

APPENDIX D BREAKPOINT ANALYSIS RESULTS MEMORANDUM

January 7, 2014

MEMORANDUM

TO: Andrew Stratton, PE

FROM: Holly Buck
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SUBJECT: Breakpoint Analysis Results
FHU Reference No. 11-166-04

The goal for the breakpoint analysis is to determine an approximate year when the projects included in the "Year 2015 Phasing Plan with 88th Avenue Bridge Replacement" Package will lose efficacy. The Package and No Action alternative were evaluated in the Year 2015, 2025, and 2035 time horizons to determine the breakpoint year. The network was evaluated in the southbound direction in the morning peak period and the northbound direction in the evening peak period utilizing the performance measures, peak travel time and congestion duration. The peak travel time represents the longest travel trip time through the corridor between SH 7 and US 36 and the congestion duration represents the span of time during which trip duration exceeds free flow travel time as a result of congestion throughout the corridor.

The "2015 Phasing Plan with 88th Avenue Bridge Replacement" Package includes the following components:

1. SB general purpose lanes segment 84th Ave to Thornton Pkwy
 2. Continuous acceleration/deceleration lane SB 84th Ave to US 36
 3. Continuous acceleration/deceleration lane SB Thornton Pkwy to 84th
 4. NB general purpose lanes segment 84th Ave to Thornton Pkwy
 5. Continuous acceleration/deceleration lane NB I-270 to 84th Ave
 6. Continuous acceleration/deceleration lane NB 84th Ave to Thornton Pkwy
 7. Ramp meters SB at 120th Ave, 136th Ave, 144th Ave, and NB at Thornton Pkwy, 104th Ave, and 120th Ave
 8. Continuous acceleration/deceleration lane SB 104th Ave to Thornton Pkwy
 9. Continuous acceleration/deceleration lane SB 120th Ave to 104th Ave
 10. Continuous acceleration/deceleration lane NB Thornton Pkwy to 120th Ave
 11. Continuous acceleration/deceleration lane NB 104th to 120th Ave
 12. 70th Ave & Washington St intersection improvements
- AND Replacement of 88th Avenue bridge
AND Extended I-25 managed lane from 120th Ave to SH 7 (RAMP funding)

The results of the No Action alternative have been compiled in Table 1. As expected, the Year 2025 No Action results lie between Year 2015 and Year 2035 conditions, with the exception of the 2025 southbound AM peak travel time, which exceeds both Year 2015 and Year 2035 travel times. This result is highlighted in the table below.

Table 1. No Action Peak Travel Time and Congestion Duration

	AM Southbound Peak Travel Time	AM Southbound Congestion Duration	PM Northbound Peak Travel Time	PM Northbound Congestion Duration
Existing Conditions	23 min	222 min	20 min	270 min
2015 No Action	21 min	196 min	21 min	207 min
2025 No Action	58* min	231 min	22 min	251 min
2035 No Action	43 min	240 min	24 min	272 min

*Value is higher than anticipated due to modeling anomaly.

Thorough review of the model indicates that the unexpected southbound AM peak travel time results have not occurred due to model development issues, and instead, reflect the model’s anticipation of future trip routing and bottleneck locations along the I-25 corridor which create a worse peak travel time during the 2025 period than will occur in 2035. While we do not expect that the network performance will actually produce travel times in 2025 that are significantly worse than 2035, the congestion duration results from the same run reveal that the majority of increase in duration between 2015 and 2035 should be expected by 2025.

The results of the improvement model runs have been included in Table 2. These results reflect each time period with the projects listed in the “Year 2015 Phasing Plan with 88th Avenue Bridge Replacement” Package.

Table 2. “Year 2015 Phasing Plan with 88th Avenue Bridge Replacement” Package Peak Travel Time and Congestion Duration

	AM Southbound Peak Travel Time	AM Southbound Congestion Duration	PM Northbound Peak Travel Time	PM Northbound Congestion Duration
Existing Conditions	23 min	222 min	20 min	270 min
2015 with Package	14 min	64 min	15 min	208 min
2025 with Package	38 min	202 min	19 min	232 min
2035 with Package	42 min	229 min	20 min	281 min

In order to determine the breakpoint for the Package, a failure threshold must be defined along the corridor. It is difficult to define failure, since users have different expectations for the corridor. In an attempt to provide various viewpoints, breakpoints have been defined for three general conditions: an average speed of 45 mph from SH 7 to US 36, an average speed of 30 mph from SH 7 to US 36, and a return to existing conditions from SH 7 to US 36 (which represents a speed of 30 mph in the morning southbound and 34 mph in the afternoon northbound). Figure 1 and Figure 2 provide a visual representation of the breakpoint analysis results for the AM Southbound and PM Northbound, respectively.

Figure 1
AM Southbound Breakpoint

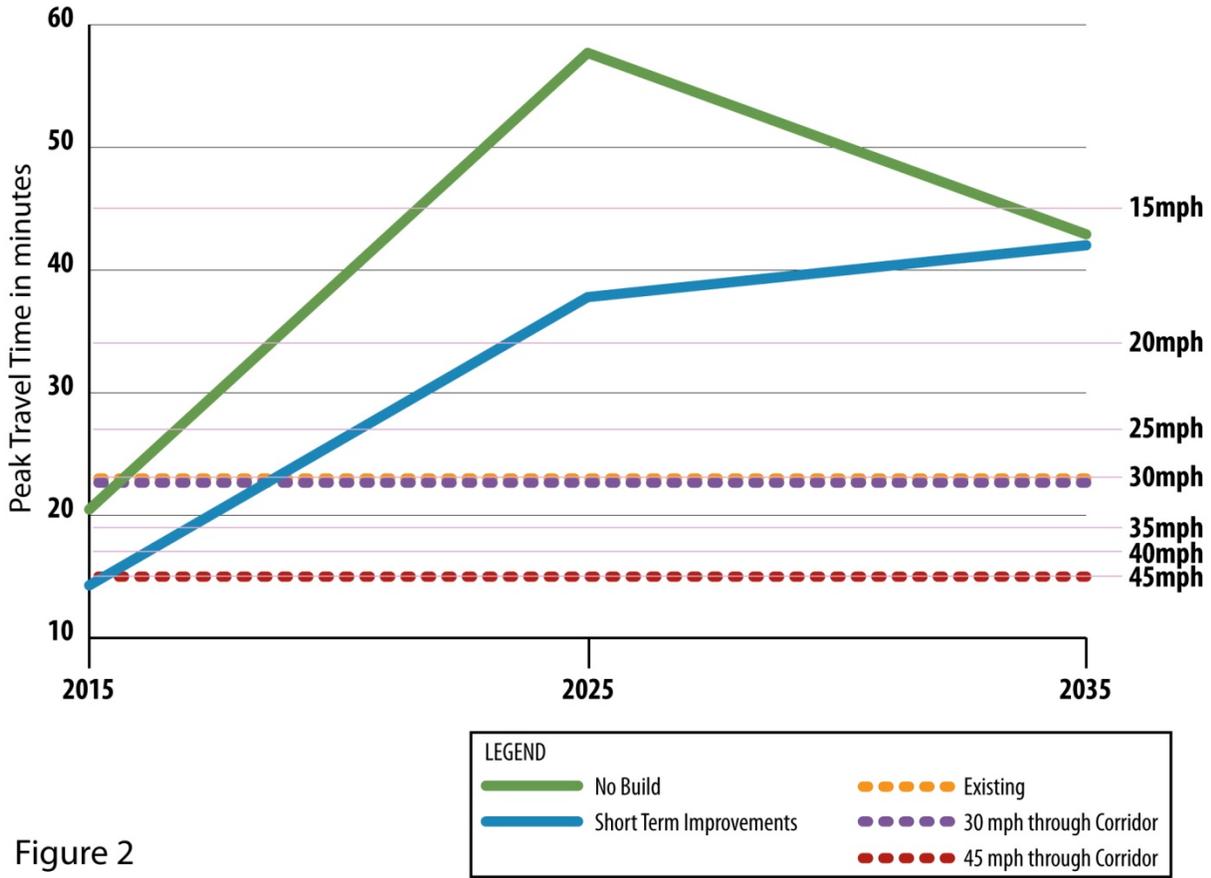
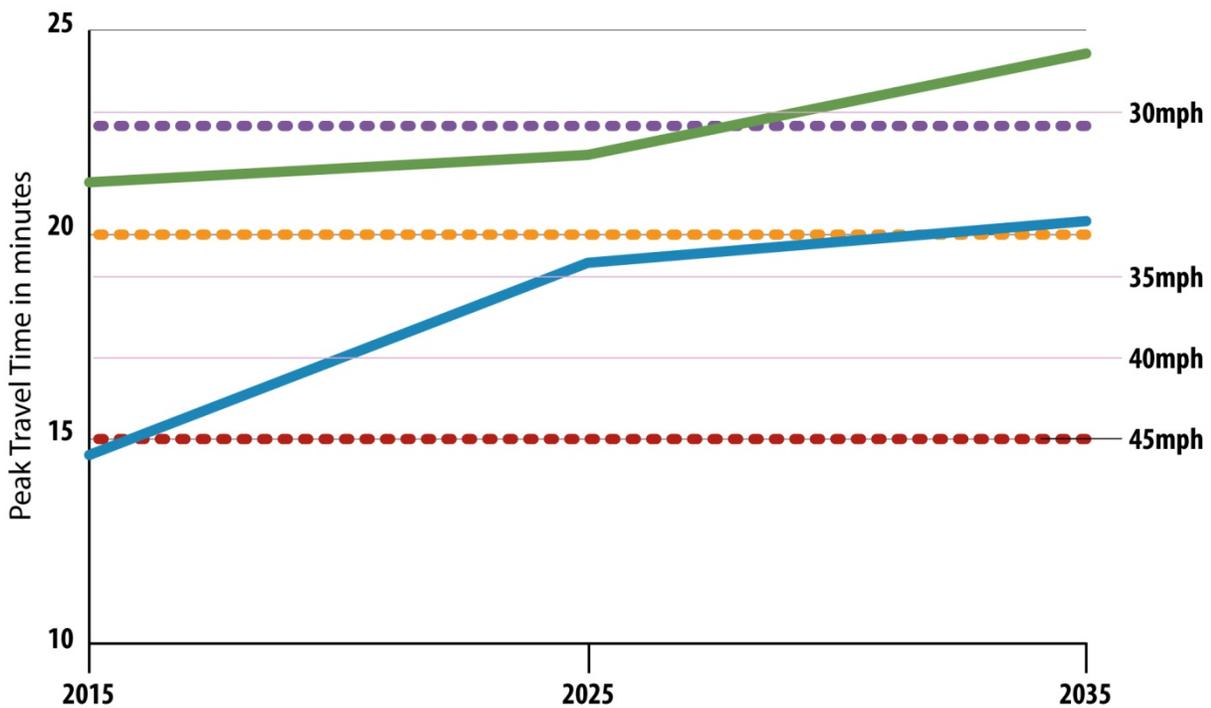


Figure 2
PM Northbound Breakpoint



Based on these results, the breakpoint year for each criterion has been identified. Table 3 demonstrates the breakpoint period for each of these conditions.

Table 3. Improvement Benefit Breakpoints

	AM Southbound Breakpoint	PM Northbound Breakpoint
45 mph (SH 7 to US 36)	2015-2020	2015-2020
30 mph (SH 7 to US 36)	2020	Past 2035
Existing Conditions*	2020	2030

*Existing AM Southbound and PM Northbound average speeds are 30 mph and 34 mph, respectively.

The generalized summary of these results is that in the morning southbound direction, failure will occur quickly (between 2015 and 2020) despite the improvements included in the Package and the interim managed lanes improvement. As a result, additional improvements along the corridor will continue to be needed to accomplish acceptable levels of service along the corridor. The afternoon northbound direction will not experience as significant decline in level of service between 2015 and 2035 with the Package improvements and the interim managed lanes improvement. Depending on the failure criteria, additional improvement may be needed by 2020 extending to after 2035.