

APPENDIX D

FINAL RAILROAD CROSSING STUDY

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Introduction

One task of the Columbia Lombard Mobility Corridor Plan scope of work was to conduct a road and railway evaluation of the two at-grade crossings in the study area, at NE 11th Avenue/NE Lombard Place near NE Lombard Street and NE Cully Boulevard near NE Columbia Boulevard. This appendix identifies the existing conditions of these at-grade crossings of the Union Pacific Railroad (UP) main line track, as well as near term concepts to improve the NE 11th Avenue and NE Cully Boulevard at-grade crossings. It also notes the results of a cost-benefit analysis to grade-separate these crossings to reduce the conflict between rail transportation and other modes.

The roadway evaluation is based on information provided by Portland Bureau of Transportation (PBOT) and a site visit by members of the consultant team. The consultant reviewed the roadway conditions for automobile, pedestrian, and bicycle access. PBOT provided the projected annual vehicle traffic growth. For each crossing, the consultant's traffic engineer conducted a visual evaluation to assess queue storage, roadway lane configuration, and traffic control devices in proximity to the crossing. Local connectivity issues are identified for such things as maintaining safe routes to school and transit as well as emergency access routes.

The railroad evaluation is based on information collected from UP, Oregon Department of Transportation (ODOT) Rail, Federal Railroad Administration, American Railway Engineering and Maintenance of Way Association, and a single site visit as described above in roadway evaluation. ODOT Rail provided October 2015 Pre-Diagnostics Meeting notes for the NE Cully Boulevard at-grade crossing, which was used to inform existing conditions. The consultant confirmed current operations and planned track upgrades on the UP Kenton Line.

Existing Conditions

NE 11th Avenue/NE Lombard Place near NE Lombard Street

NE Lombard Street parallels the UP main line track and intersects with NE 11th Avenue and NE Lombard Place near their shared railroad crossing. NE 11th Avenue and NE Lombard Place crossing have two separate U.S. Department of Transportation (USDOT) Crossing Numbers, 808429C and 808428V, respectively. The public at-grade crossing of the UP Kenton Line Subdivision main line track is at UP milepost 8.76. NE 11th Avenue intersects the track skewed 15 degrees from perpendicular. NE Lombard Place intersects the track skewed 75 degrees from perpendicular.

Both NE 11th Avenue and NE Lombard Place intersect NE Lombard Street. NE Lombard Street has a five lane cross section at this intersection. Both NE 11th Avenue and NE Lombard Place have a two lane cross section. The NE 11th Avenue/NE Lombard Street intersection is signalized and interconnected with the train activated warning devices, with protected left turns in both the eastbound and westbound direction on NE Lombard Street. NE 11th Avenue has two lanes (one in each direction).

FIGURE 1. Satellite photo of NE 11th Avenue, NE Lombard Street, NE Lombard Place, and rail crossing

Source: Google Earth



FIGURE 2. Active and passive treatments, heading north on NE 11th Avenue

Source: Google Earth



The NE Lombard Place/NE Lombard Street intersection allows only one lane of NE Lombard Place westbound traffic to intersect with westbound NE Lombard Street. This intersection is severely skewed and is controlled with a stop sign. Traffic traveling between NE Lombard Street and NE Lombard Place in other directions must utilize the NE Lombard Street/NE 11th Street signalized intersection and the stop sign-controlled NE 11th Avenue/NE Lombard Place intersection. This stop also controls the perpendicular intersection of NE 11th Avenue and NE Lombard Place. NE Lombard Place has one lane approaching NE 11th Avenue from the east and one lane (westbound only) west of NE 11th Avenue to intersect westbound NE Lombard Street. NE 11th Avenue has one lane in each direction (north and south) approaching the NE Lombard Place intersection. Stop signs are located on three legs of the intersection with the fourth leg being an exit only.

The approaches to the railroad tracks from both directions of NE 11th Avenue and NE Lombard Place have passive pavement markings followed by installations of crossbucks, mounted flashing lights, and automatic gates in a three quad configuration.

FIGURE 3. Pedestrian facilities at the intersection of NE 11th Avenue and NE Lombard Street

Source: Google Earth



The presence of the traffic light controlling northbound traffic on NE 11th Street and the stop sign on either side of the tracks on NE 11th Avenue controlling the NE 11th Avenue/NE Lombard Place intersection could potentially confuse drivers and contribute to traffic issues (Figure 2).

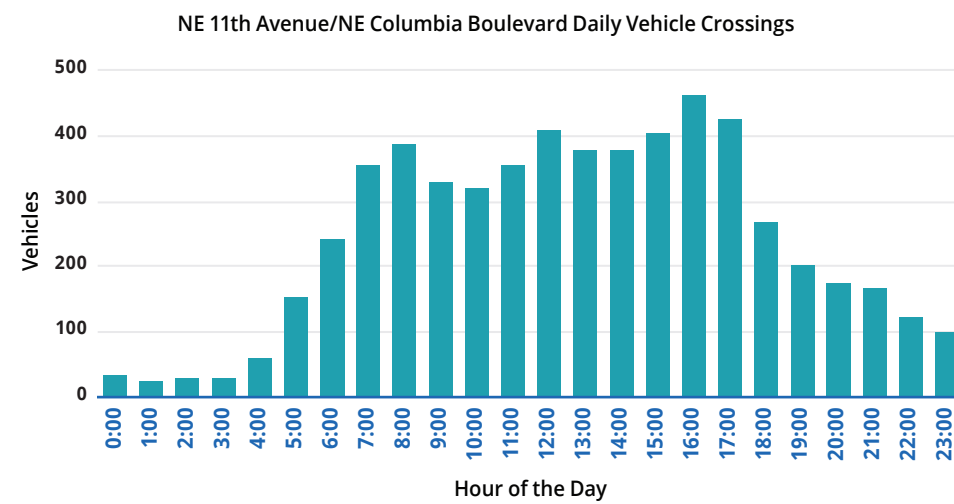
Due to height restrictions on NE Columbia Boulevard west of NE 11th Avenue, there is an over-dimensional reroute onto NE Lombard Street at the NE 11th Avenue/NE Lombard Street intersection. Eastbound over-dimensional trucks on NE Lombard Street turn left onto NE 11th Avenue, then turn right onto NE Lombard Place, and continue on NE Lombard Place to the NE Lombard Place/NE Columbia Boulevard intersection. Westbound over-dimensional trucks turn left onto NE Lombard Place at NE Lombard Place/NE Columbia Boulevard, and continue on NE Lombard Place through the at-grade crossing and turn right onto NE Lombard Street at NE Lombard Place/NE Lombard Street.

Railroad Crossing Conditions

UP operates 26 freight trains daily; 2 trains serve local customers and no passenger trains traverse the route. The average freight train has 142 60-foot cars and 5 locomotives. On an average day, 16 of the 26 freight trains run between 6 a.m. and 6 p.m. The balance between 6 p.m. and 6 a.m. freight train traffic is forecast to grow 2 percent annually. The average and maximum train speeds at this crossing are 25 mph and 35 mph, respectively. The NE 11th Avenue/NE Lombard Place at-grade crossing is made of concrete and is in good condition.

The average daily vehicle trips at the NE 11th Avenue and NE Lombard Place grade crossing is 4,731 (Portland Bureau of Transportation). The vehicle speeds on NE 11th Avenue and NE Lombard Place are not posted, but are 20 mph by statute. Automobiles make up 81 percent of vehicles using the crossing and trucks make up the remaining 19 percent. There are no public transportation or school buses that use this crossing.

FIGURE 4. Graph depicting daily vehicle crossings at NE 11th Avenue/NE Columbia Boulevard



Bike and Pedestrian Facilities

There are few path crossing treatments at the intersection (Figure 3). The southern portion of NE 11th Avenue has sidewalks that terminate at the intersection with NE Lombard Street. This point is controlled by pedestrian signals. There is a pedestrian signal that could guide people to the middle of the road without any continuing path. NE Lombard Street includes a bike lane heading eastward alone, but this lane does not cross the tracks at the intersection.

Crash History

At Railroad Crossing

The NE 11th Avenue/NE Lombard Place crossing had one property damage accident in the past 5 years. It occurred in 2016 and resulted in no fatalities or injuries. This accident occurred at 5 p.m. on December 21, 2016. The weather was dry and clear. A

64 year-old male driver was driving a flatbed truck, which stopped on the crossing prior to the gates descending when he was struck by an 81car freight train traveling west at 29 mph. The estimated vehicle property damage was \$10,000.

The only other reported accident/incident occurred in 1977 and resulted in property damage and one injury. This accident occurred at 5:15 p.m. on December 30, 1977. The weather was cloudy. A driver was driving a vehicle at 5 mph when it struck a Yard Switch Engine with 10 railcars traveling east at 5 mph. The estimated vehicle property damage was \$1,700.

Near Railroad Crossing

Based on ODOT crash data at NE Lombard Street/NE 11th Avenue, there were 11 crashes between 2012 and 2016, 3 of which were angle and 3 of which were turning crashes (see Table 1) which are fairly high percentages for these crash types.

TABLE 1. NE 11th Avenue/NE Lombard Street Crash Data

Crash Type	Total Crashes
Rear-End	4
Turning	3
Angle ¹	3
Head-on	1
Grand Total	11

Crash Cause	Total Crashes
Failed to avoid vehicle ahead	2
Followed too closely	2
Made improper turn	2
Disregarded traffic signal	2
Passed stop sign or red flasher	1
Drove left of center on two-way road; straddling	1
Did not yield right-of-way	1
Grand Total	11

Crash Data System. Oregon Department of Transportation. 2019. <https://zigzag.odot.state.or.us/uniqueid/08615cf883bed667d26bcec3a7dc5c6b/uniqueid/SecurezigzagPortalHomePage/>

Based on ODOT crash data at NE Lombard Place/NE 11th Avenue, this is a high crash intersection with 23 crashes in the last five years (see Table 2). 17 of the crashes were angle crashes with vehicles traveling westbound, and vehicles going straight either north bound or south bound. Half are due to vehicles not stopping at the stop sign (for either north bound or south bound vehicles), and a quarter are due to not yielding right of way.

As a comparison, at NE Columbia Boulevard/NE11th Avenue there was one crash in the past five years.

¹ Angle Collision — An angle collision results when vehicles collide while traveling on crossing paths. An angle collision involves one vehicle traveling on one roadway (i.e. North to South) and another vehicle entering from another roadway, open access, or driveway (i.e. East to West). In other words, a cross-movement on one street must be attempted by a vehicle traveling on the intersecting street in order for Collision Type to be classed as angle.”

TABLE 2. NE 11th Avenue/NE Lombard Place Crash Data

Crash Type	Total Crashes
Angle	17
Rear-end	4
Turning	1
Backing	1
Grand Total	23

Crash Cause	Total Crashes
Passed stop sign or red flasher	12
Did not yield right-of-way	5
Followed too closely	2
Failed to avoid vehicle ahead	2
Disregarded traffic signal	1
Other improper driving	1
Grand Total	23

Crash Data System. Oregon Department of Transportation. 2019. <https://zigzag.odot.state.or.us/uniqueid08615cf883bed667d26bcec3a7dc5c6b/uniqueid0/SecurezigzagPortalHomePage/>

The two intersections NE Lombard St/NE 11th Avenue and NE Lombard Place/NE 11th Avenue overlap each other. This, as well as the skew angle at NE Lombard Place and NE Lombard Street and the existence of the railroad crossing, likely have some effect on the crash history. The rail crossing adds complexity and may take the drivers' attention away from the stop signs. These two tightly spaced intersections require a lot of driver attention. The data does not provide information that attributes any crashes to the rail crossing, but the crash types reflect the complexity of the intersections.

This conclusion is supported by the ODOT Rail Interim Order for the alteration of the NE 11th Avenue and NE Lombard Place on UP Railroad Crossing. Based on a diagnostics team review of the crossing on May 9, 2017. The team consisted of representatives from the City of Portland, UP Railroad, and Rail and Public Transit Division (RPTD) staff. The proposed interim crossing alterations are required by the public safety, necessity, convenience and general welfare. The interim crossing order states "Over the last 10 years the crossing has experienced a number of near misses. The City of Portland has developed an interim solution until such time a more permanent solution is developed." The interim solution which has been implemented was to install one new STOP (R1-1) sign for the westbound traffic on NE Lombard Place. The two existing stop signs on NE 11th Avenue remained in place. All three STOP signs received an ALL WAY STOP (R1-3P) plaque mounted below each sign. RPTD agreed with the interim solution but expressed concern leaving the STOP sign in service on NE 11th Avenue northbound, coming of NE Lombard Street. Their concern

is that turning movements from NE Lombard Street or crossing NE Lombard Street northbound on a green signal requires traffic to stop at the crossing, unless turning right onto NE Lombard Place. This ability to turn right without stopping creates confusion and delay. The Interim Order also noted that the close proximity of the railroad crossing to NE Lombard Street can cause traffic to queue up and partially block NE Lombard Street during peak hours or after a train event.

Planned Track Upgrades

The 2013 Port of Portland Rail Plan notes that Union Pacific has long range unfunded plans to make Kenton Line track upgrades at the NE 11th Avenue grade crossing. These plans include construction of a second main line track connected to the main line siding (Champ Siding) to the east and Kenton yard track to the west, which would be upgraded to a main line track. If funded, this project would seek closure or grade separation of the at-grade crossing.

Railroad Crossing Evaluation

The NE 11th Avenue railroad crossing has acceptable train approach sight distance for vehicles for a signal-controlled at-grade crossing. The minimum set-back distance for storing rail cars on multiple adjacent tracks (track centers less than 25') is 250 feet from the edge of roadway. The current distance measured from the edge of roadway to the point where trains stop on the siding tracks on each side of the crossing exceed that minimum distance. The vehicle queuing space between the crossing and stop bar for NE 11th Avenue/NE Lombard Street for vehicles crossing or turning left (eastbound) onto NE Lombard Street is only 50 feet, which is inadequate based on observation and historical accident records could result in vehicles sitting on the crossing when the crossing signals are activated by an approaching train.

On the north side of the track, NE Lombard Place railroad crossing has unacceptable train approach sight distance for vehicles for a signal controlled at-grade crossing based on guidance in the USDOT-Federal Highway Administration Railroad-Highway Grade Crossing Handbook, August 2007. This is due to the severe angle of the road approaching the track. As westbound NE Lombard Place shares the crossing and intersection with NE 11th Avenue, the issues identified above are the same.

Based on a cursory observation of the NE 11th Avenue and NE Lombard Place grade crossings, it appeared that signage and warning devices meet the minimum appropriate standards for an actively protected grade crossing. To possibly enhance safety at this crossing, without a complete redesign "DO NOT STOP ON TRACKS" (R8-8) signing could be added at the crossing.

NE Cully Boulevard near NE Columbia Boulevard

FIGURE 5. Satellite photo of NE Cully Boulevard, NE Columbia Boulevard and rail crossing

Source: Google Earth



NE Columbia Boulevard parallels the UP main line track and intersects with NE Cully Boulevard near the NE Cully Boulevard UP at grade crossing (USDOT Crossing No. 808435F). The public at-grade crossing of the UP Kenton Line Subdivision main line track at UP milepost 11.93 NE Cully Boulevard intersects the track skewed 15 degrees from perpendicular. NE Columbia Boulevard has a three lane cross section at this intersection while NE Cully Boulevard has a two lane cross section. The NE Cully Boulevard T-intersection with NE Columbia Boulevard is skewed at approximately 18 degrees and is controlled with a stop sign and flashing beacon on NE Cully Boulevard and a flashing beacon on NE Columbia Boulevard (Figure 5). The at-grade crossing is equipped with gates and flashing lights. The distance from the nearest rail to the stop bar at NE Columbia Boulevard is 110 feet.

The right turn movement from eastbound NE Columbia Boulevard to southbound NE Cully Street is a blind turning movement due to the intersection angle and features on the property in the southwest corner of the intersection (Figure 6). If there is a train in the NE Cully Street crossing, vehicles making the blind right turn movement may cause rear end vehicle crashes or near misses while vehicles are stopped for the at-grade crossing. Traffic trying to enter onto NE Columbia Boulevard can also back up, causing queuing on the tracks.

FIGURE 6. NE Columbia Boulevard looking east to the NE Cully Boulevard

Source: Google Earth



FIGURE 7. Active and passive treatments at the NE Cully Boulevard crossing

Source: Google Earth



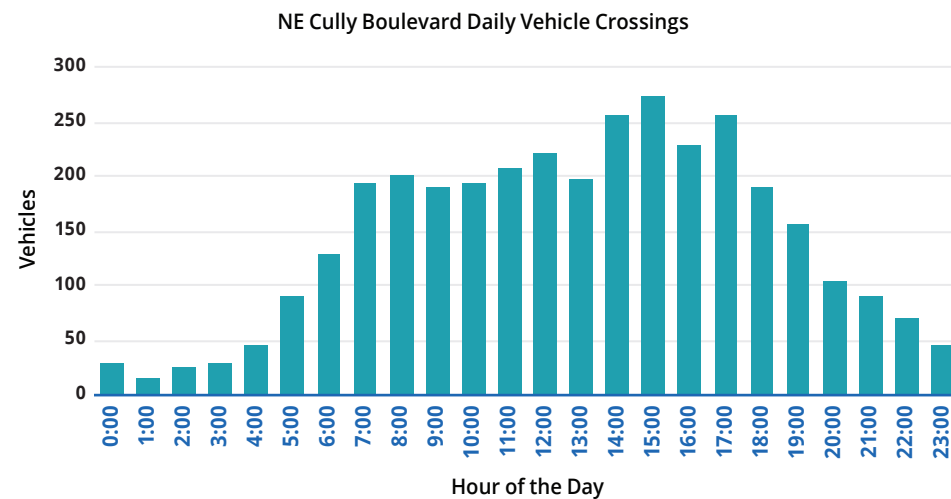
Both approaches to the railroad tracks from both directions of NE Cully Boulevard have stop lines and pavement markings that are followed by installations of crossbucks, flashing lights, and automatic gates in a two quad configuration. On entry to NE Cully Boulevard from NE Columbia Boulevard, there are also railroad warning signs. There is a distance of 110 feet from the nearest rail to the stop bar at Columbia Boulevard.

Railroad Crossing Conditions

UP operates 26 freight trains daily; 2 trains serve local customers and no passenger trains traverse the route. The average freight train has 142 60-foot cars and 5 locomotives. On an average day, 16 of the 26 freight trains run between 6 a.m. and 6 p.m. The balance between 6 p.m. and 6 a.m. Freight train traffic is forecast to grow 2 percent annually. The average and maximum train speeds at this crossing are 25 mph and 50 mph, respectively. The at-grade crossing is made of concrete panels and is in good condition.

The average daily vehicle trips at the NE Cully Boulevard grade crossing is 3,445 (Portland Bureau of Transportation). The vehicle speeds on NE Columbia are posted at 30 mph. Automobiles make up 90 percent of vehicles using the crossing; trucks make up the remaining 10 percent. There are no public transportation buses using the crossing; however, school buses do use this crossing.

FIGURE 8. Graph depicting daily vehicle crossings at NE Cully Boulevard



There are no sidewalks or crossing treatments at the crossing along NE Cully Boulevard. Sidewalks on NE Columbia Boulevard terminate at the intersection with NE Cully Boulevard. There are no bike lanes on both roads. Long range improvements along NE Cully Boulevard include pedestrian paths on both sides of the crossing.

Crash History

At Railroad Crossing

The NE Cully Boulevard crossing has had no property damage accidents in the past 5 years. There have been a total of four reported accident/incidents dating back to 1980.

The first accident occurred at 6:30 p.m. on February 1, 1980; the weather on that day was rain. A driver of a vehicle traveling 25 mph did not stop at the grade crossing signal and struck a single locomotive traveling eastbound at 25 mph. The accident resulted in no injuries and estimated vehicle property damage was \$2,500.

The second accident occurred at 3:35 p.m. on October 30, 1980; the weather was foggy. A vehicle stopped on the crossing, exited the vehicle prior to the vehicle being struck by a 96-car freight train traveling 22 mph. The accident resulted in no injuries and estimated vehicle property damage was \$4,000.

The next accident occurred at 3:45 p.m. on May 26, 1996; the weather was clear. A vehicle went around the crossing gates and was struck by a 104-car freight train traveling eastbound 35 mph. The accident resulted in no injuries and estimated vehicle property damage was \$1,000.

The last accident occurred at 10:09 a.m. on May 5, 2012. A 35-year-old male driver was driving a vehicle that stopped on the crossing prior to the gates descending, exited the vehicle prior to the vehicle being struck by a 62-car freight train traveling west at 47 mph. The estimated vehicle property damage was \$2,000.

Near Railroad Crossing

Based on ODOT Crash data at NE Cully Boulevard/NE Columbia Boulevard, there were ten crashes, five of which were turning crashes and three were rear ends between 2012 and 2016 (see Table 3). Based on crash history it is difficult to attribute these crashes to the at grade rail crossing. The turning movement crashes were north bound vehicles turning left from NE Cully Boulevard to west bound NE Columbia Boulevard. The rear end crashes are vehicles traveling east bound on NE Columbia Boulevard straight to the SE, and the rear end crashes are vehicles traveling along NE Columbia Boulevard.

TABLE 3. NE Columbia Boulevard/NE Cully Boulevard

Crash Type	Total Crashes
Turning	5
Rear-end	3
Fixed object	1
Sideswipe-overtaking	1
Grand Total	10

Crash Cause	Total Crashes
Did not yield right-of-way	4
Followed too closely	3
Passed stop sign or red flasher	1
Drove left of center on two-way road; straddling	1
Improper overtaking	1
Grand Total	10

The data does not provide near miss information related to the rail crossing, but there is a restricted storage length between the railroad crossing and NE Columbia Boulevard for south bound vehicles. If a train is coming and traffic backs up to NE Columbia Boulevard, vehicles making the left turn off of NE Columbia Boulevard on to NE Cully Boulevard will have to 1) judge the gap distance for opposite direction thru vehicles (it is a permissive left) and 2) make sure there's enough space to fit in the small storage length. This conclusion is supported by the ODOT Rail October 2015 Pre-Diagnostics Meeting for NE Cully Boulevard which states that crossing is one of 12 existing railroad crossings state wide that has been targeted by the Rail Crossing Safety Section to fund any safety improvements through the Section 130 Safety program 2015 & 2016.

Planned Track Upgrades

As documented in the 2013 Port of Portland Rail Plan (HDR 2013) and I-5 Rail Capacity Study, Portland/Vancouver I-5 Trade and Transportation Partnership (HDR 2003), long-range unfunded UP Kenton Line track upgrades at the NE Cully Boulevard at-grade crossing include construction of a second main line track connecting Champ Siding to the west and Fir Siding to the east through the crossing. The plan would require closure or grade separation of the at-grade crossing.

The consultant will contact UP to determine current operations and planned track upgrades on the UP Kenton Line. Additionally, the consultant will request a corridor-wide inventory from ODOT Rail Safety Division that identifies the existing equipment and crash history for each grade crossing.

UP asked about closing the crossing, which was discussed by the team. NE Cully Boulevard is a Major Urban Collector and is federal aid eligible. The nearest crossing from NE Cully Boulevard is an under crossing at NE 60th Avenue. The City stated that the vertical clearance is not sufficient to support truck traffic. Closing this crossing would not be a viable option and was dismissed as an option.

Currently there is a Region Project Key No. 18837 that is scheduled to improve the intersection at NE Alderwood Road and NE Columbia Boulevard, approximately 530 feet east of NE Cully Boulevard. These improvements should include traffic signal improvements to the intersection at NE Cully Boulevard and NE Columbia Boulevard are planned for a future phase of said project.

Railroad Crossing Evaluation

The NE Cully Boulevard crossing has acceptable train approach sight distance for vehicles for a signal controlled at-grade crossing. The minimum set-back distance for storing rail cars on multiple adjacent tracks (track centers less than 25 feet) is 250 feet from the edge of roadway. The current distance measured from the edge of roadway to the point where trains stop on the siding tracks on each side of the crossing is 265 feet. The vehicle queuing space between the crossing and stop bar for NE Cully Boulevard/NE Columbia Boulevard for vehicles crossing or turning onto NE Columbia Boulevard is only 140 feet, which is inadequate based on observations made at the October 2015 Pre-Diagnostics Meeting and historical accident records and could result

in vehicles sitting on the crossing when the crossing signals are activated by an approaching train.

The intersection between NE Cully Boulevard and NE Columbia Boulevard is a blind turning movement. There is also a potential for rear end vehicle crashes while a train is in the crossing. Additionally, traffic turning right from NE Cully Boulevard onto NE Columbia Boulevard has the potential to back up, resulting in cars queuing on the tracks at the crossing.

Further away from the intersection, the eastbound left turn on NE Columbia Boulevard at NE Alderwood Road (signalized) spills back to NE Cully Boulevard. Not only does this prevent northbound rights from getting into the left turn lane to NE Alderwood Road and create a longer northbound queue, it also prevents westbound vehicles wishing to get to NE Cully Boulevard from getting into the turn lane. This is along the three lane section of the corridor, so turning vehicles will block through traffic. There is not a signal at NE Cully Boulevard, but the signal at NE Alderwood Road significantly affects queuing. Distance between these two intersections is approximately 530 feet.

Based on our cursory observations of the NE Cully Boulevard grade crossing, it appeared that signage and warning devices meet the minimum appropriate standards for an actively protected grade crossing. To possibly enhance safety at this crossing, without a complete redesign, "DO NOT STOP ON TRACKS" (R8-8) signing could be added at the crossing.

At-Grade Crossing Improvements Concept Design

Following are some initial concept designs for at-grade improvements at NE 11th Avenue/NE Lombard Place and NE Cully Boulevard that address issues identified above in the Railroad Crossing Existing Conditions analysis. These high-level concepts will need to be further analyzed and refined as they move into design.

NE 11th Avenue/NE Lombard Place near NE Lombard Street

The proposed concept design for at-grade improvements at NE 11th Avenue/NE Lombard Place eliminates westbound movements through the intersection of NE Lombard Place/NE 11th Avenue and the NE Lombard Place at-grade crossing with the UP main line track by making westbound NE Lombard Place, west of NE 13th Avenue, business access only, marked with No Outlet signage (see Figure 9).

Due to height restrictions on NE Columbia Boulevard west of NE 11th Avenue, over-dimensional reroute onto NE Lombard Street at the NE 11th Avenue/NE Lombard Street intersection. The existing eastbound reroute from NE Lombard Street to NE Lombard Place and then to NE Columbia Boulevard will not be effected by the design concept.

In order to accommodate westbound vehicle traffic moving from NE Columbia Boulevard onto NE Lombard Place and then onto NE Lombard Street, a westbound turn lane with shallower curvature must be added to the NE 11th Avenue at the intersection with NE Columbia Boulevard to accommodate larger vehicle traffic. The westbound vehicles will travel south on NE 11th Avenue, and then turn right onto NE Lombard Place/NE Lombard Street.

The improvements at NE 11th Avenue and NE Columbia Boulevard include adding a traffic signal, a westbound left turn lane, pedestrian sidewalk ramps, and providing intersection signing and striping that meets the MUTCD and PBOT standards.

Converting NE Lombard Place to westbound business access only would not likely require any additional right-of-way and roadway improvement would be limited to striping to prevent westbound vehicles on NE Lombard Place from intersecting with NE 11th Avenue and crossing the track. Impacts to stormwater facilities and utilities should be limited.

Modification to track signals would be limited to removal of the flashers and gates on NE Lombard Place.

Preliminary review of the improvements do not raise any concerns regarding environmental impacts or issues with constructibility. The estimate of probable construction for the improvements depicted in Figure 9 is \$4,937,000. However, this preliminary concept requires further analysis, design, and discussion with adjacent property owners and other key stakeholders.

FIGURE 9. Possible Concept Design: NE 11th Avenue/NE Lombard Place and NE Lombard Street

Aerial Background Source: Google Earth



Benefits

The benefits of this concept are:

- Eliminating the severely skewed westbound NE Lombard Place crossing of the UP main line track.
- Eliminating the stop signs for the intersection of NE Lombard Place and NE 11th Avenue.
- Pedestrian and bicycle facilities are being added on NE 11th Avenue and at the crossing.

Issues not addressed with the possible concept are:

- Vehicle queuing space between the crossing and stop bar for NE 11th Avenue/NE Lombard Street for vehicles crossing or turning left (eastbound) onto NE Lombard Street is only 50 feet. This could only be addressed through crossing closure or grade separation. To possibly enhance safety at this crossing, DO NOT STOP ON TRACKS (R8-8) signing could be added at the crossing even if the preferred concept is not constructed.

NE Cully Boulevard near NE Columbia Boulevard

The proposed concept design for at-grade improvements at NE Cully Boulevard is compatible with the funded improvements at the intersection of NE Columbia Boulevard and NE Alderwood Road currently being designed by PBOT. This concept shifts the NE Cully Boulevard two feet east and constructs curb and gutter and ten (10) foot wide shared use path on the west side of the road through the at-grade crossing to the existing NE Cully Boulevard/NE Columbia Boulevard intersection. Proposed lane widths are 12-foot wide with 2-foot shoulders. The concept requires moving the existing UP flashers and gates and guard rails and additional right-of-way in the south-west quadrant of the NE Cully Boulevard/NE Columbia Boulevard intersection to accommodate the shared use path and improve eastbound NE Columbia Boulevard to southbound NE Cully Boulevard sight distance.

A future PBOT project will signalize the NE Cully Boulevard/NE Columbia Boulevard intersection and inter-connect it with the UP at-grade crossing signals to clear the vehicles queued between the UP at-grade crossing and NE Cully Boulevard/NE Columbia Boulevard intersection.

FIGURE 10. Preferred Concept NE Cully Boulevard crossing

Aerial Background Source: Google Earth



The project will require no modification to the UP track or road crossing but will require relocation of one crossing flasher and gates. Preliminary review of construction would require full closure of the railroad crossing during construction of sidewalks and new road. Relocation of crossing flashers and gates would be done at the same time.

Preliminary review of the improvements do not raise any concerns regarding environmental impacts. The estimate of probable construction for the improvements depicted in Figure 10 is \$3,527,000.

Benefits

The benefits of this concept are:

- Provides pedestrian and bicycle path crossing treatments on NE Cully Boulevard and NE Columbia Boulevard to receive pedestrians or bicycles.
- Widening of NE Columbia Boulevard for eastbound vehicles turning right onto NE Cully Boulevard improves intersection sight distance and may reduce collisions with vehicles stopped at the crossing.

Issues not addressed with the preferred concept are:

- Increasing northbound vehicle queuing space north of the UP tracks for the northbound traffic continuing onto NE Alderwood Road and northbound right movements.
- Designing for a WB-67, additional storage for northbound left onto NE Columbia Boulevard is not provided.

Grade Separation Analysis

The potential benefits from grade separating NE 11th Avenue and NE Lombard Place, and NE Cully Boulevard at-grade crossings was investigated applying the best practices for benefit-cost analysis set forth by the U.S. Department of Transportation (DOT).

Grade separating the two at-grade crossings is expected to reduce potential vehicle/train accidents as well as eliminating vehicle delays generated by trains. The latter is expected to translate into improved travel times and reduced out-of-pocket transportation costs for motorists as well as eliminating emissions from vehicles waiting for trains to pass the crossings. These benefits were monetized following the U.S. Department of Transportation (USDOT) 2018 Benefit-Cost Analysis Guidance and assume that the first year of benefits is 2021.

Table 4 highlights the benefits from grade separating the NE 11th Avenue and NE Lombard Place grade crossing;

Table 5 highlights the benefits from grade separating the NE Cully Boulevard grade crossing. Both tables present the total benefits over a 30 year study period. Using a 7 percent real discount rate, the analysis indicates that grade separating the NE 11th Avenue and NE Lombard Place grade crossing is expected to generate \$4.8 million in socioeconomic benefits. Grade separating the NE Cully Boulevard grade crossing is expected to generate \$2.8 million in socioeconomic benefits.

Table 6 highlights the combined benefits of grade separation. If both grade crossings were to be grade separated, it is expected to generate \$7.5 million in socioeconomic benefits.

TABLE 4. Grade Separation Benefits by Impact Categories – NE 11th Avenue and NE Lombard Place

Impact Categories	7% Discount Rate	3% Discount Rate
Avoided Grade Crossing Accidents	\$2,485,981	\$4,453,203
Vehicle Travel Time Savings	\$2,135,404	\$4,086,250
Vehicle Emissions Cost Savings	\$4,272	\$7,176
Out-of-Pocket Transportation Cost Savings	\$127,272	\$248,730
Total	\$4,752,929	\$8,795,360

TABLE 5. Grade Separation Benefits by Impact Categories – NE Cully Boulevard

Impact Categories	7% Discount Rate	3% Discount Rate
Avoided Grade Crossing Accidents	\$1,124,423	\$2,017,890
Vehicle Travel Time Savings	\$1,547,193	\$2,960,666
Vehicle Emissions Cost Savings	\$2,153	\$3,669
Out-of-Pocket Transportation Cost Savings	\$85,349	\$166,644
Total	\$2,759,119	\$5,148,869

TABLE 6. Grade Separation Benefits by Impact Categories – Combined

Impact Categories	7% Discount Rate	3% Discount Rate
Avoided Grade Crossing Accidents	\$3,610,404	\$6,471,093
Vehicle Travel Time Savings	\$3,682,597	\$7,046,916
Vehicle Emissions Cost Savings	\$6,425	\$10,845
Out-of-Pocket Transportation Cost Savings	\$212,621	\$415,374
Total	\$7,512,048	\$13,944,228

Results of Grade Separation Warrant Analysis

The analysis performed calculated the direct benefits of grade separations at NE 11th Avenue/NE Lombard Place and NE Cully Boulevard. For grade separation projects to be considered for a grant award, typically the Benefit Cost Ratio should be greater than 1. This implies the maximum cost for each grade separation should not be greater than the present value of benefits. Thus in order to benefit monetarily from grade-separation, the improvements would need to cost less than \$4.75 million at NE 11th Avenue/NE Lombard Place, and less than \$2.76 million at NE Cully Boulevard (using a 7% discount rate). While cost estimates to make these locations grade-separated were not developed, based on similar projects the cost to grade separate would far exceed the direct benefit. As such grade separations are not warranted without identifying significant additional benefits.

While neither grade crossing location meets the cost-benefit analysis conditions for grade separation, the decision to grade separate a highway-rail crossing is not just a matter of economics. Investment in a grade-separation structure is long-term and impacts many users. Such decisions should be based on long-term, fully allocated life-cycle costs, including both highway and railroad user costs, rather than on initial construction costs. Such analysis should consider the following:

- Eliminating train/vehicle collisions (including the resultant property damage and medical costs and liability).
- Savings in highway-rail grade crossing surface and crossing signal installation and maintenance costs.
- Driver delay cost savings.
- Costs associated with providing increased highway storage capacity (to accommodate traffic backed up by a train).
- Fuel and pollution mitigation cost savings (from idling queued vehicles).
- Effects of any “spillover” congestion on the rest of the roadway system.
- Benefits of improved emergency access.
- Potential for closing one or more additional adjacent crossings.
- Possible train derailment costs.

Benefits of Grade Separation

To make a compelling case for a grant award, the grade separation project or projects needs to reduce the potential for conflicts between freight trains and vehicles, pedestrians, and bicycles, and enhance multimodal connectivity for active transportation users. Benefits of the project (s) will be realized by a broad spectrum of public and private user-beneficiaries, including pedestrians, bicyclists, freight railroad operators, motorists (through reduced exposure to jaywalkers), police and fire departments and emergency medical service providers (through reduced trespasser and jaywalking incidents), freight rail shippers and receivers, business owners, and others. The ability of Union Pacific (UP) Railroad to transport freight safely, efficiently, and reliably via the Kenton Line now and in the future is necessary to sustain a comprehensive and resilient multimodal transportation network and is critical to enhancing mobility and the economy and competitiveness of Oregon and Washington.

Expected users and beneficiaries of a grade separation of the UP freight rail corridor and related improvements at NE Lombard Street, NE 11th Avenue, NE Lombard Place, NE Columbia Boulevard, and NE Alderwood Road, include the following:

- Pedestrians and bicyclists crossing the UP freight rail corridor between NE Lombard Street and NE Columbia Boulevard and walking on adjacent roadways and sidewalks.
- Motorists adjacent to freight rail corridor on NE Lombard Street and NE Columbia Boulevard. By providing a location for pedestrians to safely cross these roads, pedestrian-motor vehicle collisions (strikes) will be reduced, benefiting motorists and pedestrians alike.
- Police and Fire Departments and Emergency Medical Services that provide emergency services to the public adjacent to (and across) the freight rail corridor. The safety improvements of the project will greatly diminish trespasser incidents and pedestrian-motor vehicle collisions (strikes), leaving police, fire departments, and emergency medical services to focus on other emergencies and duties.

The grade separation project (s) would allow UP to make main line improvements, connect sidings to form double track, and construct third main line tracks on the Kenton Line for trains moving to and from the Port of Portland and to and from Burlington Northern Santa Fe and several Washington ports. The main line rail improvements, which could be constructed as a result of the grade separation project(s), will provide many quantifiable benefits to railroad operations, rail shippers, and the public. These could be additional monetized benefits not included in the preliminary cost-benefit analysis:

Avoided train crew deadhead labor costs from inadequate train meet/pass locations.

- Due to existing train delay, this impact currently affects UP operations within the

project area. It causes additional re-crewing of trains and related train crew deadheads. The project would eliminate these train crew deadheads.

Avoided train crew costs from inadequate train meet/pass locations

- This presently exists without the proposed new siding. Trains are currently required to wait due to inadequate meet/pass locations. The project would eliminate this train delay.

Avoided train crew costs due to improved running times

- Due to existing temporary slow orders, the main line within the project area has been operating at a slower track speed temporarily. The project would eliminate these temporary slow orders and return the main track back to its original timetable speed.

Avoided train delay costs from inadequate train meet/pass locations

- This presently exists without the proposed new siding. Trains are required to wait due to inadequate meet/pass locations. The project would eliminate this train delay.

Avoided train delay costs due to improved running times

- Due to existing temporary slow orders, the main line within the project area has been operating at a slower track speed temporarily. The project would eliminate these temporary slow orders and return the main track back to its original timetable speed.

Avoided emissions cost from inadequate train meet/pass locations (idling)

- This presently exists without the proposed new siding. Trains are required to wait due to inadequate meet/pass locations. The project would eliminate this train delay and corresponding idling time.

Residual value after the 30-year analysis period

- Some of the track assets installed during the construction of the project maintain residual value as their useful life is greater than the 30-year analysis period.

Significant Additional Benefits

Additional benefits include avoided locomotive fuel consumption due to a reduction in idling time (from the reduced siding delay) as well as improved running times through the project area.

The project will promote continued safe and reliable rail service for the shippers on the UP Kenton Line Subdivision, including the Port of Portland and several Washington ports, and will provide additional operational flexibility, which will increase track capacity and create transportation efficiencies, all while increasing the ability to accommodate the shipments of new customers on the line.

Improving railroad safety, security, and resiliency is one of the key goals identified in the Oregon State Rail Plan. The project will provide much-needed rail infrastructure and will aid in lowering potential derailment exposure caused by train vehicle conflicts. This capital improvement project will improve the overall safety and reliability of this railroad line. For UP the capital improvement project will reduce the overall potential

risk to train operations, which includes transporting heavy and hazardous material carloads over the existing rail line.

Reducing Highway Impacts. Previous capital improvements to the UP Kenton Line Subdivision by the state with the NE Columbia Parkway North Boulevard underpass further reduce the impact to local roads and the highway system. This improvement has allowed existing shippers to ship more weight per carload, thus avoiding extra shipment of smaller carloads or diverting excess shipments from freight rail to trucks during peak times. Further investment in the UP Kenton Line will continue to encourage local, regional, and state-wide growth opportunities and reduce the impact on state highways and local roads.

Below are some highlights of qualitative project benefits expected to occur after construction of the railroad project:

- The project's elimination of turnouts and construction of new track will greatly reduce the overall risk and the potential likelihood of derailment within the project area.
- Operating and maintenance costs will be reduced due to the main line turnout removal. This improvement will alleviate current levels of train crew delay, train crew deadhead time, train delay, and locomotive idling time, as trains dwell during meet/pass events.
- With the conversion of single track with sidings to double track, over 4 miles of speed restrictions can be removed through the congested area, which will greatly increase the line capacity and efficiency of the railroad line.
- Shippers and employees of surrounding businesses that support these local shippers rely on a reliable local rail system to transport products via the UP.
- Shippers will benefit by having fewer overall train delays due to speed restrictions and a suitable location for trains to meet and pass one another because of the new double track.
- A more reliable railroad system helps control supply chain cost variability, which is beneficial to the shippers. Local businesses also thrive when the shippers on the railroad line are productive and profitable.
- Maintaining the freight railroad system in Oregon is crucial to the economies of the counties and communities along the railroad line.

With the connection of sidings to form double tracks and addition of a new main line track, UP would be able to operate additional trains, which could reduce the number of trucks on the highway. The project supports economic vitality at the regional and national level. UP transports various commodities that are important raw material and energy inputs that the U.S. economy demands. Targeted infrastructure investment such as the double and triple tracking of the UP Kenton Line Rail Project, can provide improvements to the region's transportation system safety, reliability, and resilience, while also having positive effects on job creation and economic competitiveness within this rural area.

Conclusion

As documented in this study, the existing crossing conditions at NE 11th Avenue/NE Lombard Place near NE Lombard Street and NE Cully Boulevard near NE Columbia Boulevard necessitate improvements. The recommended short-term improvements identified in this study should be incorporated into the final Columbia Lombard Mobility Corridor plan, and move into further project development and design. Additionally, while the benefits of grade-separating the railroad tracks at these locations does not currently justify the cost, the additional benefits noted in this study should be further considered and explored further as part of any future double-tracking project.

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