

Tooele Loop Replacement Size Analysis

	<i>Initials</i>	<i>Date</i>
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Tooele Feeder Line Loop Replacement Sizes

System and Cost Analysis Performed by: Mike Platt

Scope

Feeder Line 11-1 (FL11-1), Feeder Line 14 (FL14), Feeder Line 35 (FL35), and Feeder Line 41 (FL41), a 4.5 mile pipeline, two 14 mile pipelines and 7 mile pipeline, have been scheduled for replacement in the next few years. This analysis considers the impact of various replacement diameters and the future operation of these feeder lines.

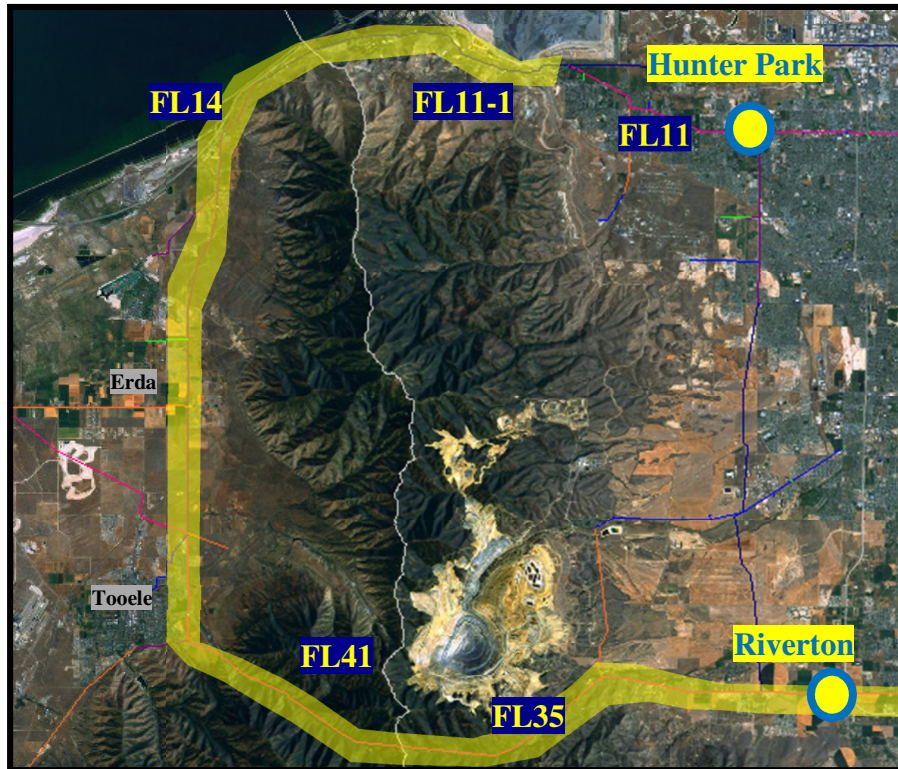


Figure 1: Feeder Line 14, Feeder Line 35, and Feeder Line 41

System Analysis

Feeder Line 14

The first consideration in the system analysis is the present day impact on the system. The current diameter of FL14 varies from 10-inch to 12-inch. Since the replacement must provide at least the same functionality and there have been isolated pressure issues west of this feeder line, diameters smaller than 12-inch were ruled out. Figure 2 shows the resultant daily pressure profiles of the lowest system pressure in proximity to this feeder line, in Tooele. The 2010 model results show that the difference in pressure gain is a minimal 4 psig regardless of pipe diameter.

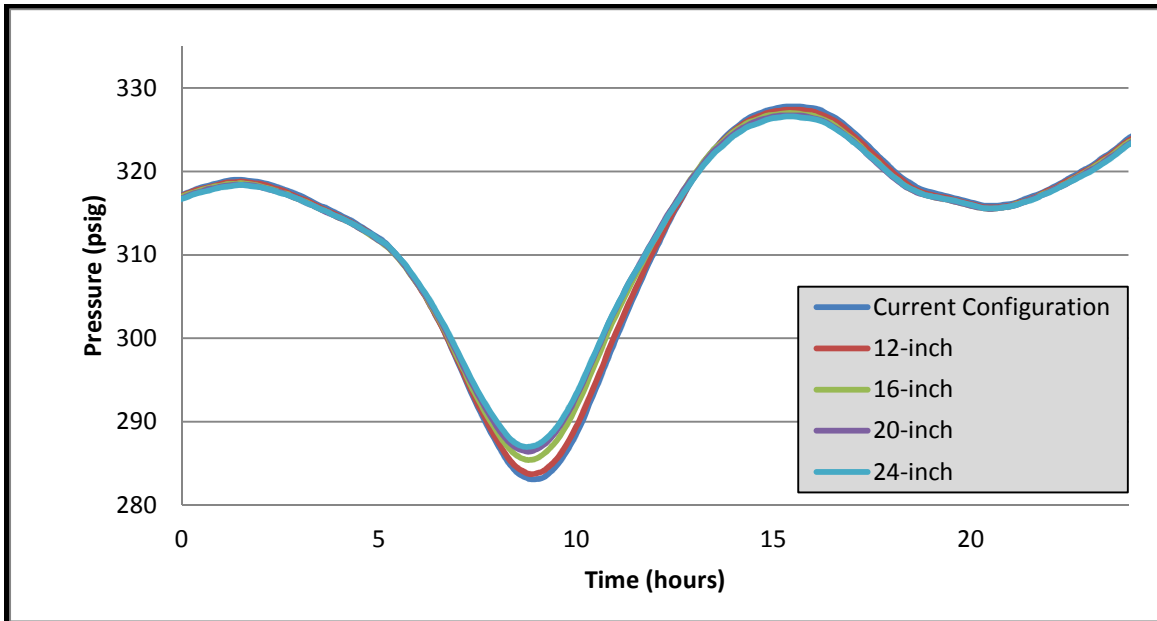


Figure 2: 2010 Tooele Regulator Station Pressures with Various Diameters of FL14

The replacement feeder line will continue to serve the customers in this area into the future. In order to determine the probable outcome of each replacement diameter a 2030 master plan model was created for the area of Tooele County utilizing anticipated growth scenarios. Figure 3 shows the resulting pressure profiles for Tooele. In this projected model, there is almost a 40 psig difference in minimum pressure between the current configuration and a 24-inch replacement, however, the difference between 20-inch and 24-inch is merely 4 psig.

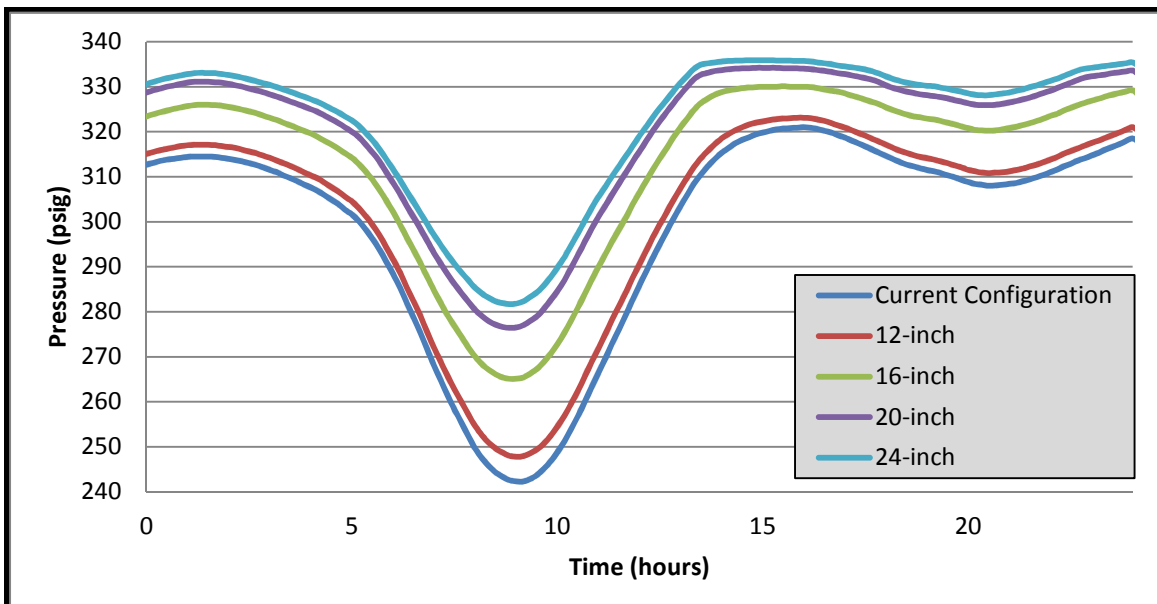


Figure 3: 2030 Tooele Regulator Station Pressures with Various Diameters of FL14

Feeder Line 41

Models were created that varied the size of FL41 independently of the FL14 size replacement. These models predict that the resulting pressures are only minimally dependent on the size of FL41 with resulting pressure difference maximums less than 1 psig. The recommendation is to install a consistent diameter pipe continuing south, past Tooele. This will allow flexibility in system operation without degradation in pressures well into the future.

Feeder Line 35

Another important requirement for this part of the system is the ability to provide reliability to the area. Feeder Line 35 (FL35), a 16-inch diameter pipeline, also feeds this region from the south. For effective reliability, the replacement pipe must be capable of supplying the customers in the event of line failure on FL35. Figure 4 shows the resulting pressure profile in Tooele should FL35 experience an outage on a peak day. In this analysis the 24-inch clearly provides the best pressure results, while the current configuration and a 12-inch replacement cannot sufficiently provide system reliability in 2030. A 20-inch replacement provides sufficient reliability. The difference in pressure between 20-inch and 24-inch is 12 psig.

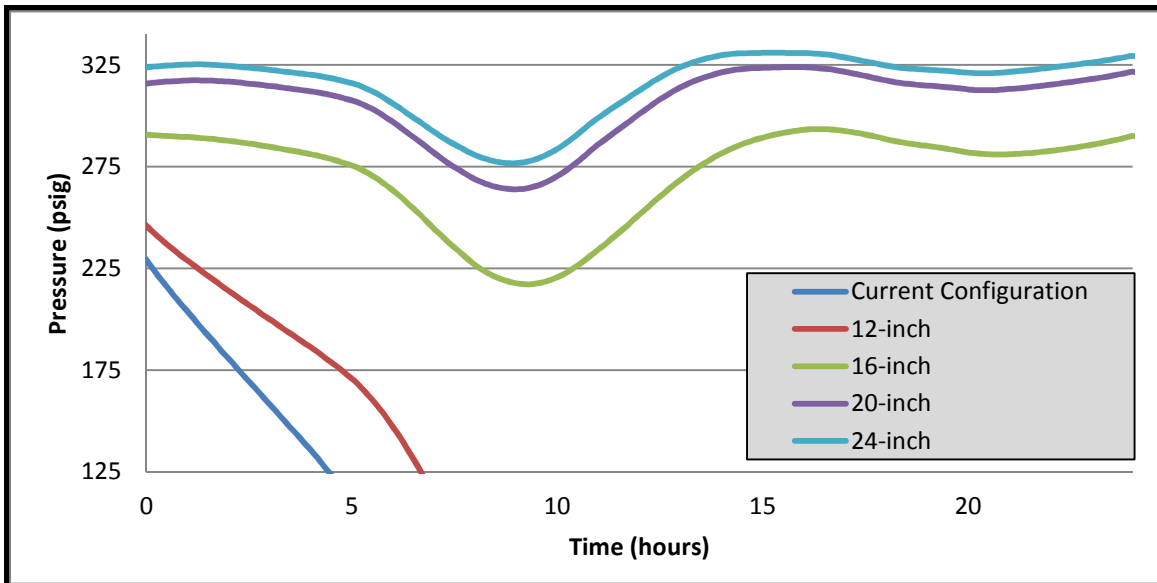


Figure 4: 2030 Tooele Regulator Station Pressures with FL35 Out of Service

One potential scenario would be to install differing FL35 replacement diameters west and east of Riverton Tap. A larger diameter FL35 east of Riverton Tap would allow more feed to enter into the Salt Lake and Utah County areas when needed. The volume brought in from Riverton Tap would augment volumes from Little Mountain and Payson which will provide greater reliability to these systems.

Figure 5 shows the resulting pressures in Draper given different diameters of FL35 (east of Riverton). The largest difference in minimum expected pressure is 13 psig between 12-inch and 16-inch replacements. A 20-inch diameter will continue to provide takeaway capacity for Riverton Gate Station well into the future.

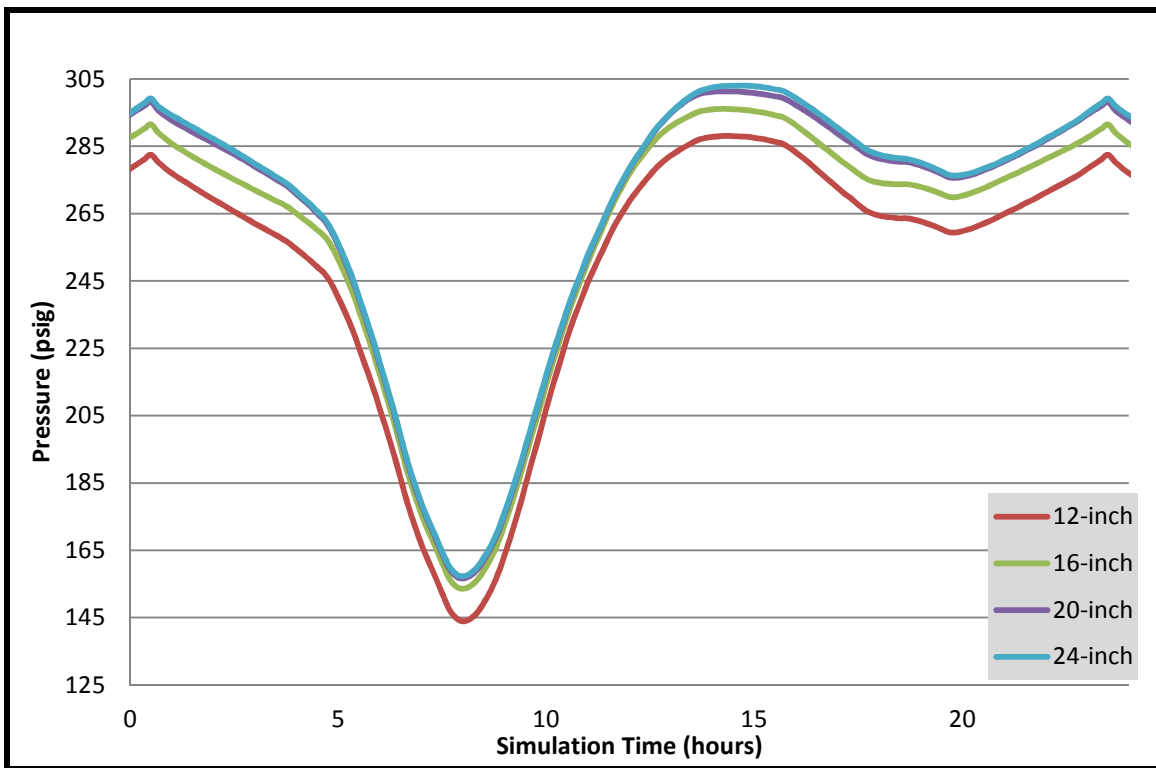


Figure 5: 2030 Draper Pressures at Various FL35 Replacement Diameters

Feeder Line 11-1

The appropriate diameter for FL11 was determined to be 24-inch in a prior analysis. The resulting downstream pressures do not significantly change between a 20-inch and a 24-inch diameter FL11-1, which is the only remaining segment of FL11 that requires replacement. The location where the chosen diameter changes from 24-inch to 20-inch depends mostly on where the best location for a pig-launcher/receiver is located along the line in the final design.

Capital Cost Estimates

Cost estimates were completed for the Tooele Loop replacements that have sufficient capacity to continue providing reliability to the area through 2030, as described in Table 1. A continuous 20-inch replacement of the lines in question will provide the highest pressure increase for the cost. Each psig increase in pressure a 20-inch replacement provides versus 16-inch in the 2030 reliability case costs \$73,000/psig. To increase the Tooele Loop diameter to 24-inch from 20-inch, the last 13 psig of increased pressure costs \$335,000/psig.

Table 1: Estimated Costs and Projected 2030 Pressures in Tooele

Diameter	FL14 Cost	FL41 Cost	FL35 Cost	Estimated Cost	Pmin (psig)
16-inch	\$17,798,000	\$8,957,000	\$18,608,000	\$26,755,000	218
20-inch	\$21,166,000	\$10,781,000	\$21,507,000	\$31,947,000	264
24-inch	\$25,525,000	\$12,811,000	\$25,280,000	\$38,336,000	277

Conclusions

A 20-inch replacement is the appropriate diameter pipe for the Tooele loop. This replacement size will allow the system to grow beyond 2030 without requiring additional pipelines to supply the Tooele county customers. The additional cost of installing a 24-inch pipe increases considerably and does not significantly improve system pressures.