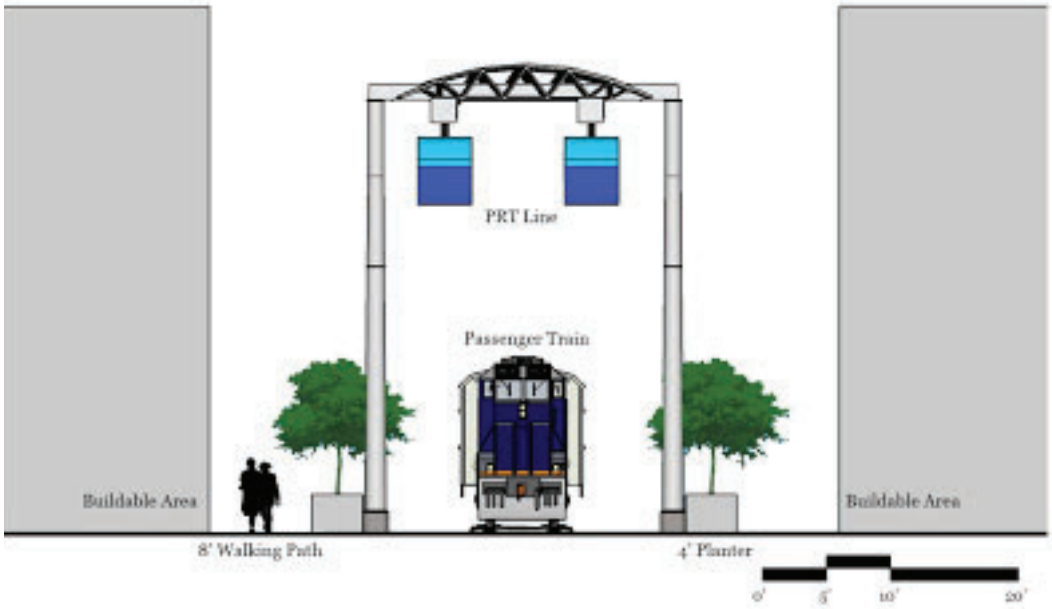

Figure 6: Section Cut of PRT and Train Tracks on Site (Image by Hefler).

Figure 7: Plan of PRT Station In Hotel (Image by Hefler).

Effects On Social and Environmental Sustainability

We focused on removing roads from the site and giving this space back to the pedestrian and bicyclist. This reduces the number of cars on the roadways and encourages the people within this area to use the PRT system. The idea behind these pathways is shown in Figure 9. This will affect people socially by encouraging them to live a more active lifestyle where they will walk and rely on the PRT and bus system of Ithaca to get around the city. This also provides more opportunities for people to have social interactions as they are walking around the town or engaging with people on the PRT system. Figure 10 shows the ¼ mile walking radius from the proposed station throughout Ithaca. The ¼ mile represents how far the average person is comfortable walking. While the PRT was the focus our site also incorporates the main transit hub that houses the PRT as well as a few of the existing modes of transportation within Ithaca. The Hub allows the PRT to connect seamlessly to these other modes of transportation to better create a transportation network throughout the city. The bus system allows for the buses to branch out from the PRT system.

The railroad track has been talked about possibly becoming an option for pedestrians to travel through the city. The station could have rentable bikes for commuters to use to travel the last ¼ mile to their location. Figure8 shows all the different modes of transportation that interact with the site.

Figure 8: Transportation Types on Site (Image by NYDOT team).

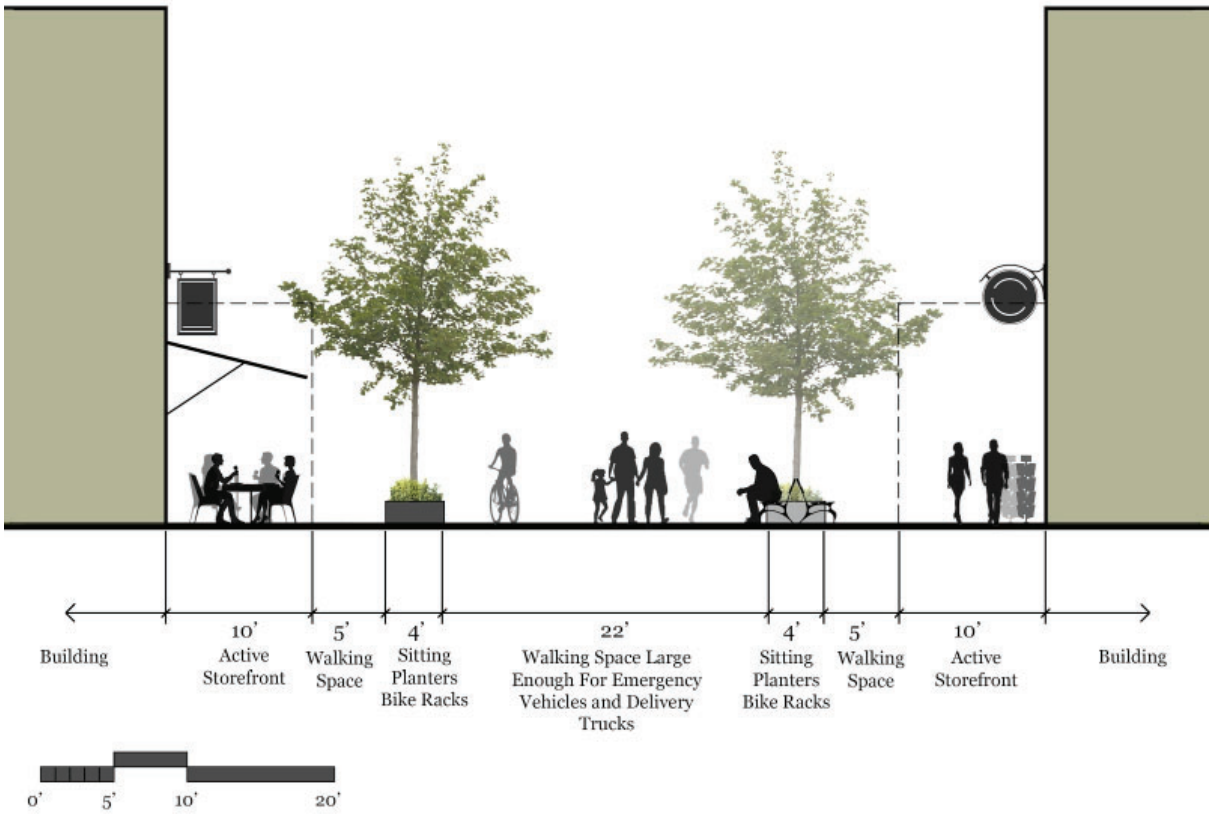

Figure 9: Section Cut of Major Pathways on Site (Image by Komperda).

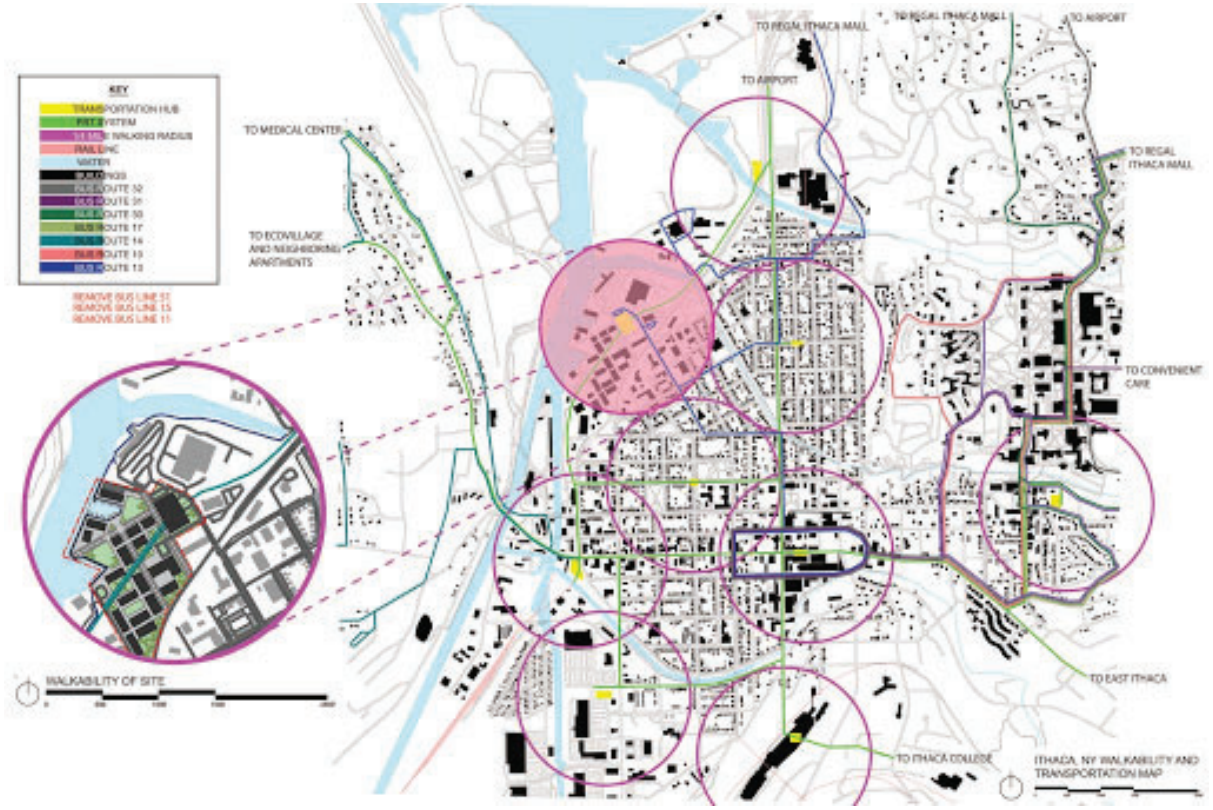

Figure 10: 1/4 Mile Walk-ability and Transportation Diagram (Image by Hefler).

Rudimentary Energy Analysis

Through analysis done on the Integrated Environmental Solutions software, the urban street pattern was proven to be most efficient with buildings oriented +/- thirty degrees from the North/South cardinal orientation. This orientation allows for the maximization of passive design strategies. According to the World Economic Forum, nine out of ten people breathe polluted air (Rowling 2020). According to the World Health Organization around seven million deaths per year are tied to air pollution (Rowling 2020). The burning of fossil fuels along with the transportation industry is one of the major contributors to air pollution (Rowling 2020). Through the use of a PRT system, the emissions will be reduced as the system is fully electric and contains solar panels that produce the necessary electricity. There is also the potential for the system to be net positive if the system does not use all of the electricity that the system produces. “About 25% of urban ambient air pollution from fine particulate matter is contributed by traffic” (Rowling 2020). The PRT system will reduce the need for car and bus traffic within Ithaca resulting in cleaner air.

Images From The 4D Model

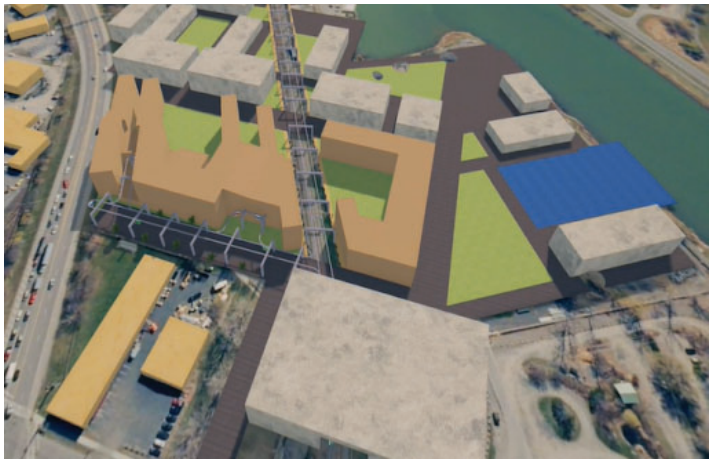

Figure 11: Master Plan with PRT System (Encitra Image).

Figure 12: PRT System and Transportation Hub (Encitra Image).

Building Renders

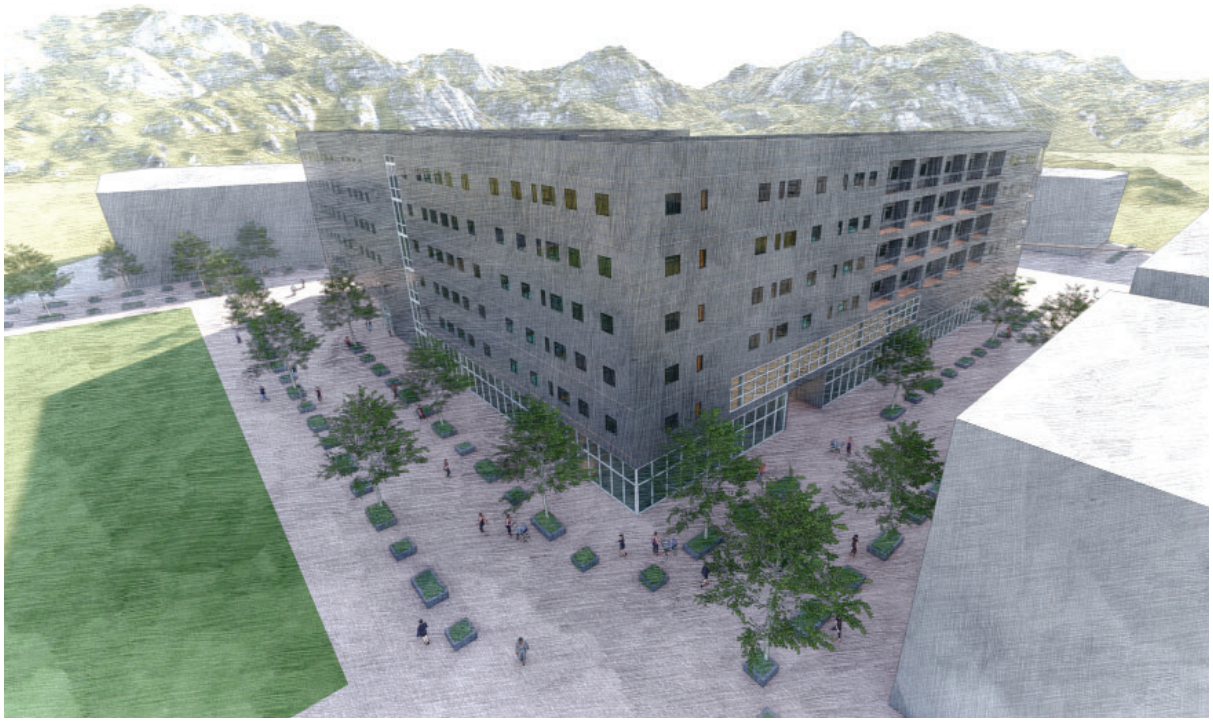

Figure 13: Mixed-Use Student Apartment Complex (Image by Komperda).

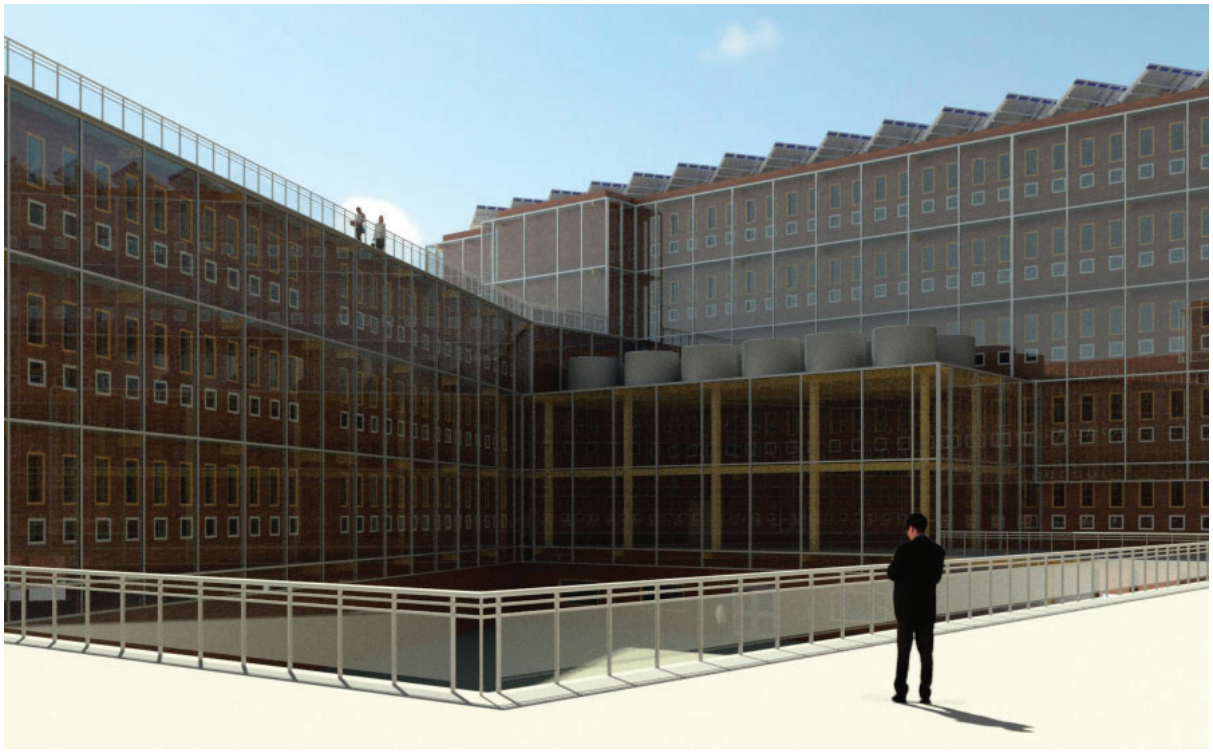

Figure 14: Mixed-Use Apartment Complex (Image by Kaczmarek).

Figure 15: Mixed-Use Student Housing Complex (Image by Sharma).

Hand Built Model Photos

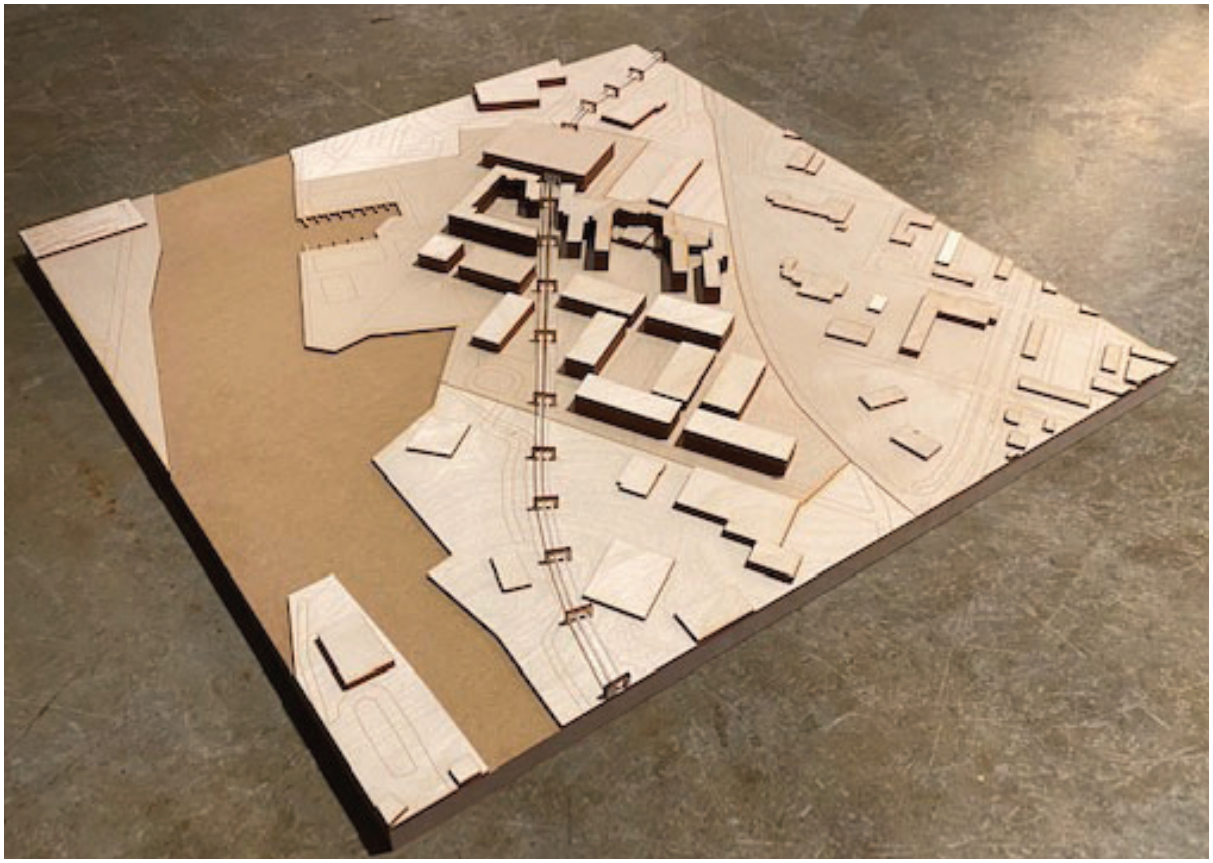

Figure 16: Overall site with PRT system (Model by Kaczmarek).

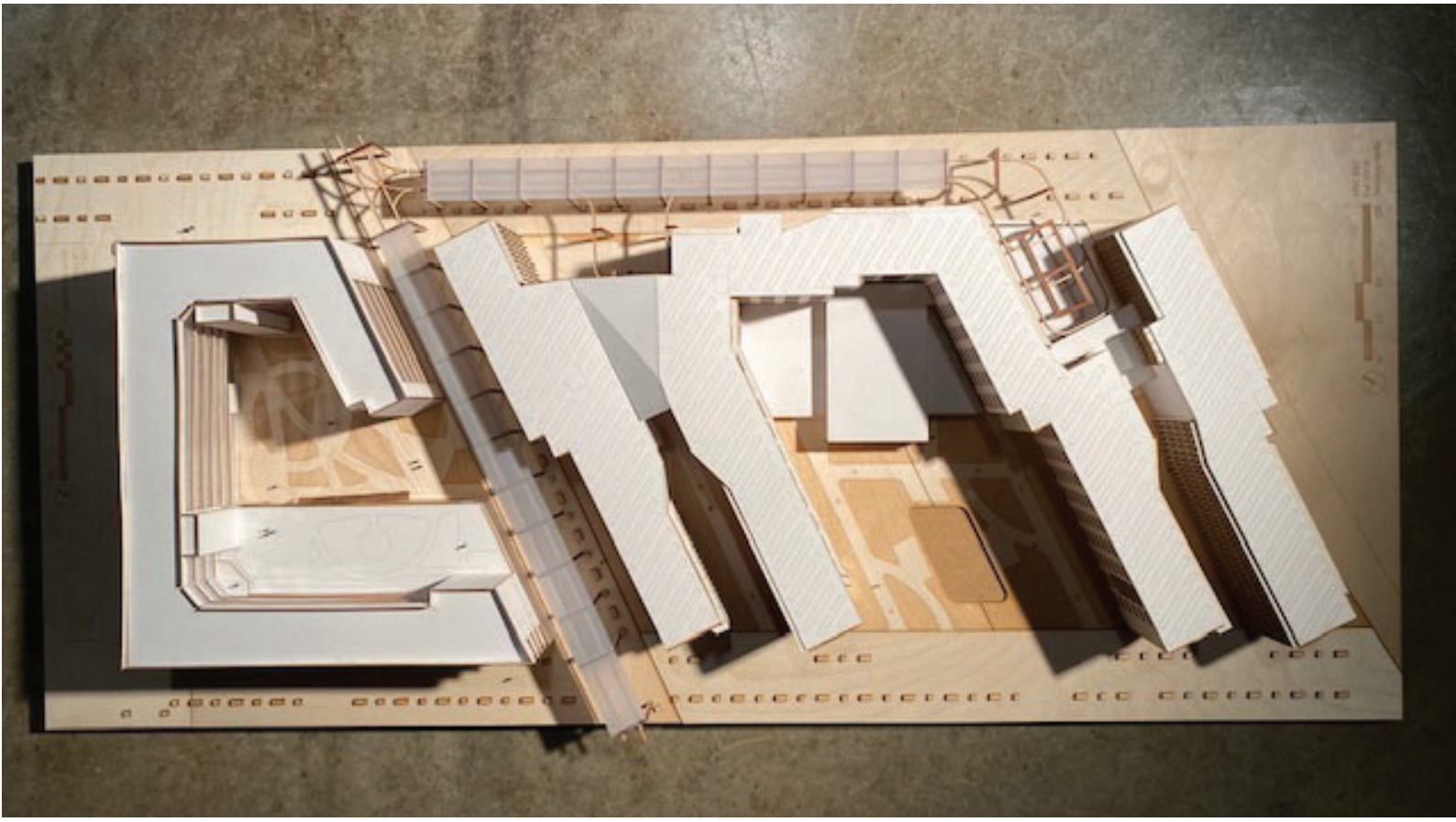

Figure 17: Overall PRT relation to buildings (Model by Komperda and Hefler).

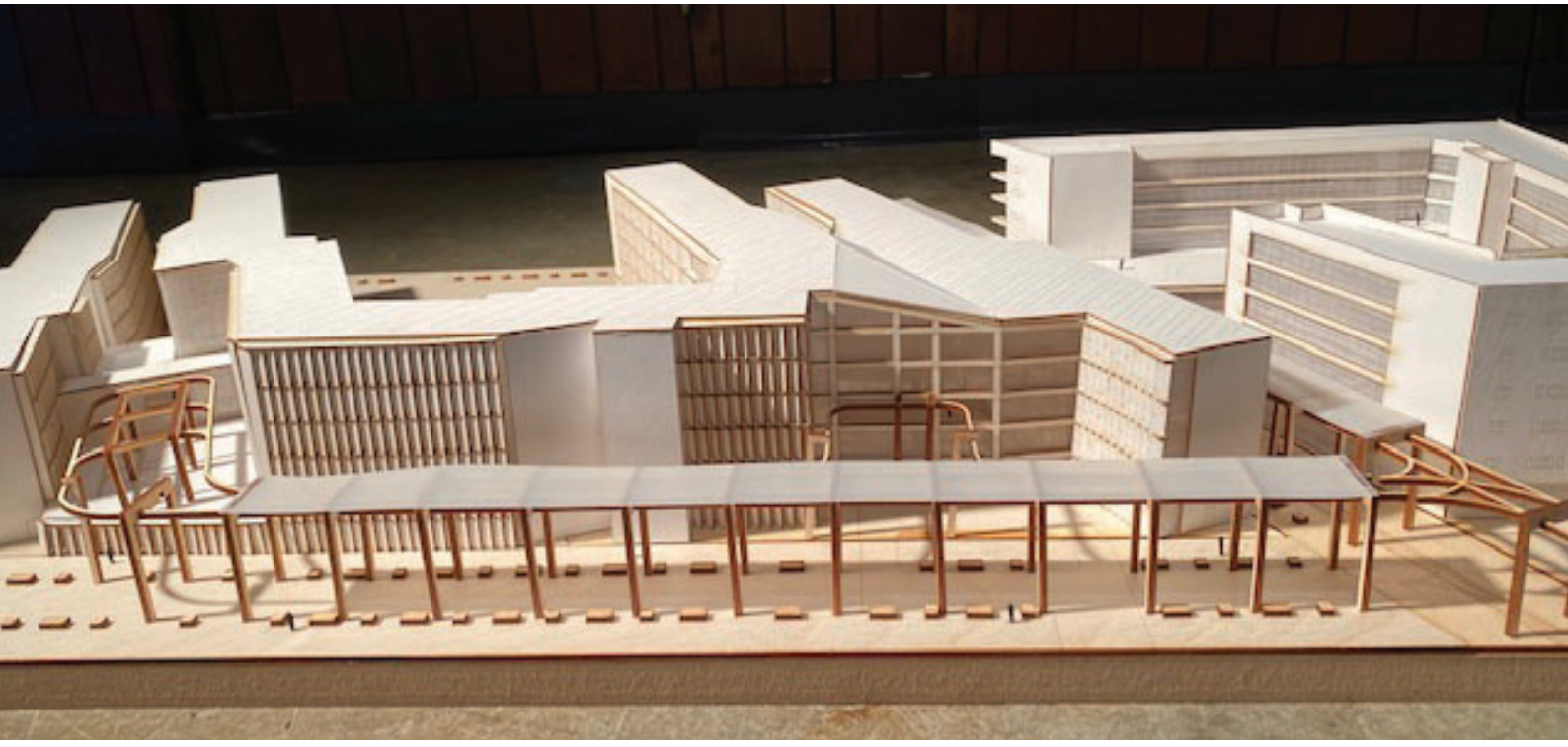

Figure 18: Elevation of PRT related to buildings (Model by Hefler and Komperda).

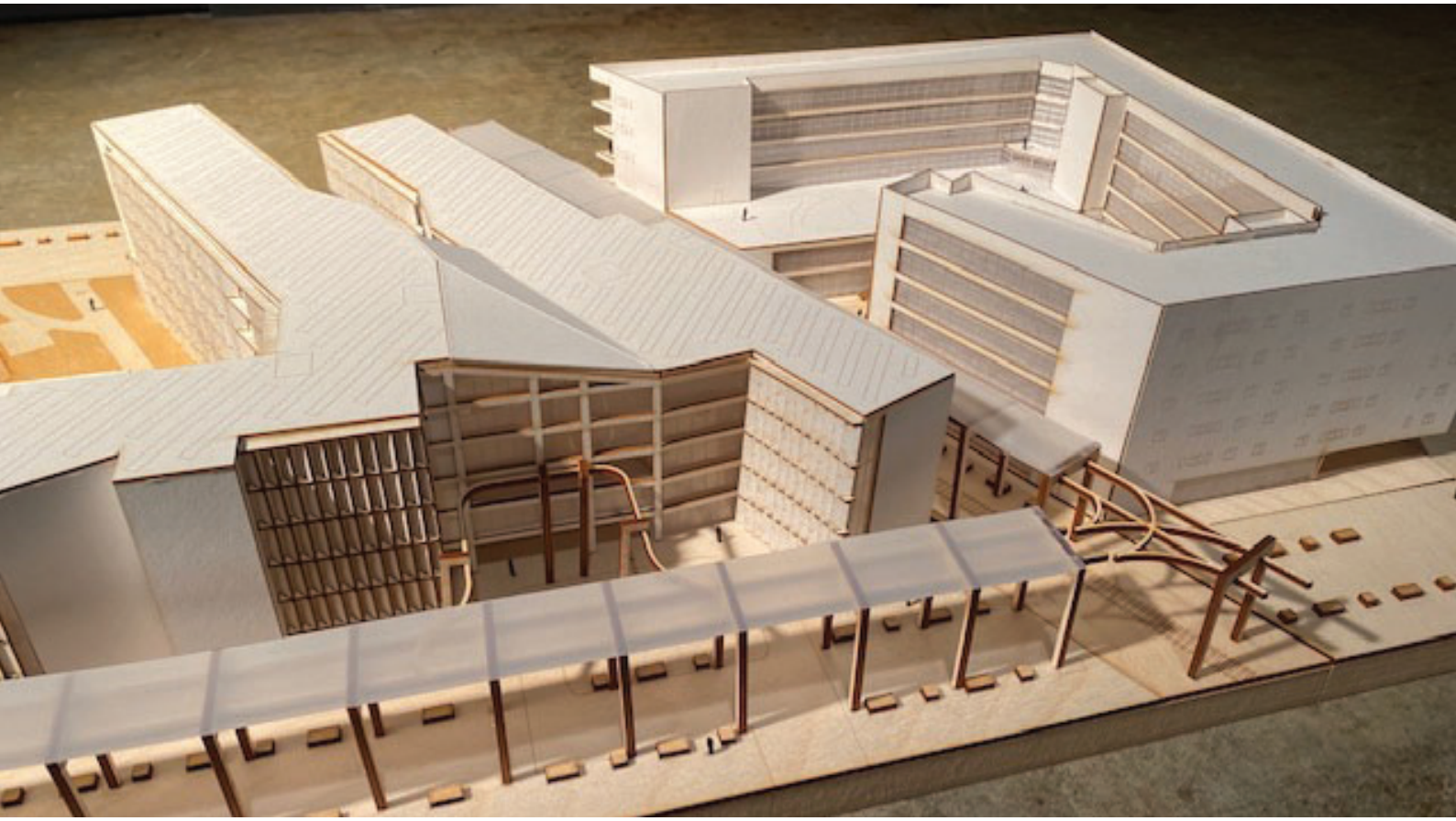

Figure 19: PRT Station 1 in the hotel lobby (Model by Hefler and Komperda).

Figure 20: PRT Station 2 and PRT parking (Model by Hefler and Komperda).

Figure 21: PRT building relationship (Model by Hefler and Komperda).

Figure 22: PRT building relationship (Model by Hefler).

Reference List

Pulver, Megan. “County Fact Sheets.” Movetogetherny, 13 June 2017, www.movetogetherny.org/fact-sheets.

Rowling, Megan, and Thomson Reuters Foundation. “10 Facts about Air Pollution on World Environment Day.” World Economic Forum, 2020, www.weforum.org/agenda/2019/06/10-facts-about-air-pollution-on-world-environment-day.

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