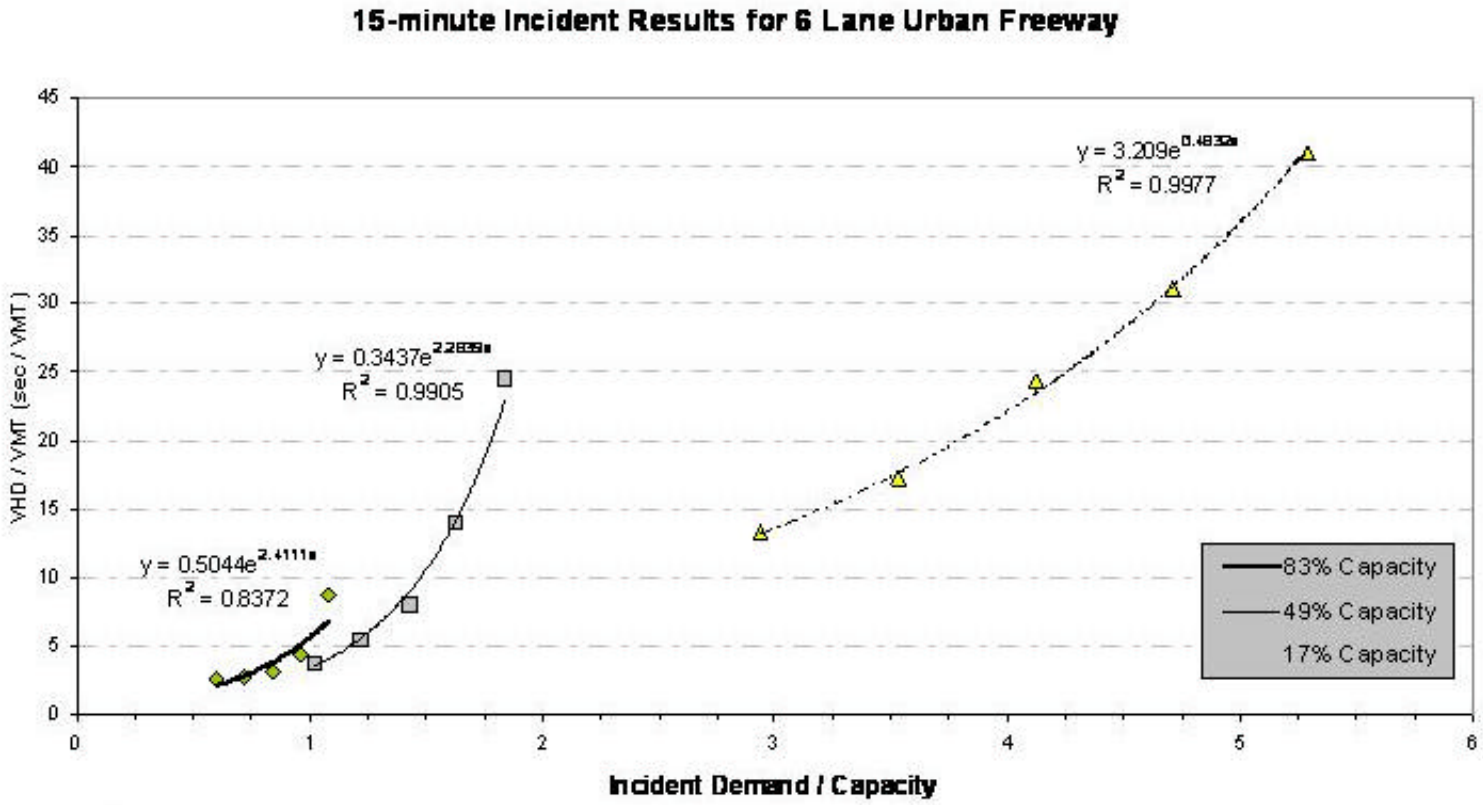
Statistical Model based on FREEVAL Results



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Quantify FSP Costs

- Calculate FSP Unit Costs
  - Compiled by each NCDOT Division
  - Building costs not considered
  - Expressed either as per hour, per mile, per vehicle, per driver, etc

- FSP Vehicle Fleet Size Estimation
  - Estimates required number of vehicles for expansion sites

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FSP Hourly Costs

Division	Total Yearly Cost	Total Hours Patrolled Yearly	Total Trucks	Hourly Cost per Truck
5	$436,900	3600	7	$17.30
7	$436,700	3840	8	$14.20
9	$610,600	3600	8	$21.20
10	$1,762,700	4608	21	$18.20
12	$379,000	4608	6	$13.70
14	$285,700	8640	4	$8.30
		Average Hourly Cost per Truck		**$15.50**
		Weighted Average Cost[a]		**$16.70**

a Averages are weighted by the multiplying the hourly costs times the total trucks for each division, summing the values for all divisions, and dividing by the total number of vehicles

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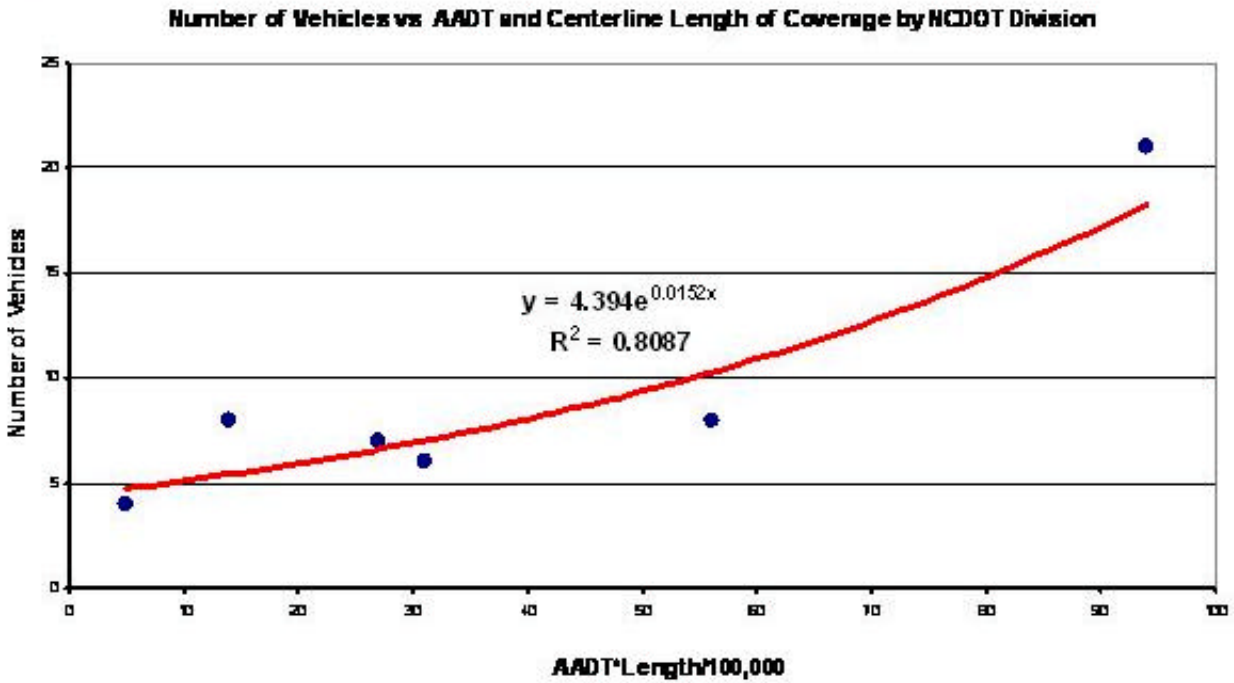
FSP Vehicle Fleet Size

- FSP vehicles required for expansion sites
- Based on current coverage level
- Inputs: AADT ; Length



Decision Support Tool

- Java-based application
- Data driven
- Three Different Applications
  1. Planning-level analysis
  2. Detailed Single-Incident Delay analysis
  3. Benefit / Cost --- aggregation of benefits/ costs

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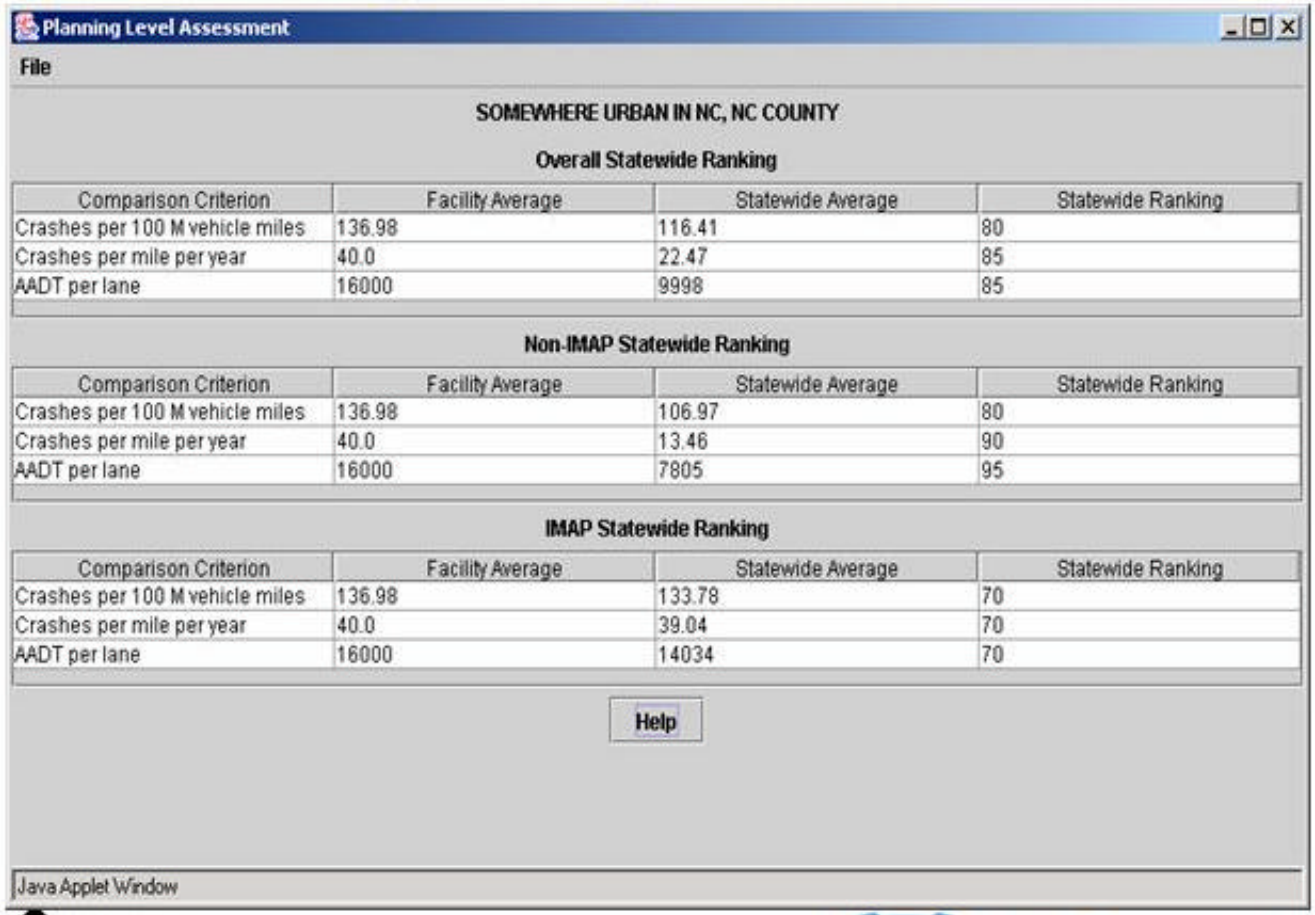
Planning Analysis Screen Shot



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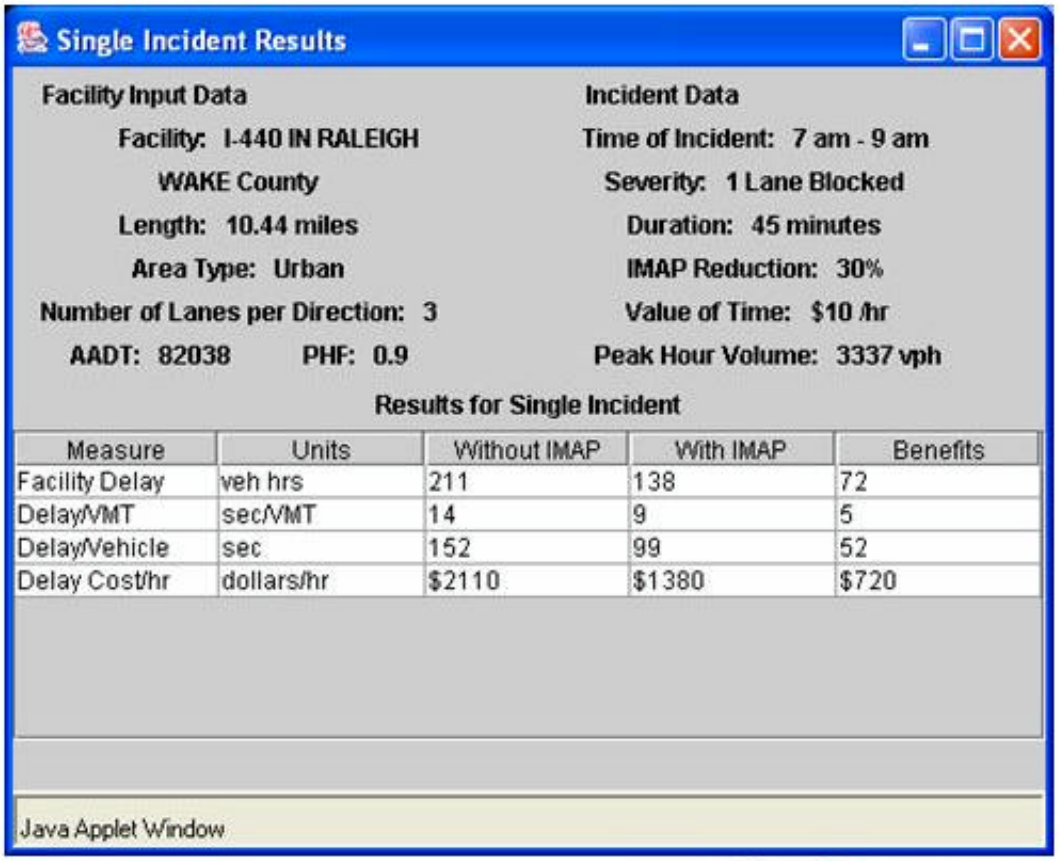
Single Incident Screen Shot



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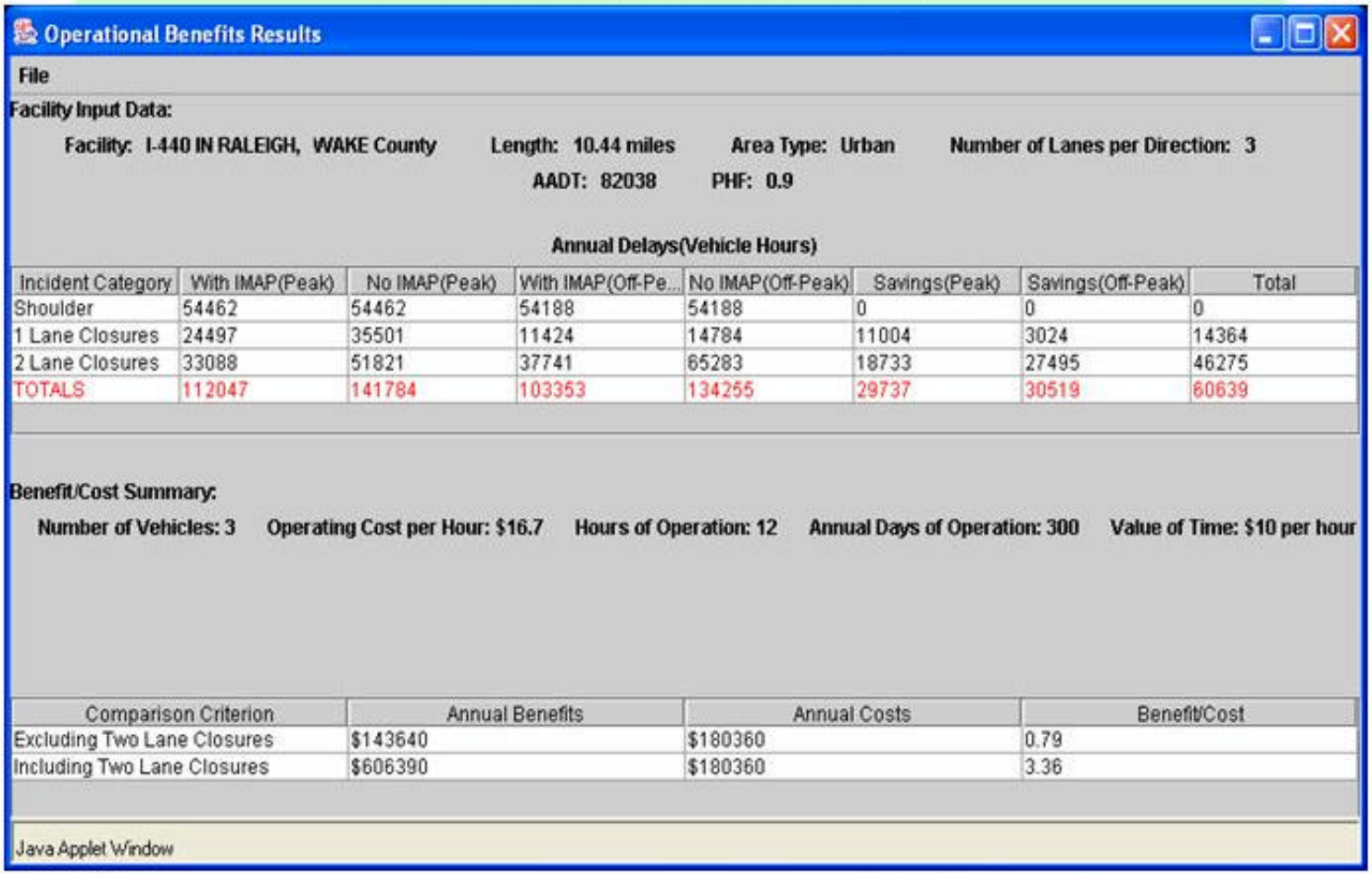
B/C Screen Shot



Operational Benefits Results

File

Facility Input Data:

Facility: I-440 IN RALEIGH, WAKE County **Length: 10.44 miles** **Area Type: Urban** **Number of Lanes per Direction: 3**

AADT: 82038 **PHF: 0.9**

Annual Delays(Vehicle Hours)

Incident Category	With IMAP(Peak)	No IMAP(Peak)	With IMAP(Off-Pe...	No IMAP(Off-Peak)	Savings(Peak)	Savings(Off-Peak)	Total
Shoulder	54462	54462	54188	54188	0	0	0
1 Lane Closures	24497	35501	11424	14784	11004	3024	14364
2 Lane Closures	33088	51821	37741	65283	18733	27495	46275
TOTALS	112047	141784	103353	134255	29737	30519	60639

Benefit/Cost Summary:

Number of Vehicles: 3 **Operating Cost per Hour: $16.7** **Hours of Operation: 12** **Annual Days of Operation: 300** **Value of Time: $10 per hour**

Comparison Criterion	Annual Benefits	Annual Costs	Benefit/Cost
Excluding Two Lane Closures	$143640	$180360	0.79
Including Two Lane Closures	$606390	$180360	3.36

Java Applet Window

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Application of Decision Support Tool
Existing FSP Benefits/Costs

Division	Benefits	Costs	B / C Ratio	Net Worth (B-C)
5	$4,528,800	$436,900	10.4	$4,091,900
7	$3,454,300	$436,700	7.9	$3,017,600
9	$701,100	$610,600	1.1	$90,500
10	$12,382,000	$1,762,700	7.0	$10,619,300
12	$888,400	$379,000	2.3	$509,400
14	**	$285,700	**	**
Statewide Value	$21,954,600	$3,911,600	5.6	$18,043,000

** Values are neglible

Assumption: VOT = $10

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Application of Decision Support Tool Candidate Site Modeling

Crashes per 100 Million Vehicle Miles Density

I-26 and I-40 Asheville

- 4-lane facility
- 15 miles in length
- 64000 ADT
- 303 crashes per year
- 4 FSP vehicles (estimated)
- B/C = 2.7 (Net worth $410K)

I-440 Raleigh

- 6-lane facility
- 12 miles in length
- 82000 ADT
- 712 crashes per year
- 3 FSP vehicles (estimated)
- B/C = 3.3 (Net worth= $420K)

Conclusions

- Methods and tools can be used to determine FSP expansion sites
  - Flexible approach based on data availability – planning & operational
  - Tool enables quick analysis; generic data needs allows application outside NC
- Results confirm previous findings in literature
  - NC Statewide average **5.6:1**
  - Existing NC FSP sites confirmed eligible
- Candidate Asheville and Raleigh are good expansion sites
- B/C analysis confirm the initial GIS screening results

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