HIGHWAY & TRANSIT RANKING MODEL

Based on Modeling Synergistic Improvements for
System- Wide Congestion Reductions Per $ Cost

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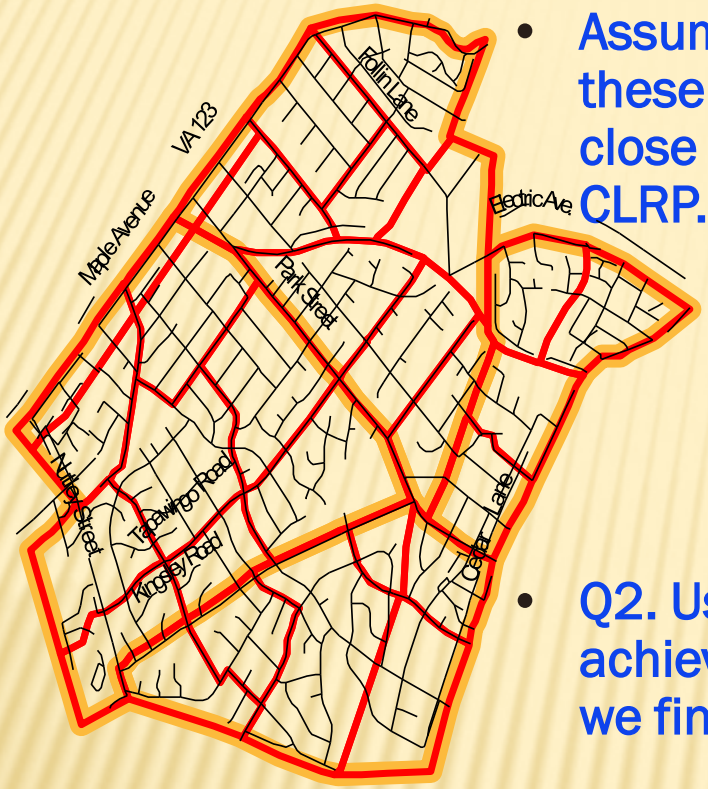
by
Bill Mann, P.E.
Transportation Planning Section
Northern Virginia District
Virginia Department of Transportation

Purpose of Model



- Assumptions – Assume this is the CLRP and all these transportation improvements have a V/C close to 1.0 meaning they are all needed in the CLRP. Cost is in the Billions.
  - Q1. How can we rank each improvement based on system congestion reduction per cost as the ranking criteria?
- Q2. Using the "old 80-20 rule", if 20% of the $ will achieve 80% of the congestion reduction, how do we find that 20%?

Ranking Procedure

1. Delete all improvements, calculate system-wide VHD below a threshold LOS.
2. Add 1 improvement, calculate system-wide VHD again, the difference is system-wide benefits for this improvement.
3. Delete this improvement.
4. Add another improvement to the Base. Repeat the calculations for VHD reductions.
5. Repeat this process 100 + times to get the First "Best" improvement per $ cost.
6. Add this First "Best" to the Base.
7. Now, repeat Steps 1 – 6 to get the Second "Best" improvement.
8. Next, repeat Steps 1 – 7 to rank All 100 + improvements.

When is VHD Measured?

- Delay reduction is measured if the improvement improves system-wide LOS from below a threshold LOS set by user.
- This threshold is input as a V/C ratio to the model.
- For example, if the threshold is set at LOS E, then any improvement on any highway that causes system-wide LOS improvements from LOS D to LOS A, B or C will have no benefits in this model.
- Benefits accrue only if LOS improves from LOS E to a better grade.

Transit Ranking Model Theory

- All transportation improvements (H & T) reduce system – wide congestion.
- Thus, transit improvements, can be compared with highway improvements for measuring congestion reduction per $ cost.
- To account for the synergistic impact of adding the "best" transit improvement to (H & T) Base, we reduce vehicle trips from the Base trip table (using MWCOG/TPB trips from 2020/2030 land use) for the next iteration of rankings.

How Can We Eliminate Model Bias?

- We can set the threshold for highways at a lower LOS grade than for transit.

  Example: TRANSIT LOS = E
  HIGHWAY LOS = F

- This example says that all system-wide highways operating at or below LOS E would get a measurable benefit from a transit improvement while only those highways operating at or below LOS F would get a benefit from a highway improvement.

What About Jurisdiction Bias?

- The previous example would probably rank highways high for outer jurisdictions and transit high for inner jurisdictions.

- If there is still a jurisdictional bias, we could set thresholds by mode by jurisdiction.

Why Hasn't This Been Done Before?

- It is cost prohibitive without new software.
- One would have to code thousands of computer networks and run thousands of computer traffic assignments to rank 70 improvement projects in long range plan
  (e.g., 70 + 69 + 68 + 67 + 66 + 65 + etc.) = 2450 computer runs.
- Coding and running 3 networks and 3 traffic assignments per week in sequential order is all one could do with traditional modeling techniques.
- This approach would take years to accomplish manually.

Why Do We Need A Computer Model?

- We need to model several thousand combinations of improvements to obtain the best sequence for construction to get the most VHD reductions, or VHD reductions per cost

- Experience shows that about 80% of total gridlock reductions come from 20% of the improvements.

Highway Ranking Model

- Execution Time With Model
  (29,000 Links - 11,500 Nodes – 2191 Zones)

- 2 days of computer time to rank 70 improvement projects in Northern Virginia using a PC with Intel core CPU, 3.06 GHz processor.

Model Output Correlates With TTI Data For 2003 Network

- Texas Transportation Institute (TTI) estimates 69 hours of delay per year, per peak period traveler in 2003[1].

- VDOT model using MWCOG's trip table estimates 108 hours of delay per year, per peak period traveler in NoVA

Explanation of Differences[2]

- TTI measures delay on freeways and major arterials only.
- VDOT measures delays on all roadways, including minor arterials and collectors.

1. Washington Post, May 10, 2005
2. Based on Discussions with Tim Lomax of TTI

Results of testing 52 possible candidate projects in Six-Year Plan for ranking

By
Transportation Planning Section, VDOT/NoVA

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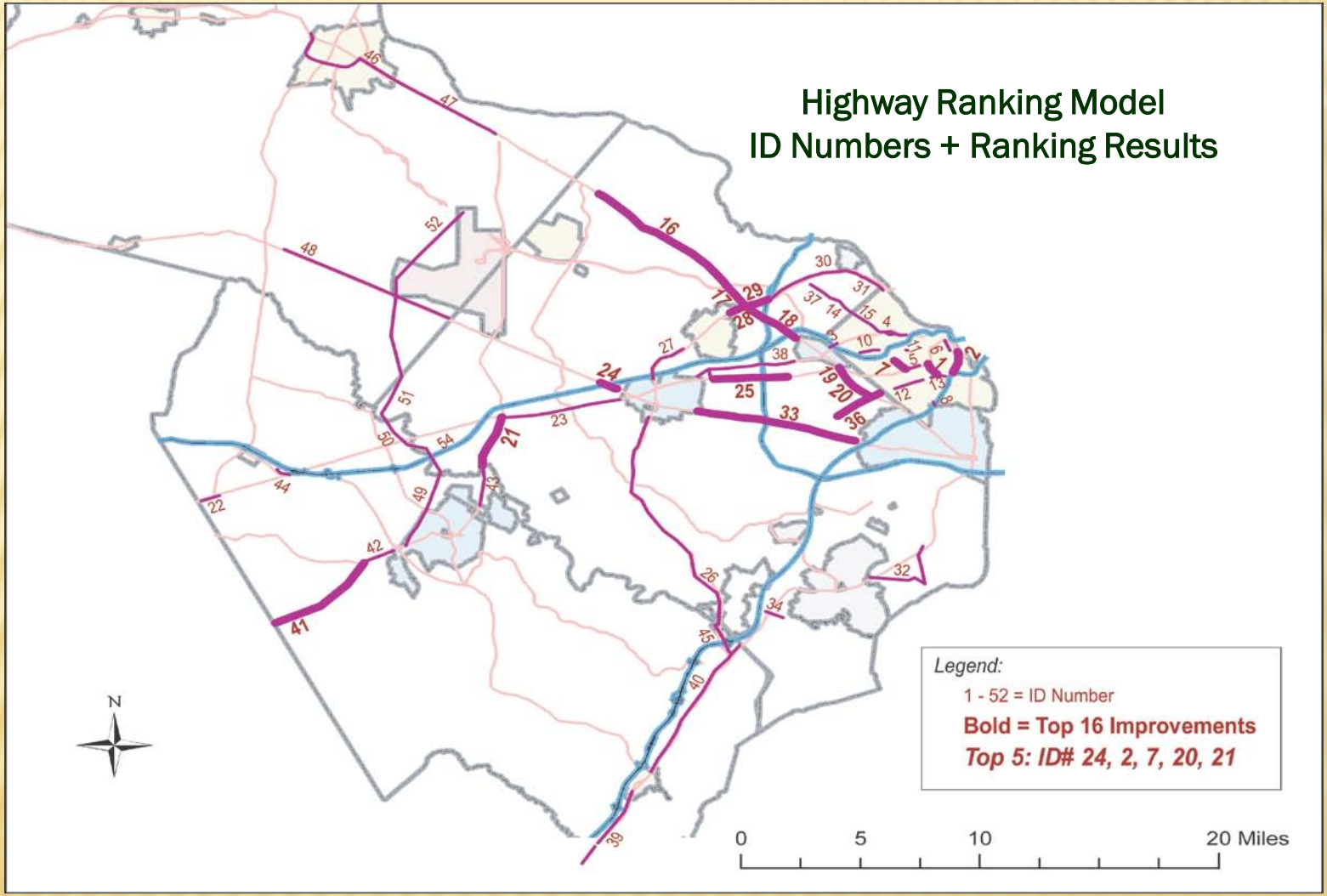
Ranking Result Map



Ranking Result Table

ID#	IMPROVEMENT	VHD Red	Cost ($M)	VHDRed/ Cost($M)
24	US 50, I-66 to Jermantown Rd., U8D, 0.81 mi.	3122	9	347
2	VA 27, Rt. 244 S. to Rt. 110, U6D, 1.60 mi.	3813	12	318
7	VA 120, Henderson Rd. to Rt. 50, U6D, 0.64 mi.	1944	7	278
20	VA 7, Patrick Henry Dr. to Rt. 244, U6D, 1.26 mi.	3337	14	238
21	VA 28, Bull Run to Rt. 29, U6D, 2.60 mi.	6042	29	208
28	VA 123, Old Courthouse to Rt. 7, U6D, 0.85 mi.	1028	9	114
29	VA 123, Rt. 7 to I-495, U8D, 0.90 mi.	988	9	110
17	VA 7, Dulles Toll Rd. to I-495, U8D, 2.36 mi.	2723	27	101
1	VA 27, Rt. 50 to Rt. 244 S., U6D, 0.72 mi.	905	9	101
33	VA 236, Pickett Rd. to Chambliss St., U6D, 7.26 mi.	6033	67	90
18	VA 7, I-495 to Birch St., U6D, 1.91 mi.	1437	17	85
25	US 50, Nutley St. to Graham Rd., U6D, 3.57 mi.	1585	34	47
36	VA 244, Sleepy Hol. Rd. to Carlin Spr. Rd., U6D, 2.23 mi.	763	21	36
41	VA 28, Fauquier Dr. to Vint Hill Rd., R4D, 5.14 mi.	506	17	30
16	VA 7, Dranesville Rd. to Dulles Toll Rd., U6D, 8.77 mi.	2806	93	30
19	VA 7, Rt. 50 to Patrick Henry Dr., U8D, 0.80 mi.	137	5	27

EXAMPLE: Project 24 reduces 347 vehicle hours of delay (daily) per construction cost ($ millions).
Final Output showed that after adding the top 16 improvements to the network, the bottom 36 did little to reduce VHD.

- Questions?
- Comments?

Contacts

Bill Mann
Bill.Mann@VDOT.Virginia.gov
b.mann@cox.net
703-383-2211

Mazen Dawoud
Mazen.Dawoud@VDOT.Virginia.gov
Ma.Dawoud@gmail.com
703-383-2229