ABSTRACT

In April 2008, Utah Transit Authority opened the first phase of a new commuter rail system connecting points north of Ogden with Salt Lake City, a distance of about 44 miles. The system combines independent operation adjacent to the existing Union Pacific Railroad tracks for most of the line, with shared operation on UP tracks for a small part of the line. Implementation activities are now under way for an ambitious package of 45 miles of additional commuter rail and 35 miles of new light rail extensions throughout the Salt Lake City area. Together, these projects are known as the FrontLines 2015 program. Several different delivery methods are being used.

This presentation will describe highlights of how the initial segment of commuter rail is performing, some interesting technical issues that have arisen since startup, and lessons learned now being applied to the design of future phases. It will also cover outside conditions that have changed since planning and design was completed for the initial phase, and how the changes are being managed.

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INTRODUCTION

In 2002 Utah Transit Authority purchased 175 miles of a combination right-of-way and trackage rights from the Union Pacific Railroad. Also in 2002, Utah Transit Authority began the environmental analysis and design for a 44-mile segment of commuter rail from Salt Lake City to Pleasant View. For 38 miles of this alignment operations are separated, with two locations where Union Pacific Railroad must cross Utah Transit Authority tracks to serve freight customers. On the northern six miles of the alignment the two companies share track, with Utah Transit Authority trains being dispatched by the Union Pacific Railroad.

Revenue operation of the Utah Transit Authority commuter rail service, named the FrontRunner, began on April 28, 2008.

LESSONS LEARNED

Peer Reviews are Beneficial

Utah Transit Authority greatly benefitted during the design and construction of rail projects by building on the experience of other agencies. Utah Transit Authority staff personnel have toured most of the commuter rail operations in North America. In addition, a number of peer reviews were held in Salt Lake City to discuss design, operations, and maintenance plans as they were developed. The peer review groups, comprised of representative of other operating agencies, provided insights based on their operations that were extremely valuable in the development of our system.

Union Pacific Railroad / Utah Transit Authority Coordination Committee

The purchase and sale agreement for Utah Transit Authority acquisition of right-of-way from Union Pacific Railroad provided for, and required, the creation of a coordination committee as a
forum for the parties to share information, discuss matters submitted by one party to the other party for review and/or approval, and progress resolution of any issues between the parties. In hindsight, this is probably one of the most important parts of the agreement. The coordination committee has been an invaluable mechanism to quickly address and resolve issues for both parties. The requirement that the committee meet in person on a regular basis has resulted in the establishment of the strong relationships necessary to successfully accomplish the construction and operation of a commuter rail operation while maintaining profitable freight service in the same corridor.

**Safety during Construction**

One of the Utah Transit Authority criteria for selection of the contractor for the project was experience with construction within an active freight rail corridor. The Utah Transit Authority contractor, a joint venture of Stacy and Witbeck, Inc. and Herzog Construction, was named Salt Lake City Commuter Rail Constructors. They demonstrated the necessary experience as well as a strong safety culture within their respective companies. Constructing a new rail line at 15- to 25-foot track centers from an existing double-track mainline freight operation carrying 35 to 40 trains per day requires a strong focus on safety in order to be successful. Commuter Rail Constructors staff included safety personnel, superintendents, and foremen with extensive construction experience in active freight corridors. While Utah Transit Authority had some experience with construction in a lightly used freight corridor with the construction of our North-South light rail line, Utah Transit Authority did not have the experience with construction in a major freight corridor. This was an area of concern to Union Pacific as the project was moving toward the construction phase.

Commuter Rail Constructors took the lead on educating the entire project team on safety issues. More importantly, Utah Transit Authority gave the contractor control of safety in the work zones. This reduced the chain of command and allowed the people performing the work to
control access to the work areas and maintain coordination with their counterparts at Union Pacific. This was an important key to the success of the construction project, as Union Pacific was able to quickly gain confidence in the contractor’s safety program. This led to the approval of longer work zones, allowing the construction to be completed more quickly and cost-effectively.

**Flaggers and Form Bs**

The Utah Transit Authority project team met frequently with Union Pacific to discuss project schedule and flagging needs in the corridor. The availability of Union Pacific flaggers was a constant concern, as was the provision of freight operations without delay through the multiple form-B work zones. In addition to the commuter rail construction, several highway projects which crossed or were adjacent to the rail corridor were under construction at the same time. Our contractor held weekly construction coordination meetings with participation by the Union Pacific Railroad and highway contractors to prioritize and schedule the work for the next four weeks. These meetings provided valuable planning for the work to be performed in the corridor as well as means of allocating the flagging resources.

**Drainage**

As noted in the AREMA introductory railroad design course, and as is widely repeated, drainage is in fact the most important component of railway design. Located between the Great Salt Lake and the Wasatch Mountains, the rail corridor is crossed by numerous storm drain systems and stream channels.

Building directly adjacent to the Union Pacific tracks, we connected to a drainage system that was many years old. This system was adequate when the Union Pacific’s predecessors
constructed the tracks, but subsequent development upstream of the rail corridor changed the hydrological dynamics of the area. Increased areas of hard surfacing with the construction of streets and residential development has reduced detention times causing higher peak flow volumes in the stream channels and storm drainage facilities. As the residential and commercial development of these areas continues, peak flows continue to increase and the land available for detention is decreasing.

During the design phase of the project, meetings were held with city and county officials to discuss all utilities crossing the railroad corridor. Utah Transit Authority’s baseline policy was to connect to existing facilities under the UPRR track and match the existing capacity of those facilities. If the local jurisdiction wanted to increase the capacity of a utility, the local jurisdiction was responsible for the incremental cost of the increased capacity under the Utah Transit Authority portion of the corridor and the full cost under the Union Pacific Railroad corridor. Unfortunately, few jurisdictions took advantage of this opportunity. Now, just over a year after revenue service began, a local jurisdiction is requesting Utah Transit Authority cost participation in a project to increase stream capacity in a section of the corridor in order to favorably adjust the floodplain maps in the area.

**At-Grade Crossings**

Construction of the commuter rail project involved 41 at-grade crossings. Initially our designers used the existing elevation and grade of the Union Pacific Railroad track through the crossing and designed the Utah Transit Authority track and associated street improvements based on that information. As construction proceeded through the first crossings, Union Pacific Railroad took the opportunity to improve their track profile through the crossings and eliminate some sag curves that have evolved over time as they had tamped the track on both sides of the crossing. Changing the profile of UPRR track at the crossing impacted the design of the Utah Transit Authority.
Authority track, the profile of the street, and the street drainage plan. Designs had to be quickly modified in the field to accommodate the changes.

To eliminate this problem for future crossings, meetings were held with Union Pacific Railroad to develop a process to determine if the Union Pacific Railroad track profile would change and if so to develop revised designs for the crossings. Utah Transit Authority crews provided the survey information to Union Pacific Railroad construction crews and developed designs that were reviewed and approved by Union Pacific Railroad engineering staff. The end result of this effort was better track profiles for both railroads and smoother grade crossings for the driving public.

**Design and Implementation of Quiet Zones**

One of the significant benefits of the commuter rail construction project to the public living near the corridor was the creation of a continuous quiet zone for the entire length of the corridor. The project corridor passes through 14 cities and three counties. The state’s department of transportation and local jurisdictions have ownership of the various streets crossing the rail corridor.

Noise from horns was identified as an impact in the environmental impact study. Mitigation for this impact required either the creation of a quiet zone or installation of wayside horns at seven intersections where the horn noise exceeded the threshold set by the Federal Transit Administration.

As Utah Transit Authority looked at how to proceed through the quiet zone implementation process, it became clear that pursuing individual approval through each of the 17 jurisdiction was not an effective or timely method. There was the risk that some jurisdictions might not follow through in their responsibilities to create the quiet zone, resulting in some pockets where
horns would still be sounded. Utah Transit Authority instead chose to obtain approval of the entire corridor as a whole. The process requires one governmental entity to serve as the lead agency for submittal of the application, public notices, and other communication with the Federal Railroad Administration.

One city in the corridor agreed to have their attorney take the lead in the process. All of the other jurisdictions agreed to provide a relatively small amount of funds to offset the cost of the attorney’s time.

Utah Transit Authority’s standard for safety improvements met most of the requirements for quiet zone implementation. Many locations required Utah Transit Authority to pay for upgrades and modernization of the Union Pacific Railroad grade crossing signals. At most grade crossings, UTA provides warning equipment on the east side of the crossing of the parallel railroads, while UP provides the equipment on the west side. Each operator maintains a separate signal bungalow. One significant example of such upgrades is where adequate lengths of raised medians could not be obtained and three- or four-quadrant gates were required. Union Pacific Railroad standards require an exit gate management system using loop detectors in this situation. This typically required replacement of the signal bungalow to accommodate the new hardware necessary to operate the system. All at-grade crossings required new communications equipment to allow information to be passed back and forth from the Union Pacific Railroad and Utah Transit Authority signal track detectors and signal control hardware. Operating and maintenance protocols were developed to address the responsibilities of each party during routine maintenance and call-outs for crossing failures.
**Rail Activation Activities**

The start-up of a new commuter rail operation on new track with new equipment and new operators is not for the faint of heart. Demonstrating readiness for revenue operations to the Federal Railroad Administration, Federal Transit Administration, Utah Transit Authority Department of Transportation, and Union Pacific Railroad required the dedicated effort of a rail activation team made up of representatives of the design, operations, and maintenance staff. Rail activation planning cannot start soon enough in the process. Revenue service could not have been realized without the dedicated efforts of all the stakeholders involved in the project.

**SECOND PHASE OF FRONTRUNNER CONSTRUCTION**

The second phase of FrontRunner construction extends 44 miles from Salt Lake City to Provo. The Utah Transit Authority track parallels the Union Pacific Railroad Provo Subdivision (formerly the Denver and Rio Grande Western) single track mainline. Many of the same designers and contractors who designed and built the first phase project (north) are working on the south project. We are putting to use the lessons learned from the north project into action on the south project.

**Utility Investigation**

The north project involved many design changes during construction due to inaccurate identification and location of underground utilities, particularly the sizes and condition of drainage structures. On the south project the contractor has been engaged in subsurface investigation of utilities much earlier in the design process. This has helped in providing much more accurate information to the designers, has minimized redesign efforts, and has provided the contractor with first-hand knowledge of the corridor.
Maximizing Track Separation between Freight and Transit

Based on the experience of recent incidents involving transit/freight collisions and freight derailments impacting transit tracks, Union Pacific Railroad expressed the desire to maximize the distance between freight and transit tracks in the rail corridor. Where the north project typically has 25-foot track separation between freight and transit, 40-foot track separations became the standard on the south with 25-foot and less separations allowed only if reasonable alternatives for land acquisition were not available. This greater lateral separation reduces the feasibility of constructing a future second track for commuter rail in several areas. This also has the impact of increasing the width of at-grade crossings at several locations in the corridor.

Pinch Point Protection

Several locations in the corridor have track centers between freight and transit of less than 25 feet, to a minimum of 15 feet, known as pinch points. There was concern with the detection of loose loads or derailed cars that could foul the other railroad’s track and how to provide notification to the other party of such occurrences. A team of Utah Transit Authority and Union Pacific Railroad personnel was created to evaluate the issues and recommend a solution. Still under development is a system consisting of a series of detectors that will be tied to Utah Transit Authority’s and Union Pacific Railroad’s signal systems. If the detectors are hit by a derailed vehicle, a signal will be sent to both systems, resulting in stop signals protecting that segment of track.

Rail Activation

Understanding the significant effort that was required for rail activation and pre-revenue testing activities on the north system start-up, Utah Transit Authority hired a full-time staff person at the
beginning of construction of the south segment dedicated to the planning and preparation of rail activation plans, as well as to document preparation.

CONCLUSION

While the construction of commuter rail in a freight corridor offers many challenges, the results to date have been beneficial for both the transit agency and the freight railroad. Through a spirit of cooperation, frequent communication and coordination, and a strong emphasis on safety, efficient and safe freight and transit operations co-exist in this corridor.