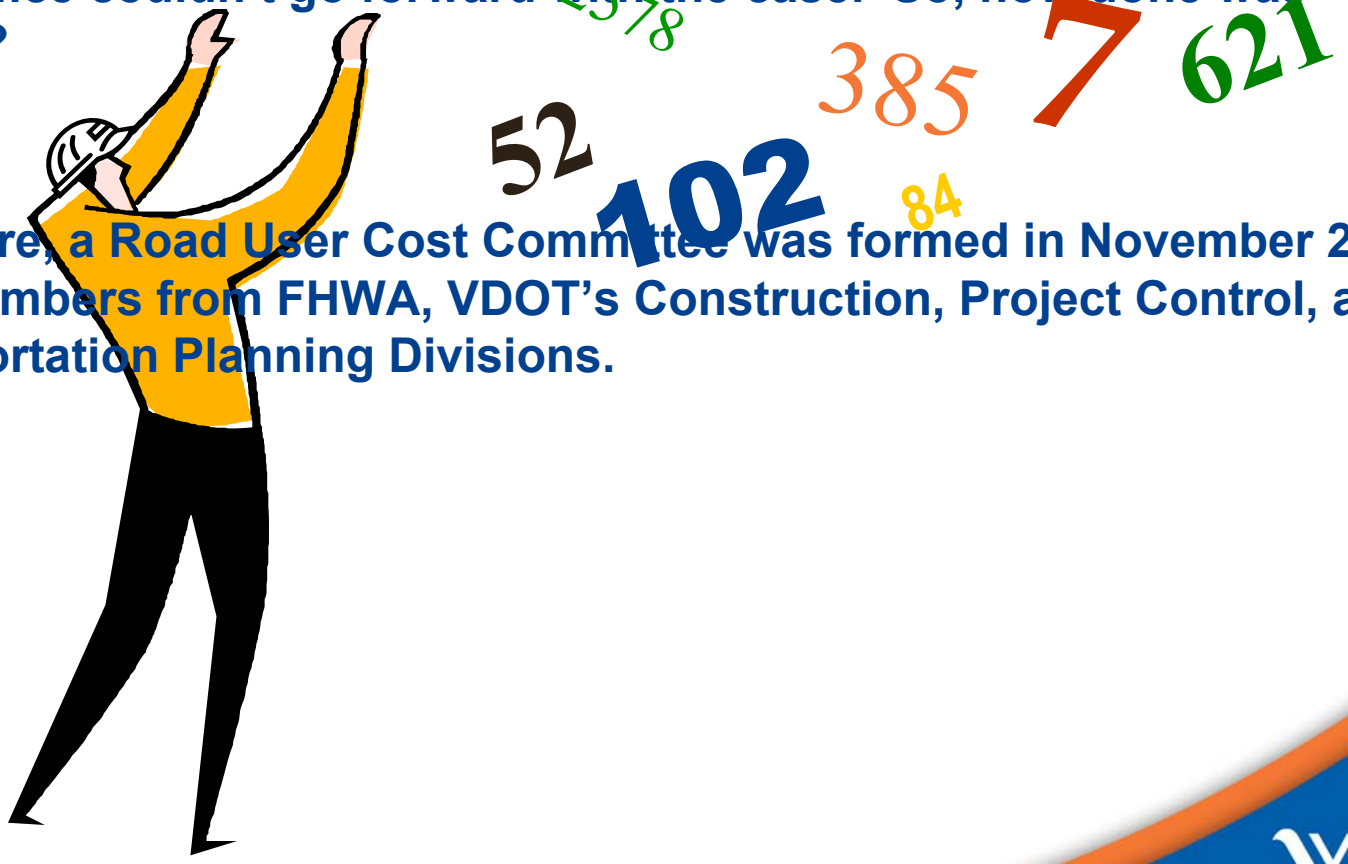
HUB-CAP, A-HOW-TOOL TO MEET LEGAL CHALLENGES FOR LANE RENTAL DURING THE CONSTRUCTION *(Session 13A)*

Presented at the 13th TRB Transportation Planning Application Conference, Reno Nevada, May 8-12, 2011

Edreece "Ed" Azimi
Sr. Transportation Engineer
Northern Virginia District Office

Background …

- VDOT's standardization of the Road User Costs calculation puts a process into effect to ensure Road User Fees are uniformly calculated and substantiated. Prior to the development of this tool, several projects' User Fees were challenged on the basis of technicality and inconsistency in their calculation and assessment. Consequently, the G.A. Office couldn't go forward with the case. So, how done was Before?



- Therefore, a Road User Cost Committee was formed in November 2007 with members from FHWA, VDOT's Construction, Project Control, and Transportation Planning Divisions.

Papers Review

- Five (5) States and two (2) Canadian User Benefit Guidelines & Policies were reviewed:

  - California
  - Kentucky
  - Maryland
  - New Jersey
  - Texas
  - Canada: Transport Canada & Victoria Transport Policy Institute

- AASHTO's 2003 User Benefit Analysis for Highway "The Red Book"

- All findings and recommendations were submitted to the Committee for review and recommendation

The Committee Recommendations

- **Produce Guideline Manual to standardize a statewide approaches**
- **Each district ability to input their local rates and figures**
- **Minimize inter-departmental data dependency**
- **Stands the legal challenges**

User Benefit Analysis Modules Created *(Before & After)*

- **Module 1A – Daily Value of Time Module** *(With 4 Detour Facilities)*
- **Module 1B – Hourly Value of Time Module** *(With 4 Detour Facilities)*
- **Module 2 – Accident Module** *(With 6 Accident Prediction Methods)*
- **Module 3 – Operation & Ownership Module** *(Out-of-pocket Expense)*

Module Refinement and Programming

- **Creation of HUB-CAP**
- **Program written in MS Excel**
- **User-friendly and crystal clear output**

Highway User Benefits-Cost Analysis Program, HUB-CAP

Modules General Inputs

- Project Information
- Project Length (mi, Km)
- Facility Type (Freeway/Xway, Major-, Minor-Arterial, Collecor & Pkway)
- Area Type (Urban, Rural)
- ADT, Average Daily Traffic (Before & After)
- Seasonal Factor (ADT/AADT)
- Free-Flow Speed: 85th Percentile Method (7.675+0.98*PS)
  Where Posted Speed (PS) >= 35 mph
- Percent Detour (0%-100% to max. 4 facilities)

Highway User Benefits-Cost Analysis Program, HUB-CAP



VDOT

Version 11.04

INPUTS * ARE * HIGHLIGHTED * IN * YELLOW

Input Module:	Module 1A	% Detour:	75%	Facility Name:	I-66				4/21/2011
Project Type:	i-66 Highway For Life			Facility Type:	Minor Arterial			Project Year:	2009
Project Number:	UPC			Analyst Name:	EA			Area Type:	Urban
Project Limit:	VA Route 243 to US Route 50			District:	9. Northern Virginia			User Manual	
Mod. 1A Calc Method:	Speed-Oper	Length:	1.00 mi.	County:	Fairfax				
Directional ADT:	BEFORE: 25,000	AFTER:	25,000	ADT/AADT Rate:	1.00	Capacity/h/l:		Selected	Recommended
Directional AADT:	BEFORE: 25,000	AFTER:	25,000	Speed (mph)	BEFORE: 30		BEFORE:	1,000	1,000
Directional VMT:	BEFORE: 25,000	AFTER:	25,000		AFTER: 30		AFTER:	1,000	1,000
Directional lane #:	BEFORE: 2	AFTER:	1	F-F Speed (If PS >= 35):	BEFORE: 30		AFTER:	30	

Additional comment here....

Detour Facility Name	Posted Speed, mph	Length, mi.	Detour Facility Name	Posted Speed, mph	Length, mi.
Road 1	45	0.50	Road 3	30	0.75
Road 2	35	1.00	Road 4	35	1.25

VDOT

Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 1A – Daily Value of Time Module

- Change in Daily Travel Time is valued (Before & After)
- Offers Three (3) Methods for Calculation of Benefit-Cost:
  1- Delay 2- Operating Speed 3- Posted Speed

Method 1 (Auto & Truck)

- Hourly Wages & % Compensation
- Vehicle Occupancy Rate
- Percent Truck
- Delay (Before & After), min.

Method 2 (Auto & Truck)

- Hourly Wages & % Compensation
- Vehicle Occupancy Rate
- Percent Truck
- Op. Speed (Before & After)

Method 3 (Auto & Truck)

- Hourly Wages & % Compensation
- Vehicle Occupancy Rate
- Lane Capacity/Hr. (Before & After)
- PH K-factor
- Posted Speed (Before & After)
- Dir. No. of Lane (Before & After)
- Percent Truck

Highway User Benefits-Cost Analysis Program, HUB-CAP

M O D U L E 1 A - Daily Value of Time Input

	Auto	Truck
Percentage of Hourly Wage/Compensation:	50%	100%
Average hourly wage:	$10.67	$25.00

Delay (min.):	Auto	Truck
BEFORE:	50	50
AFTER:	25	25

M O D U L E 1 A - Daily Value of Time Input

	Auto	Truck
Percentage of Hourly Wage/Compensation:	50%	100%
Average hourly wage:	$10.67	$25.00

Operating Speed (mph):	Auto	Truck
BEFORE:	50	50
AFTER:	25	25

M O D U L E 1 A - Daily Value of Time Input

F-Fspeed= (7.675+0.98*PostSpeed)

	Auto	Truck
Percentage of Hourly Wage/Compensation:	50%	100%
Average hourly wage:	$10.67	$25.00
Vehicle occupancy rate:	1.20	1.05
Percent ADT:	95.0%	5.0%

K-factor: 8%

VDOT

Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 1B – Hourly Value of Time Module

- Change in Hourly Travel Time is valued (Before & After)
- Directional No. of Lane (Before & After)
- Lane Capacity/Hr. (Before & After)
- Posted Speed, mi/hr or km/hr (Before & After)
- Percent Truck ADT, 2X-6T, SU & Tractor Trailer (Before & After)
- PCE, Passenger Car Equiv. Rate, Auto & 3 Truck Classes (Before & After)
- Vehicle Occupancy Rate, Auto, 2X-6T, SU & Tractor Trailer (Before & After)
- Value of Time/Hr., Auto, 2X-6T, SU & Tractor Trailer (Before & After)
- Additional Input: Hourly Traffic Volume or Hourly Rate (K-factor) for up to 24 hours required.

Highway User Benefits-Cost Analysis Program, HUB-CAP

M O D U L E 1B - Hourly Time Saving Benefit-Cost Input

		Class 4-5	Class 6-7	Class 8+
% Truck:	BEFORE:	2.0%	1.0%	2.0%
	AFTER:	2.0%	1.0%	2.0%
Weekday to Weekly Expansion Factor:				5.00

	Auto	Class 4-5	Class 6-7	Class 8+
PCE Rate:	1.0	1.0	2.0	3.0
Auto Occupancy Rate:	1.2	1.1	1.1	1.0
Value of Time $/hr.:	$10.67	$21.24	$21.24	$25.00

Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 1A & 1B – Utilized Volume-Delay Function (BPR Formulation)

- Base = $1 + 0.15 (v/c)^4$
- Updated Freeway = $1 + 0.2 (v/c)^{10}$
- Updated Arterial (Signalized) = $1 + 0.05 (v/c)^{10}$
- Updated Collector = $1 + 0.075 (v/c)^{10}$
- FHWA = $0.87 + 0.13 (v/c)^4$
- HCM Updated

F-F Speed	Freeway	Multi-lane Hwy
70 mph	$1 + 0.88 (v/c)^{9.8}$	$1 + 1.0 (v/c)^{5.4}$
60 mph	$1 + 0.83 (v/c)^{5.5}$	$1 + 0.83 (v/c)^{2.7}$
50 mph	$1 + 0.56 (v/c)^{3.6}$	$1 + 0.71 (v/c)^{2.1}$

Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 2 – Accident Module

- Potential safety costs during and/or after construction
- Accident Prediction Methods
  - VA Historical Accident Rates, *per million VMT*
    - Latest Single- & Ten-year Statewide historical crash data
    - Functional Class: Freeway, Primary & Secondary
    - Selected District
  - HSIS (Highway Safety Information System)

$$A_p = \text{Exp-3.6323} \times AADT^{0.5722} \times Length^{0.7182})$$

Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 2 – Accident Module *Cont.*

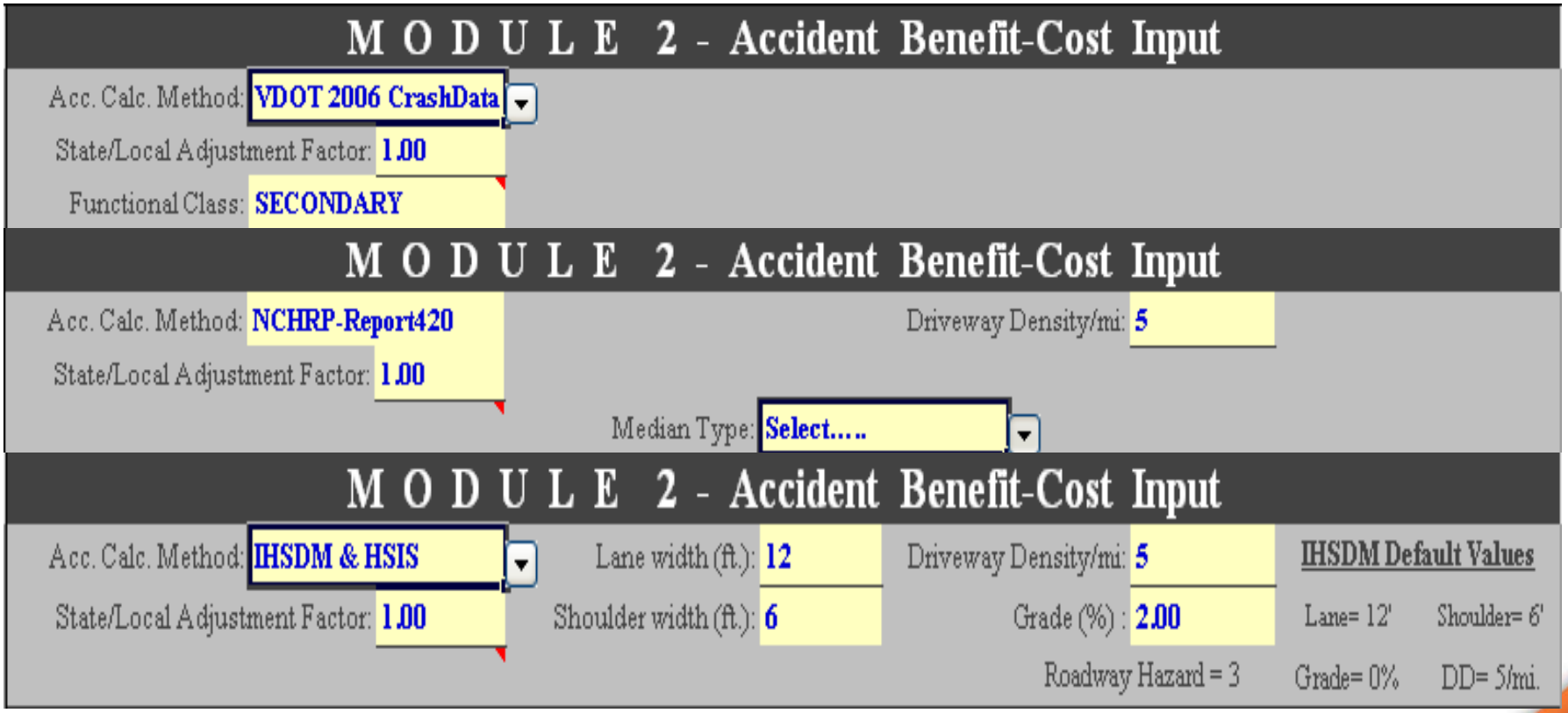
- IHSDM 2-lane Rural Hwy Model
  - Base Model: $A_p = AADT \times 365 \times 0.6148 \times L \times 10^{-6}$ (L = Length)
  - AMFs: Accident Modification Factors (Default)
    1. Lane width (12')
    2. Shoulder width, (6')
    3. Roadside hazard rating (3)
    4. Driveway density (5/mi)
    5. H-V curvature (No)
    6. Level grade (%)

Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 2 – Accident Module (*Cont.)*

- **NCHRP Report 420,** ***Impacts of Access Mgmt. Techniques, TRB 1999***
  - **Median type: Undivided, TWLTL & Non-traversable,** ***option 1***
  - **ADT,** ***Acc./mi/yr Based on Avg. of 7 Computer Models, option 2***
  - **No. of Access/mile,** ***Driveway density***
  - **Location,** ***Urban & Rural***

Highway User Benefits-Cost Analysis Program, HUB-CAP



Highway User Benefits-Cost Analysis Program, HUB-CAP

Module 3 – Operating and Ownership Module

- Out of Pocket Expenses
  - Effects on driving behavior
  - Includes driving expenses
- Operating Costs
  - Fuel & Oil
  - Maintenance
  - Tires
- Ownership Costs
  - Insurance
  - License & Registration Fees and Taxes
  - Economic Depreciation
  - Finance charges
  - Cost of Cargo on the vehicle

Highway User Benefits-Cost Analysis Program, HUB-CAP

MODULE 3 - Operation & Ownership Benefit-Cost Input								
Oper. Speed, mph:	Auto:	BEFORE:	45	AFTER:	60	Truck: BEFORE:	35	AFTER: 50
Finance Rate:	10.0%	APR	Auto	Truck	Truck Cargo Value:	$200,000	Auto	Truck
Fuel Cost per Gallon:			$1.50	$1.40	Vehicle Life (Years) :		10	8
Fuel Consumption per Mile:		BEFORE:	0.042	0.182	Vehicle Cost:		$20,000	$60,000
		AFTER:	0.040	0.166	Vehicle Salvage Value:		$2,000	$5,000
Other Operating Costs per Mile:			$0.040	$0.050	Vehicle Insurance Cost per Year:		$1,000	$1,500
Driving Miles per Year:			15,000	50,000	Percent ADT:		95.0%	5.0%

Highway User Benefits-Cost Analysis Program, HUB-CAP

Modules Output Refinement

- **MOE Adjustment Matrix**

ROAD USER COST MOE-MATRIX OUTPUT			
Facility Type	◯ Interstate	(X) **Primary**	◯ Secondary
COST OF CONSTRUCTION ($1,000)	◯ ≤ 500	◯ 500 - 2,000	(X) **2,000 - 8,000**
	◯ 8,000 - 15,000	◯ 15,000 - 45,000	◯ >45,000
LOCATION SETTING	(X) **Urban**	◯ Rural	◯ Suburbs
AADT	◯ ≤ 10K	(X) **10K to 50K**	◯ > 50K
RISK	◯ High	(X) **Medium**	◯ Low
APPLICATION	(X) **Lane Closure**	◯ Interim Milestone	◯ Substantial / Final Completion dates
Note: The MOE Matrix results a 28 percent reduction in hourly User Cost value calculated in Module 1B.			

Highway User Benefits-Cost Analysis Program, HUB-CAP

Summary

- A Comprehensive Road User Guideline Manual is Developed
- Blessed by VDOT Districts' Admin., A.G. Office, State Districts' & Construction Engineers and FHWA.
- Enables VDOT to plan more effective lane closure based on specific needs.
- HUB-CAP Standardized the process, and easily determine the lane closure guideline for a given roadway.
- User friendly, crystal clear, low data entry and high quality output

HUB-CAP Module 1A Output - Auto

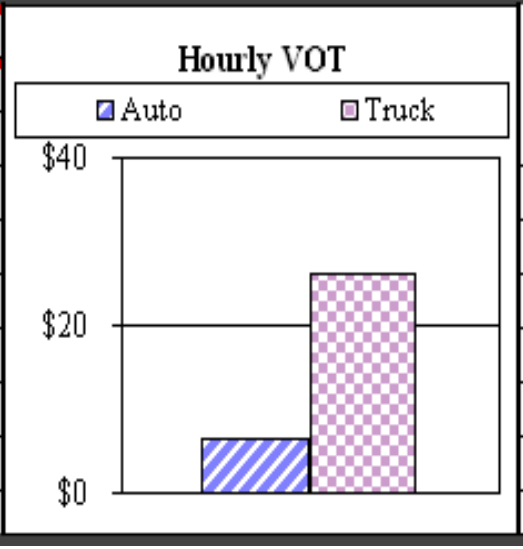
HUB | Module 1B | Module 2 | Module 3 | MOE-Matrix | Lookup Tables | Print

HUB-CAP © - Value of Time (VoT) by Day Output Sheet

Facility Name:	I-66			District:	9. Northern Virginia		
Project Type:	i-66 Highway For Life			County:	Select…..		
Project Number:	UPC	With 75 % Detour		Length:	1 mi.	Detour: 3.5 mi.	
Project Limit:	VA Route 243 to US Route 50			Analyst Name:	EA	Version 11.04	
Mod. 1A Calc Method:	2009	Calc. Method:	Speed-Post	Project Year:	4/27/2011	Area Type:	Urban
Facility Type:	Minor Arterial	K-factor:	8.0%	Lane Capacity (phpl):		BEFORE:	1,000
Directional # of Lane:	BEFORE: 2	AFTER:	3			AFTER:	1,000

AUTO

Percentage of Hourly Wage:		50%
Average hourly wage:		$10.67
Average vehicle occupancy:		1.20
Calc. Method: Po Speed	BEFORE	AFTER
Posted Speed (mph):	30	30
Operating Speed (mph):	24	29
Routed AADT:	23,800	11,900
Routed VMT:	23,800	11,900
Detoured AADT:	n/a	35,600
Detoured VMT:	n/a	124,600

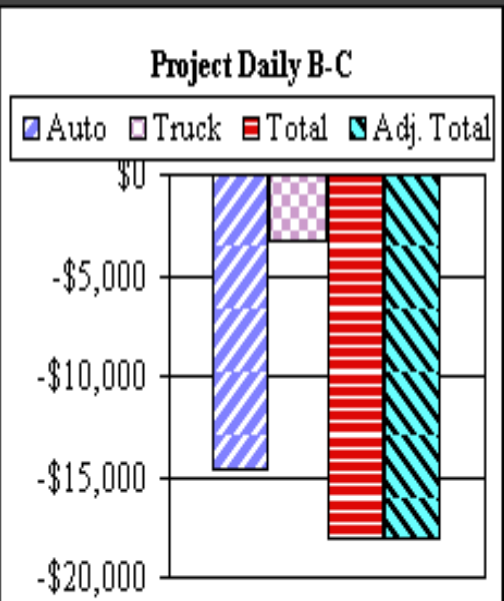


Travel Time per Vehicle (min.):	BEFORE:	2.52
	Routed After	2.04
	Detour After	6.02
Net Delay/Vehicle (min.):		-5.54
User Hourly VoT:		$6.40
User Hourly VoT/V_RMT:		$6.40
User Hourly VoT/V_DMT:		$1.83
User Benefit Routed Veh.:		$5,660
User Cost Detoured Vehicle:		-$20,342
Net User Cost:		-$14,682

HUB-CAP Module 1A Output - Truck

TRUCK

Percentage of Hourly Wage:		100%
Average hourly wage:		25.00
Average vehicle occupancy:		1.05
Calc. Method: Po Speed	**BEFORE**	**AFTER**
Posted Speed (mph):	30	30
Operating Speed (mph):	24	29
Routed AADT:	1,200	600
Routed VMT:	1,200	600
Detoured AADT:	n/a	1,900
Detoured VMT:	n/a	6,650



Travel Time per Vehicle (min.):	BEFORE:	2.52
	Routed After	2.04
	Detour After	6.02
Net Delay/Vehicle (min.):		-5.54
User Hourly VoT:		$26.25
User Hourly VoT/V_RMT:		$26.25
User Hourly VoT/V_DMT:		$7.50
User Benefit Routed Veh.:		$1,170
User Cost Detoured Vehicle:		-$4,482
Net User Cost:		-$3,312

PROJECT SUMMARY

Additional comment here....

VDOT Virginia Department of Transportation

V_RMT= Routed VMT

V_DMT= Detoured VMT

Daily User Cost:	-$17,994
Adjusted Daily User Cost (0%):	-$17,994
Routed AADT:	12,500
Detoured AADT:	37,500

For customer care, suggestion and/or comment, please contact: Ed.Azimi@VDOT.Virginia.gov **Voice: 703-259-2942, Fax: 703-815-3219**

HUB-CAP Module 1B Output

HUB | Module 1A | Module 2 | Module 3 | Lookup Tables | Print B-C | MOE-Matrix

HUB-CAP © Value of Time by Hour Output Sheet

Facility Name:	I-66	NOTE: The Yellow highlighted cells require hourly volume or rate (K-factor: Hvol./24vol.)	District:	9. Northern Virginia	Version 11.04
Project Type:	i-66 Highway For Life		County:	Select…..	With 75 % Detour
Project Number:	UPC		Area Type:	Urban	
Project Limit:	VA Route 243 to US Route 50		Project Year:	4/27/2011	ADT/AADT Rate: 1
od. 1A Calc Method:	2009		Analyst Name:	EA	
Length:	1 mi.		Facility Type:	Minor Arterial	

This Worksheet Uses Bureau of Public Roads & Updated Models using: $1+a*(v/c)^b$ Formula

For the calculation of Travel Time, the BPR, Modified BPR and HCM Modified BPR Models are utilized

Vehicle Type	BEFORE	AFTER	PCE Rates	Value of Time $/hr.	BEFORE	AFTER
Auto	95.0%	95.0%	1.0	$10.67	Lane Capacity (phpl)	
Truck-Class 4-5	2.0%	2.0%	2.0	$21.24	1,000	1,000
Truck-Class 6-7	1.0%	1.0%	3.0	$21.24	Total # of lanes	
Truck Class 8+	2.0%	2.0%	1.0	$25.00	2	3
Posted Speed, mph	30	30	PCE Weighted Avg.	$20.27	Total Hourly Capacity	
Auto Occup. Rate	1.20	Weekday to Weekly Expansion Factor		5.00	2,000	3,000

Additional comment here….

Highway User Benefit-Cost Analysis

Starting Time	BEFORE			AFTER		
	Hourly Rate (K-factor)	Total Vehicles	Total PCE	Total Vehicles	Total PCE	User Cost w/o Adjustment
12:00 AM	0.013	337	350	674	701	-$656
1:00 AM	0.008	205	213	410	426	-$399
2:00 AM	0.007	163	170	326	339	-$318
3:00 AM	0.005	130	135	259	270	-$253

HUB-CAP Module 1B Output Contd.

8:00 PM	0.043	1,074	1,117	2,148	2,234	-$2,079
9:00 PM	0.038	953	991	1,906	1,982	-$1,851
10:00 PM	0.033	827	860	1,653	1,719	-$1,611
11:00 PM	0.022	559	582	1,119	1,164	-$1,090
AADT	1,000	25,000	26,000	50,000	52,000	-$47,526

Summary: User cost value with asterisk (*) indicates congested hour (total 0 hours) with speed <= 50% of the Free-Flow speed of 30 mi./hr. & Travel Time Index (Actual TT/F-F TT) value > 2. The hourly user cost adjusted by 0 percent.

Weekly Cost	-$237,629
Monthly Cost	-$1,032,553
Annual Cost	-$12,390,632

For customer care, suggestion and/or comment, please contact: Ed.Azimi@VDOT.Virginia.gov 703-259-2942 Fax: 703-815-3219

The highlighted cells provided below are for making charts up to 5 Benefit-Cost scenarios comparison. After each B-C scenario, click on appropriate "Copy Scen. #" button or type manually.

I-66 Scenario Comparison

Starting Time	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
12:00 AM	$0	$0	$0	$0	$0
1:00 AM	$0	$0	$0	$0	$0
2:00 AM	$0	$0	$0	$0	$0
3:00 AM	$0	$0	$0	$0	$0
4:00 AM	$0	$0	$0	$0	$0
5:00 AM	$0	$0	$0	$0	$0
6:00 AM	$0	$0	$0	$0	$0
7:00 AM	$0	$0	$0	$0	$0
8:00 AM	$0	$0	$0	$0	$0
9:00 AM	$0	$0	$0	$0	$0
10:00 AM	$0	$0	$0	$0	$0
11:00 AM	$0	$0	$0	$0	$0
12:00 PM	$0	$0	$0	$0	$0

Copy Scen. 1

Copy Scen. 2

Copy Scen. 3

Copy Scen. 4

Copy Scen. 5

Scen. Chart

HUB-CAP Module 2 Output

HUB | Module 1A | Module 1B | Module 3 | MOE-Matrix | Lookup Tables | Print

HUB-CAP © Accident Output Sheet

Facility Name:	I-66 VA Route 243 to US Route 50			District:	9. Northern Virginia		
Project Type:	i-66 Highway For Life			County:	Select…..		
Project Number:	UPC	AMF[1]:	0.73	Length:	1.00	mi.	
Calc. Method:	IHSDM & HSIS	Grade (%) :	2.00	Analyst Name:	EA	Version 11.04	
Area Type:	Urban	Driveway Density/mi:	5.00	Median Type:	Select…..		
Project Year:	2009	Lane width (ft.):	12.00	Functional Class:	SECONDARY		
Date:	4/27/2011	Shoulder width (ft.):	6.00	State/Local Adjustment Factor:	1.00		

1 - AMF, Accident Modification Factor applied to the model results if IHSDM Accident Model selected.

BEFORE	AADT	25,000	VMT	25,000	Cost/Acc.: Fatal	Injury	PDO
AFTER		50,000		50,000	$3,760,000	$86,000	$6,500

BEFORE				AFTER			
Fatal	Injury	PDO	Total	Fatal	Injury	PDO	Total
Annual Accident and Cost Prediction using F H W A - IHSDM 2-Lane Hwy							
0	2	2	4	0	3	5	8
$125,795	$134,954	$16,081	$276,829	$251,590	$269,907	$32,161	$553,659
Annual Accident and Cost Prediction using Highway Safety Information System, HSIS							
0	3	5	9	0	5	8	13

HUB-CAP Module 2 Output Contd.

Annual Accident and Cost Prediction using Highway Safety Information System, HSIS							
0	3	5	9	0	5	8	13
$268,148	$287,671	$34,278	$590,097	$398,680	$427,706	$50,964	$877,349
Accident Analysis Δ							
Net Annual Accident and Cost Prediction using FHWA - IHSDM 2-Lane Hwy (BEFORE - AFTER)	FATAL	# Accidents	0	Net Annual Accident and Cost Prediction using Highway Safety Information System, HSIS (BEFORE - AFTER)	FATAL	# Accidents	0
		Cost	$125,795			Cost	$130,532
	INJURY	# Accidents	2		INJURY	# Accidents	2
		Cost	$134,954			Cost	$140,035
	PDO	# Accidents	2		PDO	# Accidents	3
		Cost	$16,081			Cost	$16,686
	Total	# Accidents	4		Total	# Accidents	4
		Cost	$276,829			Cost	$287,257

Additional comment here….

VDOT Virginia Department of Transportation

For Customer care, suggestion and/or comment, please contact: Ed.Azimi@VDOT.Virginia.gov 703-259-2942, Fax: 703-815-3219

VDOT

HUB-CAP Module 3 Output

HUB | Module 1A | Module 1B | Module 2 | MOE-Matrix | Lookup Tables | Print

HUB-CAP © Operating and Ownership Output Sheet

Facility Name:	I-66			District:	9. Northern Virginia	Version 11.04
Project Type:	i-66 Highway For Life			County:	Select…..	
Project Number:	UPC	Area Type:	Urban	Length:	1.00 mi.	Total users out of pocket cost:
Project Limit:	VA Route 243 to US Route 50			Date:	4/27/2011	
Project Year:	2009	BEFORE	AFTER	Analyst Name:	EA	
AADT:		25,000	50,000	Facility Type:	Minor Arterial	-$127
% Truck:		5.0%	5.0%	VDOT Virginia Department of Transportation		Finance Rates?
Operating Speed:	Auto:	45	60			
(mph)	Truck:	35	50	Finance Rate	10.0% APR	

AUTO			TRUCK		
Fuel Cost per Gallon		$1.50	Fuel Cost per Gallon		$ 1.40
Fuel Consumption per Mile	BEFORE	0.042	Fuel Consumption per Mile	BEFORE	0.1820
	AFTER	0.040		AFTER	0.1660
Other Operating Costs per Mile		$0.040	Other Operating Costs per Mile		0.0500
Vehicle Life (Year)		10	Vehicle Life (Year)		8

HUB-CAP Module 3 Output Contd.

Vehicle Life (Year)		10		Vehicle Life (Year)			8
Vehicle Cost		$20,000		Vehicle Cost			$60,000
Vehicle Salvage Value		$2,000		Vehicle Salvage Value			$5,000
Driving mi. per Year		15,000		Driving mi. per Year			50,000
Insurance Cost per Year		$1,000	$ 1,500	Cargo Value			$200,000
Fuel Cost per VMT	BEFORE	$0.063		Fuel Cost per VMT	BEFORE		$0.255
	AFTER	$0.060			AFTER		$0.232
Total Operating Cost per VMT	BEFORE	$0.103		Total Operating Cost per VMT	BEFORE		$0.305
	AFTER	$0.100			AFTER		$0.282
Amortized Vehicle Cost per Year		$3,129		Amortized Vehicle Cost per Year			$10,809
Additional comment here….				Inventory Cost per Hour			$2.283
				Inventory Cost per Mile	BEFORE		$0.065
					AFTER		$0.046
Amortized Vehicle Cost per VMT		$0.21		Vehicle Cost per VMT			$0.216
Insurance Cost per VMT		$0.07		Insurance Cost per VMT			$0.030
Ownership Cost per VMT	BEFORE	$0.28		Ownership Cost per VMT	BEFORE		$0.551
	AFTER	$0.28			AFTER		$0.529
Operation & Ownership Cost per VMT	BEFORE	$0.38		Operation & Ownership Cost per VMT	BEFORE		$0.856
	AFTER	$0.38			AFTER		$0.811
Operation & Ownership Saving per VMT		$0.00		Operation & Ownership Saving per VMT			$0.045
BEFORE	Auto VMT	23,750	Truck VMT	1,250	Total Operation and Ownership with 0 % Adj.	$127	-$127
AFTER		47,500		2,500		$255	

For Customer care, suggestion and/or comment, please contact: Ed.Azimi@VDOT.Virginia.gov 703-259-2942, Fax: 703-815-3219