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Managed Lane Analysis on SH 358 Using VISSIM

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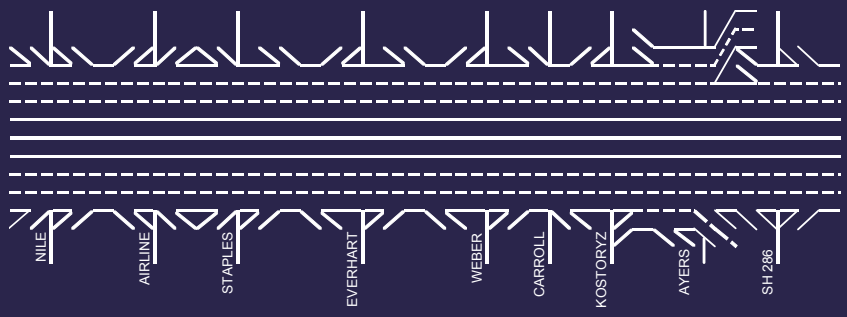
Presentation Outline

- Project Background
- Proposed Alternatives
- Data Collection / Traffic Projections
- VISSIM Modeling
- Measures of Effectiveness
- Results
- Conclusions

Project Background



- Existing six-lane facility from SH 286 to Rodd Field Road
- Only freeway between downtown and Padre Island
- Current congestion near ramps – especially near SH 286

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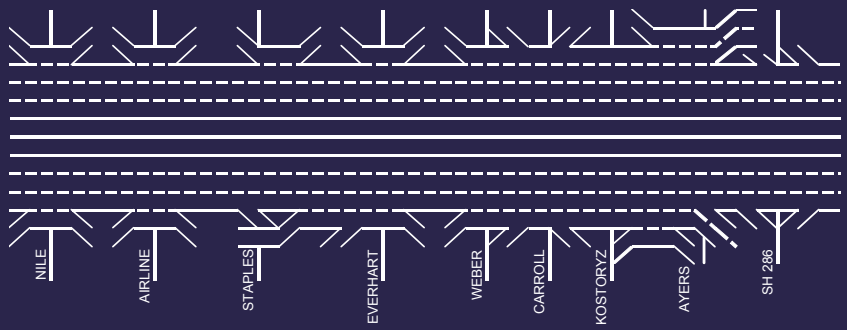
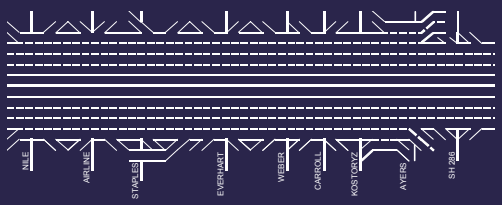
Freeway Improvements

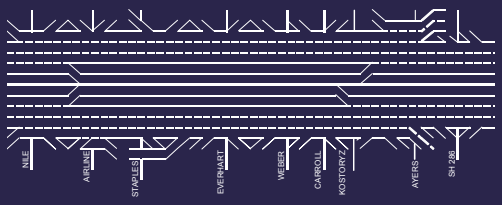


- Reverses ramps to create “X-ramp” configuration
- Adds auxiliary lanes between ramps
- Defined as “Alternative 1”
- Look at short, mid, & long term with managed lanes

Proposed Alternatives



- Alternative 2:
  - Widens to 8-lane facility (remove aux. lanes)



- Alternative 3A:
  - Managed lane provides access to SH 286
  - One ingress/egress

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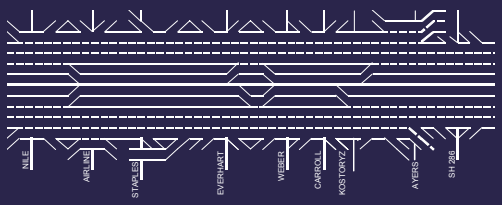
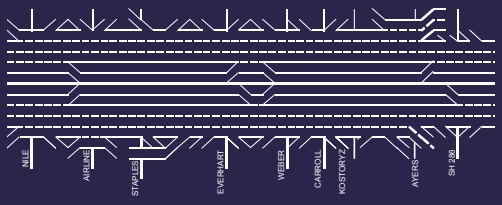
Proposed Alternatives

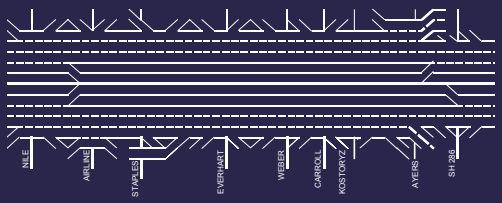


- Alternative 3B:
  - Same as 3A, but with intermediary ingress / egress point

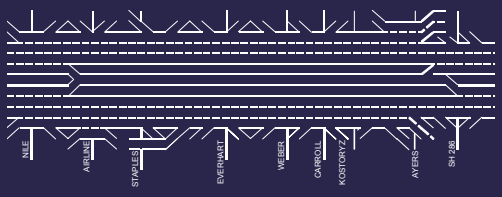


- Alternative 3C:
  - Same as 3B, but no managed lane access to SH 286

Proposed Alternatives



- Alternative 4:
  - Same as 3C, but with only one ingress / egress point



- Alternative 5:
  - Same as 4, but with one reversible managed lane

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Data Collection / Traffic Projections

- Ramp volumes counted for 3 days, averaged, & redistributed for new configurations
- 2.04% growth rate to year 2022, then 2.0% afterward
- 1.10% base vehicle occupancy rate
- Traffic routed through O-D network via gravity model and held constant

Managed Lane Projections

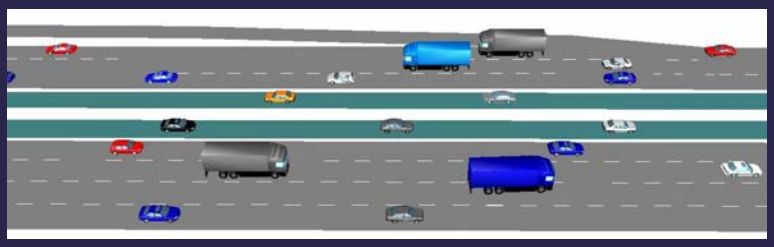
- Increased carpooling ➔ vehicle occupancy rate jumps to 1.20%
- Number of people served held constant on freeway
- Constraints:
  - Number of eligible vehicles based on O-D
  - Managed lane density
  - Demand limited to 1,500 vph

VISSIM Modeling

- Chose VISSIM 4.3-02 due to its capability to analyze complex geometry
- Models include main lanes, ramps, and managed lanes, but no frontage roads
- Default values selected for freeway driving behavior / car following models
- Decision distances set to ¼ or ½ mile
- Traffic counted at all access points and compared to target values; 5% variance allowed
- Visual analysis for unreasonable behavior

Modeling Limitations

- Vehicles arrive randomly
- Limitations inherent to gravity model
- No “Dynamic Assignment” feature enabled to re-route vehicles because of congestion
- Delay not calculated for queues extending beyond model



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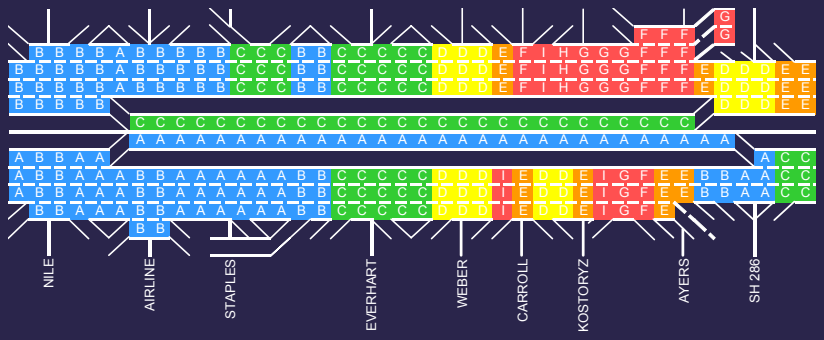
Measures of Effectiveness

- Each alternative modeled three times with three separate seed numbers
- Results averaged
- Freeway densities recorded at all junctions and in ¼ mile sections
- Density provided basis for Level of Service (LOS)
- HCM gradation used:
  - LOS A: <11 veh/mi-ln
  - LOS B: <18 veh/mi-ln
  - LOS C: <26 veh/mi-ln
  - LOS D: <35 veh/mi-ln
  - LOS E: <45 veh/mi-ln
- Expanded gradation:
  - LOS F: <60 veh/mi-ln
  - LOS G: <75 veh/mi-ln
  - LOS H: <90 veh/mi-ln
  - LOS I: >90 veh/mi-ln

Results



- Color-coded LOS results generated in Excel for Years 2007, 2027, and 2047
- Projected total delay calculated based on total delay output and percentage of served vehicles
- Average vehicular delay taken from VISSIM

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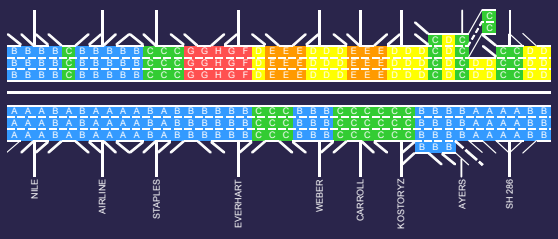
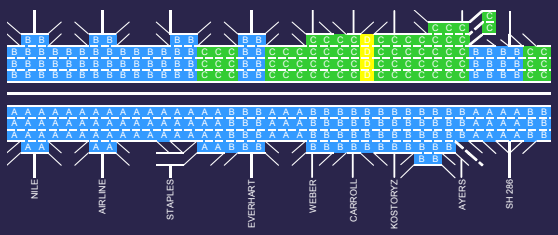
2007 Results – PM Peak



Existing Condition:

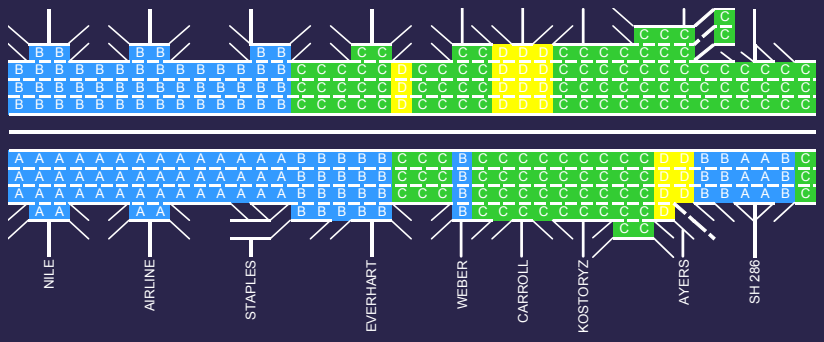
- Existing condition has problems on EB side
- 139 hrs total delay
- 26.6 secs avg delay



Alternative 1:

- Cuts delay by 85%
- Adequate in the short term

2027 Results – AM Peak



- Alternative 1 still works, although problems are beginning to arise
- Other alternatives provide some extra benefit, but are probably not justified by added cost

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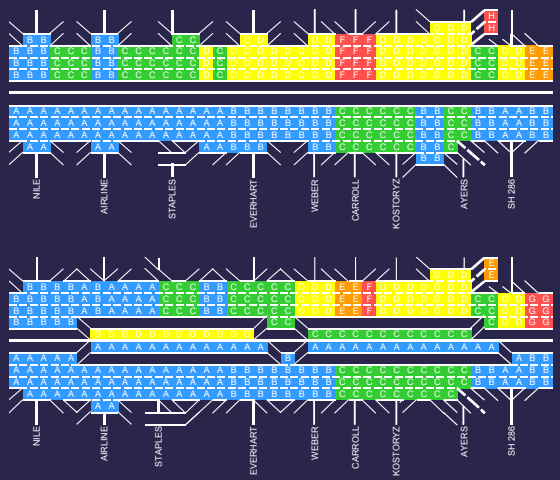
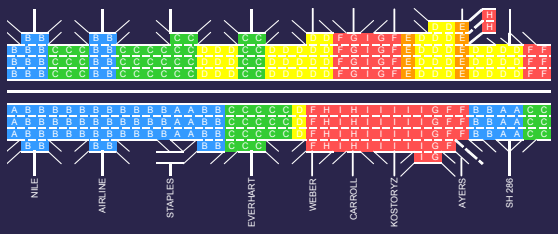
2027 Results – PM Peak



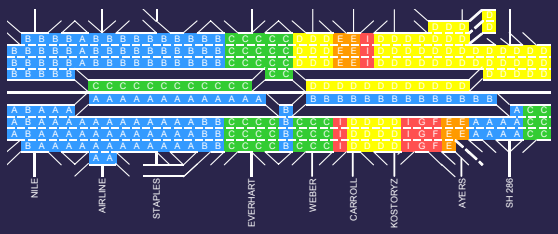
Alternative 1:
- Two main problem areas on EB side
- 157 hrs total delay
- 23.2 secs avg delay

Alternative 3C:
- Cuts delay by 60%
- Benefits due to carpooling, lane choice
- Mngd. ln. on EB only

2047 Results – AM Peak



Alternative 1:
- Problems galore
- 879 hrs total delay
- 110.6 secs avg delay



Alternative 3C:
- Cuts delay by 80%
- Does not fully address SH 286 demand problem

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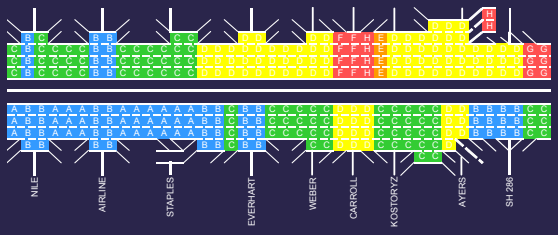
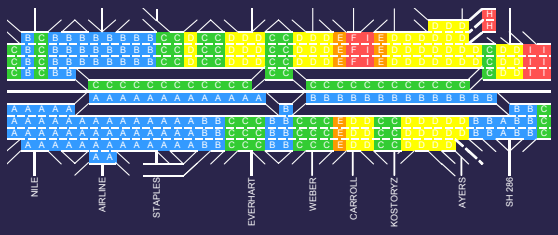
2047 Results – PM Peak

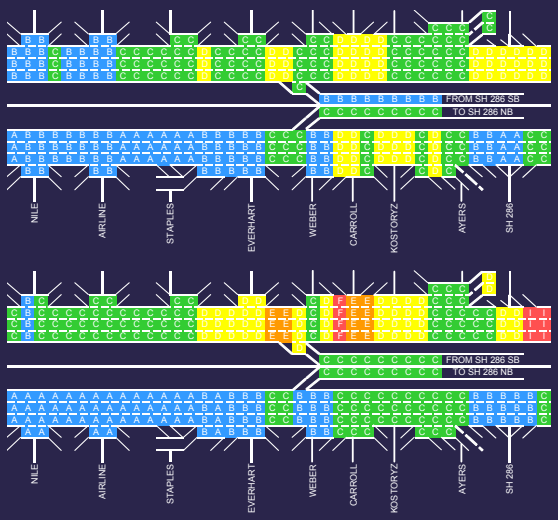


Alternative 1:
- Same problems as before, but worse
- 241 hrs total delay
- 27.8 secs avg delay



Alternative 3C:
- Cuts delay by 3%
- Does not address SH 286 demand problem

2047 Results – Alternative 1 DC



AM Peak Period:

- Cuts delay by 90% over Alt. 1; 67% over Alt. 3C
- Addresses SH 286 demand

PM Peak Period:

- Cuts delay by 50% over both Alt. 1 and Alt. 3C
- Addresses SH 286 demand

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Conclusions

- For Short Term (2007), Alternative 1 is sufficient
- For Mid Term (2027), Alternative 3C provides some benefit, but on the EB side only
- Alternative 1 may be ok in 2027
- For Long Term (2047), SH 286 direct connector managed lane is best – significantly better than other SH 358 managed lanes alternatives
- Costs for each alternative required to develop B/C ratios before final recommendations