



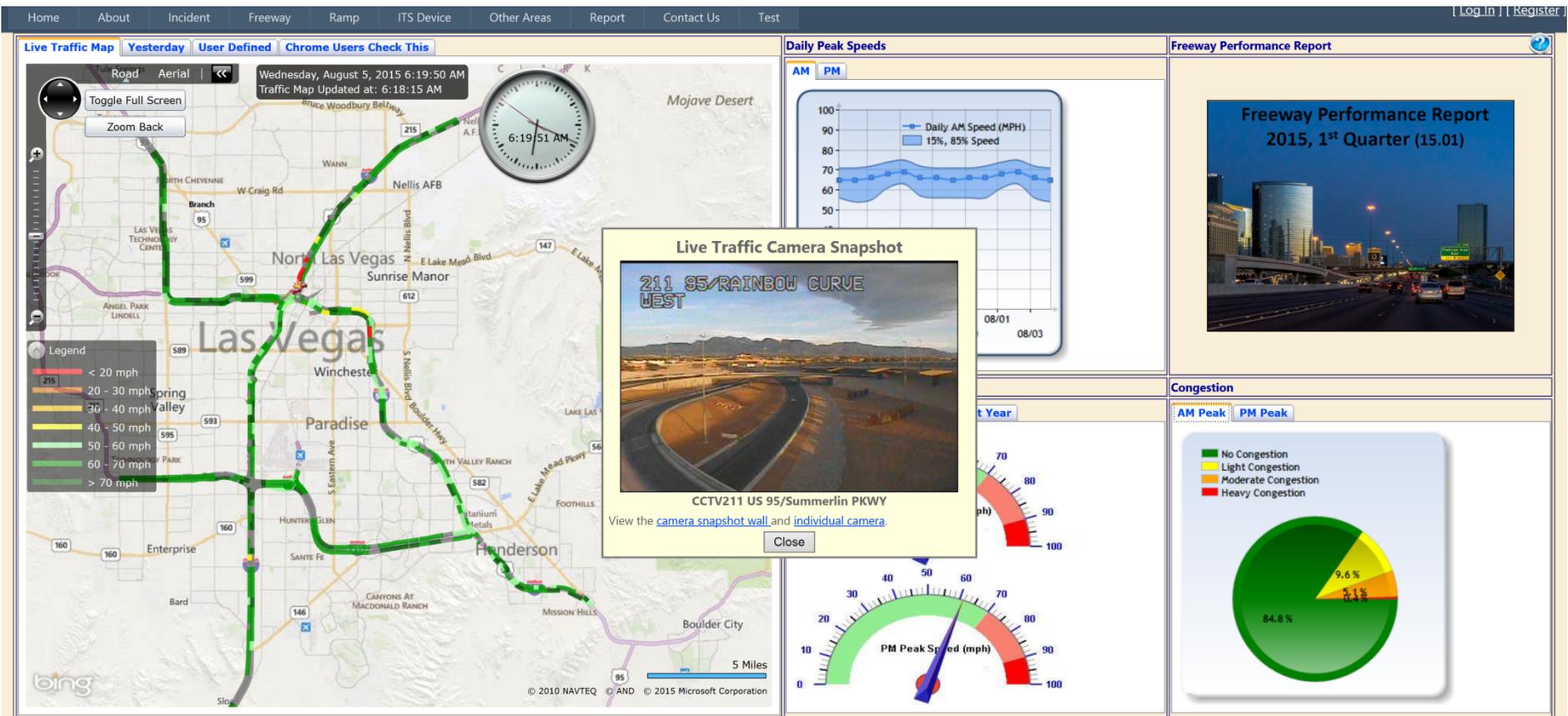
*Accelerating solutions for highway safety, renewal, reliability, and capacity*

# Planning for Operations and Performance Measurement

Freeway & Arterial System of  
Transportation, Las Vegas

Caltrans District 12, August 5, 2015

# FAST Dashboard bugatt.nvfast.org





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## JUN 3 DOT Data Innovation Challenge attracts talented field

Posted by Victor Mendez

In February, Secretary Foxx launched DOT's Data Innovation Challenge, a three-month quest to see what app developers could do to improve transportation by taking advantage of new access to multiple sources of transportation data. Today, I'm happy to announce the results of our challenge. While we had numerous submissions, we narrowed the field down to three final winners.



Secretary Foxx with Data Challenge winners at the White House Office of Science and Technology Policy. Photo courtesy USDOT, Larry Simmons.

In the category of **Transportation Access**, we sought apps that show how transportation connects people to jobs, schools, housing, and other community resources. And our judges determined two winners:

- **RideScout** -- a mobile app that provides available transportation options in real time including transit, taxi, car share, bike share, parking, and walking directions; and
- **Choices & Voices** -- a web-based, long range planning tool that educates users on the linkages between land use and transportation, the cost of maintenance, and the consequences of not investing in transportation.

In the **Traffic and Congestion Management** category, we were looking for tools that help understand and reduce traffic. Our judges picked:

- **FAST Dashboard** -- a congestion analytics dashboard that provides an easy-to-understand online user interface allowing the public and transportation professionals access to real-time and historical freeway monitoring and performance data.

# Freeway Performance Report 2015, 1<sup>st</sup> Quarter (15.01)



## Highlights:

- Identifies performance thresholds for seven freeway locations in Las Vegas that experience recurring congestion.
- Future quarterly reports will compare corridor performance with the thresholds and provide commentary and recommendations.
- Thresholds are based on recent historical performance. Delay, duration of congested conditions, and crash frequency are considered in the performance thresholds. Secondary supporting data includes volume and speed.



# Overview 15.01

- This quarterly report measures performance of freeway bottlenecks in the Las Vegas area. It compares a corridor's performance against customized thresholds based on historical performance.
- Performance reports are provided to NDOT on a quarterly basis, and their content and recommendations will continue to evolve. Each time we prepare a report we learn more about the complex interplay between traffic volumes, throughput, incidents, construction, and seasonal patterns.
- The 15.01 report establishes the initial set of thresholds.

***This combination of information has led to, and will continue to lead towards, investing in and deploying strategies to enhance safety, reliability, and efficiency of our transportation system and measuring system effectiveness.***

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## Individual Corridor Performance

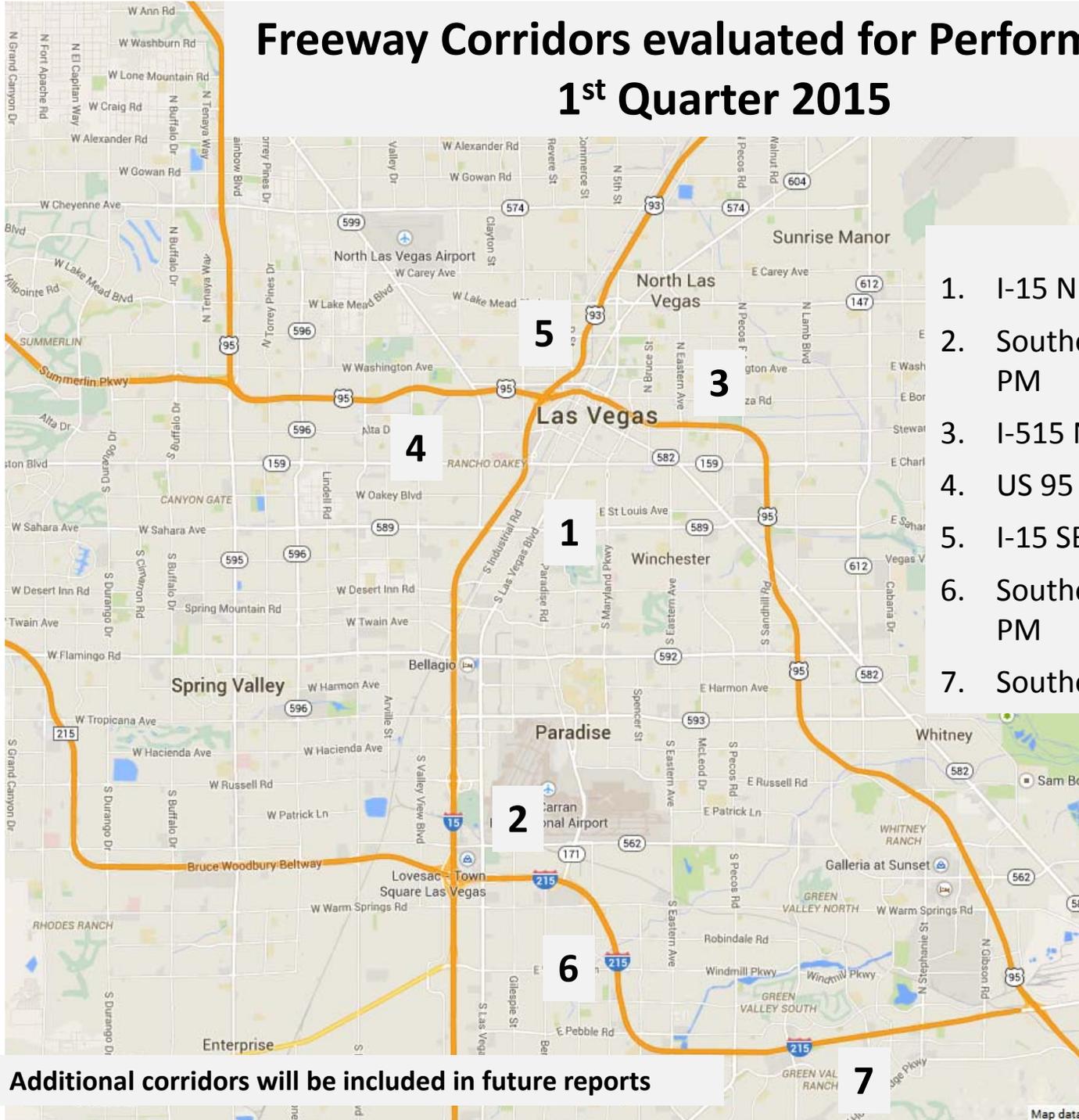
18. Corridor Performance Summary
- 19 to 21: I-15 NB, PM
- 22 to 24: So Beltway, 215 WB, AM & PM
- 25 to 27: I-515 NB, AM & PM
- 28 to 30: US 95 SB to I-15 SB, AM & PM
- 31 to 33: I-15 SB, AM & PM
- 34 to 36: So Beltway EB to Windmill, PM
- 37 to 39: So Beltway EB to I-515, PM

# Corridors and Seasons

(spatial and temporal)

- Performance of congested corridors and time periods on the Southern Nevada freeway system are described.
- A display of the seven corridors and AM / PM peak periods used in this report is shown on page 6.
- The 15.01 report contains data through mid-March, which includes the Beginning of Year season for 2015.
- The use of 'Seasons' to temporally group performance is described on page 7.

# Freeway Corridors evaluated for Performance 1<sup>st</sup> Quarter 2015



1. I-15 NB, PM
2. Southern Beltway, 215 WB, AM & PM
3. I-515 NB, AM & PM
4. US 95 SB to I-15 SB, AM & PM
5. I-15 SB, AM & PM
6. Southern Beltway EB to Windmill, PM
7. Southern Beltway EB to I-515, PM

Additional corridors will be included in future reports

Based on review of several years of traffic volumes and patterns from ITS data, FAST recommends the performance analysis be grouped temporally as shown below. There are six seasons per year; details on the most recent seasons are shown.

| Season                   | Description  | Most recent season dates |                  | Days | Comment   |
|--------------------------|--|--------------------------|------------------|------|---|
|                          |  | Begin                    | End              |      |   |
| <b>Beginning of year</b> | First day of CCSD school following holiday break through a Friday in mid-March                   | Monday, 01.05.15         | Friday, 03.13.15 | 68   | Traffic volumes and patterns pick up following holiday break and resemble Fall patterns   |
| <b>Holiday</b>           | Monday before Thanksgiving to day before CCSD school begins                                      | Monday, 11.24.14         | Sunday, 01.04.15 | 42   | Although school is still in session during part of this season, traffic volumes and patterns begin to transition out of the fall travel mode. The three lowest volume travel days of the year occur during this season: Thanksgiving, Christmas, and New Year's Day. Traffic volumes to and from California are very high on several days during this season.   |
| <b>Fall</b>              | First day of CCSD school following summer vacation to Sunday before Thanksgiving                 | Monday, 08.25.14         | Sunday, 11.23.14 | 91   | By mid-September traffic volumes and patterns typically are built up to represent what will occur until the holidays. There is a distinct change from patterns and volumes experienced during the Summer season.  |
| <b>Summer</b>            | Final weekend of CCSD high school graduations through Sunday before the new school year begins   | Saturday, 06.07.14       | Sunday, 08.24.14 | 79   | Recurring congestion and traffic volumes on the urbanized Las Vegas freeways are slightly reduced during the summer. There is an increase in travel between Las Vegas & California and towards Boulder City and Arizona.  |
| <b>Early Summer</b>      | A Monday in mid-April through the last weekend of CCSD school activity and graduation ceremonies | Monday, 04.21.14         | Friday, 06.06.14 | 47   | Patterns and volumes are typically similar to Fall and Beginning of Year  |
| <b>Spring</b>            | A Saturday in mid-March through a Sunday in mid-April  | Saturday, 03.15.14       | Sunday 04.20.14  | 37   | Due to Spring Break, great weather, Easter, March Madness, conventions, and other events and activities, there is a noticeable increase in traffic volumes between mid-March and Mid-April. For the urbanized freeway corridors, the highest daily average traffic volumes of the year typically occur during this season; they are noticeably higher than the adjacent Beginning of Year and Early Summer seasons and, therefore, earn their own season. Most Sundays experience high volumes and long delays between Las Vegas and Southern California. |

# Performance Thresholds

(goal setting, targets)

- The concept of the corridor performance threshold is introduced in the 15.01 report and the initial thresholds are established.
- Thresholds will be used to address questions such as
  - Does corridor performance exceed, negatively, a threshold?
  - If so, why? What can be done to address?

# Performance Thresholds (cont)

## Establishment and use

- Each corridor's delay, congestion duration, crash rate and other data sets dating back to mid-2013 were reviewed.
- This review provided a sense of seasonal performance ranges of freeway corridors and bottlenecks.
- With this understanding, upper performance boundaries for the parameters were created. These are the performance thresholds
- How performance compares to these thresholds will be evaluated in future reports, and opportunities for projects, programs, and other activities to address performance will be introduced.
- The table on page 10 lists the thresholds for the seven bottleneck corridors. Page 11 describes threshold details. Pages 19 through 39 provide more extensive performance details for each bottleneck.

| Temporal / Spatial description |            |                     | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                    |            | Days per crash |                   | How do changes<br>in volume &<br>speed relate? |
|--------------------------------|------------|---------------------|---|----------------|-------------------------|--------------------|------------|----------------|-------------------|--|
| Corridor                       | AM /<br>PM | School in or<br>out | duration  | duration color | Average                 | 95th<br>percentile | 95th color | crash          | very bad<br>crash |  |
| 15 NB                          | pm         | na                  | 2.5 to 3 hours  | red            | 12                      | 20                 | yellow     | 1.2            | 10                | constr   |
| 515 NB                         | am         | sch                 | 30 to 45 mins   | orange         | 8                       | 14                 | green      | 3              | 15                | v+ sp-   |
|                                | am         | summer              | 30 mins   | green          | 8                       | 14                 | green      |                |                   |  |
|                                | pm         | sch                 | lt 100 mins   | maroon         | 12 to 14                | 20                 | yellow     |                |                   |  |
|                                | pm         | summer              | lt 45 mins  | green          | 8                       | 12                 | green      |                |                   |  |
| 215 WB                         | am         | sch                 | 45 mins   | orange         | 8                       | 16                 | yellow     | 5              | 30                | constr   |
|                                | am         | summer              | 30 mins   | green          | 8                       | 14                 | green      |                |                   |  |
|                                | pm         | sch                 | lt 75 mins  | red            | 14                      | 20                 | yellow     |                |                   |  |
|                                | pm         | summer              | lt 60 mins  | maroon         | 10                      | 14                 | green      |                |                   |  |
| 95 to 15 SB                    | am         | sch                 | lt 70 mins  | maroon         | 10 to 12                | 16                 | yellow     | 2              | 20                | v+ sp-   |
|                                | am         | summer              | lt 70 mins  | orange         | 10                      | 12                 | green      |                |                   |  |
|                                | pm         | sch                 | lt 135 mins   | red            | 10                      | 14                 | yellow     |                |                   |  |
|                                | pm         | summer              | lt 100 mins   | red            | 8                       | 12                 | yellow     |                |                   |  |
| 15 SB                          | am         | sch                 | lt 60 mins  | maroon         | 10                      | 16                 | yellow     | 1.5            | 8                 | v+ sp-   |
|                                | am         | summer              | lt 45 mins  | orange         | 10                      | 14                 | yellow     |                |                   |  |
|                                | pm         | sch                 | lt 75 mins  | red            | 12                      | 16                 | yellow     |                |                   |  |
|                                | pm         | summer              | lt 75 mins  | red            | 12                      | 16                 | yellow     |                |                   |  |
| 215 EB to<br>Eastern           | pm         | sch                 | lt 60 mins  | maroon         | 6                       | 10                 | yellow     | 8              | 30                | constr   |
|                                | pm         | summer              | lt 30 mins  | orange         | 4                       | 8                  | green      |                |                   |  |
| 215 EB to 515                  | pm         | sch                 | lt 30 mins  | green          | 6                       | 10                 | green      | 8              | 30                | v+ sp =  |
|                                | pm         | summer              | lt 30 mins  | green          | 4                       | 8                  | green      |                |                   |  |

# Performance Threshold details

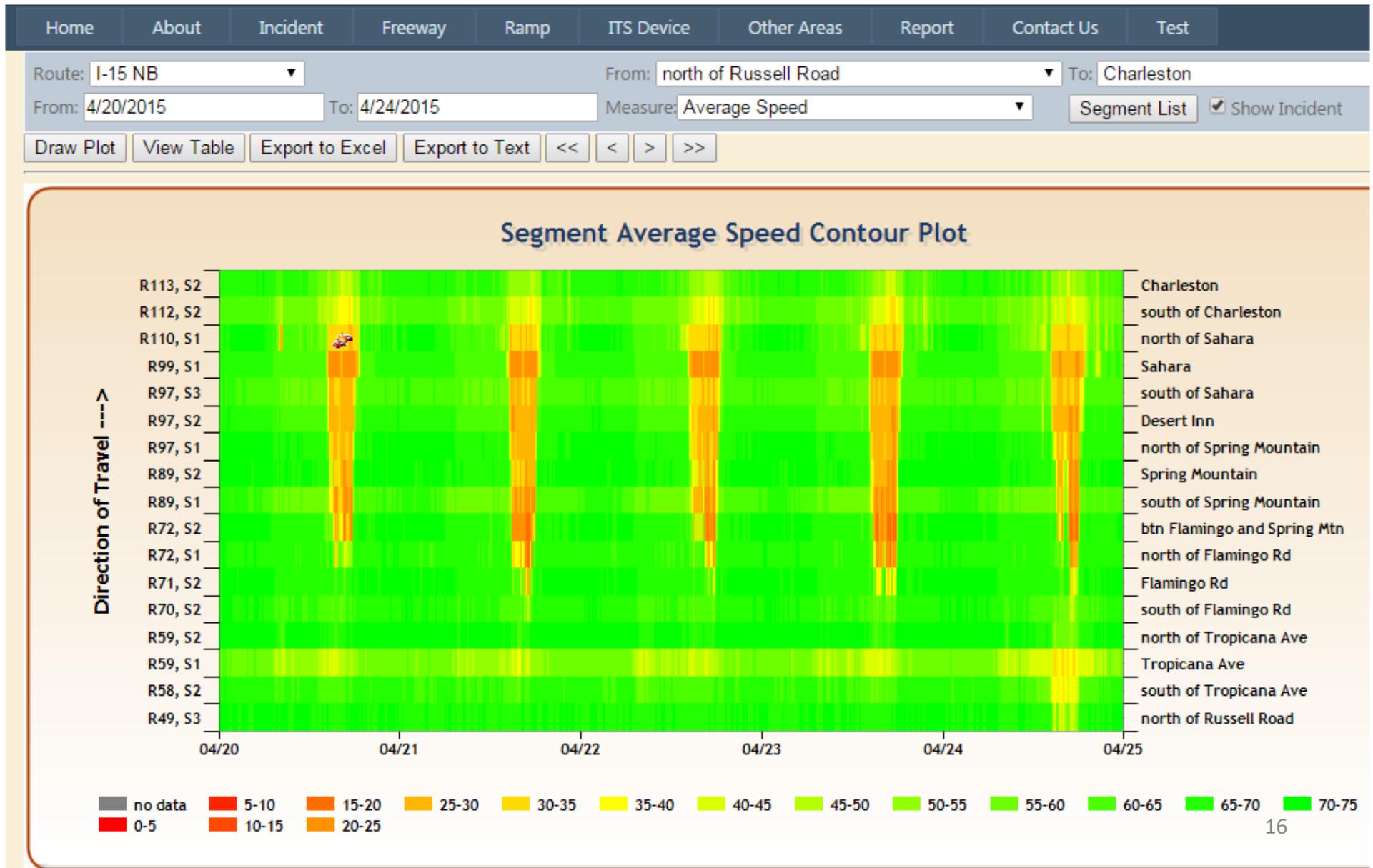
- **Corridor, AM-PM, School-Summer:** temporal and spatial information.
- **Duration and Duration color:** on average, how long does the congestion event last? The color corresponds to percentage of days that have a congestion event. More events means a redder color.
- **Max delay fields:** each congestion event will have a maximum delay over and above the free-flow travel time. The average and 95<sup>th</sup> percentile delay are shown.
- **Crashes:** how many days elapse between crashes and very bad crashes. Very bad crashes are not cleared from travel lanes in time to meet the 30 or 60 minute criteria.
- **Volume-Speed relationship:** the change in average daily volume and speed are compared over time. Does volume increase while speed decreases, or is there some other relationship? In some corridors, this cannot be determined because of construction during the previous season.

# The Congestion Event

Used to monitor and quantify performance

- Evaluation of performance thresholds requires temporal and spatial measurements of congestion events.
- Congestion event examples displayed on slides 13 through 17 show
  - Frequency
  - Duration, and
  - Maximum delay
- Speed contour plots, obtained from the FAST dashboard at <http://bugatti.nvfast.org/CorridorContour.aspx> are used to visualize and evaluate congestion events. Congestion events for many corridors are available as far back as Fall 2009.

# Plot 1 of 5: I-15 NB congestion events for Monday April 20 through Friday April 24 that are reliable in terms of duration and max delay.

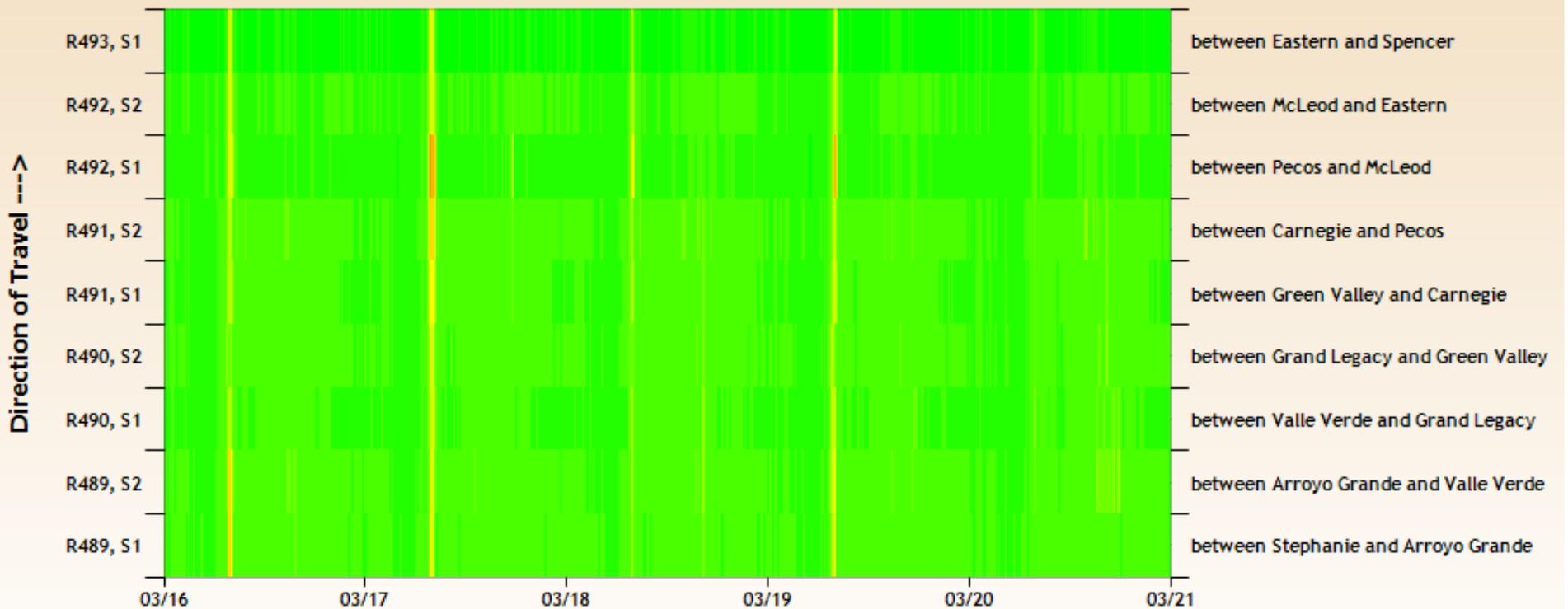


**Plot 2 of 5** The 215 WB corridor has been experiencing congestion events only a few days per week. The number of events may increase in the future, but for now the duration color would be yellow or orange.

I-215 WB      From: between Stephanie and Arroyo Grande      To: between Eastern and Spencer  
 3/16/2015      To: 3/20/2015      Measure: Average Speed      Segment List       Show Incident

Plot    View Table    Export to Excel    Export to Text    <<    <    >    >>

Segment Average Speed Contour Plot



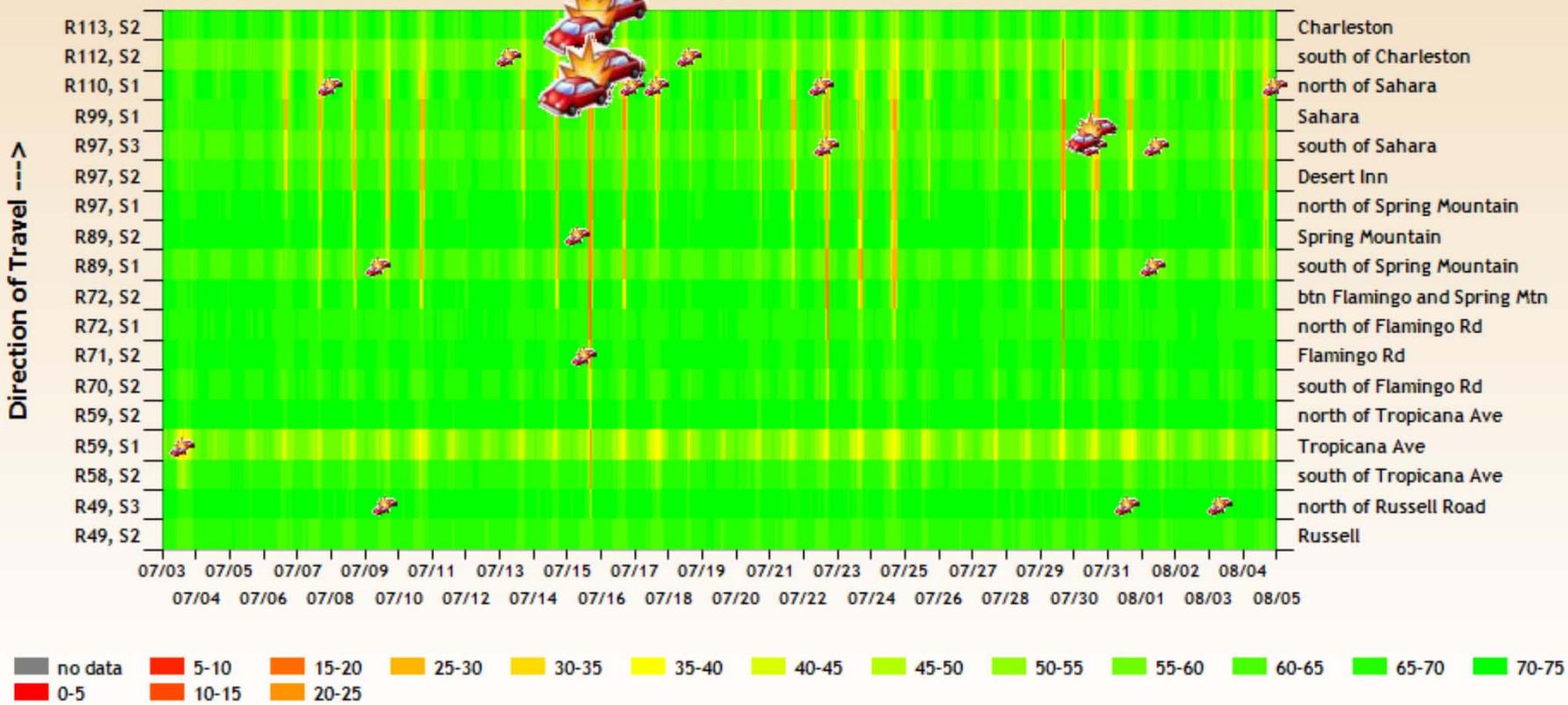
**Plot 3 of 5:** Here's a subsequent week of the same 215 corridor with congestion events that are unreliable in terms of location and extent; this is directly attributable to incidents.



Route: I-15 NB From: Russell To: Charleston  
 From: 7/3/2015 To: 8/4/2015 Measure: Average Speed Segment List  Show Incident

Draw Plot View Table Export to Excel Export to Text << < > >>

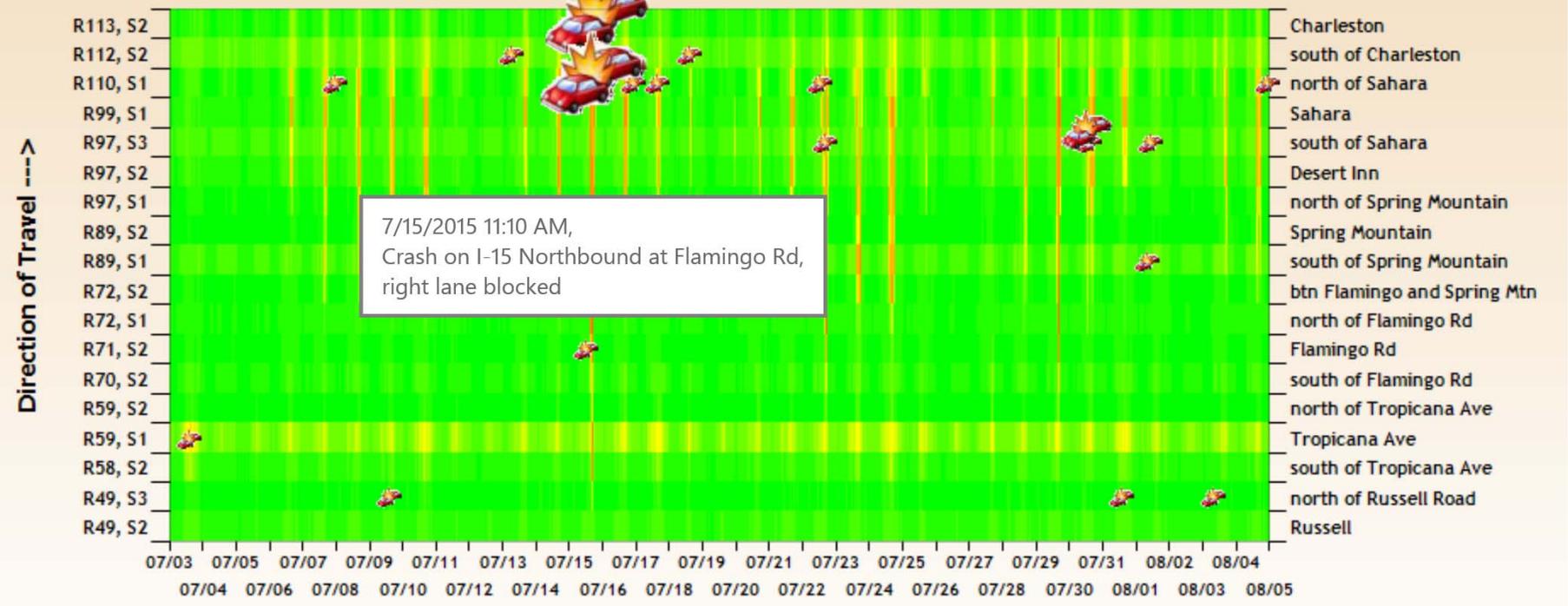
### Segment Average Speed Contour Plot



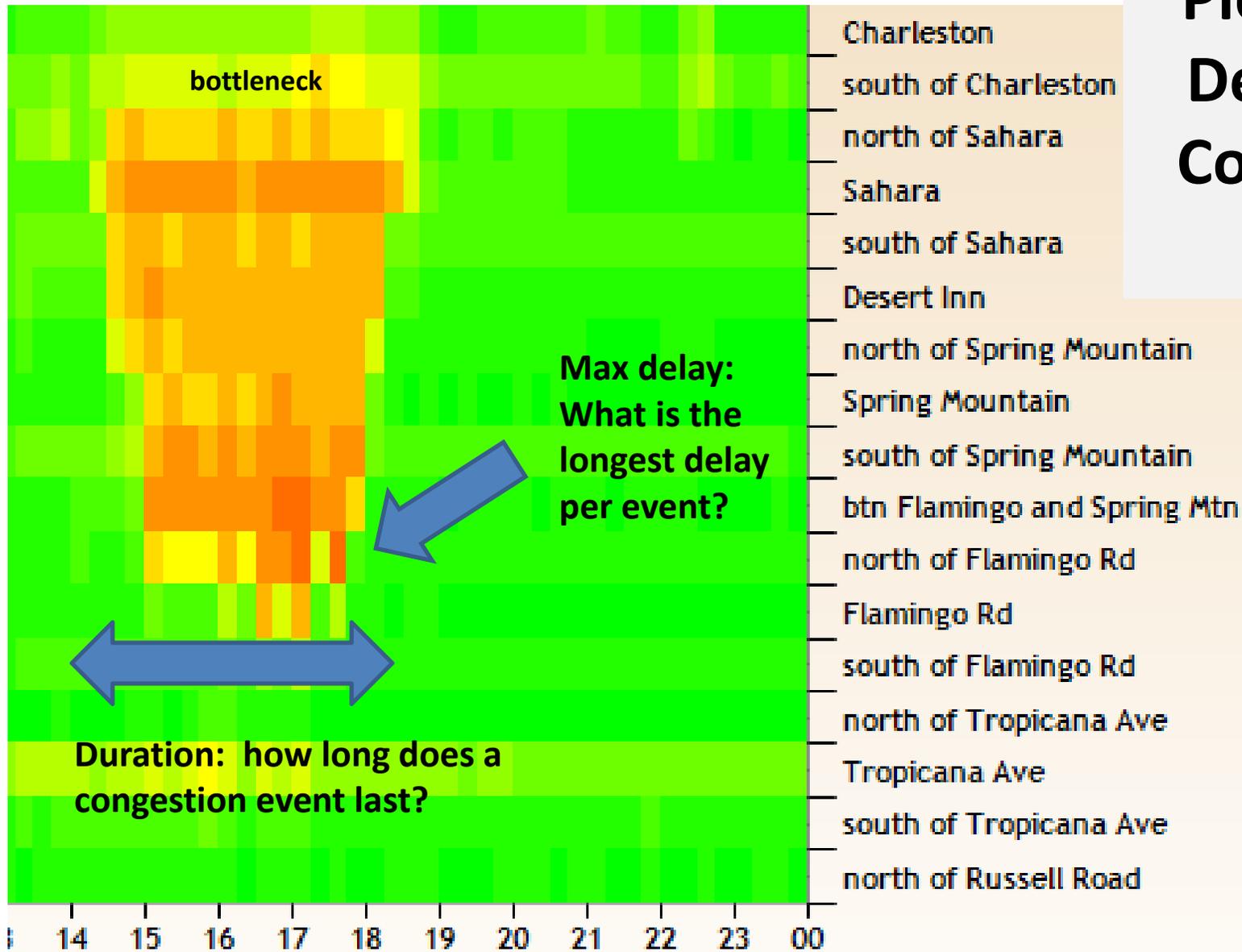
Route: I-15 NB From: Russell To: Charleston  
 From: 7/3/2015 To: 8/4/2015 Measure: Average Speed Segment List  Show Incident

Draw Plot View Table Export to Excel Export to Text << < > >>

### Segment Average Speed Contour Plot

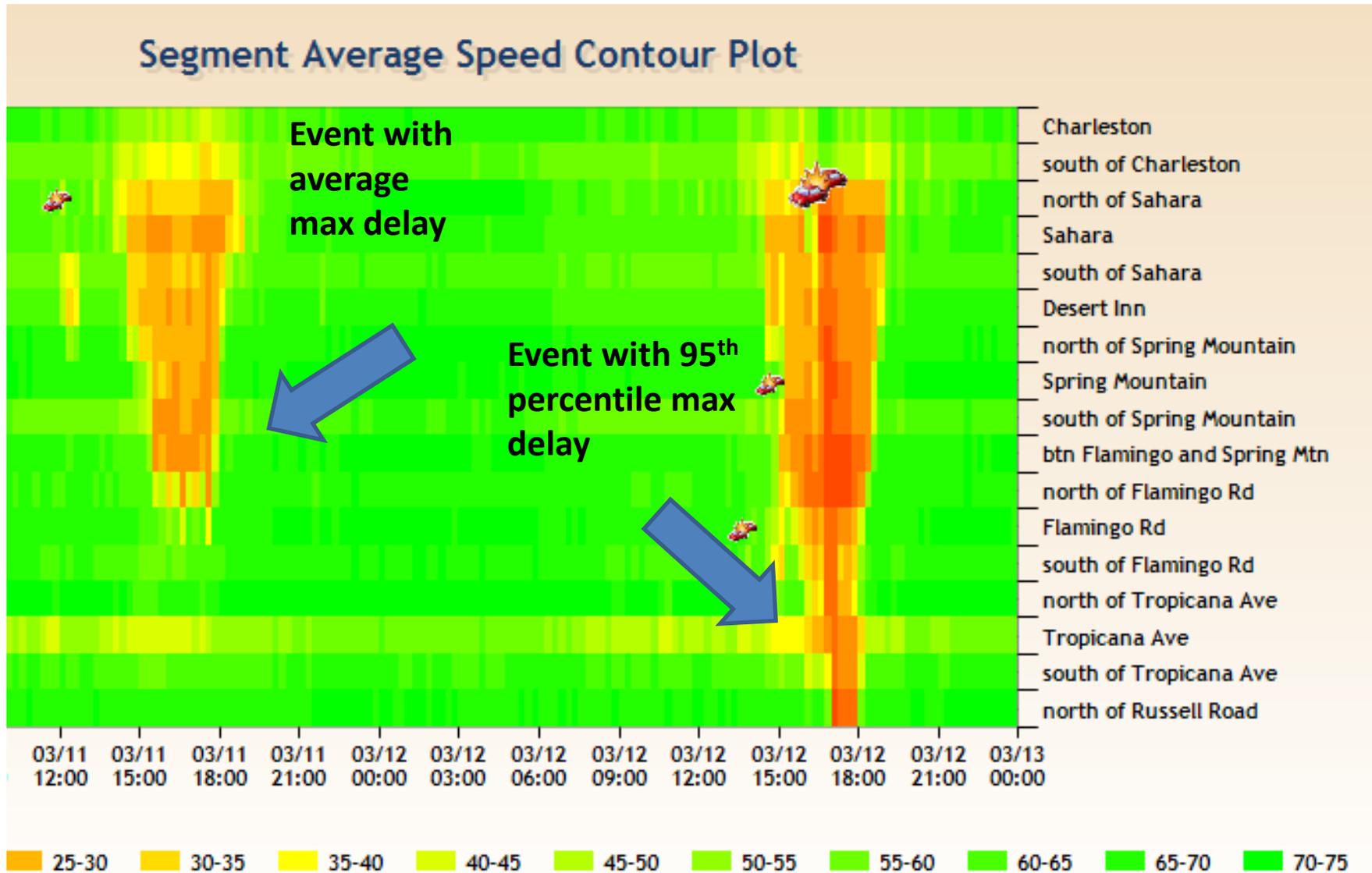


# Plot 4 of 5: Describing Congestion Events



40-45 45-50 50-55 55-60 60-65 65-70 70-75

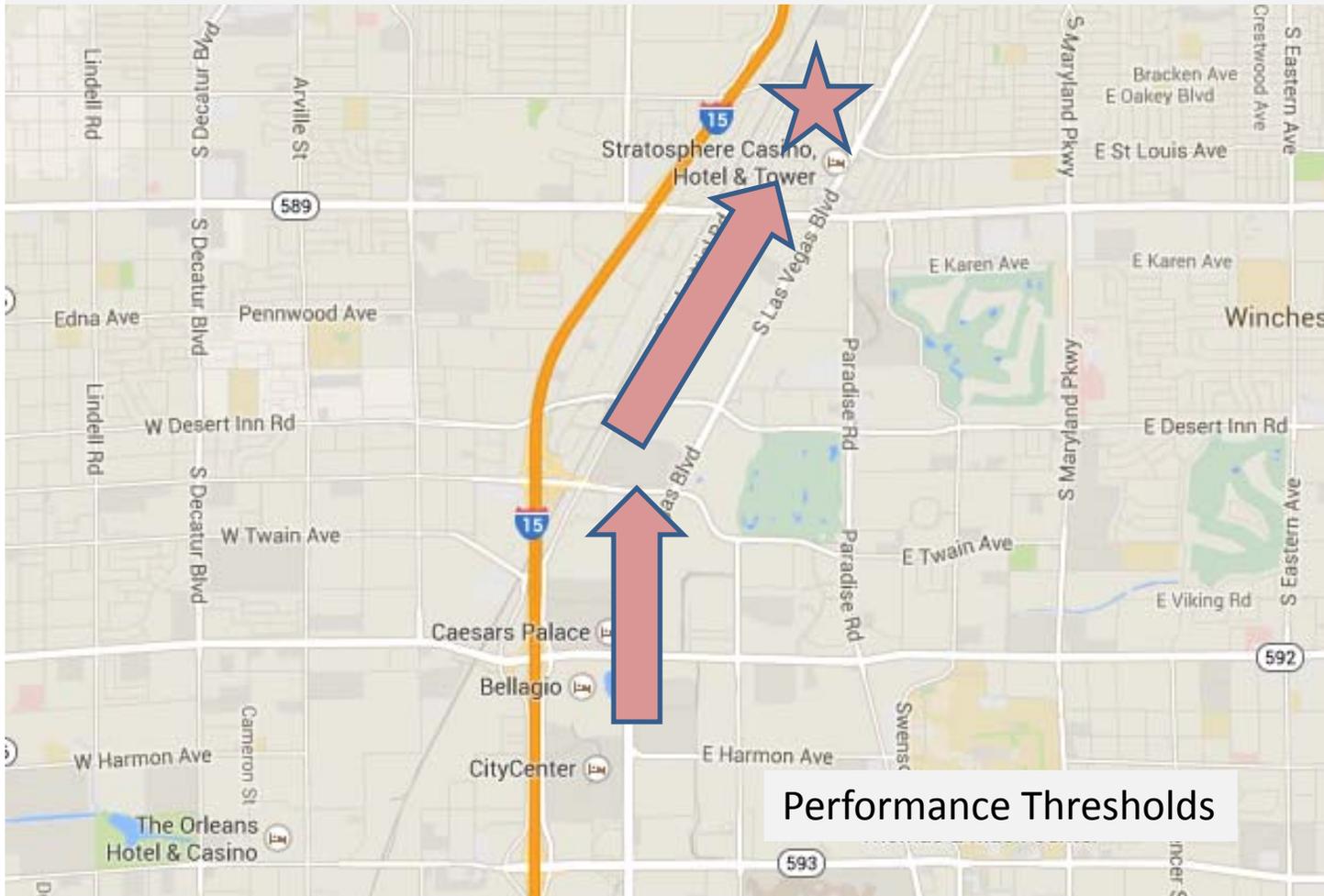
Plot 5 of 5: The left congestion event has average max delay; the right one has 95<sup>th</sup> percentile delay. As stated previously, traffic incidents are the main cause of unreliable congestion activity.



# Corridor Performance

- Seven bottlenecks evaluated in 15.01
- For each bottleneck you will see
  - Map of location and performance thresholds
  - Duration, including start and end time of congestion event
  - Maximum delay during congestion event (average day, 95<sup>th</sup> percentile day)
  - Frequency of crashes and bad crashes
  - Percent increase in avg daily volume & pct decrease in avg daily speed

# Bottleneck 1: I-15 NB between Charleston & Sahara, PM



Performance Thresholds

| Temporal / Spatial description |            |                     | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                    |            | Days per crash |                   | How do changes<br>in volume &<br>speed relate? |
|--------------------------------|------------|---------------------|---|----------------|-------------------------|--------------------|------------|----------------|-------------------|--|
| Corridor                       | AM /<br>PM | School in or<br>out | duration  | duration color | Average                 | 95th<br>percentile | 95th color | crash          | very bad<br>crash |  |
| 15 NB                          | pm         | na                  | 2.5 to 3 hours  | red            | 12                      | 20                 | yellow     | 1.2            | 10                | constr   |



# Bottleneck 1 (cont): I-15 NB between Charleston & Sahara, PM

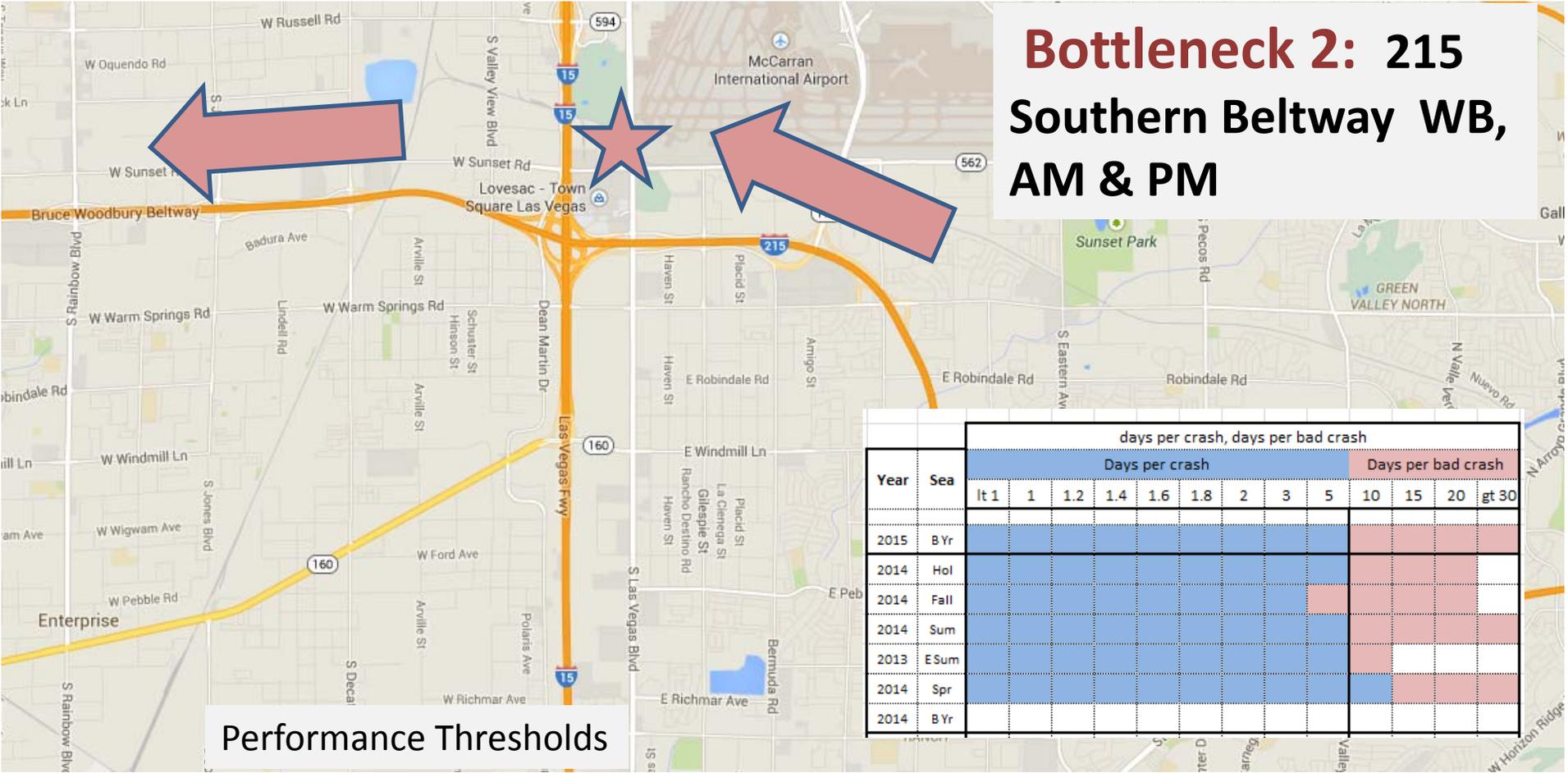
Percent increase in daily average volume at three locations in corridor

| Year | Sea   | between Tropicana & Flamingo |     |     |     |     |     |     |     |     |     |     |     | south of Sahara              |     |     |     |     |     |     |     |     |     |     |     | between Sahara & Charleston  |     |     |     |     |     |     |     |     |     |     |     |
|------|-------|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |       | 0.5                          | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 0.5                          | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 0.5                          | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 |
| 2015 | BYr   |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Hol   |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     | 6.2 >                        |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Fall  |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Sum   |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Spr   |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | BYr   |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Hol   | <i>F Street construction</i> |     |     |     |     |     |     |     |     |     |     |     | <i>F Street construction</i> |     |     |     |     |     |     |     |     |     |     |     | <i>F Street construction</i> |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Fall  |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Sum   |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                              |     |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     | 8.3 >>                       |     |     |     |     |     |     |     |     |     |     |     |

Percent change in daily average speed at three locations in corridor

| Year | Sea   | between Tropicana & Flamingo |      |      |      |      |      |      |      |      |      |     |     | south of Sahara |      |      |      |      |      |      |      |      |      |     |     | between Sahara & Charleston |      |      |      |      |      |      |      |      |      |     |     |
|------|-------|------------------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----------------|------|------|------|------|------|------|------|------|------|-----|-----|-----------------------------|------|------|------|------|------|------|------|------|------|-----|-----|
|      |       | lt -2                        | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2           | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2                       | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos |
| 2015 | BYr   |                              |      |      |      |      |      |      |      |      |      |     |     | << -3.4         |      |      |      |      |      |      |      |      |      |     |     | << -2.2                     |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Hol   |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Fall  |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Sum   |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Spr   |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | BYr   |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Hol   |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     | << -2.3                     |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Fall  |                              |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     | << -2.4                     |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Sum   |                              |      |      |      |      |      |      |      |      |      |     |     | << -2.9         |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum |                              |      |      |      |      |      |      |      |      |      |     |     | << -3.4         |      |      |      |      |      |      |      |      |      |     |     |                             |      |      |      |      |      |      |      |      |      |     |     |

# Bottleneck 2: 215 Southern Beltway WB, AM & PM



| Year | Sea   | days per crash, days per bad crash |   |     |     |     |     |   |   |                    |    |    |    |       |
|------|-------|------------------------------------|---|-----|-----|-----|-----|---|---|--------------------|----|----|----|-------|
|      |       | Days per crash                     |   |     |     |     |     |   |   | Days per bad crash |    |    |    |       |
|      |       | lt 1                               | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 3 | 5                  | 10 | 15 | 20 | gt 30 |
| 2015 | B Yr  |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |
| 2014 | Hol   |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |
| 2014 | Fall  |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |
| 2014 | Sum   |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |
| 2013 | E Sum |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |
| 2014 | Spr   |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |
| 2014 | B Yr  |                                    |   |     |     |     |     |   |   |                    |    |    |    |       |

| Temporal / Spatial description |         |                  | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                 |            | Days per crash |                | How do changes in volume & speed relate? |
|--------------------------------|---------|------------------|---|----------------|-------------------------|-----------------|------------|----------------|----------------|--|
| Corridor                       | AM / PM | School in or out | duration  | duration color | Average                 | 95th percentile | 95th color | crash          | very bad crash |  |
| 215 WB                         | am      | sch              | 45 mins   | orange         | 8                       | 16              | yellow     | 5              | 30             | constr                                   |
|                                | am      | summer           | 30 mins   | green          | 8                       | 14              | green      |                |                |  |
|                                | pm      | sch              | lt 75 mins  | red            | 14                      | 20              | yellow     |                |                |  |
|                                | pm      | summer           | lt 60 mins  | maroon         | 10                      | 14              | green      |                |                |  |

| Year | Sea   | 7:00 AM |    |    |    |    |    | 8:00 AM |   |   |    |    |    |    |    |    |
|------|-------|---------|----|----|----|----|----|---------|---|---|----|----|----|----|----|----|
|      |       | 25      | 30 | 35 | 40 | 45 | 50 | 55      | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 2015 | B Yr  |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2014 | Hol   |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2014 | Fall  |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2014 | Sum   |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2013 | E Sum |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2014 | Spr   |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2014 | B Yr  |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2013 | Hol   |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2013 | Fall  |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2013 | Sum   |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |
| 2013 | E Sum |         |    |    |    |    |    |         |   |   |    |    |    |    |    |    |

| Year | Sea   | Maximum delay in minutes |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
|------|-------|--------------------------|---|---|---|----|----|----|-----------------|----|----|----|----|----|--|--|
|      |       | Average                  |   |   |   |    |    |    | 95th percentile |    |    |    |    |    |  |  |
|      |       | 2                        | 4 | 6 | 8 | 10 | 12 | 14 | 16              | 18 | 20 | 22 | 24 | 26 |  |  |
| 2015 | B Yr  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2014 | Hol   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2014 | Fall  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2014 | Sum   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2013 | E Sum |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2014 | Spr   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2014 | B Yr  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2013 | Hol   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2013 | Fall  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2013 | Sum   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |
| 2013 | E Sum |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |

**Bottleneck 2  
(cont): 215  
Southern Beltway  
WB, AM & PM**

| Year | Sea   | 4:00 PM |    |    |    |    |    | 5:00 PM |   |    |    |    |    | 6:00 PM |    |    |    |    |    |   |   |    |    |    |    |
|------|-------|---------|----|----|----|----|----|---------|---|----|----|----|----|---------|----|----|----|----|----|---|---|----|----|----|----|
|      |       | 30      | 35 | 40 | 45 | 50 | 55 | 0       | 5 | 10 | 15 | 20 | 25 | 30      | 35 | 40 | 45 | 50 | 55 | 0 | 5 | 10 | 15 | 20 | 25 |
| 2015 | B Yr  |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2014 | Hol   |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2014 | Fall  |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2014 | Sum   |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2013 | E Sum |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2014 | Spr   |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2014 | B Yr  |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2013 | Hol   |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2013 | Fall  |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2013 | Sum   |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |
| 2013 | E Sum |         |    |    |    |    |    |         |   |    |    |    |    |         |    |    |    |    |    |   |   |    |    |    |    |

| Year | Sea   | Maximum delay in minutes |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
|------|-------|--------------------------|---|---|---|----|----|----|-----------------|----|----|----|----|----|--|--|--|--|--|--|--|--|--|--|--|
|      |       | Average                  |   |   |   |    |    |    | 95th percentile |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
|      |       | 2                        | 4 | 6 | 8 | 10 | 12 | 14 | 16              | 18 | 20 | 22 | 24 | 26 |  |  |  |  |  |  |  |  |  |  |  |
| 2015 | B Yr  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2014 | Hol   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2014 | Fall  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2014 | Sum   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2013 | E Sum |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2014 | Spr   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2014 | B Yr  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2013 | Hol   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2013 | Fall  |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2013 | Sum   |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |
| 2013 | E Sum |                          |   |   |   |    |    |    |                 |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |

## Bottleneck 2 (cont): 215 Southern Beltway WB, AM & PM

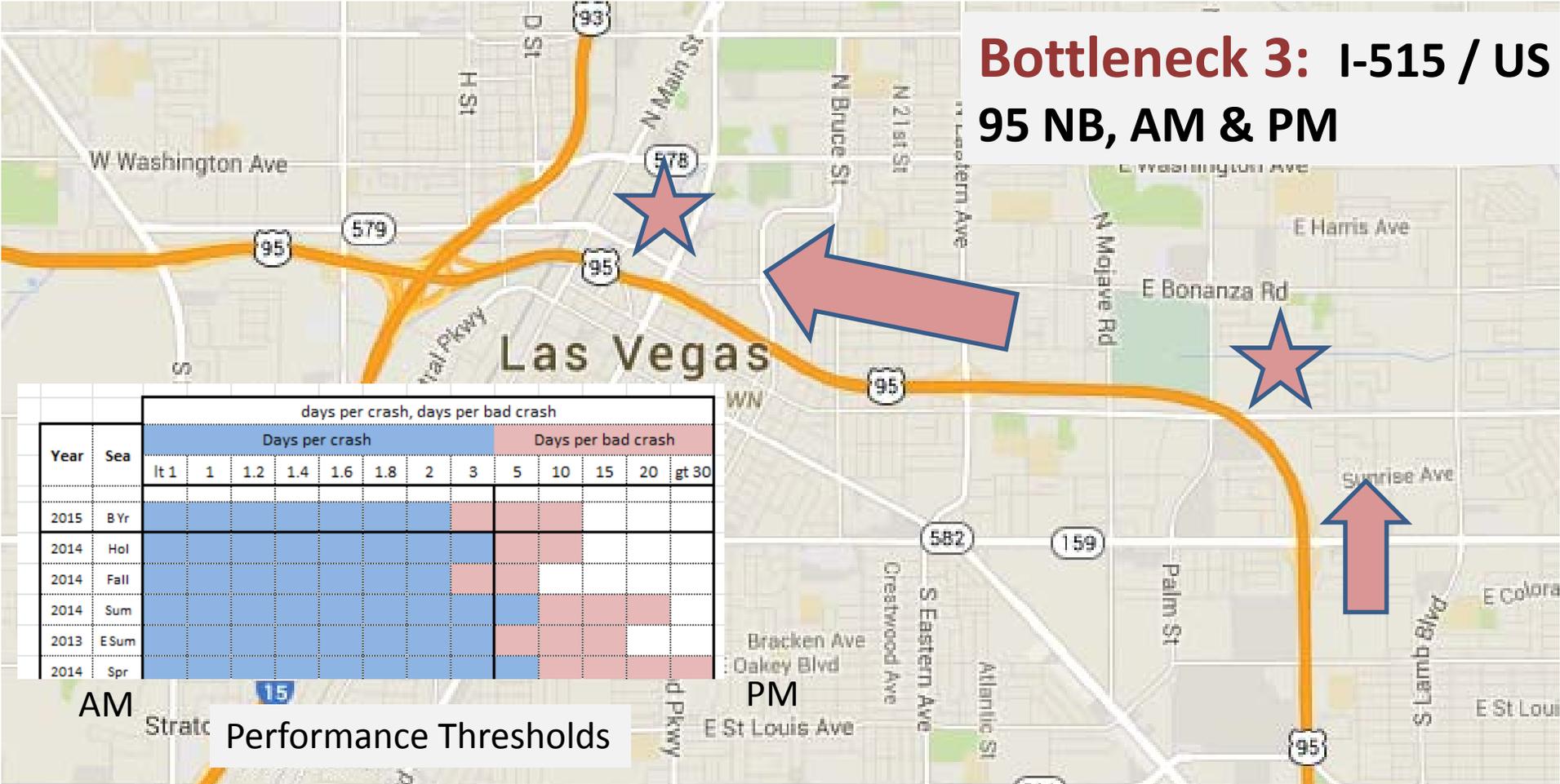
Percent increase in daily average volume at three locations in corridor

| Year | Sea   | east of Eastern |     |     |     |     |     |     |     |     |     |     | west of Eastern |     |     |     |     |     |     |     |     |     |     | at Decatur |     |     |     |     |     |     |     |     |     |     |     |
|------|-------|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |       | 0.5             | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0             | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5        | 6.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |
| 2015 | B'Yr  |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Hol   |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Fall  |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Sum   |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Spr   |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | B'Yr  |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Hol   |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Fall  |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Sum   |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                 |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |            |     |     |     |     |     |     |     |     |     |     |     |

Percent change in daily average speed at three locations in corridor

| Year | Sea   | east of Eastern |      |      |      |      |      |      |      |      |      |     | west of Eastern |       |      |      |      |      |      |      |      |      |      | at Decatur |     |       |      |      |      |      |      |      |      |      |      |
|------|-------|-----------------|------|------|------|------|------|------|------|------|------|-----|-----------------|-------|------|------|------|------|------|------|------|------|------|------------|-----|-------|------|------|------|------|------|------|------|------|------|
|      |       | lt -2           | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos             | lt -2 | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0        | pos | lt -2 | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 |
| 2015 | B'Yr  |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2014 | Hol   |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2014 | Fall  |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2014 | Sum   |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2013 | E Sum |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2014 | Spr   |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2014 | B'Yr  |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2013 | Hol   |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2013 | Fall  |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2013 | Sum   |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |
| 2013 | E Sum |                 |      |      |      |      |      |      |      |      |      |     |                 |       |      |      |      |      |      |      |      |      |      |            |     |       |      |      |      |      |      |      |      |      |      |

# Bottleneck 3: I-515 / US 95 NB, AM & PM



Performance Thresholds

| Temporal / Spatial description |         |                  | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                 |            | Days per crash |                | How do changes in volume & speed relate? |
|--------------------------------|---------|------------------|---|----------------|-------------------------|-----------------|------------|----------------|----------------|--|
| Corridor                       | AM / PM | School in or out | duration  | duration color | Average                 | 95th percentile | 95th color | crash          | very bad crash |  |
| 515 NB                         | am      | sch              | 30 to 45 mins   | orange         | 8                       | 14              | green      | 3              | 15             | v+ sp-                                   |
|                                | am      | summer           | 30 mins   | green          | 8                       | 14              | green      |                |                |  |
|                                | pm      | sch              | lt 100 mins   | maroon         | 12 to 14                | 20              | yellow     |                |                |  |
|                                | pm      | summer           | lt 45 mins  | green          | 8                       | 12              | green      |                |                |  |



## Bottleneck 3 (cont): I-515 / US 95 NB, AM & PM

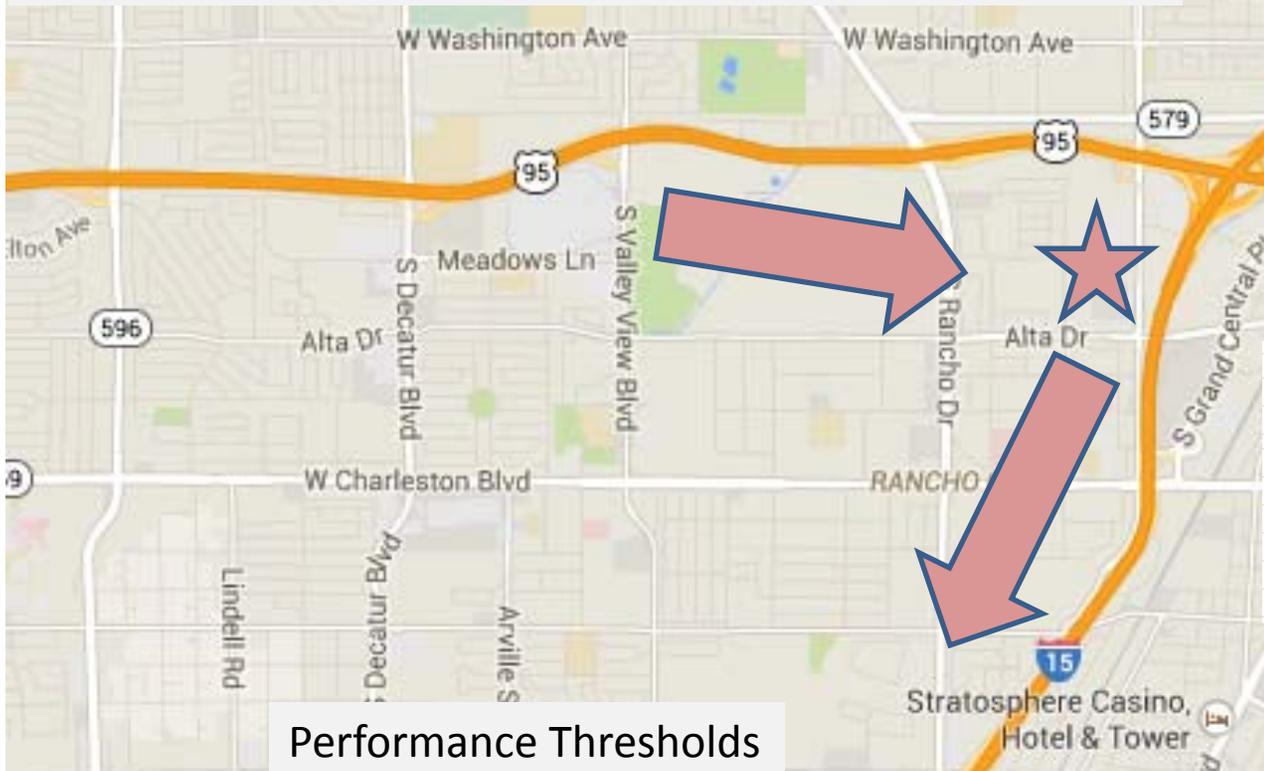
Percent increase in daily average volume at two locations in corridor

| Year | Sea   | between Charleston & Eastern |     |     |     |     |     |     |     |     |     |     |     | east of I-15 |     |     |     |     |     |     |     |     |     |     |     |
|------|-------|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |       | 0.5                          | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 0.5          | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 |
| 2015 | BYr   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Hol   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Fall  | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Sum   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Spr   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | BYr   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Hol   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Fall  | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Sum   | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum | [Green]                      |     |     |     |     |     |     |     |     |     |     |     | [Green]      |     |     |     |     |     |     |     |     |     |     |     |

Percent change in daily average speed at two locations in corridor

| Year | Sea   | between Charleston & Eastern |      |      |      |      |      |      |      |      |      |     |     | east of I-15 |      |      |      |      |      |      |      |      |      |     |     |
|------|-------|------------------------------|------|------|------|------|------|------|------|------|------|-----|-----|--------------|------|------|------|------|------|------|------|------|------|-----|-----|
|      |       | lt -2                        | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2        | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos |
| 2015 | BYr   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Hol   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Fall  | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Sum   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Spr   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | BYr   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Hol   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Fall  | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Sum   | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum | [Red]                        |      |      |      |      |      |      |      |      |      |     |     | [Red]        |      |      |      |      |      |      |      |      |      |     |     |

# Bottleneck 4: US 95 SB to I-15 SB at Spaghetti Bowl, AM & PM



| Year | Sea   | days per crash, days per bad crash |   |     |     |     |     |                    |   |   |    |    |    |       |
|------|-------|------------------------------------|---|-----|-----|-----|-----|--------------------|---|---|----|----|----|-------|
|      |       | Days per crash                     |   |     |     |     |     | Days per bad crash |   |   |    |    |    |       |
|      |       | lt 1                               | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2                  | 3 | 5 | 10 | 15 | 20 | gt 30 |
| 2015 | B Yr  |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Hol   |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Fall  |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Sum   |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2013 | E Sum |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Spr   |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |

| Year | Sea  | days per crash, days per bad crash |   |     |     |     |     |                    |   |   |    |    |    |       |
|------|------|------------------------------------|---|-----|-----|-----|-----|--------------------|---|---|----|----|----|-------|
|      |      | Days per crash                     |   |     |     |     |     | Days per bad crash |   |   |    |    |    |       |
|      |      | lt 1                               | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2                  | 3 | 5 | 10 | 15 | 20 | gt 30 |
| 2015 | B Yr |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Hol  |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Fall |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Sum  |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2013 | ESum |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |
| 2014 | Spr  |                                    |   |     |     |     |     |                    |   |   |    |    |    |       |

Performance Thresholds

| Temporal / Spatial description |         |                  | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                 |            | Days per crash |                | How do changes<br>in volume &<br>speed relate? |
|--------------------------------|---------|------------------|---|----------------|-------------------------|-----------------|------------|----------------|----------------|--|
| Corridor                       | AM / PM | School in or out | duration  | duration color | Average                 | 95th percentile | 95th color | crash          | very bad crash |  |
| 95 to 15 SB                    | am      | sch              | lt 70 mins  | maroon         | 10 to 12                | 16              | yellow     | 2              | 20             | v+ sp-   |
|                                | am      | summer           | lt 70 mins  | orange         | 10                      | 12              | green      |                |                |  |
|                                | pm      | sch              | lt 135 mins   | red            | 10                      | 14              | yellow     |                |                |  |
|                                | pm      | summer           | lt 100 mins   | red            | 8                       | 12              | yellow     |                |                |  |



Percent increase in daily average volume at two locations in corridor

| Year | Sea   | US 95 SB at Rancho |     |     |     |     |     |     |     |     |     |     |     |
|------|-------|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |       | 0.5                | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 |
| 2015 | B Yr  |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Hol   |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Fall  |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Sum   |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Spr   |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | B Yr  |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Hol   |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Fall  |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Sum   |                    |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                    |     |     |     |     |     |     |     |     |     |     |     |

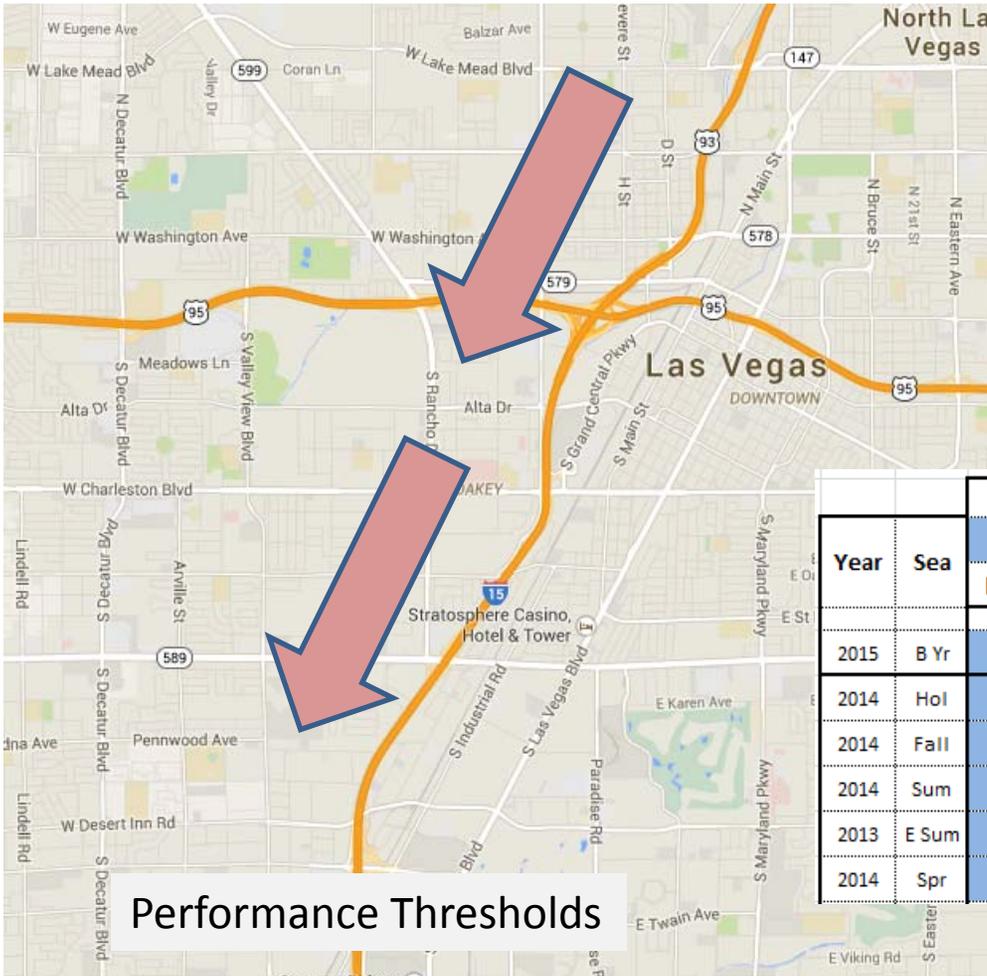
| Year | Sea   | I-15 SB at Lake Mead Blvd |     |     |     |     |     |     |     |     |     |     |       |
|------|-------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|      |       | 0.5                       | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0   |
| 2015 | B Yr  |                           |     |     |     |     |     |     |     |     |     |     | 6.2 > |
| 2014 | Hol   |                           |     |     |     |     |     |     |     |     |     |     |       |
| 2014 | Fall  |                           |     |     |     |     |     |     |     |     |     |     |       |
| 2014 | Sum   |                           |     |     |     |     |     |     |     |     |     |     |       |
| 2013 | E Sum |                           |     |     |     |     |     |     |     |     |     |     |       |
| 2014 | Spr   |                           |     |     |     |     |     |     |     |     |     |     |       |
| 2014 | B Yr  |                           |     |     |     |     |     |     |     |     |     |     |       |

**Bottleneck 4 (cont): US 95 SB to I-15 SB at Spaghetti Bowl, AM & PM**

Percent change in daily average speed at two locations in corridor

| Year | Sea   | US 95 SB at Rancho |      |      |      |      |      |      |      |      |      |     |     |
|------|-------|--------------------|------|------|------|------|------|------|------|------|------|-----|-----|
|      |       | lt-2               | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos |
| 2015 | B Yr  |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Hol   |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Fall  |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Sum   |                    |      |      |      |      |      |      |      |      |      | 0.1 |     |
| 2013 | E Sum |                    |      |      |      |      |      |      |      |      |      | 0.6 |     |
| 2014 | Spr   |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | B Yr  |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Hol   |                    |      |      |      |      |      |      |      |      |      | 0.3 |     |
| 2013 | Fall  |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Sum   |                    |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum |                    |      |      |      |      |      |      |      |      |      |     |     |

| Year | Sea   | I-15 SB at Lake Mead Blvd |      |      |      |      |      |      |      |      |      |     |     |
|------|-------|---------------------------|------|------|------|------|------|------|------|------|------|-----|-----|
|      |       | lt-2                      | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos |
| 2015 | B Yr  |                           |      |      |      |      |      |      |      |      |      |     | 2.2 |
| 2014 | Hol   |                           |      |      |      |      |      |      |      |      |      |     | 3.4 |
| 2014 | Fall  |                           |      |      |      |      |      |      |      |      |      |     | 1.1 |
| 2014 | Sum   |                           |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum | <<                        | -3.2 |      |      |      |      |      |      |      |      |     |     |
| 2014 | Spr   | <<                        | -4.0 |      |      |      |      |      |      |      |      |     |     |
| 2014 | B Yr  | <<                        | -4.2 |      |      |      |      |      |      |      |      |     |     |
| 2013 | Hol   | <<                        | -4.0 |      |      |      |      |      |      |      |      |     |     |
| 2013 | Fall  | <<                        | -4.0 |      |      |      |      |      |      |      |      |     |     |
| 2013 | Sum   | <<                        | -2.1 |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum |                           |      |      |      |      |      |      |      |      |      |     |     |



# Bottleneck 5: I-15 SB, AM & PM

| Year | Sea   | days per crash, days per bad crash |   |     |     |                    |     |   |   |   |    |    |    |       |
|------|-------|------------------------------------|---|-----|-----|--------------------|-----|---|---|---|----|----|----|-------|
|      |       | Days per crash                     |   |     |     | Days per bad crash |     |   |   |   |    |    |    |       |
|      |       | lt 1                               | 1 | 1.2 | 1.4 | 1.6                | 1.8 | 2 | 3 | 5 | 10 | 15 | 20 | gt 30 |
| 2015 | B Yr  |                                    |   |     |     |                    |     |   |   |   |    |    |    |       |
| 2014 | Hol   |                                    |   |     |     |                    |     |   |   |   |    |    |    |       |
| 2014 | Fall  |                                    |   |     |     |                    |     |   |   |   |    |    |    |       |
| 2014 | Sum   |                                    |   |     |     |                    |     |   |   |   |    |    |    |       |
| 2013 | E Sum |                                    |   |     |     |                    |     |   |   |   |    |    |    |       |
| 2014 | Spr   |                                    |   |     |     |                    |     |   |   |   |    |    |    |       |

Performance Thresholds

| Temporal / Spatial description |         |                  | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                 |            | Days per crash |                | How do changes in volume & speed relate? |
|--------------------------------|---------|------------------|---|----------------|-------------------------|-----------------|------------|----------------|----------------|--|
| Corridor                       | AM / PM | School in or out | duration  | duration color | Average                 | 95th percentile | 95th color | crash          | very bad crash |  |
| 15 SB                          | am      | sch              | lt 60 mins  | maroon         | 10                      | 16              | yellow     | 1.5            | 8              | vt sp-                                   |
|                                | am      | summer           | lt 45 mins  | orange         | 10                      | 14              | yellow     |                |                |  |
|                                | pm      | sch              | lt 75 mins  | red            | 12                      | 16              | yellow     |                |                |  |
|                                | pm      | summer           | lt 75 mins  | red            | 12                      | 16              | yellow     |                |                |  |



# Bottleneck 5: I-15 SB, AM & PM

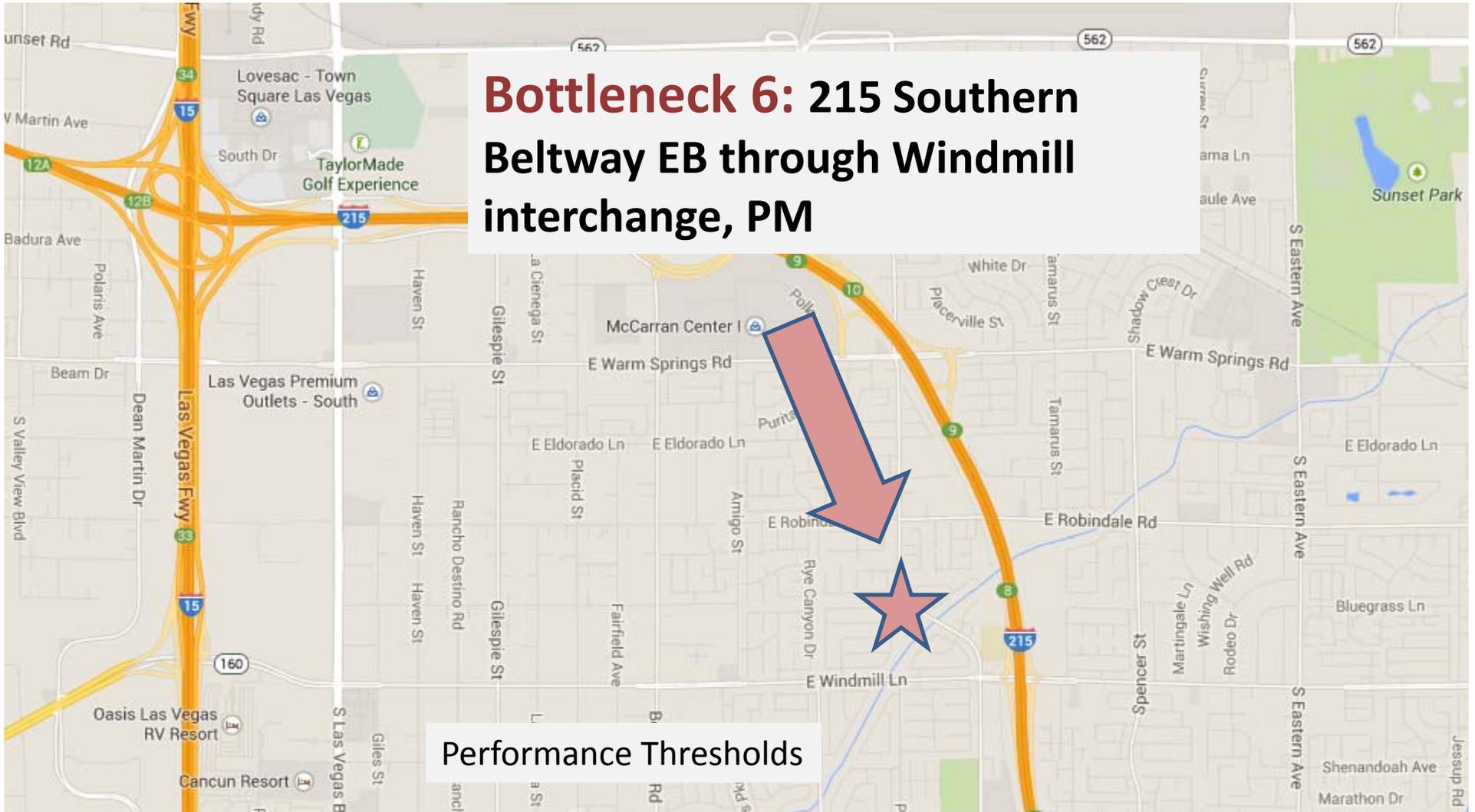
Percent increase in daily average volume at three locations in corridor

| Year | Sea   | at Lake Mead Blvd |     |     |     |     |     |     |     |     |     |     | at Charleston |     |     |     |     |     |     |     |     |     |     | between Flamingo & Tropicana |     |     |     |     |     |     |     |     |     |     |     |
|------|-------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |       | 0.5               | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0           | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5                          | 6.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |
| 2015 | BYr   | 6.2 >             |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Hol   |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Fall  |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Sum   |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | Spr   |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2014 | BYr   |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Hol   |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Fall  |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | Sum   |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     | 7.1 >>                       |     |     |     |     |     |     |     |     |     |     |     |
| 2013 | E Sum |                   |     |     |     |     |     |     |     |     |     |     |               |     |     |     |     |     |     |     |     |     |     |                              |     |     |     |     |     |     |     |     |     |     |     |

Percent change in daily average speed at three locations in corridor

| Year | Sea   | at Lake Mead Blvd |      |      |      |      |      |      |      |      |      |     |     | at Charleston |      |      |      |      |      |      |      |      |      |     |     | between Flamingo & Tropicana |      |      |      |      |      |      |      |      |      |     |     |
|------|-------|-------------------|------|------|------|------|------|------|------|------|------|-----|-----|---------------|------|------|------|------|------|------|------|------|------|-----|-----|------------------------------|------|------|------|------|------|------|------|------|------|-----|-----|
|      |       | lt -2             | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2         | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2                        | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos |
| 2015 | BYr   | 2.2               |      |      |      |      |      |      |      |      |      |     |     | << -4.0       |      |      |      |      |      |      |      |      |      |     |     |                              |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Hol   | 3.4               |      |      |      |      |      |      |      |      |      |     |     |               |      |      |      |      |      |      |      |      |      |     |     | 1.0                          |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Fall  | 1.1               |      |      |      |      |      |      |      |      |      |     |     | << -2.1       |      |      |      |      |      |      |      |      |      |     |     |                              |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Sum   |                   |      |      |      |      |      |      |      |      |      |     |     | << -2.9       |      |      |      |      |      |      |      |      |      |     |     | 0.2                          |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum | << -3.2           |      |      |      |      |      |      |      |      |      |     |     |               |      |      |      |      |      |      |      |      |      |     |     |                              |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | Spr   | << -4.0           |      |      |      |      |      |      |      |      |      |     |     |               |      |      |      |      |      |      |      |      |      |     |     | 0.2                          |      |      |      |      |      |      |      |      |      |     |     |
| 2014 | BYr   | << -4.2           |      |      |      |      |      |      |      |      |      |     |     |               |      |      |      |      |      |      |      |      |      |     |     |                              |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Hol   | << -4.0           |      |      |      |      |      |      |      |      |      |     |     |               |      |      |      |      |      |      |      |      |      |     |     |                              |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Fall  | << -4.0           |      |      |      |      |      |      |      |      |      |     |     | 0.2           |      |      |      |      |      |      |      |      |      |     |     | 0.2                          |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | Sum   | << -2.1           |      |      |      |      |      |      |      |      |      |     |     |               |      |      |      |      |      |      |      |      |      |     |     | 3.4                          |      |      |      |      |      |      |      |      |      |     |     |
| 2013 | E Sum |                   |      |      |      |      |      |      |      |      |      |     |     | << -3.6       |      |      |      |      |      |      |      |      |      |     |     |                              |      |      |      |      |      |      |      |      |      |     |     |

# Bottleneck 6: 215 Southern Beltway EB through Windmill interchange, PM



Performance Thresholds

| Temporal / Spatial description |            |                     | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                    |            | Days per crash |                   | How do changes<br>in volume &<br>speed relate? |
|--------------------------------|------------|---------------------|---|----------------|-------------------------|--------------------|------------|----------------|-------------------|--|
| Corridor                       | AM /<br>PM | School in or<br>out | duration  | duration color | Average                 | 95th<br>percentile | 95th color | crash          | very bad<br>crash |  |
| 215 EB to<br>Eastern           | pm         | sch                 | lt 60 mins  | maroon         | 6                       | 10                 | yellow     | 8              | 30                | constr   |
|                                | pm         | summer              | lt 30 mins  | orange         | 4                       | 8                  | green      |                |                   |  |

# Bottleneck 6: 215 Southern Beltway EB through Windmill interchange, PM

| Year | Sea   | 4:00 PM |    |    |    | 5:00 PM |   |    |    |    |    |    |    |    |    | 6:00 PM |    |   |   |    |    |  |  |
|------|-------|---------|----|----|----|---------|---|----|----|----|----|----|----|----|----|---------|----|---|---|----|----|--|--|
|      |       | 40      | 45 | 50 | 55 | 0       | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50      | 55 | 0 | 5 | 10 | 15 |  |  |
| 2015 | B Yr  |         |    |    |    |         |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |
| 2014 | Hol   |         |    |    |    |         |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |
| 2014 | Fall  |         |    |    |    |         |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |
| 2014 | Sum   |         |    |    |    | N O N E |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |
| 2013 | E Sum |         |    |    |    |         |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |
| 2014 | Spr   |         |    |    |    |         |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |
| 2014 | B Yr  |         |    |    |    |         |   |    |    |    |    |    |    |    |    |         |    |   |   |    |    |  |  |

| Year | Sea   | Maximum delay in minutes |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
|------|-------|--------------------------|---|---|-----------------|----|----|----|----|----|----|----|----|----|--|--|--|--|--|--|--|
|      |       | Average                  |   |   | 95th percentile |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
|      |       | 2                        | 4 | 6 | 8               | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 |  |  |  |  |  |  |  |
| 2015 | B Yr  |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2014 | Hol   |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2014 | Fall  |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2014 | Sum   |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2013 | E Sum |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2014 | Spr   |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2014 | B Yr  |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |
| 2013 | Hol   |                          |   |   |                 |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |

| Year | Sea   | days per crash, days per bad crash |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |
|------|-------|------------------------------------|---|-----|-----|-----|-----|---|---|---|----|--------------------|----|-------|--|--|--|--|--|--|--|
|      |       | Days per crash                     |   |     |     |     |     |   |   |   |    | Days per bad crash |    |       |  |  |  |  |  |  |  |
|      |       | lt 1                               | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 3 | 5 | 10 | 15                 | 20 | gt 30 |  |  |  |  |  |  |  |
| 2015 | B Yr  |                                    |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |
| 2014 | Hol   |                                    |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |
| 2014 | Fall  |                                    |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |
| 2014 | Sum   |                                    |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |
| 2013 | E Sum |                                    |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |
| 2014 | Spr   |                                    |   |     |     |     |     |   |   |   |    |                    |    |       |  |  |  |  |  |  |  |

# Bottleneck 6: 215 Southern Beltway EB through Windmill interchange, PM

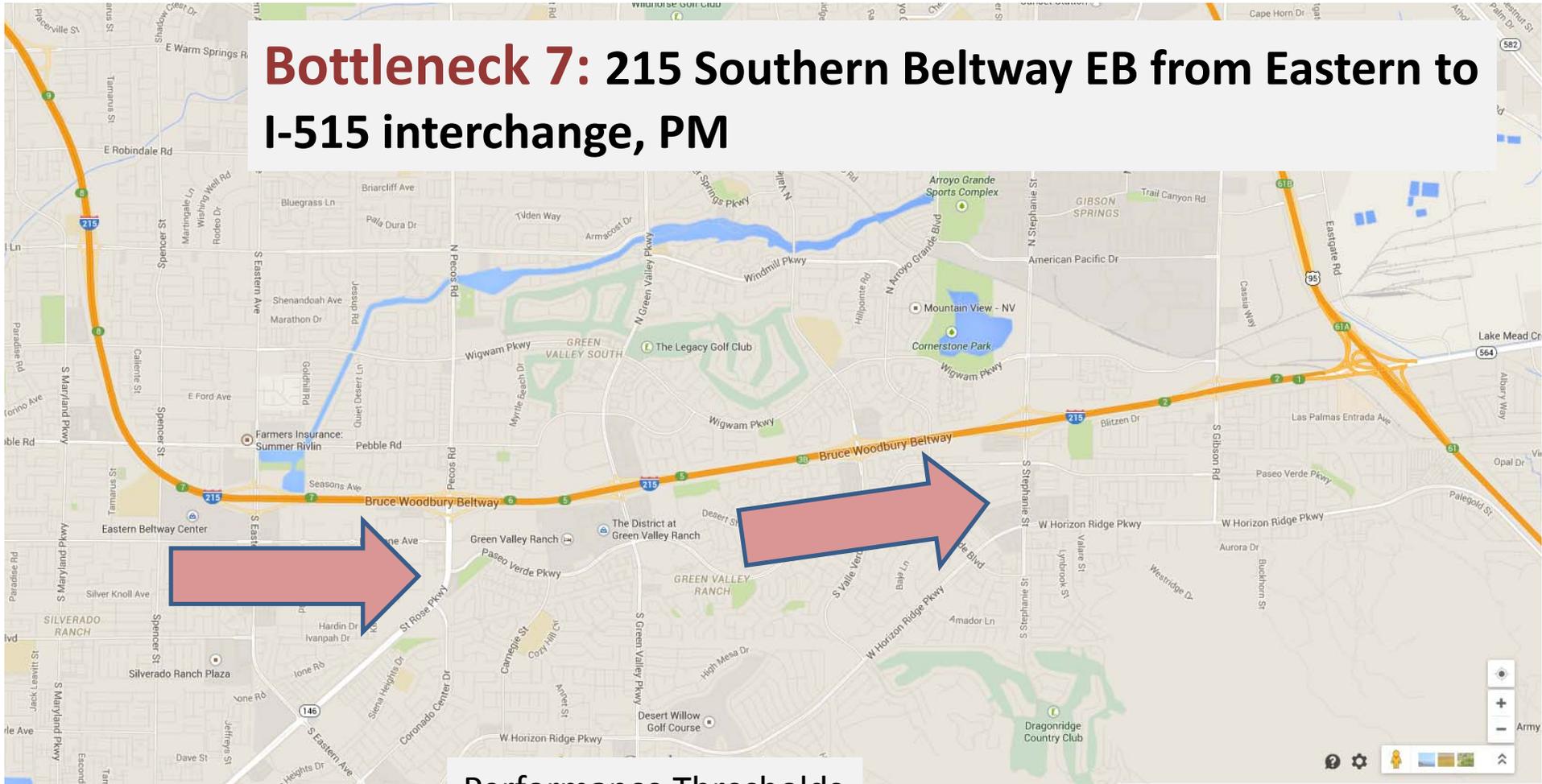
Percent increase in daily average volume at three locations in corridor

| Year | Sea   | between Durango & Buffalo |     |     |     |     |     |     |     |     |     |     |     | between LV Blvd & Airport ramps |     |     |     |     |     |     |     |     |     |     |     | west of Eastern |     |     |     |     |     |     |     |     |     |     |      |     |
|------|-------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
|      |       | 0.5                       | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 0.5                             | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 0.5             | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0  |     |
| 2015 | B Yr  |                           |     |     |     |     |     |     |     |     |     |     | 9.1 | >>>                             |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 7.2  | >>  |
| 2014 | Hol   |                           |     |     |     |     |     |     |     |     |     |     | 7.2 | >>                              | na  |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 6.1  | >   |
| 2014 | Fall  |                           |     |     |     |     |     |     |     |     |     |     | 7.9 | >>                              |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 13.4 | >>> |
| 2014 | Sum   |                           |     |     |     |     |     |     |     |     |     |     | 6.0 | =                               |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 10.2 | >>> |
| 2013 | E Sum |                           |     |     |     |     |     |     |     |     |     |     |     |                                 |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 9.2  | >>> |
| 2014 | Spr   |                           |     |     |     |     |     |     |     |     |     |     | 6.9 | >                               |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 9.3  | >>> |
| 2014 | B Yr  |                           |     |     |     |     |     |     |     |     |     |     |     |                                 |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     | 13.7 | >>> |
| 2013 | Hol   |                           |     |     |     |     |     |     |     |     |     |     |     |                                 | na  |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |      |     |
| 2013 | Fall  |                           |     |     |     |     |     |     |     |     |     |     |     |                                 |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |      |     |
| 2013 | Sum   |                           |     |     |     |     |     |     |     |     |     |     |     |                                 |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |      |     |
| 2013 | E Sum |                           |     |     |     |     |     |     |     |     |     |     |     |                                 |     |     |     |     |     |     |     |     |     |     |     |                 |     |     |     |     |     |     |     |     |     |     |      |     |

Percent change in daily average speed at three locations in corridor

| Year | Sea   | between Durango & Buffalo |      |      |      |      |      |      |      |      |      |     |     | between LV Blvd & Airport ramps |      |      |      |      |      |      |      |      |      |     |     | west of Eastern |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     |      |
|------|-------|---------------------------|------|------|------|------|------|------|------|------|------|-----|-----|---------------------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----------------|------|------|------|------|------|------|------|------|------|-----|-----|--|--|--|--|--|--|--|--|--|-----|------|
|      |       | lt -2                     | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2                           | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos | lt -2           | -1.8 | -1.6 | -1.4 | -1.2 | -1.0 | -0.8 | -0.6 | -0.4 | -0.2 | 0.0 | pos |  |  |  |  |  |  |  |  |  |     |      |
| 2015 | B Yr  | <<                        | -2.3 |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  | 1.6 |      |
| 2014 | Hol   |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 5.0  |
| 2014 | Fall  | <<                        | -2.1 |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 10.8 |
| 2014 | Sum   | <<                        | -2.0 |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 8.8  |
| 2013 | E Sum |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 10.2 |
| 2014 | Spr   |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 9.6  |
| 2014 | B Yr  |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 7.5  |
| 2013 | Hol   |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 4.8  |
| 2013 | Fall  |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 1.5  |
| 2013 | Sum   |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 4.1  |
| 2013 | E Sum |                           |      |      |      |      |      |      |      |      |      |     |     |                                 |      |      |      |      |      |      |      |      |      |     |     |                 |      |      |      |      |      |      |      |      |      |     |     |  |  |  |  |  |  |  |  |  |     | 1.0  |

# Bottleneck 7: 215 Southern Beltway EB from Eastern to I-515 interchange, PM



Performance Thresholds

| Temporal / Spatial description |            |                     | How long does a congestion event last?<br>How frequent are congestion events? |                | Maximum Delay (minutes) |                    |            | Days per crash |                   | How do changes<br>in volume &<br>speed relate? |
|--------------------------------|------------|---------------------|---|----------------|-------------------------|--------------------|------------|----------------|-------------------|--|
| Corridor                       | AM /<br>PM | School in or<br>out | duration  | duration color | Average                 | 95th<br>percentile | 95th color | crash          | very bad<br>crash |  |
| 215 EB to 515                  | pm         | sch                 | lt 30 mins  | green          | 6                       | 10                 | green      | 8              | 30                | v+ sp =  |
|                                | pm         | summer              | lt 30 mins  | green          | 4                       | 8                  | green      |                |                   |  |



