XCAP Report on Rail Corridor Safety Measures
Redesign Options at the Railroad Crossings in Palo Alto
(June 13, 2020)

The citywide effort called Connecting Palo Alto includes the Expended Community Advisory Panel (XCAP) which was formed to help provide outreach to Palo Alto's residents and greater community about the range of options for redesigning the existing rail grade crossings. This initiative was developed in anticipation of the Peninsula Corridor Electrification Project (2022) and California High Speed Rail proposal (date undetermined), resulting in up to 12 trains or more per hour, at peak times. The with relative speed for the electrified trains is estimated at 110 mph.

As a member of the Extended Community Advisory Panel, and a former editor for the first technical manual for the National Violent Death Reporting System, Centers For Disease Control and Prevention, I would like to provide information that may enhance our understanding about the safety requirements related to the redesign options for three railroad crossings located at Churchill Avenue, Meadow Drive, and Charleston Road.

The focus of my effort is to provide a comprehensive public health approach for preventing unintentional and intentional injuries and fatalities at these grade crossings, as well as highlight safety measures on the railroad corridor in Palo Alto. A track safety initiative should be an integral part of the overall plan, implementation, and evaluation of the redesign project. And it should be noted that trespassing along the railroad right-of-way is the leading cause of railroad related deaths in America.

From a historical perspective, the railroad crossings in Palo Alto have created tremendous challenges in terms of public health and safety for vehicles, pedestrians, and bicyclists. For example, according to the Palo Alto Historical Organization, a tragic collision involving teenagers driving a car and the train that was traveling towards the rail crossing near Palo Alto High School in 1927 sparked a movement to build an underpass at this dangerous intersection. The Embarcadero Underpass was constructed nine years later in 1936, in response to the public's advocacy and insistence for building a "subway" for this rail crossing.

In terms of self-harm, there are several types of safety measures that address suicide prevention on the railroad corridor. According to presentation by experts at the Federal Railroad Administration. In 2014, Scott Gabree, PhD, made a presentation titled, Potential Countermeasures to Mitigate Suicides on the Railroad Right-of-Way. This document shared several prevention efforts including the use of blue lights, gate keeper training, public awareness campaigns, signage for crisis center hotlines, media guidelines, means restriction/fencing, and track surveillance.

Over the years, railroad crossings continue to be "hot spot" locations for collisions involving vehicles and pedestrians, resulting in both unintentional and intentional injuries and fatalities.

The Federal Railroad Administration ranks the most dangerous grade crossings at the county, state, and national levels using the Web Accident Prediction System (WBAPS). In 2018, the following WBAPS ranking data indicated the need for Palo Alto to address this critical public health issue for redesigning the crossings.

Santa Clara County, Caltrain Rail Corridor

#1 Charleston Road
#2 E Meadow Drive
#3 Churchill Avenue
#10 Palo Alto Avenue

State of California (over 10,000 rail crossings in the State)

#4 Charleston Road
#5 E Meadow Drive
#15 Churchill Avenue

United States (includes all 50 states)

#8 Charleston Road
#12 E Meadow Drive
#72 Churchill Road

Most recently, Palo Alto suffered two youth suicide cluster incidents in 2009-10 and 2014-15. A multidisciplinary public health approach was created to address these tragic events, ranging from improving the mental health resources for students to implementing lethal means restriction efforts to prevent suicidal and/or at-risk behaviors.

Since 2009, the rail corridor has been the subject of much discussion from multiple stakeholders in response to the planned rail investments, including traffic mitigation and safety concerns. Regarding intentional injury and fatality prevention, the City of Palo Alto implemented several measures to support our youth's health and well-being including public education about mental health resources through Project Safety Net (PSN). A comprehensive strategy evolved to address railroad safety including key leaders from various domains such as adolescent behavioral health, education, law enforcement, policy making, media, Caltrain, and community-based organizations.

And in 2016-2017, the Centers for Disease Prevention and Control conducted an epidemiological countywide study to help further our understanding about circumstances surrounding these tragic events, including teenagers in Palo Alto in Santa Clara County.

According to Harvard School of Public Health's Means Matter campaign, restriction to lethal means is one of the most effective ways to prevent a suicidal person's access to mechanisms that cause injuries and fatalities. Although this campaign focuses on firearm related deaths, the train is also considered a lethal means for intentional harm.

In collaboration with Caltrain and the City of Palo Alto's Emergency Response Department, several lethal means restriction methods were implemented to prevent suicides:

- Professional track watch program with monthly incident reports
- Removal of vegetation to enhance vision along the Caltrain rail corridor
- Uniform eight feet tall fencing with 18-inch anti-climbing winglets on eastside of Alma
- Intrusion Detection System (IDS) with nine cameras at the E Meadow Drive crossing
- Warning system to prevent trespassing on the rail corridor
- Signage for the assistance; crisis/suicide emergency hotline

With regards to the Connecting Palo Alto effort, there are seven possible alternative options for redesigning three rail crossings located at Churchill Avenue, E Meadow Drive and Charleston Road:

1) Churchill Avenue Closure
2) Churchill Avenue Vicinity Hybrid
3) Meadow / Charleston Trench
4) Meadow / Charleston Hybrid
5) Meadow / Charleston Viaduct
6) South Palo Alto Tunnel (with passenger and freight train)
7) South Palo Alto Tunnel (with at-grade freight train)

In addition, two more alternatives were proposed by local residents which are now under consideration but need further study and evaluation. These proposals include:

1) Churchill Avenue Partial Underpass
2) Meadow / Charleston Underpass

Safety Concerns for Seven Alternative Redesign Options

<u>Churchill Avenue Closure</u>

This railroad crossing is one of the main thoroughfares that connects the eastside of Palo Alto to El Camino Real and Stanford University.

Because of the close proximity to Palo Alto High School, and the ranking on the Web Based Accident Prediction System as the most dangerous grade crossings in Santa Clara County, closure of this crossing is highly recommended.

According to Frank Frey, general engineer with track safety expertise for the Federal Railroad Administration, the safest option for preventing injuries and fatalities at a dangerous crossing is closure. He also recommended tall fencing around "hot spot" areas where illegal trespass has occurred.

To ensure overall safety, a pedestrian and bicycle overcrossing will be built to separate residents from vehicles and train traffic, which will remain at grade. A public education campaign is needed to inform the residents about the increased frequency and speed before the electrification process is completed in 2022. Railroad track is designed for 110 mph.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

Construction Timeframe: Approximately 2 years. During the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $50M to $65M

<u>Churchill Avenue Viaduct</u>

The viaduct alternative design allows for an elevated structure over Churchill Avenue, and rises at Homer Avenue and returns to grade at the California Avenue Caltrain Station.

This dangerous rail crossing would separate the bicyclists and pedestrians from the train tracks. The roadway at Churchill Avenue will remain at its existing grade, and pedestrians and bicyclists will be separated from the vehicles and trains.

To ensure overall safety, a pedestrian and bicycle overcrossing will be built to separate residents from vehicles and train traffic. A public education campaign is needed to inform the residents about the increased frequency and speed before the electrification process is completed in 2022. Railroad track is designed for 110 mph.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

In this design, pedestrians and bicyclists will be separated from the train traffic. A public education campaign is needed to inform the residents about the increased frequency and speed before the electrification process is completed in 2022.

The sound barrier wall encompassing the elevated trains may also serve as a safety measure to prevent illegal trespass onto the newly constructed railroad tracks.

Construction Timeframe: Approximately 2 years. During the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $300M to $400M

Meadow / Charleston Trench

The trench design option involves lowering the train tracks in a U-shaped box below Meadow Drive and Charleston Road in South Palo Alto. Tracks would be lowered near Loma Verde Avenue and return to existing grade at the San Antonio Caltrain Stations. The railroad track is designed for 110 mph.

In February 2018, James Keene, former city manager, City of Palo Alto, presented a White Paper by Mott MacDonald to the City's Rail Committee and interested members of the public. The subject of this document was connecting Palo Alto via a trench or tunnel, in an effort to lower the Caltrain railroad tracks through all or a portion of this community. These design alternatives included an open trench, a covered trench, and bored tunnel options that allowed current crossings to remain at grade.

Open access to the train tracks regarding both trenching and tunneling is problematic with regards to illegal trespass concerns. Emergency egress and safety were also considered in these designs.

In addition, an Intruder Detection System (IDS) with multiple cameras and a warning system may be needed to monitor the rail corridor, and identify at-risk behavior for intentional and unintentional injuries and fatalities.

Pedestrians and bicyclists will be separated from the train traffic and bicycle lanes will be added to Charleston Road. A public education campaign is needed to inform the residents about the increased frequency and speed before the electrification process is completed in 2022.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

Construction Timeframe: Approximately 6 years; during the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $800M to $950M

Meadow / Charleston Viaduct

This redesign option includes an elevated structure over the Meadow Drive and Charleston Road rail crossings, beginning at Loma Verde Avenue and return to existing elevation south of Ferne Avenue. The railroad track is designed for 110 mph.

This alternative design includes Class II buffered bicycle lanes through the underpass of the railroad, and accommodates the new column supporting the railroad elevated structure. Meadow Drive and Charleston Road will remain at grade and separated from the railroad for all modes of traffic.

Pedestrians and bicyclists will be separated from the train traffic and bicycle lanes will be added to Charleston Road. A public education campaign is needed to inform the residents about the increased frequency and speed before the electrification process is completed in 2022.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

Construction Timeframe: Approximately 2 years. During the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $400M to $500M

Meadow / Charleston Hybrid

This alternative design raises the railroad tracks above Meadow Drive and Charleston Road, rising near El Verano Avenue and returning to existing level at Ferne Avenue. Between Park Boulevard and Alma, the roadways at Meadow Drive and Charleston Road will be lowered approximately 6 feet. The railroad track is designed for 110 mph.

Meadow Drive and Charleston Road will be elevated, and pedestrians and bicyclists at grade will be separated from train traffic. Bicycle lanes will be added to Charleston Road. A public education campaign is needed to inform the residents about the increased frequency and speed before the electrification process is completed in 2022.

Sound barrier walls at a height of 6-feet may prevent illegal access to the rail corridor in this alternative design option.

In some cases, hybrid design options have encountered vandalism such as graffiti.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

Construction Timeframe: Approximately 4 years. During the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $200M to $250M

<u>South Palo Alto Tunnel (Passenger and Freight)</u>

This redesign alternative is a railroad tunnel that includes tracks to accommodate both passenger and freight trains. The twin bore tunnels will begin near Loma Verde Avenue and extend to the south of Charleston Road. The railroad tracks will be then raised in trench to approximately Ferne Avenue.

The new electrified southbound train will be built at the same horizontal location as the existing railroad track, however, the northbound train track will be moved to the east, within the limits of the tunnel to accommodate the spacing required between the twin bores. The railroad tracks will carry both passenger and freight trains as it does currently. The railroad track is designed for 110 mph.

The roadways at Meadow Drive and Charleston Road will remain at the existing grade, and have a similar configuration that currently exists today, with the addition of Class II buffered bicycle lanes on Charleston Road. This will require expanding the width of the road to maintain bicycle lanes through the overpass of the road.

Meadow Drive and Charleston Road will be grade separated in this design, and all modes will remain open. Pedestrians and bicyclists will be separated from the train traffic.

Open access to the train tracks for the tunnel design is still problematic with regards to illegal trespass concerns. Emergency egress and safety is also considered in this design. In addition, an Intruder Detection System (IDS) with multiple cameras and a warning system may be needed to monitor the rail corridor, and identify at-risk behavior for intentional and unintentional injuries and fatalities.

Emergency egress and safety is also considered in this design. There is also risk to train operations due to flooding.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

Construction Timeframe: Approximately 6 years. During the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $1,218M to $1,827M

South Palo Alto Tunnel (with At-Grade Freight)

This design option includes passenger trains within the twin bores and freight trains at grade. The railroad tracks will be lowered in a trench, south of Oregon Expressway to approximately Loma Verde Avenue. The twin bores will begin near Loma Verde Avenue and extend to just south of Charleston Road. The railroad tracks will then be raised in trench to approximately Ferne Avenue.

The new electrified train southbound railroad tracks will be built at the same horizonal location as the existing railroad track, however, the northbound track will be moved to the east with the limit of the tunnel to accommodate the spacing required between the twin bores. The railroad track is designed for 110 mph. It should be noted that the freight trains will remain at grade. Meadow Drive and Charleston Road will be grade separated from passenger trains for all modes and remain open.

From a safety perspective, pedestrians and bicyclists will be separated from passenger trains only. The railroad crossing gates, warning lights, IDS cameras, and signage at Meadow Drive and Charleston Road will remain, and traffic will be interrupted by the railroad crossing gates. Although freight trains currently travel late at night, these rail crossings will continue to have open access, and there is a risk for illegal trespass, with the potential for both intentional and unintentional injuries and fatalities.

The roadways at Meadow Drive and Charleston Road remain at their existing grade and will have a similar configuration that exists today, with the addition of Class II buffered bicycle lanes on Charleston Road. This will require expanding the width of the road to maintain bicycle lanes thought the overpass of the railroad. Emergency egress and safety is also considered in this design. There is also risk to train operations due to flooding.

Because of the frequency and speed of the electrified trains, it is also highly recommended that eight feet tall uniform fencing with an 18-inch anti-climbing winglet be constructed along the westside of the rail corridor, where houses and businesses are located close to the rail corridor.

Construction Timeframe: Approximately 6 years. During the construction period, track safety measures should include fencing, signage, public education, and other measures to prevent illegal access to the rail corridor.

Cost: $1,173M to $1,759M

Recommendations

Railroad track safety should be considered a priority, and an integral part of the City of Palo Alto's Summary of Evaluation with City Council - Adopted Criteria for redesigning the at-grade crossings.

Characteristics of typical grade separation methods should be reviewed in an effort to compare different options for the Peninsula Rail Program, San Francisco to San Jose Rail Corridor. (see references for more information)

Egress and access safety protocols should be outlined within the context of the complete design efforts for the alternative proposal.

Cost for countermeasures to prevent illegal access to the Caltrain rail corridor regarding installation and maintenance over time should be part of the budget process. The injury and fatality prevention efforts may include means restriction equipment such as standardized eight feet tall fencing with 18-inch winglets, Intruder Detection System (IDS) for track surveillance, flashing lights, warning systems, gate keeper training, public awareness campaigns, signage for crisis center hotlines, and media guidelines.

Safe Routes to School representatives should be consulted regarding the safety and efficacy of the recommended redesign alternative. The overall health and safety of pedestrians and bicyclists is an essential factor for the selecting the best option.

Mental health resources should be shared with key stakeholders including schools and community-based organizations, in an effort to prevent intentional injuries and fatalities on the Caltrain rail corridor.

To ensure overall public health and well-being, track safety expertise and collaboration is required from the Federal Railroad Administration, Caltrain, Emergency Response Department, City of Palo Alto, and the San Francisco Transit Police.

A strong public education campaign should be planned and implemented to ensure that the community residents are aware of the increased frequency and speed of the electrified trains.

Anticipation of High Speed Rail (HSR) trains should also be considered during the planning phase of the redesign efforts. For example, officials in Florida are now considering legislation to help decrease the number of deaths on the Brightline tracks and crossings between Miami and West Palm Beach. There have been over 20 deaths during the past two years, and a public education campaign is being planned, according to NPR, Good Morning Edition, January 2020.

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