

Comparative Analysis for an Urban Design-Build Construction Project using Dynamic Traffic Assignment

Neveen Shlayan, Naveen Veeramisti and Pushkin Kachroo

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NEVADA UNIVERSITY TRANSPORTATION CENTER



I-15 North Design/ Build Project Achieved Major Success

- ▶ Total duration of the construction project was reduced by 45% (from 22 months to 10 months).

The most significant factor that was believed to majorly affect this success is:

- ▶ The contractor's request to keep 2 lanes open instead of 3 lanes open during the construction.

I-15 North Design/Build Construction Project

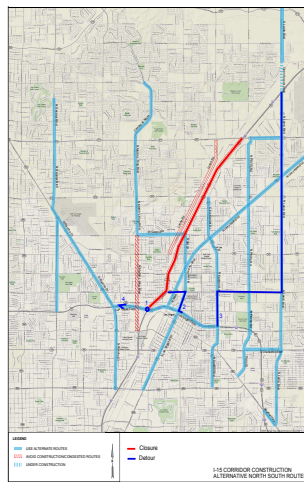


Figure: Official detours map

Major Future Projects:

- ▶ I-15 South
- ▶ Project Neon

Issues:

- ▶ What are the various associated costs?
- ▶ Is it always beneficial to reduce the number of open lanes at construction zones?
- ▶ What is the equilibrium point for each cost with respect to project completion duration?

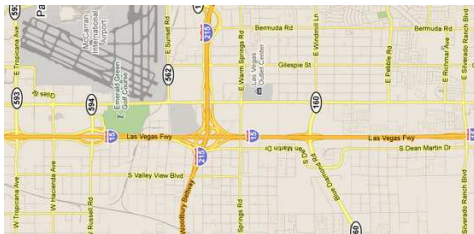
- ▶ Congestion
- ▶ Construction
- ▶ Travel Time
- ▶ Safety
- ▶ Environmental

- ▶ Case Study
 - ▶ I-15 South Design/ Build Project
- ▶ Mesoscopic Simulations Using DynusT
- ▶ Simulations Results Analysis
 - ▶ Network Level
 - ▶ Link Level

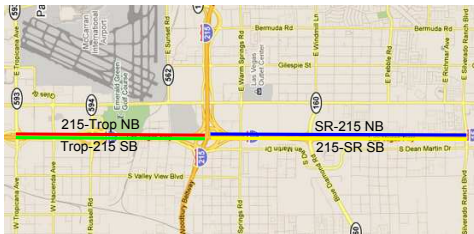
- ▶ **Network Level:** Determine the travel time costs when keeping 2 lanes vs. 1 lane open with respect to time or different construction durations.
- ▶ **Link Level:** Compare density, speed, and volume for each link within the given segment.

I-15 South Design/ Build Project Geographical Area

Extends from Tropicana Ave to South of Silverado Ranch Blvd.



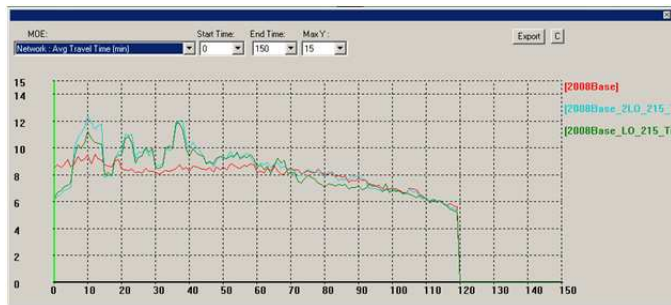
4 main segments:



8 Scenarios:

1. 215 to Tropicana NB 1 lane open
2. 215 to Tropicana NB 2 lanes open
3. Silverado Ranch to 215 NB 1 lane open
4. Silverado Ranch to 215 NB 2 lanes open
5. Tropicana to 215 SB 1 lane open
6. Tropicana to 215 SB 2 lanes open
7. 215 to Silverado Ranch SB 1 lane open
8. 215 to Silverado Ranch SB 2 lanes open

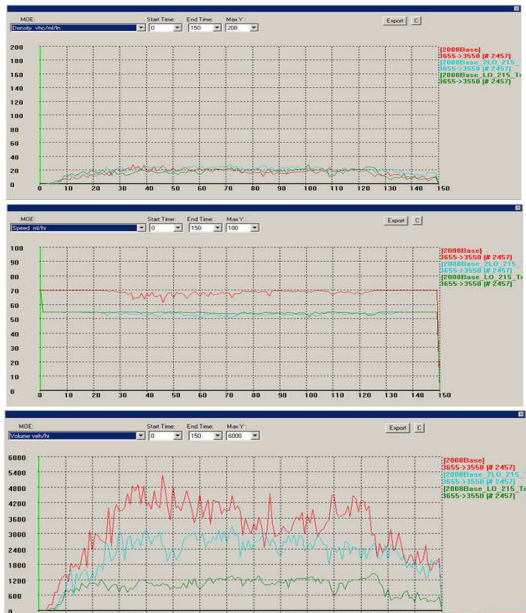
Simulations results- Network Level



Annual Travel Time Cost in Billions:

1LO-215-Trop-NB-1	4.38
1LO-215-Trop-SB-2	4.28
1LO-SR-215-NB-3	4.33
1LO-SR-215-SB-4	4.19
2LO-215-Trop-NB-5	4.33
2LO-215-Trop-SB-6	4.21
2LO-SR-215-NB-7	4.29
2LO-SR-215-SB-8	4.23

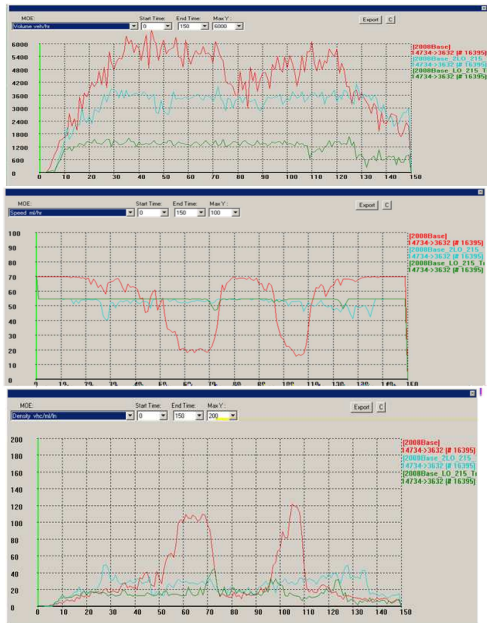
Simulation Results- Link Level- 1



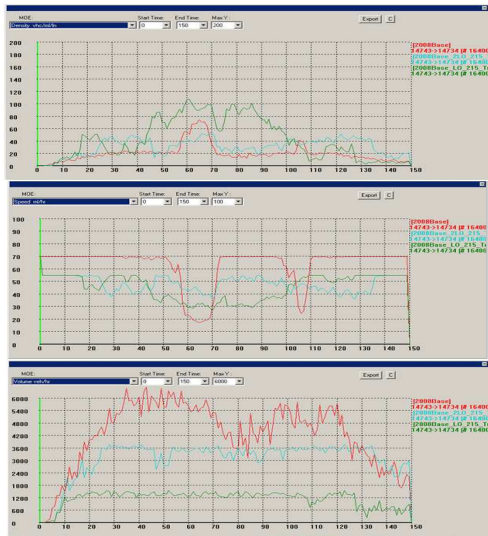
Simulation Results- Link Level- 2



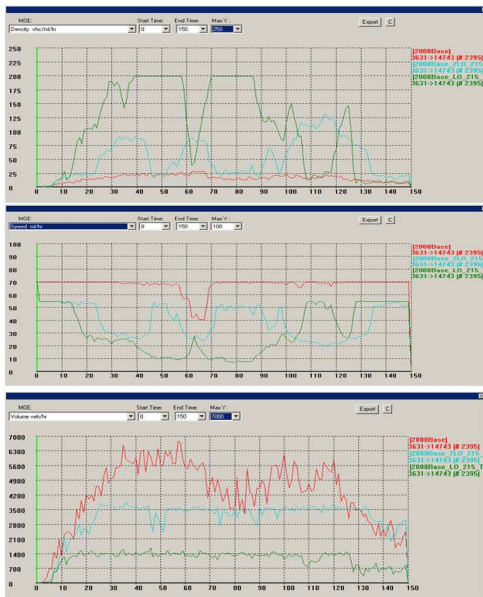
Simulation Results- Link Level- 3



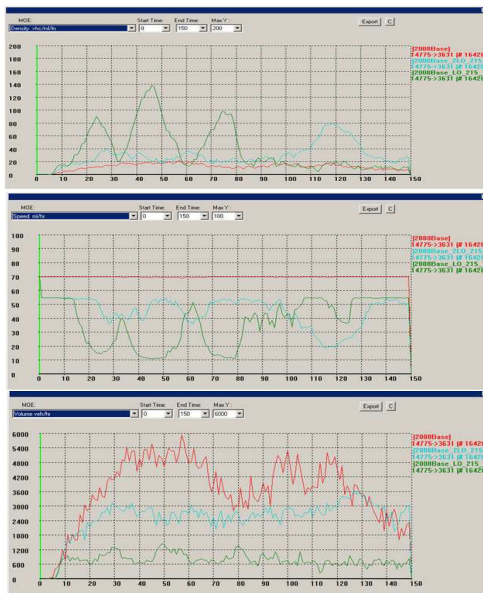
Simulation Results- Link Level- 4



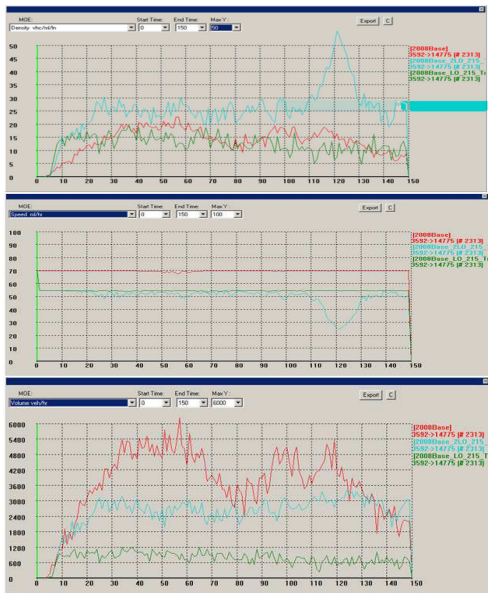
Simulation Results- Link Level- 5



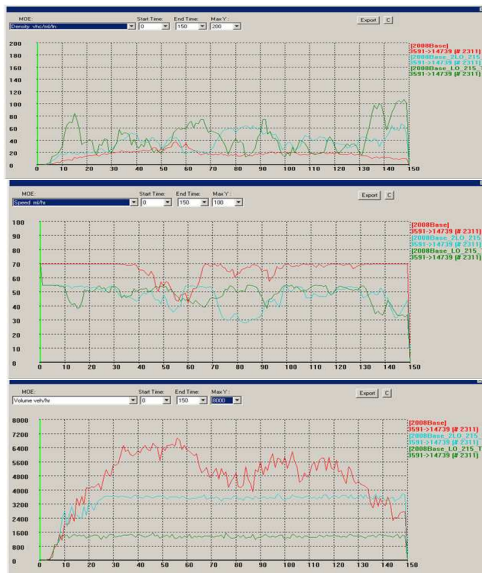
Simulation Results- Link Level- 6



Simulation Results- Link Level- 7



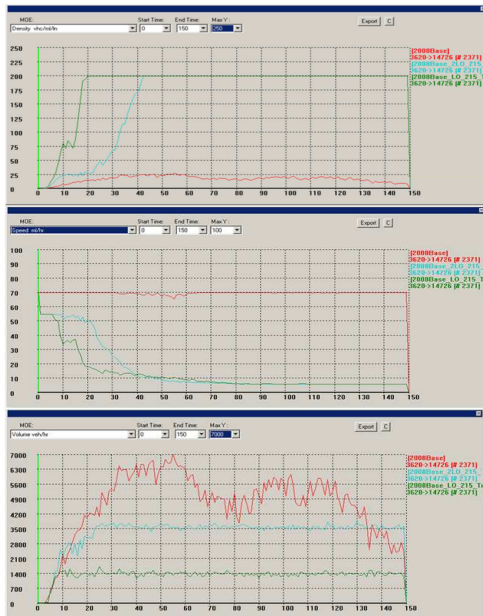
Simulation Results- Link Level- 8



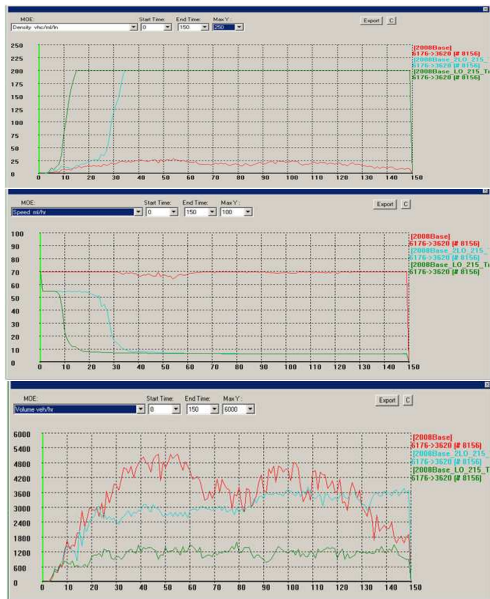
Simulation Results- Link Level- 9



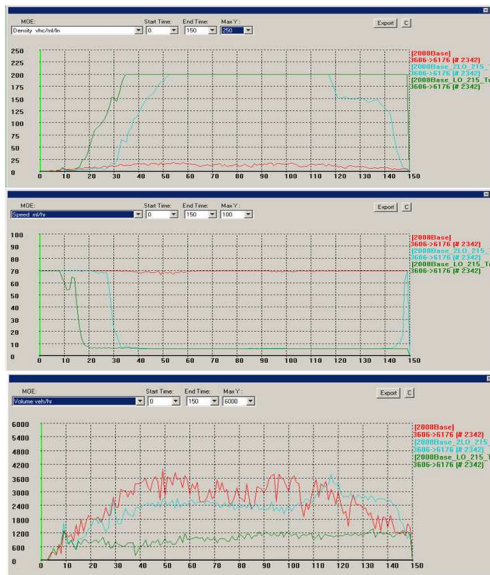
Simulation Results- Link Level- 10



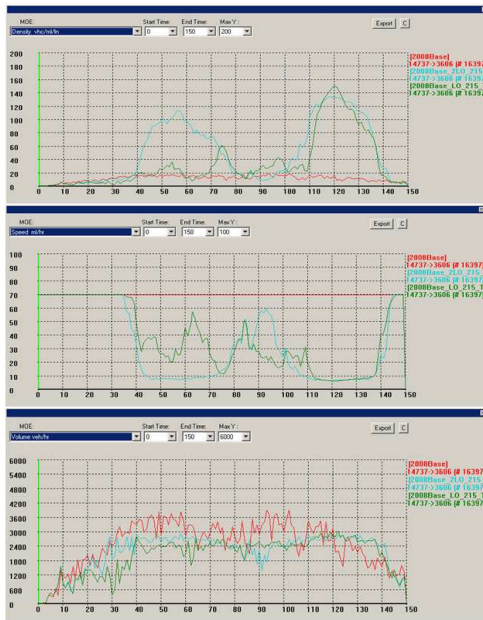
Simulation Results- Link Level- 11



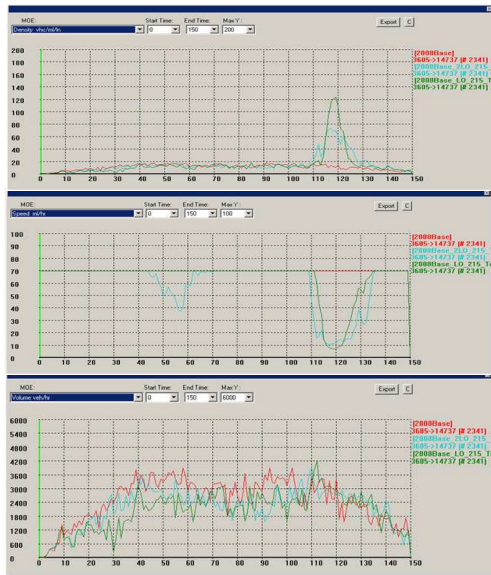
Simulation Results- Link Level- 12



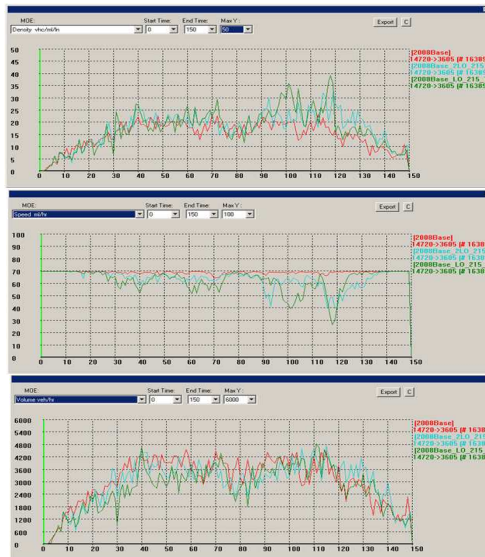
Simulation Results- Link Level- 13



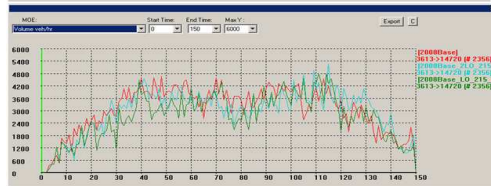
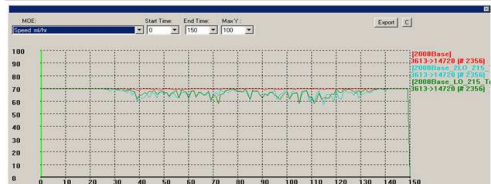
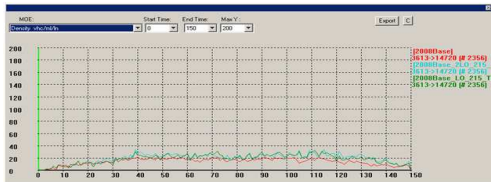
Simulation Results- Link Level- 14



Simulation Results- Link Level- 15



Simulation Results- Link Level- 16



- ▶ Network Level:
 - ▶ The network's total travel time is always higher when only one lane is open
 - ▶ Annual network travel time cost savings are, on average, \$50 million
- ▶ Link Level:
 - ▶ The freeway segment under effect for both cases (1 or 2 lanes open) can be categorized into 3 regions:
 1. **The Closure Front Region:** minimum closure effect on this region other than the speed limit reduction
 2. **The Closure Back Region:** capacity begins to saturate as time increases correspondingly speeds tend to decrease; furthermore, traffic queue starts forming
 3. **The Tail Region:** This region is not necessarily under closure or construction; however, the saturated capacity experienced by the back region propagates to effect this region as well
 - ▶ the speed reduction or the density saturation was leading in the case of 1 lane open by approximately 20 min

- ▶ microscopic simulation
- ▶ Compare simulations results with actual detector data