National Capital Region Transportation Planning Board
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Item 3

MEMORANDUM

TO: Management, Operations, and Intelligent Transportation Systems (MOITS) Policy Task Force and MOITS Technical Subcommittee

FROM: Andrew J. Meese, AICP ajm
Systems Management Planning Director

Melanie Wellman mlw
Transportation Planner

DATE: December 4, 2007

SUBJECT: Update on Congestion Management Process development

The Congestion Management Process (CMP) is a requirement in metropolitan transportation planning, and focuses on evaluating transportation system performance; defining, analyzing, and implementing strategies for reducing congestion; and compiling project-specific information.

The lead development of the CMP falls under the TPB Technical Committee, with additional input and advice from various subcommittees. As outlined at the previous MOITS meeting, it is proposed that MOITS Policy Task Force and Technical Subcommittee advise staff in the CMP components related to non-recurring congestion and incident management. This is an ongoing process as information becomes available over the years, necessitating the continuing involvement and interaction of MOITS representatives.

At the October 9, 2007 meeting, MOITS was briefed on their role and input to the CMP. There are currently two tracks of the CMP. The initial track involves defining the process of the CMP for the long-range plan update, which will be released for public review mid-December, and is anticipated to be approved by the TPB in January. The second track involves development of the CMP technical report, which delves into greater detail on the process and strategies. It was suggested by the Travel Management Subcommittee in September that process development be pursued before completion of the technical report.

Over the past several months TPB staff has been compiling information on non-recurring and incident related congested, based on the knowledge of strategies being implemented by member agencies. A list of potential strategies to be included in the CMP was distributed to MOITS on October 9. A more detailed outline of these operational management strategies is attached.

Simply listing what strategies are being implemented in the region does not result in a process. We must also understand how these strategies were evolved, how they are addressing congestion, and the cost/benefit information associated with them. Also, once this information is collected, the data should be analyzed, evaluated, and categorized. We should be able to drawn conclusions and interpret the data we collect. As it stands, we currently have incomplete information on non-recurring and incident related strategies, and hope to gather additional information. Therefore, a

"straw man" is proposed as a potential means of collecting and analyzing non-recurring and incident management related data for the CMP. A process for doing that could look something like this:

1. ***Develop and identify*** a detailed list of strategies, based on knowledge of non-recurring and incident related congestion strategies being implemented by TPB member agencies, and in general, around the Country.
    a. Review monitoring activities and strategies through outreach with TPB subcommittees.
2. ***Gather data and information*** (both qualitative and quantitative) on each strategy from member agencies.
    a. How, when, why did the agency develop the strategy or program?
    b. Were any performance measures used to test the impact of that strategy on congestion?
    c. Are there existing maps, tables, reports outlining or explaining the strategy in further detail?
3. ***Analyze and organize data.***
    a. ***Design*** CMP analysis methodology
        i. ***Determine*** performance measures and evaluation criteria (e.g. volume-to-capacity ratio, level of service, duration of delay, etc.)
    b. ***Categorize*** strategies based on their potential impacts, and develop a "short list." (such as what was done with the TERMs).
4. ***Document conclusions*** in the form of a technical report.
    a. Were there strategies that seemed to have a greater impact than others? Were there certain locations in the region where certain strategies had a greater impact than others?
5. ***Continue*** to gather new information and data as it becomes available from member agencies and ***update information***.
6. ***Refine*** process as needed.

This "straw man" is intended to generate additional discussion on the CMP process. Any comments and feedback on this process are welcome, and further discussion will take place at the January MOITS meeting.

ATTACHMENT A:
Excerpts from CHART report

Input and Analysis

Performance Evaluation and Benefit Analysis for CHART

— Coordinated Highways Action Response Team –

in

Year 2006

(Final report)

Prepared by

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the analysis did not take into account data with duration greater than 2hours and outside the range of (mean ± two standard deviations). Also, incidents with durations less than 1 minute were excluded for the analysis. Based on the results shown in Table 4.1, it seems that with the assistance of CHART/MSHA response units, the time it took to clear an incident was reduced. On the average, CHART contributed to about 29% reduction in blockage duration reduction in incident duration has certainly contributed significantly to savings on travel time, fuel consumption, and related socio-economic costs. Note that the statistics shown in Table 4.1 are likely to be biased as only about 87% of incident reports contain all the information(reported received time and cleared time) required for incident duration computation. Data quality remains a critical issue to be addressed by CHART.

Table 4.1 Comparison on Incident Durations for Various Types of Lane Blockages

Duration= Cleared Time-Received Time

Blockage	With SHA Patrol		Without SHA Patrol	
	Duration (min)	Frequency	Duration (min)	Frequency
Shoulder	17.37	1979	32.59	26
1 lane	23.25	4583	29.36	121
2 lanes	35.89	1552	38.16	70
3 lanes	42.18	355	44.85	13
>=4 lanes	49.38	212	54.40	9
Unknown	19.02	5944	28.37	95
Weighted Average	22.92 (21.93)	14625*	32.45 (28.65)	334*

Note: 1. "Duration" is computed by the qualified samples with durations within mean±2 ×deviation and less than 2 hours

2. "Duration" less than 1 minute is excluded for the analysis

3. The number in each parenthesis shows the result of year 2005

*4. The number indicated with * denote the total number of available cases for this comparison*

Reduction due to Chart		Amount	Unit rate	Dollar (million)
Delay (M veh-hr)	Truck	2.446 (2.386)	$19.58 truck drivers' cost	47.89 (46.72)
			$45.40/hour (cargo's cost)	111.04 (108.33)
	Car	35.091 (26.276)	$14.34(car driver's cost)	503.20 (376.80)
Fuel Consumption (M gallon)		6.336 (4.838)	$1/gal	6.34 (4.84)
Emission (tons)	HC	490.72 (487.63)	6,700/ton	41.37 (41.11)
	CO	5,511.54 (5,476.90)	6,360/ton	
	NO	235.02 (233.54)	12,875/ton	
Total		**709.85 (577.79)**		

Table 5.2 Total Direct Benefits to Highway Users in 2006 Using Previous Unit Rates

Note: 1.The number in each parenthesis shows the results in Year 2005

Reduction due to Chart		Amount	Unit rate	Dollar (million)
Delay (M veh-hr)	Truck	2.446 (2.386)	$19.58 truck drivers' cost	47.89 (46.72)
			$45.40/hour (cargo's cost)	111.04 (108.33)
	Car	35.091 (26.276)	$25.06(car driver's cost)[2]	879.37 (658.48)
Fuel Consumption (M gallon)		6.336 (4.838)	$2/gal[2]	12.67 (9.68)
Emission (tons)	HC	490.72 (487.63)	6,700/ton	41.37 (41.11)
	CO	5,511.54 (5,476.90)	6,360/ton	
	NO	235.02 (233.54)	12,875/ton	
Total		**1092.35 (864.31)**		

Table 5.3 Total Direct Benefits to Highway Users in 2006 Using Updated Unit Rates

Note: 1.The number in each parenthesis shows the results in Year 2005

2. The car driver's cost and fuel price are updated based on the information from the U.S Census Bureau in Year 2005

The estimated reductions in vehicle emissions were based on parameters provided by MDOT and on the total delay reduction. Using the cost parameters shown in Table 5.3(DeCorla-Souza, 1998), the above reduction in emissions resulted in a total savings of 41.37 million dollars. Thus, CHART/MSHA's activities in Year 2006 generated a total savings of 1092.35 million

dollars, more than the benefits of 864.31 million dollars in Year 2005.

In addition to the above savings, a reduction in emissions due to reduced running time in the Baltimore and Washington regions have been computed. The results are summarized in Tables 5.4.

Table 5.4(a) Delay and Emissions Reductions for Trucks due to CHART/MSHA Operations for Washington and Baltimore Regions

Trucks		Total by Chart		Washington Region		Baltimore Region	
		Year 2006	Year 2005	Year 2006	Year 2005	Year 2006	Year 2005
Annual Delay Reduction	hour	2,445,865	2,386,080	658,954	768,708	1,786,911	1,617,373
Daily Delay Reduction	hour	9,407	9,177	2,534	2,957	6,873	6,221
Emission Reduction							
HC reduction	ton/day	0.123	0.120	0.049	0.052	0.074	0.068
	$/day	823.97	803.83	330.39	345.57	493.58	458.26
CO reduction	ton/day	1.381	1.348	0.554	0.579	0.827	0.768
	$/day	8,784.84	8,570.11	3,522.51	3,684.33	5,262.34	4,885.79
NO reduction	ton/day	0.059	0.057	0.024	0.025	0.035	0.033
	$/day	758.32	739.78	304.07	318.03	454.25	421.75
Total	$/day	10,367.13	10,113.72	4,156.96	4,347.93	6,210.16	5,765.79

Table 5.4 (b) Delay and Emissions Reductions for Cars due to CHART/MSHA Operations for Washington and Baltimore Regions

Cars		Total by Chart		Washington Region		Baltimore Region	
		Year 2006	Year 2005	Year 2006	Year 2005	Year 2006	Year 2005
Annual Delay Reduction	hour	35,090,766	26,276,118	12,748,222	9,997,882	22,342,544	16,278,235
Daily Delay Reduction	hour	134,964	101,062	49,032	38,453	85,933	62,609
Emission Reduction							
HC reduction	ton/day	1.764	1.321	0.707	0.568	1.057	0.753
	$/day	11,821.42	8,851.93	4,740.10	3,805.48	7,081.32	5,046.45
CO reduction	ton/day	19.817	14.839	7.946	6.379	11.871	8.460
	$/day	126,035.93	94,376.25	50,537.32	40,572.74	75,498.61	53,803.51
NO reduction	ton/day	0.845	0.633	0.339	0.272	0.506	0.361
	$/day	10,879.54	8,146.64	4,362.43	3,502.28	6,517.11	4,644.37
Total	$/day	148,736.89	111,374.82	59,639.85	47,880.50	89,097.04	63,494.33

As shown in Tables 5.4a and 5.4b, the daily delay reductions for the Washington region in 2006 were 2,534 hours/day and 49,032 hours/day for trucks and cars respectively,

TABLE 3

SUMMARY OF TERMs FOR 99-04 TIP & CLRP

- QUALITATIVE CRITERIA - (Maryland & Virginia)

		QUALITATIVE CRITERIA (noted by high, med., or low)									
		Impacts on Congestion		Enhance Existing Programs		Ease of Implementation		Likelihood of Adoption		Supports Multi-Modal	
		MD	VA	MD	VA	MD	VA	MD	VA	MD	VA
RECOMMENDED TERM											
M-101a	Mass Marketing Campaign (Consumer)	HIGH		HIGH		HIGH		MED-HIGH		HIGH	
SHORT LIST OF CANDIDATE TERMs											
M-123	Employer Outreach Service For Public Sector Agencies	HIGH		HIGH		HIGH	LOW-MED	MED-HIGH	HIGH	HIGH	
M-95	Additional Park-and-Ride Lot Spaces	MED		HIGH		MED		HIGH/MED		HIGH	MED/HIGH
M-110	Transit Stores in Maryland	HIGH		HIGH		HIGH		MED-HIGH		HIGH	
M-117	Transit Stores in Virginia	MED		HIGH		MED		HIGH		HIGH	
M-118	Expand Metrorail Parking	HIGH		HIGH		MED		MED	HIGH	HIGH	
M-113	Kiosks in Maryland	LOW		MED		MED		MED		LOW	MED
M-14a	Metrobus Fare Buydown (MD)	Pending results of evaluation of pilot program.									
LIST OF OTHER TERMs											
M-122	GRH for Southern Maryland (St. Mary's County)	LOW	MED	MED	HIGH	HIGH		HIGH	MED	MED	
M-70c	Bicycle Parking Canopies	LOW		LOW		HIGH		MED		MED	
M-115	Telecourses at Local Colleges and Universities	MED		MED		MED		MED		LOW	
M-102	Selected Bicycle Routes	LOW	MED	MED		MED		LOW	MED	LOW	MED
M-14	Metrobus Fare Buydown (VA)	MED		MED		HIGH		MED		MED	
M-112	Proximity Commuting	LOW		HIGH		MED		MED		LOW	
M-98	Alternative Fueled Vehicles (50)	LOW		MED	LOW	MED		LOW		LOW	
M-119	2 Electric Shuttle Buses in Tysons Corner	MED		HIGH		LOW		LOW		MED	
M-78	Increased Frequency on Selected Bus Routes	MED		MED		MED		LOW		HIGH	MED
M-76	TMOs in Maryland	LOW-MED		HIGH		LOW		MED		HIGH	MED
M-99	Bus Replacement (50)	LOW		MED		HIGH		LOW		MED	
M-93	Improve Pedestrian Facilities Near Rail Stations	LOW		MED		LOW	LOW-MED	LOW		MED	

LOW-MED = Value is between the two rankings

ATTACHMENT B:
Sample TERM short list

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TABLE 2

SUMMARY OF TERMs FOR 99-04 TIP & CLRP

- NOx Emissions Reductions -

	NOx Emissions Reduction Requirements /1	June 1999 N/A	June 2005 N/A	June 2010 N/A	June 2020 N/A	Time for Benefits	1999-2004 TOTAL TIP COST	COST EFFECT. /2 2005	DC/MD/V PERCENT SHARE
RECOMMENDED TERM									
M-101a	Mass Marketing Campaign (Consumer)	0.0000	0.7014	0.7001	0.7980	2 years	$4,610,000	$4,400	10/45/45
SHORT LIST OF CANDIDATE TERMs									
M-123	Employer Outreach Service For Public Sector Agencies	0.0000	0.1822	0.1848	0.2106	1 years	$2,880,000	$10,500	10/45/45
M-95	Additional Park-and-Ride Lot Spaces	0.0000	0.0183	0.0185	0.0211	3 years	$2,875,000	$15,200	**
M-110	Transit Stores in Maryland	0.0000	0.0831	0.1846	0.2747	2 years	$1,796,000	$19,800	0/100/0
M-117	Transit Stores in Virginia	0.0000	0.0590	0.0789	0.0943	2 years	$753,500	$36,600	0/0/100
M-118	Expand Metrorail Parking /4	0.0000	0.0000	0.0371	0.0365	3 years	$4,500,000	$41,600	**
M-113	Kiosks in Maryland	0.0000	0.0191	0.0273	0.0327	2 years	$928,000	$47,100	0/100/0
M-14a	Metrobus Fare Buydown (MD)	0.0000	0.0117	0.0119	0.0135	0.5 year	$1,252,800	$71,400	0/100/0
LIST OF OTHER TERMs									
M-122	GRH for Southern Maryland (St. Mary's County)	0.0021	0.0133	0.0170	0.0185	1 year	$333,100	$16,700	0/100/0
M-70c	Bicycle Parking Canopies	0.0000	0.0011	0.0011	0.0012	1 year	$86,500	$21,000	33/33/33
M-115	Telecourses at Local Colleges and Universities	0.0000	0.0340	0.0345	0.0393	2.5 years	$1,200,000	$23,500	33/33/33
M-102	Selected Bicycle Routes	0.0000	0.0249	0.0253	0.0288	3 years	$5,202,000	$23,600	0/65/35
M-14	Metrobus Fare Buydown (VA) /3	0.0000	0.0643	0.0652	0.0743	0.5 years	$4,980,000	$51,600	0/0/100
M-112	Proximity Commuting	0.0000	0.0235	0.0238	0.0272	1 year	$360,000	$61,300	10/45/45
M-98	Alternative Fueled Vehicles (50)	0.0000	0.0051	0.0041	0.0000	1 year	$1,550,000	$121,600	10/45/45
M-119	2 Electric Shuttle Buses in Tysons Corner	0.0000	0.0065	0.0066	0.0075	2 year	$1,265,700	$129,800	0/0/100
M-78	Increased Frequency on Selected Bus Routes	0.0000	0.0593	0.0601	0.0685	2 years	$11,592,450	$130,300	**
M-76	TMOs in Maryland	0.0000	0.0075	0.0168	0.0304	3 years	$2,221,000	$180,700	0/100/0
M-99	Bus Replacement (50)	0.0000	0.0734	0.0669	0.0000	3 years	$90,000,000	$225,000	**
M-93	Improve Pedestrian Facilities Near Rail Stations	0.0000	0.0016	0.0048	0.0086	3 years	$1,650,000	$275,000	0/50/50

** Funding shares of each jurisdiction is to be determined during implementation

/1 If any; to be estimated from the mobile emissions for each year vs. the mobile budget.

/2 Dollars per ton.

/3 This program was adopted as a TIP amendment in FY96 and cannot be adopted as an emissions reduction measure until I-66 reverts to HOV-3.

/4 The cost effectiveness is calculated for 2010.

Notes: **The mobile source emissions budget for NOx is 199.2 T/D**

M-76, M-110, M-113, & M-117 are TERMs with multiple elements. For ease of reference the Cost Effectiveness reflects calculations for single elements.

OPERATIONAL MANAGEMENT STRATEGIES

The TPB's CMP effort focuses on defining the existing operational management strategies that contribute to the more effective use and improved safety of existing and future transportation systems. The TPB is committed to a number of ongoing operational management strategies, such as:

Incident Management/Non-Recurring Congestion Strategies

According to the Federal Highway Administration, an estimated 50% of congestion is associated with incidents such as crashes, disabled vehicles, and traffic associated with special events. The TPB minimizes the impact these events have on the transportation network and traveler safety. If an incident disrupts traffic, it is important for congestion that normal flow resumes quickly. The TPB compiles and analyzes data associated with these incident management programs.

- **DDOT's emergency incident plan** provides information on many incident management areas, including updating and protecting communication network, deployment of evacuation dynamic message signs, emergency public address system, evacuation plans, and deployment of CCTV cameras.
- **Maryland's Coordinated Highways Action Response Team (CHART) program** provides TPB with information such as distribution of incidents and disabled vehicles by location; number and type of incidents responded to; reduction in secondary incidents; percent of incidents occurring on weekdays versus weekends; and roadway segments with highest number of incidents.
- **VDOT's Smart Traffic Control Center in Northern Virginia** collects data from loop detectors and pavement sensors embedded in the roadways to prompt an automatic incident detection system which alerts the traffic control center when there is an accident, complete with speed and occupancy data. In addition, VDOT alerts drivers of unexpected conditions with variable message signs and an AM radio station, such as for the Springfield Interchange and Woodrow Wilson Bridge projects.
- **The Metropolitan Area Transportation Operations Coordination (MATOC) program**, comprised of DDOT, MDOT, VDOT, and WMATA, is a regional program to enhance the availability of real-time transportation information and strengthen coordination among transportation agencies.

ITS Technologies and Systems Management

The TPB works with the region's jurisdictions and local transportation agencies to implement these ITS technologies, from which the TPB compiles and analyzes operational management data.

- **Advanced Traffic Signal Systems** apply computer and communications technologies to the operations of traffic signals in order to maximize safety and efficiency. Components of such systems include interconnection of groups of signals to facilitate timing and coordination among them, and countdown signals for pedestrians to bolster safety and walkability.
- **Electronic Payment Systems** use cards or transponders carried by the user that electronically communicate with devices maintained by a transportation agency to conduct and record payment transactions. Examples include WMATA's SmarTrip card, for uses on bus, rail, and WMATA parking lots, as well as the E-Z Pass toll system.
- **Service Patrols** involve specialized trucks or vans traveling the highways and rendering assistance where needed, such as pushing disabled vehicles off the road, providing gasoline, or changing tires.DDOT, MDOT, and VDOT all implement service patrols on roadways. Also, Montgomery County is the first local jurisdiction in the area to have patrols (since 2006), primarily on arterials.
- **Advanced Traveler Information Systems (ATIS)** are technology-based means of compiling and disseminating transportation system information on a real-time or near-real-time basis prior to or during tripmaking. Examples include the Virginia 511 system.
- **Transit Information Systems** provide information to riders after their trips have started,

including arrival and departure times, information on transfers and connections, and related services like park and ride availability.Metrorail implements passenger information on platform displays, on the web, and via mobile phone.

Capacity Increases (Where Necessary)

Federal law and regulations list capacity increases as another possible component of operational management strategies, for consideration in cases of:

- **Elimination of bottlenecks**, where a modest increase of capacity at a critical chokepoint can relieve congestion affecting a facility or facilities well beyond the chokepoint location. Widening the ramp from I-495 Capital Beltway Outer Loop to westbound VA 267 (Dulles Toll Road) relieved miles of regularly occurring backups on the Beltway and across the American Legion Bridge .
- **Safety improvements**, where safety issues may be worsening congestion, such as at high-crash locations, mitigating the safety issues may help alleviate congestion associated with those locations.
- **Traffic operational improvements**, including adding or lengthening left turn, right turn, or merge lanes or reconfiguring the engineering design of intersections to aid traffic flow while maintaining safety.