# Resolving Union Pacific Railroad Intermodal Concerns from TriMet's Interstate MAX LRT Line

**JENNIFER RYAN**
*HDR*

**KAREN KARLSSON RABINER**
*formerly with City of Portland*
*KLK Consulting*

**JOHN TRUMBULL**
*Union Pacific Railroad*

During the final design of Tri-County Metropolitan Transportation District of Oregon's (TriMet's) Interstate MAX project, a LRT station was located at an intersection that serves as the main truck access to the Albina Intermodal Freight Yard of Union Pacific Railroad (UPRR) and to the River Street businesses in the Lower Albina Industrial District. The railroad raised concerns about the impact the station location might have on truck movements on Interstate Avenue at Russell Street, particularly with respect to inadequate signal time and turning radii. In addition, the local businesses were concerned with the cumulative impacts of the LRT project along with the UPRR's own train yard improvements at Russell Street and a proposed City of Portland railroad grade separation project over the UPRR tracks to improve traffic movements from the River Street businesses to Interstate Avenue.

In response to these concerns a traffic model was developed that simulated the intense truck activity along Interstate Avenue within the Lower Albina Industrial district, currently and in the future, which also incorporated the three overlapping projects. Through this detailed, iterative traffic simulation modeling effort, a series of design modifications to the two public projects were made to mitigate the traffic concerns, maintain the UPRR Intermodal Yard entrance, and reinforce the Lower Albina District as an industrial sanctuary with improved access to the River Street businesses.

## INTRODUCTION

Tri-County Metropolitan Transportation District of Oregon's (TriMet's) Interstate MAX Project to extend the existing light rail system 7 mi to the north of the Rose Quarter Transit Center dealt with several significant challenges during final design of the $350 million project in 1999. The LRT route traverses the Lower Albina Industrial District, a small industrial sanctuary area, which borders Interstate 5 on the east and the Willamette River on the west (see Figure 1). The district's northern boundary is the UPRR's Albina Manifest and Intermodal Yard, and is narrowed down to the south by Interstate Avenue and Broadway Bridge.

Several businesses in the Lower Albina Industrial District identified concerns with the loss of two traffic lanes on the five lane arterial street paralleling Interstate 5 north towards Vancouver, Washington. One of those businesses, the UPRR, was concerned with the potential for trucks

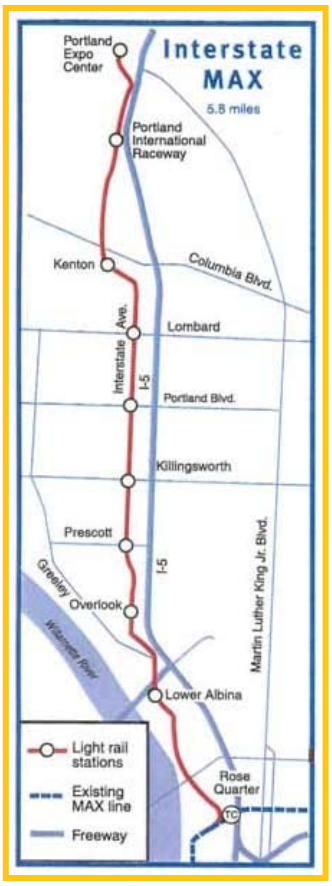


**FIGURE 1 Interstate MAX alignment.**

entering UPRR's Intermodal Yard to block light rail traffic on Interstate Avenue, thereby forcing UPRR to relocate the truck entrance to the Yard, or possibly the entire Intermodal Yard itself.

This was complicated by the convergence of two additional multimillion dollar projects within an eight-block section of Interstate Avenue. The UPRR was making modifications to several buildings near the Russell Street intersection along with track improvements to the south. Moreover, at the southern end of the Lower Albina District, an overpass was proposed to alleviate the queuing resulting from train blockages at the five grade crossings of the UPRR tracks south of Russell Street.

Through a detailed traffic modeling effort, a series of design modifications to the light rail project and the Lower Albina Overpass were made to 1) mitigate the concerns of the industrial businesses; 2) maintain the UPRR Intermodal Yard entrance; and 3) reinforce the Lower Albina District as an industrial sanctuary.

## The Challenge of Three Overlapping Projects

The challenge to the light rail project was how to accommodate these construction projects together without adversely impacting the businesses in the Lower Albina Industrial District, forcing the relocation of the UPRR Intermodal Yard, and potentially delaying the LRT project.

The first project was privately funded and on its own schedule. UPRR was in the process of relocating its crew change quarters from Brooklyn Yard (5 mi to the south) to Albina Yard near Russell Street in order to improve Amtrak travel times through Brooklyn Yard. In addition, UPRR was designing an upgrade of the track nearest to Interstate Avenue, known as Track 100, as the mainline through track around the perimeter of the Intermodal and Train Manifest Yard to reduce congestion within the Yard and along the approach tracks to the Yard, as shown in Figure 2. Track 100 affords the UPRR a more fluid way to run through trains north to Seattle and east towards Idaho and the Midwest. When UPRR bought the Southern Pacific Railroad in 1996, the I-5 corridor became a far more important route into California and the Pacific Northwest. Trains north and south need to pass through the Albina Yard area, which becomes very slow when switching is required. The run through Track 100 would help increase traffic flows and train speeds.

The second project was partially funded based on a public–private partnership. The UPRR was also under pressure to address the problem of frequent train blockages at the five grade crossings on the approach tracks at the south end of the Yard (see Figure 3). The UPRR was paying heavy monetary fines associated with blockages of grade crossings for longer than 10 min in the Lower Albina District. Several of the businesses that were blocked by train activity had time sensitive materials, such as freshly mixed concrete, leaving the district for delivery. Businesses west of the railroad tracks were being cut off from Interstate Avenue when those grade crossings were blocked by normal switching activities associated with the UPRR yard, and these events led to an effort by the City of Portland, the Lower Albina Industrial District, UPRR, and Oregon Department of Transportation Rail Safety Division to develop an overpass plan. By 1999, a type, size, and location study had identified that the optimal location for the new

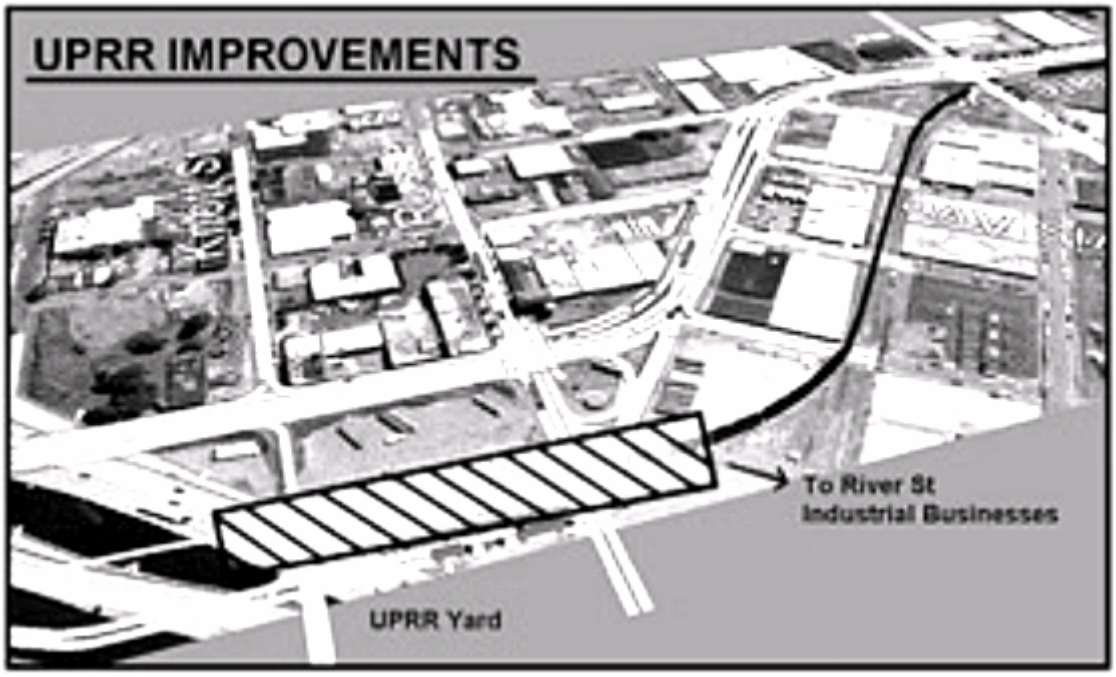


**FIGURE 2 Union Pacific railroad improvements to Track 100.**

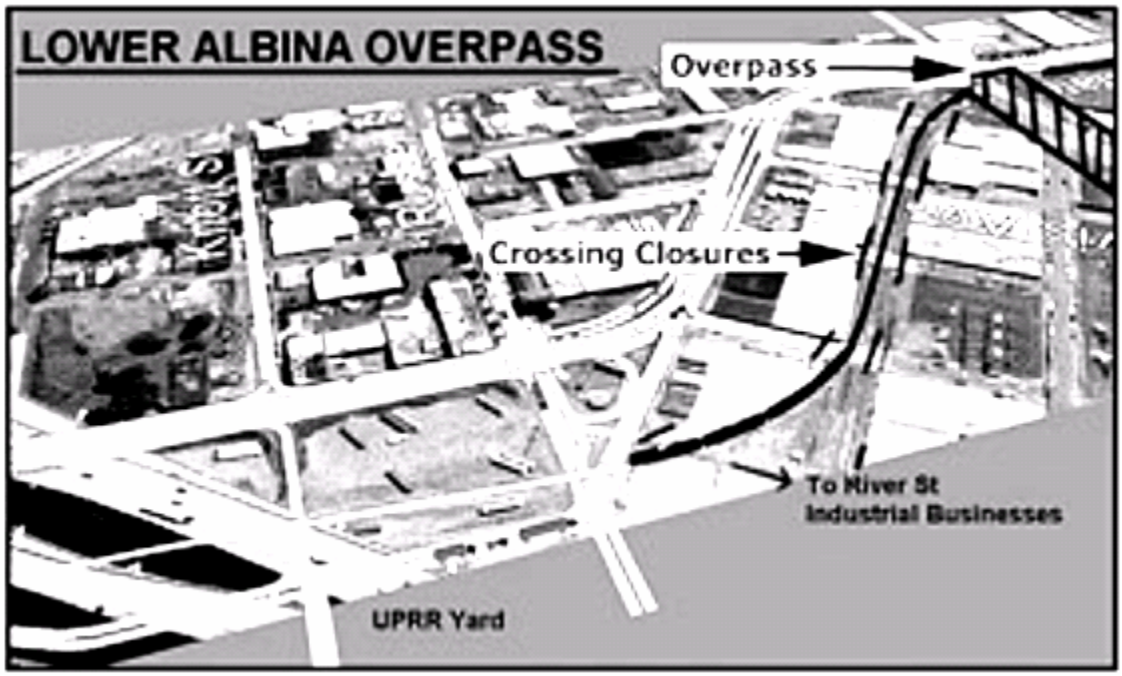


**FIGURE 3 Lower Albina Overpass improvements.**

overpass was at the south end of the district connecting into the existing intersection of Interstate Avenue with Tillamook Street. The businesses and users of the streets benefiting from the overpass were below the thresholds for full public funding of a major grade separation project within the city. As a result, a technical solution had been identified, the Lower Albina Overpass, but the project was only partially funded. As it stood, the estimated cost was $14 million. Although the city had secured federal highway funds and state crossing safety funds, had dedicated Transportation System Development Funds, and received a significant commitment of funding from UPRR, the project had identified a serious shortfall. A Local Improvement District (LID) had been discussed in the Lower Albina neighborhood, but the neighborhood was not willing to fill the entire gap with an LID. In addition, with the Interstate MAX Light Rail project starting up, time was becoming critical. TriMet's desire was to have the Overpass project completed before Interstate MAX construction began in order to avoid costly construction conflicts.

With TriMet's goal of building two tracks of LRT in the middle of Interstate Avenue and replacing the five-lane arterial with a two lane, two track cross-section, the businesses that were already affected by the UPRR train blockages raised additional concerns with the loss of truck capacity on Interstate Avenue. In addition, a key element in serving the Lower Albina area and Emanuel Hospital east of Interstate Avenue along Russell Street was locating a light rail station at the corner of Russell Street and Interstate Avenue, where several restaurants on the east side of the street were thriving (see Figure 4). The location of the station at the entrance to the Intermodal Yard increased UPRR staff concerns about the potential conflicts between pedestrians accessing the station and the wide turning movements of trucks exiting the Yard at Russell Street, as well as raising the question of who would get signal priority after the LRT

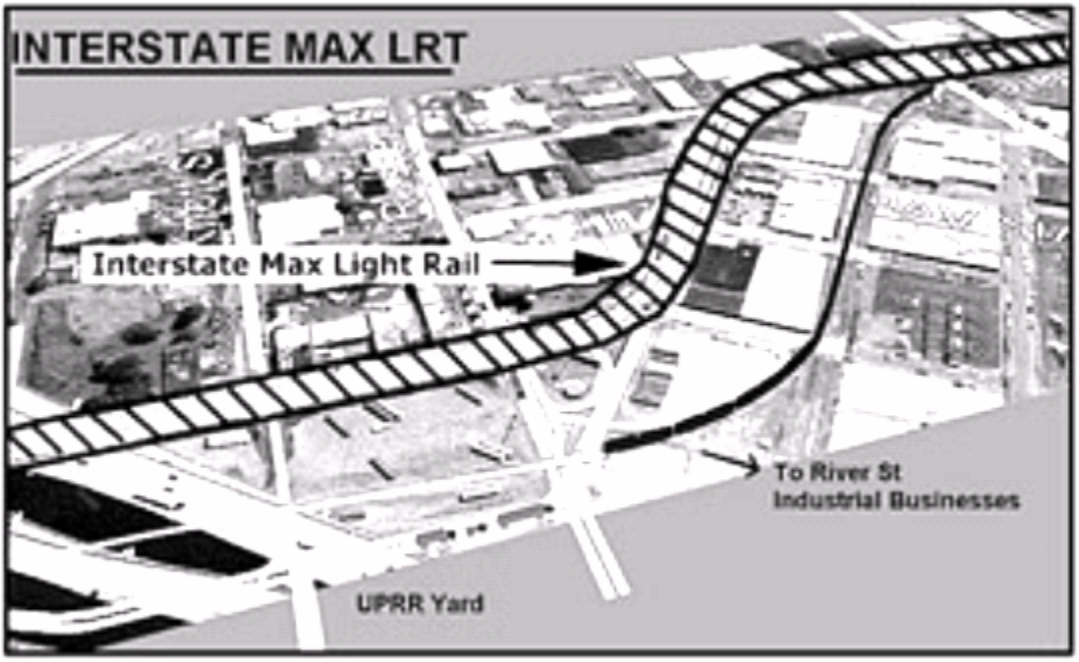


**FIGURE 4 Interstate MAX alignment through Lower Albina.**

trains. In addition, with the increase in UPRR train traffic on Track 100, the Intermodal Yard staff were concerned with UPRR being fined for trucks queuing up on Interstate Avenue due to a Track 100 train blockage and the trucks blocking vehicular and LRT traffic on Interstate Avenue. Along with the traffic issues was the potential for gentrification of the area around the Russell Street station, which was owned by UPRR on the west side of Interstate and used as truck and container storage for the Intermodal Yard. Both of these issues caused UPRR to raise the concern that the Intermodal facility was being incrementally pushed out of the Russell Street area and potentially displaced by the Interstate MAX project. UPRR started looking at alternative Intermodal sites with price tags in the range of more than $20 million for relocation.

## Multimodal Modeling

As part of the preliminary engineering for the Interstate MAX project, TriMet had developed a standard multimodal traffic simulation model using computer modeling to visually represent how the street network would work with the predicted traffic volumes after the light rail line was built. The model incorporated the LRT traffic, and all classes of roadway traffic (i.e., 5% trucks, 1% buses, 94% automobile) along Interstate Avenue. The model did not assign additional truck movements from any of the side streets, such as Russell Street, as shown in Figure 5. In reviewing this analysis, the businesses in the Lower Albina District and UPRR raised concerns that the model did not reflect either the existing or future traffic since the truck movements were not typical of what they experienced daily on Interstate Avenue.

Based on these concerns, TriMet and the City of Portland revised their methodology to address the gaps identified by the business community. Additional traffic counts were collected along the side streets to expand the traffic model. The methods used are summarized in Table 1.

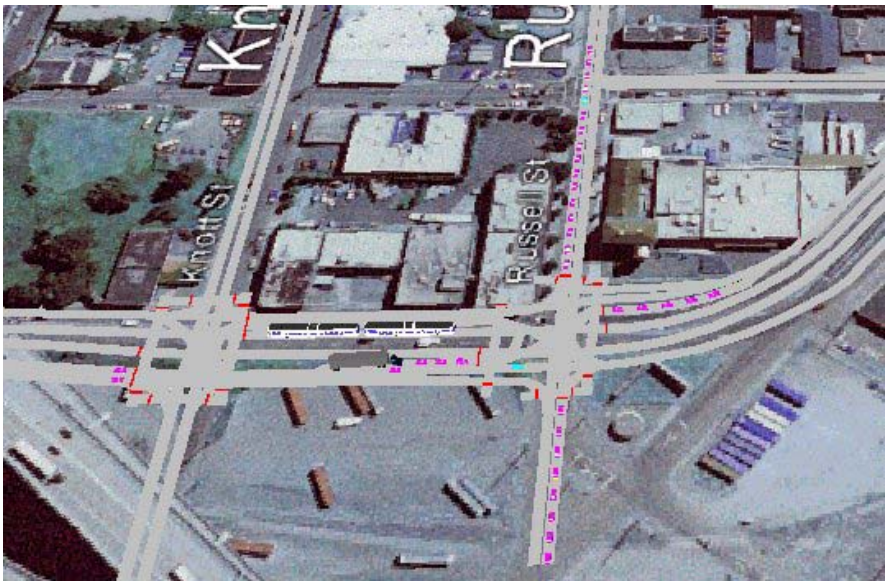


**FIGURE 5 Initial traffic simulation model of Interstate Avenue at Russell Street. LRT vehicles are shown in white, buses in blue, trucks in gray, and passenger cars in pink. No train is shown on Track 100 or trucks on Russell Street.**

**TABLE 1 Lower Albina Truck Data Collections Methods**

| Method | Data Collected |
|---|---|
| Automatic Traffic Recorder | • General traffic pattern<br>• Peak day<br>• Peak hour<br>• Heavy use streets (eg., Lewis and Knott) |
| Business Surveys | • Peak days and seasons<br>• Picture during peak season by firm:<br>number of trucks/time of day/truck type/direction<br>• Seasonal growth (% increase over current for peak condition)<br>• 5-year growth (% increase to use in future year forecasts) |
| Video Turning Counts | • Truck turning counts at intersections for peak hours<br>• Speed and other operational characteristics of study area trucks<br>• Movement conflicts (operational issues)<br>• Direction and number of trucks<br>• Train and truck interactions |
| Train Counts | • Average blockage delay at Knott, Russell, and Randolph Streets<br>• Types of train movements<br>• Future growth of train movements |

The next step involved the compilation of a detailed truck survey from the businesses located along Interstate Avenue within the District. The business survey found that 85% of the trucks were entering and exiting the west side of Interstate Avenue at Russell Street, near the UPRR yard entrance. Half of the truck traffic accessing via Russell Street was associated with the Intermodal Yard, with the other half accessing the River Street businesses; such as the two concrete plants or the sand and gravel company. Truck movements were classified by direction arriving and exiting, time of day, day of week, seasonal peaks, and into 11 vehicle types running the gamut from semis and Western Doubles to concrete mixer trucks. One of the major elements to come out of the business survey information was that the peak truck traffic leaves the River Street area in the a.m. peak and returns evenly throughout the day.

For the truck traffic destined for the UPRR Intermodal Yard, data from the Automatic Traffic Recorders (hose counts) was correlated with vehicle counts from video taping of the major intersections entering the Yard, including Russell Street. The vehicle movements were tracked by direction arriving and exiting, time of day, day of week, seasonal peaks, and into 7 vehicle types running the gamut from doubles to vans and cars. Since UPRR was concerned that the LRT station at Russell Street would limit the throughput capacity of the existing Intermodal Yard, the truck data was converted into typical intermodal freight data, such as the gate count where UPRR takes custody of the trailers or containers. This gate count data correlated with the video counts once the containers that were rejected by the gate and the internal movements within the UPRR yard between storage lots were accounted for. One of the major elements to come out of the UPRR information was that the peak truck traffic accesses the Intermodal Yard at midday rather than an a.m. or p.m. peak. There is also a distinct increase in truck traffic accessing the Intermodal Yard on Mondays and Thursdays corresponding to intermodal train movements between Portland and Los Angeles.

The final element was to identify UPRR train movements affecting truck traffic movements within the district. One of the major elements controlling the function of the Russell Street intersection was the frequency and length of grade crossing blockages from UPRR trains. As part of the effort to quantify the types of blockages and predict future blockages, the frequency of and types of train movements on UPRR's tracks were monitored. Train counts were collected for Tracks 100, 101, 102, and 528 (the locomotive engine repair shop lead) over several days. Data was collected by track with identification by direction of train, number of locomotives, type and length of train, time of day, day of week, grade crossings blocked, amount of time crossing blocked, length of traffic queue on either side of blockage, type of movement (switching, through movement, locomotive move, etc.). This information was then used to predict the increase in train movements on Track 100 from UPRR improvements as they might affect traffic queuing on Interstate Avenue from Russell Street for the Intermodal Yard.

From this data collection, the simulation model was revised to reflect the increase in truck movements in the a.m. and midday peaks, along with the interaction of the trucks queued up at Russell Street for the trains using Track 100. The traffic patterns in the simulation model were revised to shift all traffic accessing the businesses between the railroad tracks and the river to the proposed new overcrossing. It was also revised to incorporate pedestrian movements at signalized intersections, as they would access the LRT station and bus stops. The truck modes were expanded to reflect the concrete mixer trucks with their short wheel base along with the semis, doubles, and dump trucks accessing the River Street businesses. Truck types accessing the Intermodal Yard included single container trucks such as the typical WB 40 or WB 67 trucks. Also included were local delivery vans such as UPS deliveries. The resulting traffic model, as

shown in Figure 6, reflected the experience of the businesses within the Lower Albina District and clarified the interactions of the LRT vehicles with the truck movements.

**Findings**

Once the simulation model incorporated a more accurate representation of typical truck movements and time of day truck peaks, the process of identifying the LRT impacts and developing mitigation measures began. The modeling demonstrated that the Lower Albina Overpass reduces the turning movements at the Russell Street intersection by 50%. It also showed that LRT train movements have little to no effect on truck queuing on Interstate Avenue, even with signal priority. The model also showed, however, that the pedestrian movements to the Russell Street Station competed with the trucks making left turns to exit the Intermodal Yard, limiting the number of trucks exiting the Yard per signal cycle. The extended traffic queuing on Interstate Avenue at Russell Street occurs only when a UPRR train blocks Track 100, as shown in Figure 7. Further iterations on the modeling identified that a single lane southbound, right turn into UPRR at Russell Street. may result in up to 20 blockages of Interstate Avenue annually for 3-5 min.

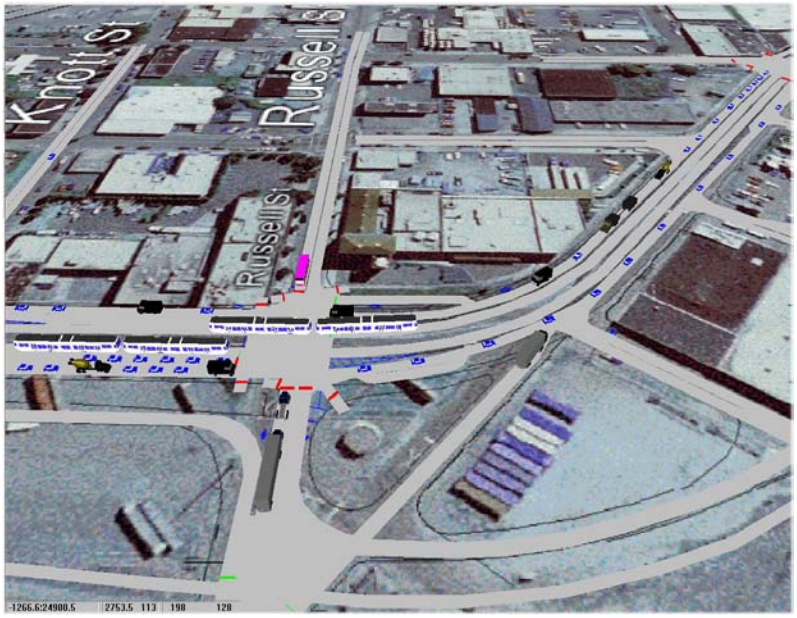


**FIGURE 6 Revised traffic simulation model during typical traffic cycle with LRT priority. The gray trucks and pink buses are queued up at Russell Street for the LRT trains, and passenger cars are shown in blue intermixed with a higher number of trucks in the through traffic movements on Interstate Avenue.**


**FIGURE 7 Revised traffic simulation model at midday with Train 100 event. UPRR train blocks the Russell and Knott Street accesses, resulting in truck queuing on Interstate Avenue.**

## Project Modifications

Based on the impacts identified in the revised traffic simulation model, the following modifications were made to the Interstate MAX Light Rail Project:

1. The LRT station was shifted 3 blocks south to Albina Street and away from the Russell Street intersection. This separated the pedestrian and bus movements from the intermodal truck turning movements, addressing the UPRR concerns about the traffic congestion associated with the LRT station. The station shift also reduced the perceived land use pressure to redevelop the UPRR's Intermodal Yard parking lots next to Interstate Avenue to housing or other mixed use to support transit.
2. A dedicated double right turn lane to Russell Street westbound was constructed to optimize the truck queuing space on Interstate Avenue associated with grade crossing blockages from UPRR train movements. This additional queuing space minimizes the potential for UPRR Freight operations to adversely affect automobile or LRT train traffic on the rebuilt Interstate Avenue by increasing the right turn storage space. The double right turn was incorporated into the critical path as one of the first elements to be built as part of the construction traffic mitigation for the Interstate MAX project.
3. The Russell Street traffic signal was reprogrammed to accommodate long truck queues for the left turn movement exiting the Intermodal Yard onto Interstate Avenue.
4. Since the traffic model only worked if the Lower Albina Overpass removed half the truck traffic from the Russell Street intersection, the LRT project's critical path was revised to incorporate the Lower Albina Overpass as construction traffic mitigation.

### Funding Challenges

Early funding discussions had included a small funding contribution from the LRT project to the Overpass project for accommodating changes in the bridge design to better function with light rail on Interstate Avenue. As a result of the traffic analysis, however, TriMet increased its contribution helping to fill the gap. A LID was then formed, incorporating the properties in the Lower Albina district west of Interstate Avenue including UPRR, and the City of Portland increased its contribution. The funding gap was nearly closed but time had advanced and the City no longer had time to build the bridge before light rail construction began. At this point the City and TriMet conferred, and as a result the City asked TriMet to construct the bridge with their LRT contractor, with the City and TriMet jointly managing its construction, thus reducing costs through efficiencies and eliminating the inevitable conflict of two independently hired contractors attempting to build simultaneously in a very compact neighborhood.

## CONCLUSION

Through a detailed, iterative traffic simulation modeling effort, a series of design modifications to the two public projects were made to mitigate the traffic concerns, maintain the UPRR Intermodal Yard entrance, and reinforce the Lower Albina District as an industrial sanctuary.

The combined computer modeling of the three overlapping projects allowed the technical discussions to focus on the pertinent traffic issues. The visual medium of the modeling software provided all parties with a compelling image of the complex, overlapping patterns. This allowed a clearer understanding of what impacts were associated with the light rail project versus freight rail. The cumulative risk analysis for freight blockages identified in the modeling allowed appropriate managing of risk for each project.

This allowed for the merger of the two public projects, which reduced the cost of the combined projects by narrowing the scope of the LRT project and minimizing the impacts to the UPRR Yard and access points. The resulting projects maintained the UPRR's competitive access to I-5 and surrounding street network from Interstate Avenue at Russell Street and the Swan Island area. The visual medium of the modeling allowed the City and UPRR to gain confidence in approving closure of grade crossings and reduction in traffic lanes crucial to the two projects. Finally, acknowledging the Interstate MAX project's dependency on Lower Albina Overcrossing for traffic mitigation allowed the funding reallocation to be adjusted, enabling the bridge to be constructed and traffic congestion to be relieved.

## ACKNOWLEDGMENTS

The Interstate MAX Project Team included TriMet, Parametrix, Parsons Brinkerhoff, HDR Engineering, Inc., and Innovative Transportation Concepts (VISSIM Modeling). The Lower Albina Project involved the City of Portland, CH2M-Hill, Union Pacific Railroad, HNTB, and the Oregon Department of Transportation. Union Pacific Railroad improvements were coordinated by Union Pacific Railroad, the City of Portland, and the Rail Division of the Oregon Department of Transportation.

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