APPENDIX G – Summary of VISSIM Analysis

G. USE OF VISSIM MICRO-SIMULATION MODEL TO COMPARE TRANSIT ALTERNATIVES IN THE CORRIDOR

The VISSIM micro-simulation model was used to model traffic behavior in the Crystal City/Potomac Yard corridor. The VISSIM model was chosen because of its capabilities to simulate several transit alternatives including Bus Rapid Transit (BRT) and Light Rail Transit (LRT), running in mixed traffic or on an exclusive right of way. Another important reason in selecting this model was the possibility of modeling several traffic signal strategies, including transit signal priority.

The simulations done in this study were mainly applied to evaluate and compare changes in the corridor travel time for each alternative being analyzed for both automobile and transit traffic. Additionally, the model provided an excellent tool to observe the overall behavior of traffic and the impacts on major and minor streets when transit signal priority was applied.

A secondary objective achieved with traffic simulation was to graphically illustrate traffic conditions in the study area through animation. This capability of the model was used to communicate different aspects of the project to decision-makers and the public. The following sections describe the general characteristics of the model and its use in this study.

G.1 DESCRIPTION OF THE MODEL

The VISSIM Simulation System Version 3.6 models both traffic and transit operations (including bus, BRT, and LRT). The model consists of two integrated programs: the traffic flow model and the signal control model. The traffic flow model sends second by second detector information to the signal control program. The signal control uses this information to determine signal operation and re-send signal aspects to the traffic flow model. VISSIM then starts the next iteration of the traffic-flow. (See Figure G-1)

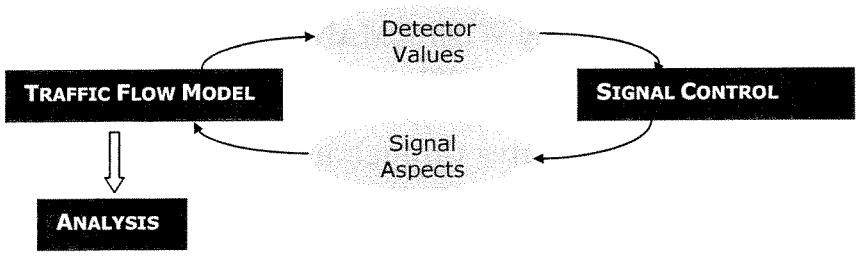

Figure G-1: Vissim Model Components

Simulation in VISSIM is microscopic and stochastic with fixed time-slices (one-second intervals). Since it is a microscopic simulation, all vehicles are simulated individually as they respond to various traffic conditions and other vehicles in the network. The result of the simulation is an online animation of the traffic flow and offline reports of several operational measures.

G.1.a. Description Of The Traffic Flow Model

Two sub-models are the basic components of the traffic flow model, the car-following model and the lane-changing model. The car-following sub-model describes the movement of vehicles based on a psychophysical driver behavior model developed by Wiedemann (1974). The basic concept behind this model is that the driver of a faster moving vehicle starts to decelerate when approaching a slower vehicle based on an individual perception threshold. Since the driver cannot determine the exact speed of the vehicle ahead, driver's speed will fall below that speed. The driver will then accelerate trying to adjust the speed to the vehicle ahead. This results in an iterative process of acceleration and deceleration as shown in Figure G-2

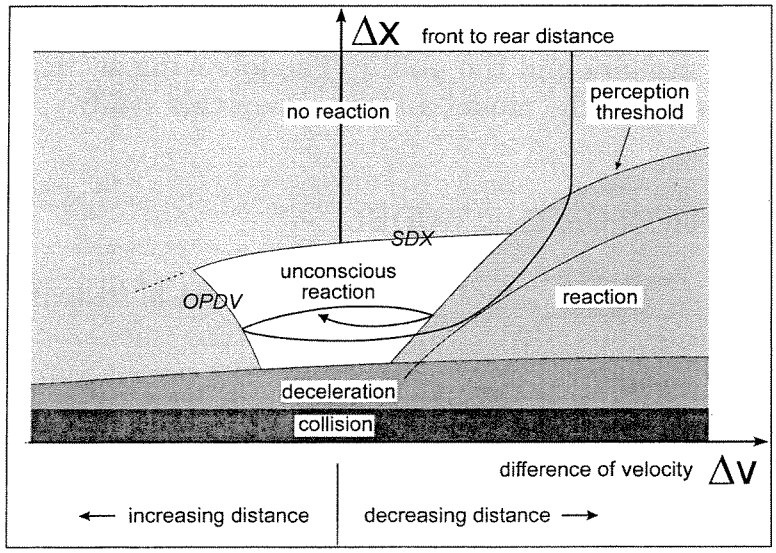

Figure G-2: Car-following model by WIEDEMANN. Source: Vissim 3.6 User Manual

The lane-changing sub-model operates through a complex set of rules, which mainly depend on the type of roadway environment (i.e. urban, freeway). The basic logic behind this sub-model is based on the concept that a faster vehicle approaching a slower one on the same lane, would check if it could improve its position by changing to an adjacent lane. In doing so, it takes into account up to six other near-by vehicles at each second. Drivers on multiple lane

roadways yield to preceding vehicles, but they also yield to adjacent vehicles when changing lanes.

The following attributes characterize each driver-vehicle unit present in the simulation:

- Vehicle length
- Maximum speed
- Potential acceleration
- Actual position in the network
- Actual speed and acceleration
- Behavior of driver-vehicle unit
- Psychophysical sensitivity thresholds of the driver (ability to estimate speeds and distances, aggressiveness)
- Memory of the driver
- Acceleration based on current speed and the driver's desired speed
- Interdependence of driver-vehicle units
- Reference to leading and following vehicles on own and adjacent lanes
- Reference to current link and next intersection
- Reference to next traffic signal.

The basic element of a VISSIM network is a link. A link represents a single or multiple-lane roadway segment. Connecting several links creates a network. A VISSIM network contains both static and dynamic data.

Static data remains unchanged during the simulation. It represents the roadway and/or track infrastructure and includes:

- Directional roadway segments with a specific number of lanes (these are called links)
- Connectors between links that replicate turning movements, lane drops, and lane additions
- Location and size of transit stops
- Position of traffic signals and stop lines
- Position and size of detectors
- Location of transit call points.

Dynamic data contains information about the simulated traffic. It includes:

- Traffic volumes for links entering the network
- Location of route selection points
- Priority rules to model unsignalized intersections and permissive left-turns
- Location of stop signs

- Public transit routes, departure times and dwell times
- Passenger boarding and alighting at transit stops.

The desired speed in urban areas does not derive directly from the technical data of a car but rather from the geometrical layout of the street and its intersections. Usually the desired speed is reduced around intersections. Semi-compatible movements are modeled via gap acceptance. The values of gap acceptance and waiting positions are user-definable. A public transport route is defined as a sequence of stops along lines. The stops are either on the link or next to it. Figure G-3 shows a schematic representation of the input data of an intersection being modeled in VISSIM.

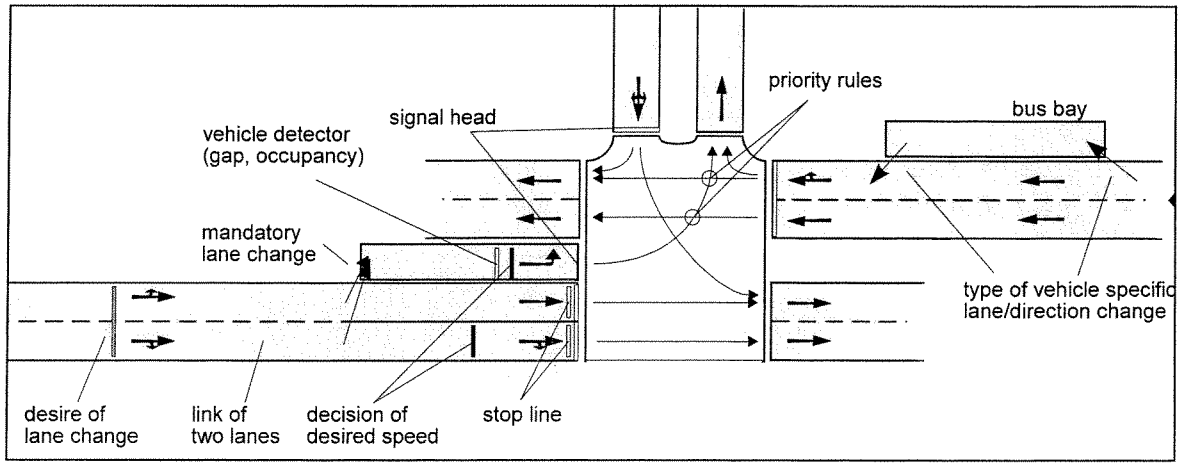

Figure G-3:
Intersection being modeled in VISSIM. Source: Vissim 3.6 user manual

G.1.b. Description Of The Signal Control Model

The Signal Control Model is where the signal control logic resides. Several types of signal strategies can be analyzed including fixed time, actuated, adaptive, transit signal priority, and ramp metering. This model reads detector information from the simulator for every time step. Based on the detector information, it decides the status of the signal display during the subsequent time step.

The model also includes a programming language called vehicle actuated programming (VAP) that can be used to model the control logic of a signal controller. During a simulation run, VAP interprets the logic programmed by the user, and sends the signal commands to the traffic flow model. At the same time, it interprets detector variables from the traffic flow model and adjusts the signal commands accordingly.

Two main components link the traffic flow model with the signal control model. These are signal heads and detectors. In VISSIM, signal controls are

modeled by placing signal heads at the positions of the stop bars on the street. Signal heads can be placed at any location, either on links or connectors, and during the simulation they will display the status of the signal control at each simulation second (green, amber, or red). Detectors measure the traffic for the signal control (i.e., gap, occupancy, and presence) and they are also used for microscopic and macroscopic measurements (i.e. speeds, volumes, and travel times).

G.2 SIMULATION APPROACH

Two sections of the corridor in the study area were simulated in the model. Those included one in the Potomac Yard area and one in the Crystal City area. The Potomac Yard network covered the triangular area encompassed by Jefferson Davis Highway (Route 1) on the west, the future Potomac Avenue on the east, and East Glebe Road on the north. The transit corridor in this area represents roughly ¾ of a mile along an exclusive right of way on the east side of Jefferson Davis Highway northbound. (See Figure G-4)

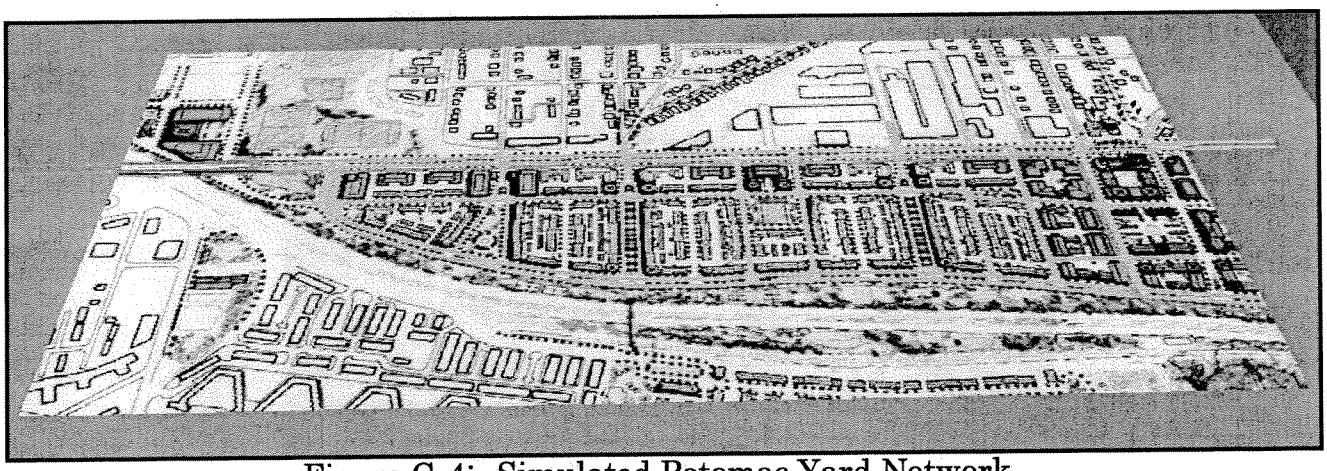

Figure G-4: Simulated Potomac Yard Network

The Crystal City section included the roadway network encompassed by Eads Street on the west, Crystal Drive on the east, Army Navy and 12th Street on the north, and 26th Street on the south. Figure G-5 shows the Crystal City network developed in VISSIM.

G.2.a. Data Input

The following information was used in developing the simulations:

- Aerial photograph (to scale) of the Crystal City area, and architectural drawings of the future site development in Potomac Yard
- Hourly traffic volumes per movement and traffic classification

- Signal timing parameters including forceoffs, offsets, clearance intervals, and detector locations obtained from the cities of Arlington and Alexandria, combined with HNTB analysis using SYNCHRO
- Intersection configuration
- Posted speed limits
- Bus routes and schedules from WMATA
- Transit stop locations and average dwell times.

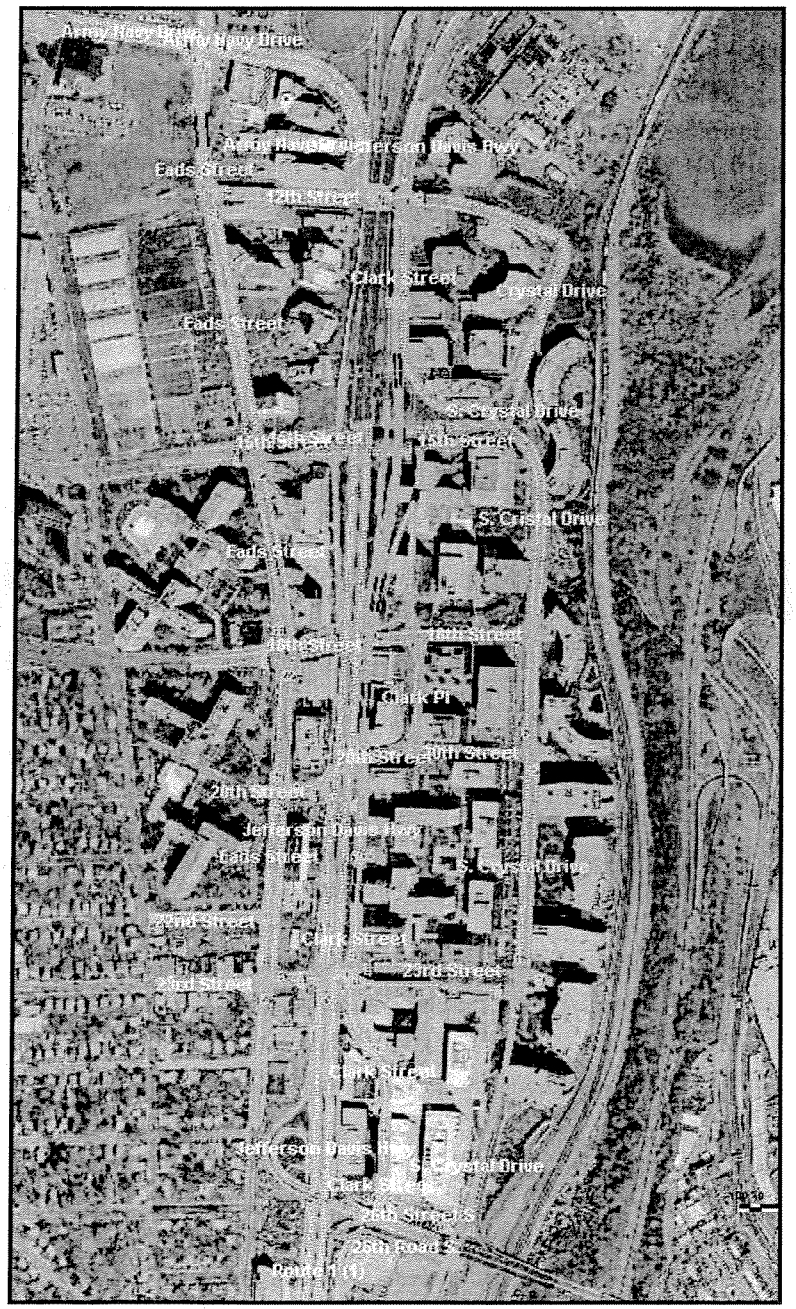

Figure G-5: Crystal City Simulated Network

G.2.b. Model Development

The first step in building the model was to create the traffic and transit network components discussed above. A GIS program was used to extract a scale copy of the corridor for importing into VISSIM. The GIS maps served as templates for using VISSIM's graphical user interface network tool to trace (code) the transit and traffic networks. The GIS maps also served as backgrounds for the simulation animations. The most important factor was that the network be scaled properly so that any input or output related to distance, such as vehicle travel time and speed, would be accurate.

As a second step, passenger boarding and alighting activity was coded into the model for each transit stop in the network. Transit schedule data was also prepared at this time and put into the model. This included vehicle arrival rates for each transit alternative.

As a third step, turning movement traffic volumes, provided by Arlington County and the City of Alexandria, were analyzed and prepared for the model. The traffic data represented PM peak hour conditions for the year 2010.

In addition to the traffic volumes, the city and county also provided the traffic signal parameters for most of the intersections in the corridor. The signalization data included SYNCHRO files from which the system offsets were obtained so that the proper signal coordination could be simulated. For other intersections, a SYNCHRO simulation was created using future traffic flows to obtain optimal signal data (splits, green time, cycle length, offsets, etc.). Traffic volumes were then input into the model, as well as routing decisions and priority rules for each of the networks.

The LRT/BRT configuration and traffic network were enhanced to collect information needed for analysis of the simulation results. VISSIM allows the user to define time segments that initiate the collection of vehicle travel times and other statistics over any particular time period. The time segments created for each alternative were placed to correspond with the time point intervals used to summarize the travel time along the corridor.

G.2.c. Transit Dwell Time

The operation of an LRT/BRT system is chiefly affected by dwell time factors that, at the same time influence travel time, delay, and reliability. Dwell time is a function of several factors including fare collection strategies, vehicle characteristics such as the capacity and low floor design, bus stop design, clearance time factors, etc. Bus stop design variables can incorporate bus stop size, bus stop placement either inline or offline (i.e., bus bays that

are constructed outside of the travel lane), layout of the passenger area, boarding/alighting height, etc. These elements are largely reflected in the boarding and alighting rates. For this study, the following dwell time factors were applied:

	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
Average "dead time" per stop	4 seconds	8 seconds
Average service time per passenger (boarding plus alighting)	1.1 seconds	0.8 seconds

In VISSIM, boarding times at each transit stop are simulated by defining an hourly rate of passenger arrival, and the time period in which passengers arrive. Alighting rates are defined by specifying the percentage of passengers on the bus that will get off at each stop. This percentage at each stop remains constant during the simulation. For both boarding and alighting, the user can specify either a fixed rate or use of a Poisson distribution, which will introduce more variability into the simulation.

G.2.d. Transit Signal Priority

Signal priority was considered a "given" feature for LRT/BRT in this study. Although no signal operation data (type of controller and type of signal priority strategy) is available at this planning stage, the assumption was that a "green extension and red truncation strategy" would be applied on signalized intersections on the corridor transit routes. VISSIM simulates this strategy by coding a VAP file (see section G.1.b.) that emulates a standard NEMA Controller that grants priority to transit vehicles running on a main street in the following fashion:

- As the simulation is running, if the bus approaches a green signal and additional green time is needed to clear the bus through the intersection (based on the vehicle's speed), the amount is compared with the green time remaining on that phase. The green is extended to provide the additional green time needed, unless this exceeds a defined maximum extension.

- If the bus is approaching a red signal, the possibility of truncating the main street red (returning green to the approaching bus early) will be checked. The time needed to end the main street red (for pedestrian clearance, etc.) is compared with the remaining red time to decide if there is enough time left for the truncation.

G.2.e. Impact Assessment

Several alternatives were modeled for a 2010 peak-hour traffic scenario. These included:

- Potomac Yard – No-build (no addition of new transit)
- Potomac Yard LRT
- Potomac Yard BRT
- Crystal City – Baseline (no addition of new transit)
- Crystal City LRT – Alternative 1 (Eads Street)
- Crystal City LRT – Alternative 2 (Clark Street)
- Crystal City BRT – Alternative 1 (Eads Street)
- Crystal City BRT – Alternative 2 (Clark Street)

Measures of Effectiveness (MOEs) for this analysis were limited to travel time. It is generally accepted that a minimum of three simulation runs should be performed. For this project, five one-hour simulation runs were performed for each model using the same five random seeds.[1] Data collection was not started until 600 seconds had passed to allow for sufficient vehicle buildup in the network.

Using the output of the simulation runs, the travel times were collected on each alternative for both transit and general-purpose vehicles. Travel times for the entire corridor were obtained by integrating the results from the model on the simulated areas and adding travel time estimations for the remaining areas based on traffic average speed.

Table G-1 summarizes the results for each alternative.

[1] A seed is the starting number used to start a random number generator.

Table G-1: Travel Time Changes in the Corridor

Alternative			Travel Time (minutes)		Difference w/Baseline	
			Northbound	Southbound	Northbound	Southbound
Auto	Auto Base Condition (No-build)		22.10	18.23	-	-
	LRT	Alternative 1	20.48	16.63	-1.62	-1.60
		Alternative 2	20.57	16.50	-1.53	-1.73
	BRT	Alternative 1	18.40	19.07	-3.70	+0.84
		Alternative 2	18.41	16.49	-3.69	-1.74
Transit	Transit Base Condition (No-build)		30.89	26.45	-	-
	LRT	Alternative 1	20.57	23.60	-10.32	-2.58
		Alternative 2	19.83	20.42	-11.06	-6.03
	BRT	Alternative 1	18.30	20.04	-12.59	-6.41
		Alternative 2	17.30	17.62	-13.59	-8.83

APPENDIX H – Travel Demand Forecasting

H. TRAVEL DEMAND FORECASTING

H.1 VERSION 2 MODEL

The alternatives evaluation process for the Crystal City/Potomac Yard Transit Alternatives Analysis included the use of the regional travel forecasting model to generate forecasts of transit ridership under each alternative for the year 2025. Many of the evaluation factors used to compare the alternatives were calculated on the basis of the results of the model.

The travel demand forecasting model used in this study was based on the MWCOG Version 2 Model that was first applied in the *WMATA Transit Patronage Forecast* study undertaken by MWCOG for WMATA during 2000. This model was also used in the Capital Beltway Rail Feasibility Study and is currently being utilized on a number of regional planning studies. This model is based on the standard four-step urban transportation planning (UTP) process.

The UTP process has been used and continuously enhanced by transportation planning practitioners and researchers for more than four decades. Through the years, the four basic model components have remained unchanged but numerous model variations have been developed and applied to address the changing planning issues and agenda. The four basic steps of the UTP process are:

- Trip generation
- Trip distribution
- Mode choice
- Trip assignment.

Trip generation analysis estimates the number of trips generated over an entire geographical area, such as the Washington metropolitan area, for a given time period (i.e., daily trips or peak-period trips). Trip generation analysis also estimates the number of trips produced or attracted by specific geographical areas (i.e., traffic analysis zones) within the larger region, based on socio-demographic and land use information.

Trip distribution modeling determines, on a zonal basis, the trip origins and destinations based on the locations of households, workplaces, schools, and other activity sites. Trip distribution also considers travel time, travel cost, and accessibility factors. Travel surveys and an assortment of behavioral models are also used to facilitate the trip distribution process.

Mode choice modeling predicts the travel mode that individuals would likely take for a given trip based on their preferences, travel time, cost, and the availability and characteristics of alternative modes of travel.

Trip assignment models then determine the most likely travel path, through the highway or transit networks, that an individual would follow given the origin and destination zones of the trips. The end results are an estimate of traffic volumes for every link in the highway network, and ridership for bus routes and rail lines in the transit network.

The Version 2 Model is similar to earlier models utilized in the region in a number of respects: (a) it is based on the standard four-step UTP process; (b) it covers the same geographical area known as the expanded cordon which includes the twelve member jurisdictions of MWCOG plus ten counties immediately adjacent to the outer MWCOG counties; (c) it contains the same set of trip purpose definitions.

The primary Version 2 Model has a number of enhancements not found in earlier models:

- An improved iterative feedback linkage between trip distribution and trip assignment that allows for a better representation of the effects of congestion on travel behavior.
- Inclusion of models to estimate motorized person trips and transit trips for non-work trip purposes.
- Inclusion of models for non-motorized person trips (i.e., walking and bicycle trips).
- Explicit modeling of highway and transit travel by time of day (AM peak period and off-peak period).
- The entire four-step process is modeled at the finer traffic analysis zone level, instead of at the traffic district level which is an aggregation of traffic analysis zones.
- Inclusion of household size and income level as model inputs.
- Inclusion of transit accessibility variables in the modeling process.

The enhancements to the Version 2 Model make it better-suited than earlier models for use in this project due to its increased sensitivity to characteristics of transit service that are likely to differ among the various alternatives being evaluated.

An additional important element of the travel forecasting process is the use of regionally accepted forecasts of population, households, and employment. These are key factors in determining the number, location, and types of trips

to be made in the future. For this project, MWCOG's Round 6.2 Cooperative Forecast was utilized.

H.2 MODEL REFINEMENTS FOR THE STUDY AREA

Before it could be applied to the alternatives being considered, the MWCOG Version 2 Model was validated and refined for the Crystal City/Potomac Yard Transit Alternatives Analysis. The MWCOG Staff calibrated the Version 2 Model for the *WMATA Patronage Forecast* study using survey data for 1994 conditions. The accuracy of the 1994 model calibration work performed by the MWCOG staff for the WMATA study was sufficient for the ridership analysis requirements of the Crystal City/Potomac Yard Transit Alternatives Analysis. The percentage error between the actual and estimated boardings was 3.2% for the entire Metrorail system and 12.2% for the Northern Virginia Metrorail stations.

The calibrated model was then validated for this study by applying it to year 2000 conditions. The validation process involved the execution of the base year (2000) model for the purposes of replicating the MWCOG model run, and evaluating the accuracy of the model's ridership estimates.

The first step in the validation process was model replication. The Study Team successfully replicated the MWCOG model run. The results were verified by comparing the outputs from the project team's execution of the model with the corresponding outputs provided by MWCOG. This step is necessary to guarantee that no unexpected results occur due to the model being run under a different computing environment from that in which it was developed.

Validation of the model was then made by comparing the ridership estimates from the model with ridership statistics obtained from WMATA. The validation process focused on comparing the actual and estimated Metrorail boardings and alightings at the Metrorail stations of the Blue and Yellow Lines within Northern Virginia. The results of the validation indicate that the model estimates are within 10% of actual ridership on the Blue and Yellow Lines within Northern Virginia.

Next, certain refinements were made to the model to improve its sensitivity to the types of system changes being proposed for study within the Crystal City/Potomac Yard area. The initial model refinements made by the Study Team focused on providing additional zone and network detail within the study area corridor. The project study area included a total of 35 MWCOG traffic analysis zones. These MWCOG zones were split in order to achieve a

better representation of the walk and auto access trips to proposed rail stations and BRT boarding locations. The zone splitting process increased the number of zones from 35 to 57 within the project area. Each of the new zones was checked to ensure that the employment and population in the original zones was properly distributed within the new smaller zones. This included a thorough review of the various current land use plans for the proposed developments in the Potomac Yard area in Arlington and Alexandria, as well as changes envisioned for the Pentagon City and Crystal City areas of Arlington.

Transit accessibility factors were then calculated for each of the 57 zones to reflect the ability of residents and employees within these zones to access the study alternatives by transit, by car, and by various non-motorized modes.

The final step in the process of refining the model for use in this project included coding the various project transit elements into the transit network. This included making sure that the various project alternatives were each correctly reflected in the network and that the appropriate background or baseline rail transit network was also correctly reflected. Finally, the bus routes along the corridor were also verified and the new feeder bus routes previously described were coded for each of the project alternatives.

H.3 ASSUMPTIONS

Once the MWCOG Version 2 Model was validated and calibrated for use in the Crystal City/Potomac Yard Transit Alternatives Analysis, a number of detailed assumptions needed to be made and coded into the 2025 network. These assumptions included the frequency of service (headways) on the various transit lines included in the network, the fare structure for the regional transit system, and which other planned or proposed transit projects to include as part of the background network for the current analysis. The following sections outline the major assumptions that were made and coded into the model.

As stated above, the characteristics of the transit system are an important input to the travel forecasting model. One of the most important characteristics is the headway or frequency of service on each element of the transit network. The headway impacts upon the waiting time for access to buses and trains and therefore impacts the total travel time and the relative travel time between the transit and auto modes.

For the Crystal City/Potomac Yard Transit Alternatives Analysis, headways for the background regional transit system were set to match those used in

the *WMATA Transit Patronage Forecast* project. For the project alternatives, headways were initially set at 10 minutes for the BRT and LRT alternatives. For the Metrorail alternative, the headways were the same as those used in the WMATA study. The headway for the new feeder bus routes were added to the network for the current project and set at 15 minutes throughout the day.

As the study progressed and the initial ridership estimates were produced for the various alternatives, it was determined that the BRT alternatives did not have adequate peak period capacity to carry the number of riders assigned to the BRT service. In order to accommodate the projected ridership levels, peak headways for the BRT alternatives were reduced to six minutes. By reducing the headways, waiting times and thus total travel times for this mode would were reduced. This increased the attractiveness of the BRT mode over the alternative transit modes and increased its ridership.

Rather than running the entire model chain over again to estimate the impact of this change, it was decided to use an alternative method to derive the increased ridership to be expected from the headway reduction. Over the years, based on various research efforts, the transit industry has developed a number of elasticity measures to estimate the ridership impacts of changing various aspects of a service such as fare, travel time, the number of transfers, and waiting times. Using this approach, a revised ridership estimate was calculated for the BRT alternatives and then checked to see if the increased peak period capacity would be able to carry the resulting ridership. The result of the improved headways (from ten minutes to six minutes) was approximately a four percent increase in BRT ridership.

The monetary cost of using the transit system is another variable that is considered by the travel forecasting process. For the Crystal City/Potomac Yard Transit Alternatives Analysis, the fare structure assumed to be in place was the same one used in the *WMATA Transit Patronage Forecast.*

In that study, two major assumptions were made relative to transit fares. One was that the latest WMATA tariff (#19) was assumed to be in place for all forecast years, including 2025. That tariff included the simplification of regional bus fares with a reduction in the number of fare zones and capping fares for local bus service at $1.10 and express service at $2.00 (in year 2000 dollars.) Rail fares were set at current year levels. The second fare assumption was that both bus and rail fares would increase only every fifth year at the rate of inflation in that year (assumed at 2.5 percent per year). This assumption reduces future fare levels for transit when expressed in terms of current dollars (year 2000).

H.4 BASELINE – BACKGROUND TRANSPORTATION NETWORK

Another important issue for the travel forecasting effort, deals with what other projects and transit services are assumed to be in place in the forecast year. This assumption can dramatically impact the results of the future year forecasts as the Crystal City/Potomac Yard alternatives will be part of a regional network of services. Also, assumptions about the future highway network affect projected transit and non-transit travel times and impact the predicted mode splits of future travelers.

The baseline utilized for this analysis included: the adopted 2025 CLRP network, without an additional Metrorail station at Potomac Yard; a number of additional highway and transit projects in the corridor that are already included in other state and local plans; signal priority; and improvements to the bus service in the corridor.

The various study alternatives were compared against this alternative baseline network. For a full discussion on the baseline established for this study, see Appendix B.

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APPENDIX I – Cost Estimate

Baseline Lite Alternative

New Roadway				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Asphalt Pavement	sf	$13.10	0	$0.00
Curb & Gutter	lf	$120.00	0	$0.00
			Total Cost	$0.00

Bus Stops				
Item Description	Unit	Unit Cost	Quantity	Total Cost
CIP concrete platform slab (60' x 12')	sf	$150.00	0	$0.00
Station canopy (40' x 12')	sf	$60.00	0	$0.00
Wind screen shelter	ea	$10,000.00	1	$10,000.00
Ticket vending machines	ea	$80,000.00	2	$160,000.00
Concrete slab to prevent shoving in pavement (60' x 8' x 9")	cy	$416.26	13.33	$5,548.75
Asphalt pavement removal (60' x 8')	sy	$5.00	53.33	$266.65
Common excavation & haul 10 miles (60' x 8' x 9")	cy	$8.00	13.33	$106.64
Miscellaneous demolition - crew and equipment (Asphalt pavement removal)	hr	$300.00	10	$3,000.00
Display signs	ea	$6,000.00	1	$6,000.00
			Cost/Bus Stop with Asphalt Removal	$184,815.40
			Cost/Bus Stop with Earth Removal	$181,655.39
			Number of Bus Stops with Asphalt Removal	32
			Number of Bus Stops with Earth Removal	8
			Total Cost	$7,367,335.75

Buses				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Buses	ea	$300,000.00	4	$1,200,000.00
Spares	ea	$300,000.00	1	$300,000.00
Vehicle hardware	ea	$2,200.00	11	$24,200.00
CDPD Modem	ea	$1,000.00	11	$11,000.00
Maintenance	ea	$250,000.00	11	$2,750,000.00
Announcements onboard bus	ea	$4,000.00	11	$44,000.00
AVL (GPS, receiver, processor)	ea	$5,000.00	11	$55,000.00
			Total Cost	$4,384,200.00

Feeder Buses				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Feeder Bus	ea	$300,000.00	0	$0.00
Maintenance	ea	$250,000.00	0	$0.00
			Total Cost	$0.00

Signals				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Intersection hardware	ea	$20,000.00	1	$20,000.00
			Cost/Intersection	$20,000.00
			Number of Intersections	7
			Total Cost	$140,000.00

Right of Way for Alignment				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Alexandria and Arlington Taking for Transitway	ls	$2,548,195.00	0	$0.00

Additional System Costs				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Host processor, WAN connection, etc.	ea	$150,000.00	1	$150,000.00
Software system	ea	$1,700.00	1	$1,700.00
Audio database for on-board announcements	ea	$50,000.00	1	$50,000.00
System engineering & documentation	ls	$40,340.00	1	$40,340.00
			Total Cost	$242,040.00

Transit Dedicated Bridge				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Transit Dedicated Bridge - Parallel to Potomac Yard Route 1 Bridge	sf	$150.00	0	$0.00
			Total Cost	$0.00

Total Project Cost	$12,133,575.75
Contingency	30%
Total Construction Cost	$15,773,648.48

Key-Units

ea	each
tf	track-foot
lf	linear foot
sf	square foot
sy	square yard
cy	cubic yard
ls	lump sum
rm	route mile
space	individual parking space

BRT Cost Estimate (Alternative 1 - Eads Street)

New Roadway

Item Description	Unit	Unit Cost	Quantity	Total Cost
Asphalt Pavement	sf	$13.10	336,000	$4,401,600.00
Curb & Gutter	lf	$120.00	28,000	$3,360,000.00
			Total Cost	$7,761,600.00

Bus Stops

Item Description	Unit	Unit Cost	Quantity	Total Cost
CIP concrete platform slab (60' x 12')	sf	$150.00	720	$108,000.00
Station canopy (40' x 12')	sf	$60.00	480	$28,800.00
Wind screen shelter	ea	$10,000.00	1	$10,000.00
Ticket vending machines	ea	$80,000.00	2	$160,000.00
Concrete slab to prevent shoving in pavement (60' x 8' x 9")	cy	$416.26	13.33	$5,548.75
Asphalt pavement removal (60' x 8')	sy	$5.00	53.33	$266.65
Common excavation & haul 10 miles (60' x 8' x 9")	cy	$8.00	13.33	$106.64
Miscellaneous demolition - crew and equipment (Asphalt pavement removal)	hr	$300.00	10	$3,000.00
Display signs	ea	$6,000.00	1	$6,000.00
			Cost/Bus Stop with Asphalt Removal	$321,615.40
			Cost/Bus Stop with Earth Removal	$318,455.39
			Number of Bus Stops with Asphalt Removal	32
			Number of Bus Stops with Earth Removal	8
			Total Cost	$12,839,335.75

Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Buses	ea	$399,000.00	10	$3,990,000.00
Spares	ea	$399,000.00	1	$399,000.00
Vehicle hardware	ea	$2,200.00	11	$24,200.00
CDPD Modem	ea	$1,000.00	11	$11,000.00
Maintenance	ea	$250,000.00	11	$2,750,000.00
Announcements onboard bus	ea	$4,000.00	11	$44,000.00
AVL (GPS, receiver, processor)	ea	$5,000.00	11	$55,000.00
			Total Cost	$7,273,200.00

Feeder Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Feeder Bus	ea	$300,000.00	7	$2,100,000.00
Maintenance	ea	$250,000.00	7	$1,750,000.00
			Total Cost	$3,850,000.00

Signals

Item Description	Unit	Unit Cost	Quantity	Total Cost
Intersection hardware	ea	$20,000.00	1	$20,000.00
			Cost/Intersection	$20,000.00
			Number of Intersections	7
			Total Cost	$140,000.00

Right of Way for Alignment

Item Description	Unit	Unit Cost	Quantity	Total Cost
Alexandria and Arlington Taking for Transitway	ls	$2,548,195.00	1	$2,548,195.00

Additional System Costs

Item Description	Unit	Unit Cost	Quantity	Total Cost
Host processor, WAN connection, etc.	ea	$150,000.00	1	$150,000.00
Software system	ea	$1,700.00	1	$1,700.00
Audio database for on-board announcements	ea	$50,000.00	1	$50,000.00
System engineering & documentation	ls	$40,340.00	1	$40,340.00
			Total Cost	$242,040.00

Transit Dedicated Bridge

Item Description	Unit	Unit Cost	Quantity	Total Cost
Transit Dedicated Bridge - Parallel to Potomac Yard Route 1 Bridge	sf	$150.00	27200	$4,080,000.00
			Total Cost	$4,080,000.00

The Transit Dedicated Bridge will allow the LRT to pass through the Potomac Yard area without having to share travel lanes with other drivers. The total cost was developed based off of the existing plans for the Potomac Yard Route 1 Bridge that will straighten Route 1 by bypassing the Monroe Street Bridge through the Potomac Yard area. The unit cost was determined by looking at the individual pieces that make up the already designed structure and removing the unneeded items. Among the removed items from the Transit Dedicated Bridge include a telephone conduit system, an electrical conduit system, a gas line system, and a water line system. These utilities that were included on the Potomac Yard Route 1 Bridge do not need to be duplicated on the Transit Dedicated Bridge that runs parallel to it. Other than the removal of the previously listed utility items and a more narrow bridge deck, the Transit Dedicated Bridge follows the same plans as the Potomac Yard Route 1 Bridge.

Total Project Cost	$38,734,370.75
Contingency	30%
Total Construction Cost	**$50,354,681.98**

Key-Units

ea	each
tf	track-foot
lf	linear foot
sf	square foot
sy	square yard
cy	cubic yard
ls	lump sum
rm	route mile
space	individual parking space

BRT Cost Estimate (Alternative 2 - Clark Street)

New Roadway

Item Description	Unit	Unit Cost	Quantity	Total Cost
Asphalt Pavement	sf	$13.10	336,000	$4,401,600.00
Curb & Gutter	lf	$120.00	28,000	$3,360,000.00
			Total Cost	**$7,761,600.00**

Bus Stops

Item Description	Unit	Unit Cost	Quantity	Total Cost
CIP concrete platform slab (60' x 12')	sf	$150.00	720	$108,000.00
Station canopy (40' x 12')	sf	$60.00	480	$28,800.00
Wind screen shelter	ea	$10,000.00	1	$10,000.00
Ticket vending machines	ea	$80,000.00	2	$160,000.00
Concrete slab to prevent shoving in pavement (60' x 8' x 9")	cy	$416.26	13.33	$5,548.75
Asphalt pavement removal (60' x 8')	sy	$5.00	53.33	$266.65
Common excavation & haul 10 miles (60' x 8' x 9")	cy	$8.00	13.33	$106.64
Miscellaneous demolition - crew and equipment (Asphalt pavement removal)	hr	$300.00	10	$3,000.00
Display signs	ea	$6,000.00	1	$6,000.00
			Cost/Bus Stop with Asphalt Removal	**$321,615.40**
			Cost/Bus Stop with Earth Removal	**$318,455.39**
			Number of Bus Stops with Asphalt Removal	**34**
			Number of Bus Stops with Earth Removal	**8**
			Total Cost	**$13,482,566.54**

Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Buses	ea	$399,000.00	10	$3,990,000.00
Spares	ea	$399,000.00	1	$399,000.00
Feeder Bus	ea	$300,000.00	7	$2,100,000.00
Vehicle hardware	ea	$2,200.00	11	$24,200.00
CDPD Modem	ea	$1,000.00	11	$11,000.00
Maintenance	ea	$250,000.00	18	$4,500,000.00
Announcements onboard bus	ea	$4,000.00	11	$44,000.00
AVL (GPS, receiver, processor)	ea	$5,000.00	11	$55,000.00
			Total Cost	**$11,123,200.00**

Feeder Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Feeder Bus	ea	$300,000.00	7	$2,100,000.00
Maintenance	ea	$250,000.00	7	$1,750,000.00
			Total Cost	**$3,850,000.00**

Signals

Item Description	Unit	Unit Cost	Quantity	Total Cost
Intersection hardware	ea	$20,000.00	1	$20,000.00
			Cost/Intersection	**$20,000.00**
			Number of Intersections	**7**
			Total Cost	**$140,000.00**

Right of Way for Alignment

Item Description	Unit	Unit Cost	Quantity	Total Cost
Alexandria and Arlington Taking for Transitway	ls	$2,548,195.00	1	**$2,548,195.00**

Additional System Costs

Item Description	Unit	Unit Cost	Quantity	Total Cost
Host processor, WAN connection, etc.	ea	$150,000.00	1	$150,000.00
Software system	ea	$1,700.00	1	$1,700.00
Audio database for on-board announcements	ea	$50,000.00	1	$50,000.00
System engineering & documentation	ls	$40,340.00	1	$40,340.00
			Total Cost	**$242,040.00**

Transit Dedicated Bridge

Item Description	Unit	Unit Cost	Quantity	Total Cost
Transit Dedicated Bridge - Parallel to Potomac Yard Route 1 Bridge	sf	$150.00	27200	$4,080,000.00
			Total Cost	**$4,080,000.00**

The Transit Dedicated Bridge will allow the LRT to pass through the Potomac Yard area without having to share travel lanes with other drivers. The total cost was developed based off of the existing plans for the Potomac Yard Route 1 Bridge that will straighten Route 1 by bypassing the Monroe Street Bridge through the Potomac Yard area. The unit cost was determined by looking at the individual pieces that make up the already designed structure and removing the unneeded items. Among the removed items from the Transit Dedicated Bridge include a telephone conduit system, an electrical conduit system, a gas line system, and a water line system. These utilities that were included on the Potomac Yard Route 1 Bridge do not need to be duplicated on the Transit Dedicated Bridge that runs parallel to it. Other than the removal of the previously listed utility items and a more narrow bridge deck, the Transit Dedicated Bridge follows the same plans as the Potomac Yard Route 1 Bridge.

Total Project Cost	**$43,227,601.54**
Contingency	**30%**
Total Construction Cost	**$56,195,882.01**

Key-Units

ea	each
tf	track-foot
lf	linear foot
sf	square foot
sy	square yard
cy	cubic yard
ls	lump sum
rm	route mile
space	individual parking space

LRT Cost Estimate (Alternative 1 - Eads Street)

New Track

Item Description	Unit	Unit Cost	Quantity	Total Cost
136 RE rail	tf	$31.00	1	$31.00
New tie plates, spikes & clips	tf	$25.00	1	$25.00
Install tie plates, spikes & fasten clips	tf	$5.00	1	$5.00
Welding	tf	$3.25	1	$3.25
Raise, surface & align	tf	$3.50	1	$3.50
Concrete	cy	$416.26	0.62	$256.83
Concrete ties 24" centers	tf	$100.00	1	$100.00
Subballast	cy	$27.00	0.22	$5.99
			Cost/Track Foot	$430.58
			Total Length	52800
			Total Cost	$22,734,434.98

Station

Item Description	Unit	Unit Cost	Quantity	Total Cost
CIP concrete platform slab (180' x 12')	sf	$150.00	2160	$324,000.00
Station canopy (40' x 12')	sf	$60.00	480	$28,800.00
Wind screen shelter	ea	$10,000.00	1	$10,000.00
Ticket vending machines	ea	$80,000.00	2	$160,000.00
Platform Tactile Strip	lf	$60.00	180	$10,800.00
Display signs at each station	ea	$6,000.00	1	$6,000.00
Area Lighting	sf	$2.50	2160	$5,400.00
Platform Graphics (LED)	ea		1	$0.00
Electrical/Mechanical Allowance	sf		2160	$0.00
Public address/audio system	ls		1	$0.00
Maintenance of traffic	ls	$54,500.00	1	$54,500.00
			Cost/Station	$599,500
			Number of Stations	40
			Total Cost	$23,980,000.00

Signals

Item Description	Unit	Unit Cost	Quantity	Total Cost
Central Control System	tf	$10.89	1	$10.89
Wayside signals w/ cabling	tf	$10.00	1	$10.00
Interlocking control system	tf	$52.50	1	$52.50
Train Control - reverse running	tf	$40.00	1	$40.00
Audio frequency track circuit	tf	$5.00	1	$5.00
			Cost/Track Foot	$118.39
			Total Length	52800
			Total Cost	$6,250,992.00

Special Track

Item Description	Unit	Unit Cost	Quantity	Total Cost
No. 10 Turnout, Embedded in Concrete	ea	$150,000.00	1	$150,000.00
No. 15 Turnout, Embedded in Concrete	ea	$170,000.00	1	$170,000.00
Switch Machine	ea	$30,000.00	1	$30,000.00
Switch Heater	ea	$20,880.00	1	$20,880.00
Insulated Joints	ea	$3,400.00	3	$10,200.00
Local control panel w/ communications	ea	$21,000.00	1	$21,000.00
Battery/rectifier	ea	$4,725.00	3	$14,175.00
Installation/labor	ls	$36,280.00	1	$36,280.00
			Cost/No. 10 Turnout	$282,535.00
			Cost/No. 15 Turnout	$353,415.00
			Number of No. 10 Turnouts	10
			Number of No. 15 Turnouts	4
			Total Cost	$4,239,010.00

Feeder Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Feeder Bus	ea	$300,000.00	6	$1,800,000.00
Maintenance	ea	$250,000.00	6	$1,500,000.00
			Total Cost	$3,300,000.00

Right of Way for Alignment

Item Description	Unit	Unit Cost	Quantity	Total Cost
Alexandria and Arlington Taking for Transitway	ls	$2,548,195.00	1	$2,548,195.00

Transit Dedicated Bridge

Item Description	Unit	Unit Cost	Quantity	Total Cost
Transit Dedicated Bridge - Parallel to Potomac Yard Route 1 Bridge	sf	$150.00	27200	$4,080,000.00
			Total Cost	$4,080,000.00

The Transit Dedicated Bridge will allow the LRT to pass through the Potomac Yard area without having to share travel lanes with other drivers. The total cost was developed based off of the existing plans for the Potomac Yard Route 1 Bridge that will straighten Route 1 by bypassing the Monroe Street Bridge through the Potomac Yard area. The unit cost was determined by looking at the individual pieces that make up the already designed structure and removing the unneeded items. Among the removed items from the Transit Dedicated Bridge include a telephone conduit system, an electrical conduit system, a gas line system, and a water line system. These utilities that were included on the Potomac Yard Route 1 Bridge do not need to be duplicated on the Transit Dedicated Bridge that runs parallel to it. Other than the removal of the previously listed utility items and a more narrow bridge deck, the Transit Dedicated Bridge follows the same plans as the Potomac Yard Route 1 Bridge.

Storage Yard				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Maintenance administration & Operations Control Building	sf	$185.00	3000	$555,000.00
Light repair service building	sf	$210.00	22500	$4,725,000.00
Car wash facility	sf	$85.00	1500	$127,500.00
Crane, 10-tons	ea	$80,000.00	2	$160,000.00
Wash equipment	ls	$550,000.00	1	$550,000.00
Site drainage allowance	sy	$6.37	29040	$184,984.80
Erosion & sediment control	sy	$12.00	29040	$348,480.00
8' chain link fence w/ 3-strand barb wire	lf	$29.71	2050	$60,905.50
136 RE rail	tf	$31.00	3000	$93,000.00
Concrete ties 24" centers	ea	$100.00	10	$1,000.00
Subballast	cy	$27.00	2000	$54,000.00
New tie plates, spikes & clips	tf	$25.00	2000	$50,000.00
Install tie plates, spikes & fasten clips	tf	$5.00	2000	$10,000.00
Welding	tf	$3.25	2000	$6,500.00
Raise, surface & align	tf	$3.50	2000	$7,000.00
No. 8 Turnout, w/ wood ties	ea	$115,000.00	4	$460,000.00
Switch Machine	ea	$30,000.00	4	$120,000.00
Switch Heater	ea	$20,880.00	4	$83,520.00
Insulated Joints (for No. 8 Turnout)	ea	$3,400.00	9	$30,600.00
Insulated Joints (for No. 10 Turnout)	ea	$4,500.00	3	$13,500.00
Local control panel w/ communications	ea	$21,000.00	1	$21,000.00
Battery/rectifier	ea	$4,725.00	3	$14,175.00
Installation/labor	ls	$36,280.00	6	$217,680.00
Surface Parking	space	$3,175.00	20	$63,500.00
Concrete curb & gutter (30" wide)	lf	$22.00	700	$15,400.00
Asphalt Pavement	cy	$94.50	88.89	$8,400.11
2 Track Cantilever	ea	$54,000.00	5	$270,000.00
1 Track Cantilever	ea	$44,000.00	7	$308,000.00
Concrete surface for maintenance (100' x 100' x 1')	cy	$250.00	370.37	$92,592.50
MOW Building	sf	$140.00	2500	$350,000.00
High Mast-Arm Lightpole	ea	$12,000.00	20	$240,000.00
Constant Tension Wire Along New Track	lf	$101.22	2000	$202,440.00
Substation	ea	$1,200,000.00	1	$1,200,000.00
General electric decashield 175 full cut-off luminaire with 1000 watt metal halide lamp	ea	$1,400.00	48	$67,200.00
100' galvanized high mast light poles with fixture ring and lowering system	ea	$22,300.00	8	$178,400.00
High mast pole foundations	cy	$500.00	56	$28,000.00
Test boring for soil samples	ea	$4,200.00	16	$67,200.00
Lighting service with lighting control devices	ea	$4,975.00	1	$4,975.00
Large composite junction boxes	ea	$1,100.00	1	$1,100.00
Small composite junction boxes	ea	$880.00	8	$7,040.00
Trenching	lf	$6.40	2000	$12,800.00
2" schedule 40 pvc conduit	lf	$3.15	2300	$7,245.00
2" conduit bored	lf	$20.00	75	$1,500.00
#2 AWG conductors	lf	$1.20	9600	$11,520.00
			Total Cost	$11,031,157.91

Catenary Structure				
Item Description	Unit	Unit Cost	Quantity	Total Cost
2 Track Cantilever Structure	ea	$54,000.00	0.005	$270.00
Substation	ea	$1,200,000.00	0.0004	$480.00
Constant Tension Wire Along New Track	tf	$101.22	1	$101.22
Full Tension Air Brake	ea	$51,225.00	0.00002	$1.02
			Cost/Track Foot	$852.24
			Total Cost	$44,998,509.60

Train Cars				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Train Cars	ea	$2,556,000.00	12	$30,672,000.00
Spare Cars	ea	$2,556,000.00	2	$5,112,000.00
Vehicle hardware	ea	$2,200.00	14	$30,800.00
AVL (GPS, receiver, processor)	ea	$5,000.00	14	$70,000.00
			Total Cost	$35,884,800.00

Additional System Costs				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Host processor, WAN connection, etc.	ea	$100,000.00	1	$100,000.00
Software system	ea	$1,700.00	1	$1,700.00
Audio database for on-board announcements	ea	$30,000.00	1	$30,000.00
			Total Cost	$131,700.00

Total Project Cost	$159,178,799.48
Contingency	30%
Total Construction Cost	**$206,932,439.33**

Key-Units

ea	each
tf	track-foot
lf	linear foot
sf	square foot
sy	square yard
cy	cubic yard
ls	lump sum
rm	route mile
space	individual parking space

LRT Cost Estimate (Alternative 2 - Clark Street)

New Track

Item Description	Unit	Unit Cost	Quantity	Total Cost
136 RE rail	tf	$31.00	1	$31.00
New tie plates, spikes & clips	tf	$25.00	1	$25.00
Install tie plates, spikes & fasten clips	tf	$5.00	1	$5.00
Welding	tf	$3.25	1	$3.25
Raise, surface & align	tf	$3.50	1	$3.50
Concrete	cy	$416.26	0.62	$256.83
Concrete ties 24" centers	tf	$100.00	1	$100.00
Subballast	cy	$27.00	0.22	$5.99
			Cost/Track Foot	**$430.58**
			Total Length	**52800**
			Total Cost	**$22,734,434.98**

Station

Item Description	Unit	Unit Cost	Quantity	Total Cost
CIP concrete platform slab (180' x 12')	sf	$150.00	2160	$324,000.00
Station canopy (40' x 12')	sf	$60.00	480	$28,800.00
Wind screen shelter	ea	$10,000.00	1	$10,000.00
Ticket vending machines	ea	$80,000.00	2	$160,000.00
Platform Tactile Strip	lf	$60.00	180	$10,800.00
Display signs at each station	ea	$6,000.00	1	$6,000.00
Area Lighting	sf	$2.50	2160	$5,400.00
Platform Graphics (LED)	ea		1	$0.00
Electrical/Mechanical Allowance	sf		2160	$0.00
Public address/audio system	ls		1	$0.00
Maintenance of traffic	ls	$54,500.00	1	$54,500.00
			Cost/Station	**$599,500**
			Number of Stations	**42**
			Total Cost	**$25,179,000.00**

Signals

Item Description	Unit	Unit Cost	Quantity	Total Cost
Central Control System	tf	$10.89	1	$10.89
Wayside signals w/ cabling	tf	$10.00	1	$10.00
Interlocking control system	tf	$52.50	1	$52.50
Train Control - reverse running	tf	$40.00	1	$40.00
Audio frequency track circuit	tf	$5.00	1	$5.00
			Cost/Track Foot	**$118.39**
			Total Length	**52800**
			Total Cost	**$6,250,992.00**

Special Track

Item Description	Unit	Unit Cost	Quantity	Total Cost
No. 10 Turnout, Embedded in Concrete	ea	$150,000.00	1	$150,000.00
No. 15 Turnout, Embedded in Concrete	ea	$170,000.00	1	$170,000.00
Switch Machine	ea	$30,000.00	1	$30,000.00
Switch Heater	ea	$20,880.00	1	$20,880.00
Insulated Joints	ea	$3,400.00	3	$10,200.00
Local control panel w/ communications	ea	$21,000.00	1	$21,000.00
Battery/rectifier	ea	$4,725.00	3	$14,175.00
Installation/labor	ls	$36,280.00	1	$36,280.00
			Cost/No. 10 Turnout	**$282,535.00**
			Cost/No. 15 Turnout	**$353,415.00**
			Number of No. 10 Turnouts	**10**
			Number of No. 15 Turnouts	**4**
			Total Cost	**$4,239,010.00**

Feeder Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Feeder Bus	ea	$300,000.00	6	$1,800,000.00
Maintenance	ea	$250,000.00	6	$1,500,000.00
			Total Cost	**$3,300,000.00**

Right of Way for Alignment

Item Description	Unit	Unit Cost	Quantity	Total Cost
Alexandria and Arlington Taking for Transitway	ls	$2,548,195.00	1	$2,548,195.00

Transit Dedicated Bridge

Item Description	Unit	Unit Cost	Quantity	Total Cost
Transit Dedicated Bridge - Parallel to Potomac Yard Route 1 Bridge	sf	$150.00	27200	$4,080,000.00
			Total Cost	**$4,080,000.00**

The Transit Dedicated Bridge will allow the LRT to pass through the Potomac Yard area without having to share travel lanes with other drivers. The total cost was developed based off of the existing plans for the Potomac Yard Route 1 Bridge that will straighten Route 1 by bypassing the Monroe Street Bridge through the Potomac Yard area. The unit cost was determined by looking at the individual pieces that make up the already designed structure and removing the unneeded items. Among the removed items from the Transit Dedicated Bridge include a telephone conduit system, an electrical conduit system, a gas line system, and a water line system. These utilities that were included on the Potomac Yard Route 1 Bridge do not need to be duplicated on the Transit Dedicated Bridge that runs parallel to it. Other than the removal of the previously listed utility items and a more narrow bridge deck, the Transit Dedicated Bridge follows the same plans as the Potomac Yard Route 1 Bridge.

Storage Yard				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Maintenance administration & Operations Control Building	sf	$185.00	3000	$555,000.00
Light repair service building	sf	$210.00	22500	$4,725,000.00
Car wash facility	sf	$85.00	1500	$127,500.00
Crane, 10-tons	ea	$80,000.00	2	$160,000.00
Wash equipment	ls	$550,000.00	1	$550,000.00
Site drainage allowance	sy	$6.37	29040	$184,984.80
Erosion & sediment control	sy	$12.00	29040	$348,480.00
8' chain link fence w/ 3-strand barb wire	lf	$29.71	2050	$60,905.50
136 RE rail	tf	$31.00	3000	$93,000.00
Concrete ties 24" centers	ea	$100.00	10	$1,000.00
Subballast	cy	$27.00	2000	$54,000.00
New tie plates, spikes & clips	tf	$25.00	2000	$50,000.00
Install tie plates, spikes & fasten clips	tf	$5.00	2000	$10,000.00
Welding	tf	$3.25	2000	$6,500.00
Raise, surface & align	tf	$3.50	2000	$7,000.00
No. 8 Turnout, w/ wood ties	ea	$115,000.00	4	$460,000.00
Switch Machine	ea	$30,000.00	4	$120,000.00
Switch Heater	ea	$20,880.00	4	$83,520.00
Insulated Joints (for No. 8 Turnout)	ea	$3,400.00	9	$30,600.00
Insulated Joints (for No. 10 Turnout)	ea	$4,500.00	3	$13,500.00
Local control panel w/ communications	ea	$21,000.00	1	$21,000.00
Battery/rectifier	ea	$4,725.00	3	$14,175.00
Installation/labor	ls	$36,280.00	6	$217,680.00
Surface Parking	space	$3,175.00	20	$63,500.00
Concrete curb & gutter (30" wide)	lf	$22.00	700	$15,400.00
Asphalt Pavement	cy	$94.50	88.89	$8,400.11
2 Track Cantilever	ea	$54,000.00	5	$270,000.00
1 Track Cantilever	ea	$44,000.00	7	$308,000.00
Concrete surface for maintenance (100' x 100' x 1')	cy	$250.00	370.37	$92,592.50
MOW Building	sf	$140.00	2500	$350,000.00
High Mast-Arm Lightpole	ea	$12,000.00	20	$240,000.00
Constant Tension Wire Along New Track	lf	$101.22	2000	$202,440.00
Substation	ea	$1,200,000.00	1	$1,200,000.00
General electric decashield 175 full cut-off luminaire with 1000 watt metal halide lamp	ea	$1,400.00	48	$67,200.00
100' galvanized high mast light poles with fixture ring and lowering system	ea	$22,300.00	8	$178,400.00
High mast pole foundations	cy	$500.00	56	$28,000.00
Test boring for soil samples	ea	$4,200.00	16	$67,200.00
Lighting service with lighting control devices	ea	$4,975.00	1	$4,975.00
Large composite junction boxes	ea	$1,100.00	1	$1,100.00
Small composite junction boxes	ea	$880.00	8	$7,040.00
Trenching	lf	$6.40	2000	$12,800.00
2" schedule 40 pvc conduit	lf	$3.15	2300	$7,245.00
2" conduit bored	lf	$20.00	75	$1,500.00
#2 AWG conductors	lf	$1.20	9600	$11,520.00
			Total Cost	$11,031,157.91

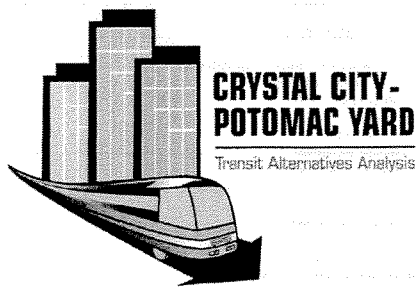
Catenary Structure				
Item Description	Unit	Unit Cost	Quantity	Total Cost
2 Track Cantilever Structure	ea	$54,000.00	0.005	$270.00
Substation	ea	$1,200,000.00	0.0004	$480.00
Constant Tension Wire Along New Track	tf	$101.22	1	$101.22
Full Tension Air Brake	ea	$51,225.00	0.00002	$1.02
			Cost/Track Foot	$852.24
			Total Cost	$44,998,509.60

Train Cars				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Train Cars	ea	$2,556,000.00	12	$30,672,000.00
Spare Cars	ea	$2,556,000.00	2	$5,112,000.00
Vehicle hardware	ea	$2,200.00	14	$30,800.00
AVL (GPS, receiver, processor)	ea	$5,000.00	14	$70,000.00
			Total Cost	$35,884,800.00

Additional System Costs				
Item Description	Unit	Unit Cost	Quantity	Total Cost
Host processor, WAN connection, etc.	ea	$100,000.00	1	$100,000.00
Software system	ea	$1,700.00	1	$1,700.00
Audio database for on-board announcements	ea	$30,000.00	1	$30,000.00
			Total Cost	$131,700.00

Total Project Cost	$160,377,799.48
Contingency	30%
Total Construction Cost	**$208,491,139.33**

Key-Units	
ea	each
tf	track-foot
lf	linear foot
sf	square foot
sy	square yard
cy	cubic yard
ls	lump sum
rm	route mile
space	individual parking space



DEC. 21 2001

RAILWAY FACILITY & STORAGE YARD AT POTOMAC YARD

WORK ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENSION
GENERAL ELECTRIC DECASHIELD 175 FULL CUT-OFF LUMINAIRE WITH 1000 WATT METAL HALIDE LAMP	48	EA	$1,400	$67,200
100 FT. GALVANIZED HIGH MAST LIGHT POLES WITH FIXTURE RING AND LOWERING SYSTEM	8	EA	$22,300	$178,400
HIGH MAST POLE FOUNDATIONS	56	CY	$500	$28,000
TEST BORING FOR SOIL SAMPLES	16	EA	$4,200	$67,200
LIGHTING SERVICE WITH LIGHTING CONTROL DEVICES	1	EA	$4,975	$4,975
LARGE COMPOSITE JUNCTION BOXES	1	EA	$1,100	$1,100
SMALL COMPOSITE JUNCTION BOXES	8	EA	$880	$7,040
TRENCHING	2,000	LF	$6.40	$12,800
2" SCHEDULE 40 PVC CONDUIT	2,300	LF	$3.15	$7,245
2" CONDUIT BORED	75	LF	$20.00	$1,500
#2 AWG CONDUCTORS	9,600	LF	$1.20	$11,520

SUBTOTAL:	*$386,980*
TOTAL:	**$386,980**
USE:	**$400,000**

ASSUMPTIONS: ADDITIONAL COMMERCIAL POWER IS AVAILABLE IN THE VICINITY OF THE YARD

Final BRT Cost Estimate (Alternative 1 - Eads Street)

New Roadway

Item Description	Unit	Unit Cost	Quantity	Total Cost
Asphalt Pavement	sf	$13.10	336,000	$4,401,600.00
Curb & Gutter	lf	$120.00	28,000	$3,360,000.00
			Total Cost	$7,761,600.00

Bus Stops

Item Description	Unit	Unit Cost	Quantity	Total Cost
CIP concrete platform slab (60' x 12')	sf	$150.00	720	$108,000.00
Station canopy (40' x 12')	sf	$60.00	480	$28,800.00
Wind screen shelter	ea	$10,000.00	1	$10,000.00
Ticket vending machines	ea	$80,000.00	2	$160,000.00
Concrete slab to prevent shoving in pavement (60' x 8' x 9")	cy	$416.26	13.33	$5,548.75
Asphalt pavement removal (60' x 8')	sy	$5.00	53.33	$266.65
Common excavation & haul 10 miles (60' x 8' x 9")	cy	$8.00	13.33	$106.64
Area Lighting	sf	$2.50	720	$1,800.00
Miscellaneous demolition - crew and equipment (Asphalt pavement removal)	hr	$300.00	10	$3,000.00
Display signs	ea	$6,000.00	1	$6,000.00
			Cost/Bus Stop with Asphalt Removal	$323,415.40
			Cost/Bus Stop with Earth Removal	$320,255.39
			Number of Bus Stops with Asphalt Removal	32
			Number of Bus Stops with Earth Removal	8
			Total Cost	$12,911,335.75

Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Buses	ea	$399,000.00	10	$3,990,000.00
Spares	ea	$399,000.00	1	$399,000.00
Vehicle hardware	ea	$2,200.00	11	$24,200.00
CDPD Modem	ea	$1,000.00	11	$11,000.00
Maintenance	ea	$250,000.00	11	$2,750,000.00
Announcements onboard bus	ea	$4,000.00	11	$44,000.00
AVL (GPS, receiver, processor)	ea	$5,000.00	11	$55,000.00
			Total Cost	$7,273,200.00

Feeder Buses

Item Description	Unit	Unit Cost	Quantity	Total Cost
Feeder Bus	ea	$300,000.00	7	$2,100,000.00
Maintenance	ea	$250,000.00	7	$1,750,000.00
			Total Cost	$3,850,000.00

Signals

Item Description	Unit	Unit Cost	Quantity	Total Cost
Intersection hardware	ea	$20,000.00	1	$20,000.00
			Cost/Intersection	$20,000.00
			Number of Intersections	7
			Total Cost	$140,000.00

Right of Way for Alignment

Item Description	Unit	Unit Cost	Quantity	Total Cost
Alexandria and Arlington Taking for Transitway	ls	$2,548,195.00	1	$2,548,195.00

Additional System Costs

Item Description	Unit	Unit Cost	Quantity	Total Cost
Host processor, WAN connection, etc.	ea	$150,000.00	1	$150,000.00
Software system	ea	$1,700.00	1	$1,700.00
Audio database for on-board announcements	ea	$50,000.00	1	$50,000.00
System engineering & documentation (calculated at 7% of hard costs)	ls	$141,190.00	1	$141,190.00
			Total Cost	$342,890.00

Transit Dedicated Bridge

Item Description	Unit	Unit Cost	Quantity	Total Cost
Transit Dedicated Bridge - Parallel to Potomac Yard Route 1 Bridge	sf	$150.00	27200	$4,080,000.00
			Total Cost	$4,080,000.00

The Transit Dedicated Bridge will allow the LRT to pass through the Potomac Yard area without having to share travel lanes with other drivers. The total cost was developed based off of the existing plans for the Potomac Yard Route 1 Bridge that will straighten Route 1 by bypassing the Monroe Street Bridge through the Potomac Yard area. The unit cost was determined by looking at the individual pieces that make up the already designed structure and removing the unneeded items. Among the removed items from the Transit Dedicated Bridge include a telephone conduit system, an electrical conduit system, a gas line system, and a water line system. These utilities that were included on the Potomac Yard Route 1 Bridge do not need to be duplicated on the Transit Dedicated Bridge that runs parallel to it. Other than the removal of the previously listed utility items and a more narrow bridge deck, the Transit Dedicated Bridge follows the same plans as the Potomac Yard Route 1 Bridge.

Total Project Cost	$38,907,220.75
Contingency	30%
Total Construction Cost	**$50,579,386.98**

Key-Units

ea	each
tf	track-foot
lf	linear foot
sf	square foot
sy	square yard
cy	cubic yard
ls	lump sum
rm	route mile
space	individual parking space

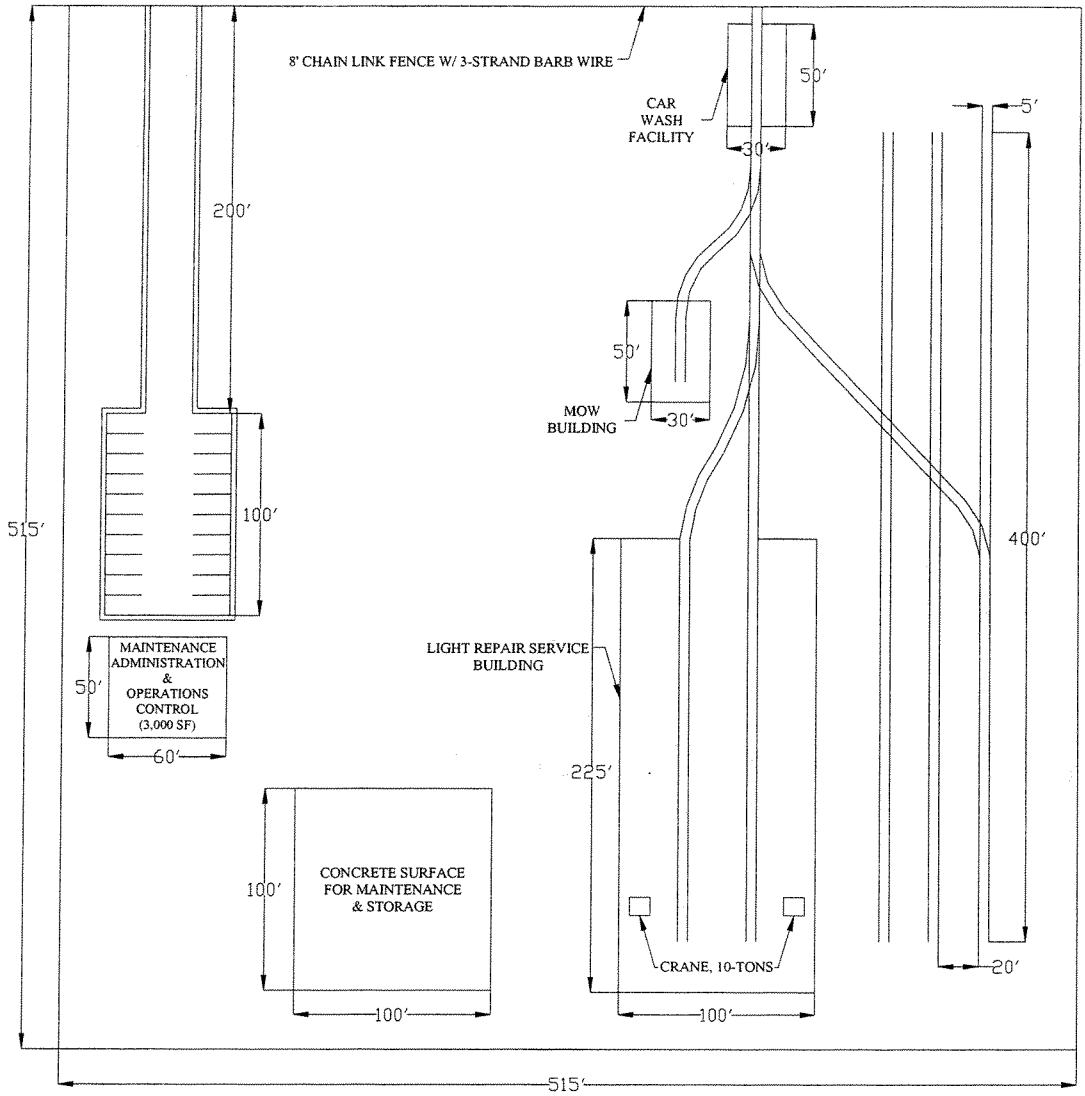


Figure I-1
LRT Maintenance Facility

APPENDIX J – BRT System Income and Expenditures.

Assumptions made for BRT Income and Expenditures

Ridership: Daily ridership (boardings) for the year 2025 was forecast as part of the alternatives development and analysis described in preceding sections. Ridership growth, between opening day and 2025 and between 2025 and 2032, twenty years after opening day, was estimated based upon Metrorail ridership forecasts. In reports sponsored by local agencies, ridership for Metrorail is predicted to double between the years 2000 and 2025 which translates to a growth rate of 5.33 percent per year.

For calculation purposes, the average annual number of days of transit ridership is assumed at 250.

Revenues: Revenue for the proposed system was estimated based upon the forecast ridership and estimate of mode of access. The study team assumed the fare structure for Metro would be applied to the new system. With that assumption, a transfer from the BRT line to a bus would be 25 cents, the same as a transfer from Metrorail to a bus. This was also applied to the cost of fares. Metrorail is a distance-based, time-based system—the price of each journey depends on the time of day and the length of the trip. The study team used this pricing scheme on the BRT line as well, determining that a trip of about three miles and less was considered a short trip with a price of $1.10 regardless of time of day. Anything between 3 and 5 miles was considered a long trip with a price between $1.10 and $1.35 (average $1.18). The study team assumed that 65 percent of the riders would travel during the peak hours (based upon the results of the ridership forecast), thus they were applied with the higher cost. The remaining 35% were assigned the $1.10 fare.

The same process was used on the feeder buses. It was assumed that the fare structure would be the same as that employed by the Metrobus system. Those riders were multiplied by the $1.10 fare except for those who transferred from the BRT line who were charged 25 cents.

Advertising on BRT vehicles: Advertising is a small but consistent portion of a transit system's revenues. The revenue anticipated to be generated was based on the current per bus revenues.

Capacity: The number of BRT vehicles required to operate the system in 2025 is eleven (ten for operating and one spare). For the purposes of this spreadsheet, a BRT vehicle has an assumed capacity of 220 persons. For feeder buses, seven buses are required (no spares), each with an assumed capacity of 80 persons. There is also an assumed frequency of 10 (ten buses per hour or six-minute headways). The maximum capacity at any one time

(the product of the capacity and the fleet) is 2,200 for the BRT vehicles and 560 for the feeder buses.

Local Government Contribution: This figure represents the amount that local governments would need to contribute each year starting in 2004 in order to cover the difference between the capital and operating costs of the system and the revenues it generates. For purposes of this calculation, all capital costs would be paid off after 20 years of operation.

2025 Operating and Maintenance Expenses (2002 dollars): This estimate was computed based on current operating costs for similar systems in the region.

Maintenance Expansion: BRT vehicles would be maintained in an existing Metrobus or other transit system facility. It is assumed that some reassignment of buses currently using existing maintenance facilities would be required and that one or more facilities would need to be expanded. Using recent Metrobus garage construction costs as a basis for estimating costs, the Study Team determined that for every bus purchased, $250,000 would be required for garage expansion. Expansion of existing facilities would occur twice: once before revenue service and again in 2022. The number of 2022 buses is multiplied by the 'per bus' expansion cost (see far left column) and divided over 2011 and 2012 for construction.

Inflation Rate: The Consumer Price Index rose 2.98 percent annually between 1980 and April 2002. This rate of inflation was applied to all items in the spreadsheet with the exception of revenues. By policy, Metro fares are programmed to increase at one half the rate of inflation.

Bond Issue: The study team assumes that a bond would be issued to cover the cost of construction and procurement. The selling expense is set at 10 percent of funds generated through bonds and interest rate of the bonds was set at 6 percent per year.

The interest earned on the fund provided by the local jurisdictions was assumed to be 4 percent.

FTA Share: Typically, the Federal Transit Administration would contribute approximately 50 percent of the construction costs but none of the operating costs.

Population: The population and employment were estimated by traffic analysis zones (TAZs) in metropolitan Washington for the following years: 1995, 2000, 2005, 2010, 2015, 2020, and 2025. Linear growth was assumed for the intermediate years. The study team determined the population and

employment of the study area and Potomac Yard for each year using the respective TAZs.

Annual Ridership: This section shows ridership on the BRT system and bus feeders. For the BRT system itself, the study team used an equation based on the projected Metro ridership to create a growth pattern specific to BRT:

$$(36{,}074) \times \frac{(P_{year} + E_{year})}{(P_{2025} + E_{2025})} = R_{year}$$

Where P_{year} and E_{year} is the population and employment for the specific year, respectfully. P_{2025} and E_{2025} are population and employment for year 2025, respectfully. R_{year} is the daily ridership for the specific year.

The busiest station peak hour reflects the highest daily passenger load increased by 15 percent. "Maximum load point" is the highest amount of passengers between two stations on a daily basis. Fifteen percent of the daily boarding provides a good estimate of the amount of peak hour riders.

For the feeder buses, the study team calculated a baseline ridership (the ridership of an alternative where enhanced bus service is created instead of the BRT system). "Feeder bus with BRT System" is determined by multiplying the BRT ridership by the proper mode split. The mode split is the percentage of riders using a certain mode. The mode split needed here is the percentage of riders that would access the BRT by transferring from or to the feeders.

Net new riders is an estimate of the number of bus riders that would be gained if the BRT system were implemented over the baseline ridership.

Future Procurement: The peak hour ridership at the busiest station allows the study team to compute the load factor α to determine whether or not a new BRT vehicle is required. The equation for the load factor in year X is the peak hour over the product of capacity of the BRT bus and the number of buses Y in the fleet the previous year (year X-1). The load factor α (Greek alpha) is set at a maximum of 0.80. The equation calculates the load factor. If α is over .8 using the same amount of buses as the previous year Y, another bus is added. By adding another bus, α is re-calculated with the new fleet size Y+1. The BRT vehicle is placed as an expense in the cash out section.

Feeder buses do not use the same method to determine the need for a new bus. Instead, the study team assumed a new bus would be purchased every ten years.

Amounts in 2002 dollars: The section displays numbers that either remain constant or increase over time without inflation. This section is for illustrating the background behind the next three sections, which contain inflated figures.

Cash Flows in inflated Dollars: Sources of Cash: This section reflects the amount of money coming into the project—the "cash in."

Cash Flows in inflated Dollars: Uses of Cash: Money that leaves the project—the "cash out."

Fund Balance: The Sources of Cash less the Uses of Cash: the net gain/loss. The amount of government contribution should zero out the balance by 2032.

From years 2004 to 2010, the only activity-taking place is the annual contribution by local jurisdictions. This money is deposited and earns interest in a fund.

The year 2010 marks the beginning of a two-year construction period. The bond is issued and half of the construction and procurement costs are used, including maintenance yard expansion. The 10% cost of selling bonds is applied in this year as well as the beginning of debt service payments. In 2011, the other half of the construction and procurement costs is applied. Interest on the government contribution becomes negative this year.

The year 2012 marks the first year of revenue service. Almost all sources and uses of cash are now active. The new BRT vehicles are purchased in years where the bus surpassed the comfortable load factor (in this case, $\alpha = .80$). Those years are 2024, 2026, 2028 (replacement of buses purchased before 2020), 2029, 2031, and 2032. Overhauls and replacement of the vehicles take place at more consistent times. Overhauls take place after ten years with replacement five years after overhaul. Feeder buses are overhauled and replaced at the same time as the BRT vehicles. During the replacement years, only the older buses are replaced.

APPENDIX K – Public Participation

CRYSTAL CITY-
POTOMAC YARD
Transit Alternatives Analysis

SUMMARY OF PUBLIC MEETINGS
MARCH 19-20, 2002

I. PUBLIC MEETINGS

The second round of public meetings for the Crystal City Potomac Yard Corridor Transit Alternatives Analysis was held on March 19 and 20, 2002. The meetings were held to update the public on the study process, to review the final list of alternatives for transit in the corridor, and to solicit the public's reactions and preferences.

The first meeting was held in Alexandria on March 19, 2002 and approximately 33 people attended. The meeting was conducted at Mount Vernon Elementary School and Mayor Kerry Donley attended.

The second meeting was held in Arlington on March 20, 2002 and approximately 37 people attended. The meeting was conducted at the Aurora Hills Community Center. Shown below is a summary of the comments received from the public.

II. MAIN TOPICS BY VENUE

Citizens' Oral Comments: Approximately 17 citizens at Mount Vernon Elementary School and 6 citizens at Aurora Hills Community Center provided oral comments at the March public meetings. While there was no overriding theme, attendees at the ***Alexandria*** meeting asked a number of questions clarifying transit location, costs, and potential impacts to existing streets and structures, i.e., the Monroe Avenue Bridge, parking on Route 1, and potential loss of open space. Most of the attendees supported some form of transit with a connection to the existing Metro system.

Attendees at the ***Arlington*** meeting also asked a number of questions related to transit costs, station location, ridership, and travel time. After the presentation, a number of attendees expressed their appreciation in having the meeting and complimented the study team on the presentation. Attendees generally supported some form of transit with a feeder system. Several citizens stated a preference for an expansion of the current Metrorail system.

Comment Sheets: Forty-seven comment sheets were received through May 8, 2002. Twenty-three comment sheets were received from residents within the ***City of Alexandria.*** Respondents frequently cited support for the expansion of the existing Metrorail lines and/or a combination of Metrorail with either LRT or BRT. Two major themes included the importance of convenience and connectivity to the existing transit network. Residents stated that a system that interacts with vehicular traffic would not be desirable. Additional comments included the desire for accessibility into Old Town and Potomac Yard and additional stations beyond Braddock Road. If transit were available in the corridor, residents stated that they would consider using it for traveling to and from work outside the corridor, shopping, and recreational events. In addition, they would most frequently use the system on the weekends, in rush hour, and during regular business hours. The west side of Route 1 was the most frequently cited preference for transit location.

Twenty-four comment sheets were received from residents within ***Arlington County.*** Respondents frequently cited support for the expansion of the existing Metrorail system followed by BRT. Major themes included the importance of connectivity with existing transit systems, i.e., Metrorail and buses; convenience; and safety. The issues identified included the need for the selected system to be cost-effective; the new system should not parallel existing transit system; responsibility for long-term maintenance of the new transit system; and system accessibility. Additional comments included the accessibility to Old Town, a loop system (i.e., from Old Town to Columbia Pike, Route 7, and Tysons Corner), and a connection to Potomac Yard, Crystal City and Pentagon City. If transit were available in the corridor, residents indicated that they would consider using it for traveling to recreational events, shopping, and to and from work outside the corridor. As to when respondents would most frequently use the system, the responses were evenly distributed throughout the week and weekend. The east side of Route 1 was the most frequently cited preference for transit location.

E-mail: Ten e-mail messages were received through May 8, 2002. Comments included requests for additional information on the remaining alternatives under consideration, the development of the travel demand forecasts, and impacts to local thoroughfares. Additional comments supported a Metrorail station at the Town Center in combination with a LRT system, inquired into the impact of citizen comments on the decision-making process, and complemented the team on the information posted on the project website.

Correspondence: One piece of correspondence was received through May 8, 2002. Comments were supportive of a combination system with LRT and a Metrorail stop at the Potomac Yard Town Center. Additional comments included appreciation for the informative public meeting, the need for additional information on local connecting bus service, and the rationale behind the comments noted in the correspondence.

Telephone Hotline: Nine telephone calls were received through May 8, 2002. Comments included requests for additional information on the transit modes under consideration, location of the alignments, additional copies of the project newsletter, and requests to be added to the project mailing list.

Discussion Forum: Five comments were posted on the project web site www.route1transit.com through May 8, 2002. Comments included support for the additional Metrorail stops, combined with a significant improvement in the existing bus system; support for a monorail system connecting the Pentagon and the Springfield transit stations; and reconsideration of the route that traverses the interior of the Potomac Yard for BRT/LRT. Additional comments concluded BRT is not a good idea because it takes up too much valuable land for a dedicated road and for stations, and a new Metrorail stop at Potomac Yard is not adequate for relieving traffic congestion.

PUBLIC MEETINGS

Summary of Citizen's Oral Comments
March 19, 2002
City of Alexandria – Mount Vernon Elementary School

The second round of public meetings for the CCPY Transit Alternatives Analysis was held on March 19 and 20, 2002. Thirty-three citizens attended the meeting at Mount Vernon Elementary School on March 19, 2002 in Alexandria, Virginia; approximately 17 citizens provided oral comments at the meeting. Below is a summary of the oral comments.

Alignments/Mode (16 Comments)

- Metro solution is the best. We want an east-west transit. A Metrorail stop is simpler and less disruptive.
- Need a combination of Metrorail and local transit to accommodate the area.
- A dedicated lane would work best.
- Need smaller buses.
- We need to increase transit and decrease parking.
- Increase the frequency of local bus #9 up and down the highway.
- Concern that feeder buses will be just as slow as cars.
- Is it part of the study design to separate traffic traveling through the corridor from local traffic?
- Will there be more transit riders between modes?
- Which of the alternatives take less open space and land from Potomac Yard?
- It appears there is no difference in the alternatives. How do we give you input and make an informed decision on this?
- Why is transit designed to go behind the retail center in Potomac Yard?
- How would Fayette Street interact with Route 1?
- Avoid the park on Route 1 and Fayette Street.
- You should be shuttling more people into denser areas.
- Which side of the street on Custis and Swan Avenue would work best for transit?

Design Recommendation/Comment (6 Comments)

- Changes to the Monroe Avenue Bridge could create aesthetic impacts or possibly impede right turn on red.
- A new bridge at Monroe Avenue could result in no continuous motion.
- Consider widening the new Main Street, as it seems quite narrow.
- Main Street was envisioned with a smaller shuttle service. Route 1 was upgraded for Potomac Yard to accommodate BRT or LRT in the right-of-way.
- Transit crosses between the north and southbound lanes approximately six times. On 15th and Eads Street there is a problem with a middle of the road crossing; it is hard to get to center stations.
- Route 1 should be more like Washington Street in regards to parking. People should be able to park along there for a short time. People did not want Route 1 to become a "thruway."

Funding (3 Comments)

- What is the difference between maintenance and construction costs?
- Who pays for the maintenance cost?
- Are costs included for the ten additional bus routes mentioned?

Public Participation and Information (2 Comments)

- Enjoyed the presentation. This is a necessary study so thank you.
- What is the next step after this study?

Technical Analysis (7 Comments)

- What is meant by new transit passengers?
- What is the benefit of this new service?
- Which of the three alternatives has the best chance of reducing the number of single drivers?
- Which of the three alternatives is the best with regard to economics and attractiveness?
- I am interested in seeing the transit capacity
- What criteria should we use to judge these modes?
- Did you study residential densities?

PUBLIC MEETINGS

Summary of Citizen's Oral Comments
March 20, 2002
Arlington County – Aurora Hill Community Center

The second round of public meetings for the CCPY Transit Alternatives Analysis was held on March 19 and 20, 2002. Thirty-seven people attended the meeting at the Aurora Hills Community Center on March 20, 2002 in Arlington, Virginia; approximately six citizens provided oral comments at the meeting. Shown below is a summary of the oral comments.

Alignments/Mode (11 Comments)

- Have you given any thoughts to the problem of bus pollution?
- Explain why the North 12th Street East is not desirable?
- LRT is half the cost of bus service.
- Natural gas destroys bus engines.
- VDOT showed that Route 1 could not handle the traffic. To place transit there defeats its purpose.
- How long will it take to cover the five-mile stretch from Braddock Road to the Pentagon?
- Are you looking at circulator feeder bus in addition to feeder bus service?
- For the Metrorail alternative would you be adding additional tracks or running express service?
- Prefer existing Metrorail or two new stations supplemented with feeder buses.
- When the alignment cuts across Four Mile Creek it appears that it doesn't cross Route 1.

Design Recommendation (3 Comments)

- Bike lanes are shown in one direction. The bike lanes should be in both directions.
- Reconfigure the Monroe Avenue Bridge in order to widen the left turn lanes.
- There doesn't appear to be much shift between auto and transit. We already have a back up on Route 1. We need longer left turn lanes behind the shopping center for autos.

Funding (2 Comments)

- How did you come up with the high cost of LRT?
- What are the fall back positions if you do not receive federal money? Is there an element of politics in this?

Technical Analysis (1 Comments)

- Expected the transit trip numbers to be larger. While there is a doubling of car travel, there is only a small net increase in transit trips. What did you use for the comparison?

COMMENT SHEETS

Summary of Comment Sheets
March 19, 2002
City of Alexandria – Mount Vernon Elementary School

Twenty-three comment sheets were received from citizens from the City of Alexandria pertaining to the CCPY Corridor Transit Alternatives Analysis. The following is a summary of the comments received between the public meeting held on March 19 and May 8, 2002. The number in parenthesis indicates the number of times that specific comment was made.

1. ***The following properties are important to me when consider using transit. Rank in the order of importance:***

First
- **Convenience (17)**
- Connection (3)
- Cost (2)
- Distance (2)
- Speed (1)

Second
- Speed (5)
- Distance (4)
- Convenience (3)
- Connection (4)
- Cost (3)

Third
- Speed (6)
- Cost (6)
- Connection (4)
- Distance (2)
- Convenience (2)

Fourth
- Distance (8)
- Connection (5)
- Speed (4)
- Cost (2)
- Convenience (0)

Fifth
- Cost (9)
- Distance (4)
- Speed (3)
- Connection (3)
- Convenience (0)

Comments (8):

- Missing safety, environmental impact, ease of connection, frequency, duration of service, intra system connection, and number of connections.
- The corridor doesn't go far enough into Old Town. Do not end it at Braddock Road.
- Would like to see a Metro stop and some form of BRT or LRT into downtown and near East Glebe Road.

- Will it get me where I want to go at a reasonable pace and keep me away from the road rage of traffic?
- I can't go to Potomac Yard without a car or a bus. I have neither now. I live at Commonwealth and Glebe Road.
- It is important to me to be able to use Metrochecks (i.e., my federal transit subsidy).
- I currently avoid Potomac Yard on weekends because of the out-of-the-way routing necessary to go to/from my home (likewise, Route 1 between Crystal City and Old Town).
- Cost must be lower than personal auto, with high quality to lure the wealthy who are clogging the corridor.

2. ***I would consider using transit for:***

Traveling to/from work outside the corridor (18)
Shopping (17)
Recreation (17)
Traveling to/from work inside the corridor (11)
Other (i.e., services, school, medical appointments) (3)

Comments (6):

- Something more accessible than a bus system is needed to D.C.
- Already using transit for all of these purposes – would increase usage if made easier.
- Wouldn't be able to use it if it stops at Braddock Road. It doesn't get me to my office near City Hall.
- East-west transportation would open up more varied shopping, services, theatres, etc.
- I have no Virginia medical practitioner because I can't get to Skyline or Old Town quickly from D.C.
- Current bus routes are poor on the weekends when demand seems higher. The shopping trip demand of the Potomac Yard Center is grossly underestimated.

3. ***If transit were available in the Corridor, I would use it more frequently:***

Weekend (14)
Rush hour (11)
During business hours (11)
Weekday non-rush hour (8)
Evenings (8)
Never (0)

Comments (3):

- Depends upon the interconnection with Metro and the ease of connection.
- Would use mostly to travel to/from work.
- We need better transit along the corridor in the off-peak period.

4. ***Rank the following transit modes in the order you find most appealing:***

First
Metrorail (15)
LRT (5)
BRT (4)

Second
BRT (7)
LRT (7)
Metrorail (4)

Third
BRT (8)
LRT (7)

Metrorail (3)

Comments (8):

- BRT would add additional vehicular traffic to already over-loaded highway system.
- Metrorail moves more people and should remove more commuters using the corridor.
- Support a Potomac Yard Metrorail station at either end. What happened to the property developer's offer to help with funding?
- Think Metrorail is a terrific system, so why not find a way to hook into existing system rather than start from scratch with a whole new system.
- If possible, something compatible or equivalent of current Metro Route behind Potomac Yard in the Crystal City – Braddock Road Corridor.
- Metrorail gets you away from car traffic, very important.
- BRT & LRT makes sense only with a broad BRT/LRT system and only in conjunction with Metrorail. Since Metrorail is designated as the backbone of this system, an additional station should come first
- Would support BRT if it were electric or Metrorail if it were diesel. Metrorail by itself fails to move people within the area. It only moves them to and from the area.

5. Which side of Route 1 would you prefer transit to be located?

West (9) as first choice and two people selected as their third choice
East (7) as first choice
Middle (6) as first choice and two people selected as their second choice

Comments (6):

- There is nothing to get to on the east side.
- Use of the median would avoid the need to acquire right-of-way; and would interface with vehicular traffic.
- Depends upon the type of transit. Prefer Metrorail, which would inevitably be on the east side but there is a need for better transit on the west side for existing businesses and communities.
- There should be in a dedicated lane along sidewalk.
- Could the system be elevated, like Hong Kong or Bangkok?
- There are plans to increase development to the east of Route 1; therefore, transit should be strengthened in the middle of the corridor with improved feeder bus service.

6. Comments regarding the alternatives shown on the project map (10):

- Rail is infinitely preferable to buses as a bus can be trapped in the same traffic as cars, which doesn't guarantee schedule or a pleasant ride compared to Metrorail.
- BRT/LRT only seem to make sense in the context of Metrorail. Makes more sense to expand Metrorail and add more stations.
- Prefer a combination of two new Metrorail stations and the addition of either BRT/LRT along Route 1. Both options will increase convenience to encourage the use of transit ridership for peak and off-peak.
- There doesn't seem to be an alternative to D.C. off of Route 1 and I do not want to transfer.
- Prefer a stop(s) toward the southern section of Potomac Yard.
- Would like to see some type of public transportation up and down East Glebe Road.
- Where are the existing and proposed bus routes for comparison with proposed BRT/LRT and Metrorail?
- Additional transit in the corridor is nice but it runs parallel to existing transit – better to extend to Old Town along North Waterfront/Fairfax Street to King Street at/or near City Hall or the Torpedo Factory.
- For me, the Metrorail stations would be enough since I do not mind walking.
- Do not run down the center of the street or switch sides so often, you increase accessibility issues that way.

7. Other Comments (13):

- What are the planned pedestrian connections across Route 1, i.e., crosswalks, pedestrian bridges?
- Prefer combination of Metrorail and either LRT or BRT.
- Prefer Metrorail – lower capital and operating costs. Feeder bus giving local circulation and buildings upon existing transit. No loss of right-of-way. There is no discerning benefit with LRT and BRT.
- Russell Road is somewhat under-served. Therefore, on weekends trying to "feed into" the new BRT/LRT routes would be exasperating at best. Scarcity of weekend mass transit has made me rethink decision to add another vehicle to the already taxing wheeled volume.
- This proposal seems to have neglected residential and shopping districts of upper Potomac West, Arlandria, and Del Ray.
- What ever happened to all the cultural items that were held out to us when the yards were first sold?
- Why in the world would it take two experts to study these issues?
- Was thinking about moving some place with Metrorail accessibility but now that a new light rail is coming in I may not have to move after all.
- Is there any way the project could be completed faster?
- Costs have to be kept low. If round trip for public transit costs $5-6, when alternative cost is $1.50 plus a gallon of gas, I have to think hard about the about the merits of public transportation.
- Expand what works: Metrorail and Metrobus (feeder). You will stand a better chance of obtaining FTA funding.
- I expect most of the traffic which drives thru this corridor is coming from beyond the area covered by the proposed transit lines.

Nearest Intersection:

Glebe Road and Jefferson Davis Highway (3)
Mount Vernon and Four-Mile Run (2)
Commonwealth Avenue and East Glebe (2)
East Reed and Route 1 (2)
Clifford Avenue and East Glebe Road
Milan Drive and West Glebe Road
Mount Vernon and West Glebe Road
King Street and Patrick Street
King Street and Fairfax Street
Van Dorn and Duke Street
I-395 and Route 1

COMMENT SHEETS

Summary of Comment Sheets
March 20, 2002
Arlington County – Aurora Hills Community Center

Twenty-four comment sheets were received from citizens from Arlington County pertaining to the CCPY Corridor Transit Alternatives Analysis. The following is a summary of the comments received between the public meeting held on March 20 and May 8, 2002. The number in parenthesis indicates the number of times that specific comment was made.

1. ***The following properties are important to me when consider using transit. Rank in the order of importance:***

First
- **Connection (11)**
- Convenience (4)
- Speed (4)
- Cost (3)
- Distance (1)

Second
- **Convenience (6)**
- Cost (3)
- Connection (3)
- Distance (2)
- Speed (2)

Third
- Speed (4)
- Connection (4)
- Cost (4)
- Convenience (3)
- Distance (2)

Fourth
- Cost (6)
- Distance (6)
- Convenience (4)
- Connection (2)
- Speed (2)

Fifth
- Speed (7)
- Distance (6)
- Connection (2)
- Convenience (2)
- Cost (2)

Comments (7):

- Safety relating to station surroundings.
- Safety must come first. Transit lines must be seen, system needs signal preemption and vehicles must be wide inside. Time and cost are important. My local bus doesn't go where I usually go. I must transfer.
- Need a system that interconnects – do not need to build a new system
- It is important to have easy access with low cars and platforms.

- Cost and convenience is all that matters.
- There is already a Metroline.
- Hardly ever need to use transit.

2. I would consider using transit for:

Recreation (15)
Shopping (12)
Traveling to/from work outside the corridor (10)
Traveling to/from work inside the corridor (7)
Other (i.e., services, school, airport, appointments) (3)

Comments (3):

- I use transit to work but wouldn't use your proposed transit alternatives unless you add a Metro stop.
- Not owning a car, mass transit is very important to me.
- Absolutely need something else as Route 1 is gridlocked with over 50,000 vehicles per weekday. Transit must be expeditious.

3. If transit were available in the Corridor, I would use it more frequently:

Weekend (9)
Weekday non-rush hour (8)
During business hours (8)
Rush hour (8)
Evenings (7)
Never (1)

Comments (4):

- Transit is available in corridor. Buses are not well coordinated, routes are not known to most people and you cannot see them.
- I wouldn't use it at all as it would not be convenient for me.
- No transit is needed other than an additional Metro stop at Potomac Yard
- I currently use buses (Route 23, K, 9, 10P and 11D) to access areas in Arlington. Metrorail to D.C. and other areas on the lines are available.

4. Rank the following transit modes in the order you find most appealing:

First
Metrorail (12)
LRT (5)
BRT (2)
Bus (1)
No Preference (1)

Second
BRT (9)
LRT (5)
Metrorail (2)

Third
LRT (6)
BRT (4)
Metrorail (4)

Comments (10):

- As long as the mode is comfortable, reliable, convenient, and frequent I don't care what it is.

- I have used transit to work and elsewhere. LRT is clearly superior except for busy subways. Buses breakdown, pollute when idling, and air condition shuts off when engine is turned off.
- Need a feeder lines to Metrorail, which is the fastest and has no auto traffic to compete with.
- Metrorail is the only one that is appealing. Don't add transit modes because of the perception of adding "character."
- Stupid to install another parallel system.
- I have used LRT in France, Germany and Portland, OR.
- My preference for LRT is for this corridor only. The project costs could change my opinion to BRT.
- Besides adding new Metrorail Stations, regular bus service with signal preemption and car jumpers should be considered.
- BRT seems practical given its speed and the distance involved.
- Metrorail isn't flexible enough and buses aren't clean enough.

5. Which side of Route 1 would you prefer transit to be located?

East (11) as first choice
West (5) as first choice and one person selected as their third choice
Middle (4) as first choice and one person selected as their second choice
Both sides (1)

Comments (10):

- Have a safety concern in placing transit behind shopping center. The access shouldn't be isolated.
- Waiting at a small station in the middle of Route 1 sounds like a noisy, smelly location (traffic, fumes).
- Look at transit safety by modes – buses have highest incidents per million passengers, followed by heavy rail then LRT.
- We need a Metrorail station at Potomac Yard and LRT must go there. Crystal Drive must be served.
- Prefer east side, except north of 12th Street South.
- Place on the same side as Potomac Yard.
- Please don't put anything on Route 1.
- Crystal City is a logical Arlington route since more apartment-dwellers will use it than home-dwellers; however, going through Pentagon Row area makes sense. In Alexandria, the side of Route 1 doesn't matter until Braddock Road as long as nothing is on Route 1.
- I don't want it at all. I think this is a waste of time and money. There are many other transportation needs in this region more important than this effort.
- After the north end of Crystal City, I would like it west of Route 1 into the Pentagon City/Fashion Center/Pentagon Row area. Columbia Pike would appear to be a prime target for good transportation.

6. Comments regarding the alternatives shown on the project map (15):

- A Metrorail system is the only one that makes sense.
- I do not see the need for additional LRT or BRT in this corridor as bus service and Metrorail currently serve it.
- Build LRT (Pentagon to Pentagon Metro Station to Crystal City Metro Station) and see how that helps traffic before building your proposal.
- Concern that transit access/system isn't integrated into "daily life" making it less safe and isolated.
- Other than building upon the region's $10 billion investment in Metro, none of the others make sense. Improved BRT-type circulators to feed Metro should be a given.
- Where are the connecting bus routes? Rail must go to Potomac Yard Metrorail Station. Run bus #9 on 15th Street to Joyce Street. Move bus route 10A to Jefferson Davis and Eads Streets to improve travel time. LRT will improve travel time on U.S. Route 1.
- Make the LRT a complete loop (Crystal City, Columbia Pike, Baileys, King Street to Alexandria to Crystal City).
- Prefer to use BRT/LRT (Alternative 1 and Alternative 1 & 2).
- Too many stops on BRT/LRT to qualify as "rapid transit;" however, the alignments look good.

- I strongly urge consideration of the LRT (or BRT) coming up Army Navy Drive and/or down Hayes Street to the Fashion Center/Pentagon City and this high-density area.
- I would like to see bus pollution included in the discussion of BRT.
- The route should be on the west side of the Braddock Road Metro and go north through Potomac Yard.
- For residents in the corridor area it may be more advantageous to locate the routes closer to the residential areas, e.g., Eads Street in Crystal City.
- Consider more realistic development options. Arlington grows "just to grow" without a comprehensive plan (witness Ballston, etc.)
- Time waiting for transit would be a major consideration - every 10 minutes? Every ½ hour?

7. Other Comments (18):

- Build more Metrorail Stations (strategically located) rather than a new system. LRT is used in many areas and to my knowledge have not been cost effective.
- Work with Metro, not against. Consider 10-20 years after completion and who will maintain the considered LRT/BRT. Cost will be borne only by Arlington/Alexandria. That's a reality.
- Connecting into the current Metro system makes the most sense to move the many commuters into and out of the area. Metro Stations should go where the higher density buildings are in Potomac Yard.
- Adding more Metro stops is not the best solution because of lack of flexibility and longer walking distances. Planners should assume the escalator breakdowns are becoming routine and would affect people on their route. An "easy on-easy-off" solution would be easier to promote ridership to all groups of people, especially older.
- Getting closer to "Old Town" Alexandria would be a great convenience.
- Busway cannot have traffic signal preemption. Preemption with the number of buses that would be required to handle the same number of riders as LRT would stop all auto traffic. Need fewer vehicles with LRT. We must go by real experience, not just computer printouts. Buses have fewer riders than estimated and LRT usually has more than estimated.
- There should not be a transit station at the intersection of 27th, Crystal Drive, and Potomac Avenue in Arlington.
- Rather than a two-way route, I would like to see a loop system, such as a turning from Braddock into Mount Vernon Avenue, Commonwealth, Glebe, Eads, etc.
- Addition of BRT or LRT should be part of a longer line from Old Town (Wilson Bridge/Prince George's County) through Columbia Pike and Route 7 from Columbia Pike to Tysons Corner. Look at higher ridership from a longer line.
- The cost of LRT or BRT is many millions of dollars and requires maintenance facilities.
- Who will be living in the corridor? Will they be working in this area as well or coming in from the suburbs? Many current residents have gone due to the increased costs of living in Crystal City.
- BRT sounds interesting, I would like to learn more.
- I am not really sure people within the corridor will use BRT/LRT for shopping, etc. This is really a "values" question.
- Make the old railroad bed a very limited access (four entrances/exits at most) from I-395 to I95 and the Beltway.
- Very important to connect Potomac Yard to Crystal City to Pentagon City.
- I have been interested in this transit alternative for Potomac Yard/Crystal City since it was first mentioned during the Potomac Yard-North Tract Work Group I participated in. Unfortunately I did not know about the March 19th and 20th meetings.
- How does this project rate compared to other Metro priorities in the region?
- I believe in public transportation.

Nearest Intersection:

18th Street and Crystal Drive (2)
23rd Street and Jefferson Davis Highway (2)
South Glebe Road and Arlington Ridge Road (2)
15th Street and Route 1
20th Street and Route 1

15th Street and Crystal Drive
20th Street and Crystal Drive
18th and Eads Streets
23rd and Eads Streets
23rd and Hayes Streets
Glebe Road and Eads Streets
Eads Street
Crystal Drive
Lee Highway and Veitch North
Columbia Pike and Fillmore Street
Aurora Highlands
Wilson Blvd and Oakland
Army Navy Drive and South Joyce Street
Route 7 and 674 but often travel to Arlington

E-Mail

Summary of E-mail Comments

Ten e-mail messages were received through May 8, 2002. The following is a summary of the comments received.

- Any transit route should be located along Route 1, if not Mt. Vernon Avenue; any alignment further east would make it inaccessible to the nearby residents.
- Connections to Metrorail must be seamless.
- Would like to see Metrorail realigned so it is adjacent to Route 1 between National Airport and Braddock Road with two stations in between.
- Think a streetcar similar to Portland's [Skoda] should be used on Mt. Vernon Avenue between Braddock Road and Crystal City. These could run with the traffic.
- Construct a thruway that would be used by buses, pedestrians, and bicycles. Could be at ground level with the right of way at intersections with cross streets; or could be elevated and then run as a continuous road from Braddock Road Metro to the Crystal City Metro.
- Would love to see a new Metrorail station for the Potomac Yard area.
- It will be important to ground your proposal in economic realities rather than an ideal proposal. Everyone is positive about Metrorail but there is a history of neighborhoods in the area no willing to allow a large development that would have sustained a Metrorail.
- Project web site is most informative and well constructed.
- Does the Metrorail alternative include a new station at Four Mile Run on the existing tracks?
- How were the ridership and automobile demand forecasts developed?
- Was there any consideration or study of the traffic impact on East Glebe/West Glebe Road? What is the outlook for Glebe Road when the new Potomac Yard development is in place?
- See where Mount Vernon Avenue was included in your study area but do not see how any of the proposed plans take it into consideration.
- No preferences on an alignment but prefer the LRT system.
- Take transit underground before Army Navy Drive and come up in the Pentagon south parking lot.
- Favor Metrorail Station at the Town Center.
- Two Metrorail stops would slow the through rider; not worth he time lost or the operation and capital costs.
- Do not favor a Metrorail stop at Four Mile Run but if you o, build a VRE stop there. VRE could consider moving the Crystal City VRE stop to be next to the our Mile Run Metrorail stop.
- Pleased to see progress is being made in looking at alterna e transportation options. At what stage is the planning process currently?
- Will comments made now or later have any substantial impac in the decision taken?
- Please send a stack of pre-paid questionnaires to give out at ur next Civic Association meeting.

HOTLINE CAL .S

Summary of Hotline Comments

Nine telephone hotline calls were received through May 8, 2002. The following is a summary of the calls received. The number in parenthesis indicates the number of times that specific comment was made.

- Please send me copies of the meeting handouts and a copy of the newsletter. (5)
- What is the time and location of the public information hearings? (3)
- Please add me to your project mailing list. (3)
- Will the project team be providing a briefing to the Del Ray Civic Association? If so, when?
- Which modes are under consideration?
- Can I still make comments on the project?
- What is the project timeframe?
- What is being planned around the Potomac Yard area?

CORRESPONDENCE

Summary of Correspondence

One correspondence was received through May 8, 2002, which is summarized below.

- Thank you for the most informative meeting in Arlington on March 20th.
- I am convinced that you need a combination of Alternatives, LRT and Metrorail.
- Potomac Yard must have a Metrorail station at the Town Center.
- The BRT alternative cannot be used, as you will need 42 articulated buses in the peak hour and will need to run every 86 seconds or 1.5 minutes. BRT cannot justify "rapid boarding, fare pre-payment" as the labor cost is too high. Every vehicle will require a driver.
- BRT attracts only one-third of the estimated travel, but LRT attracts 122 percent.
- We must consider travel safety and air pollution.
- Missing from the public meeting was a discussion of local connecting bus service other than a general statement that feeder buses would circulate to the Metrorail stations.
- Route 9 will be devastated by the LRT but it is a vital route from Alexandria south. Suggest you reroute Bus 9 from South Eads Street west on 15th Street South to South Joyce Street and Army-Navy Drive to replace Route 10-B in this area. This will serve a different route that LRT and will not duplicate service.
- It is fallacious to think of constructing BRT now with planned conversion to LRT. It would be wasteful. Look at the Metrorail to Dulles and the cost increase with BRT, making the project unaffordable and undesirable.

DISCUSSION FORUM

Summary of Comments from route1transit.com Discussion Forum

A total of five comments were posted on the discussion forum through May 8, 2002 and are summarized below.

- Can monorail be added to the list of modes under consideration? I would support a monorail system connecting the Pentagon and the Springfield transit stations.
- The transportation alternative of additional Metrorail stops combined with a significant improvement in the existing bus system seems simpler, uses less land, and is preferred.
- If the BRT/LRT alternatives must be considered, we feel that the route that traverses the interior of the Potomac Yard should not be dropped from the recommended alternatives, and actually should be considered as the primary route.
- Do not think a BRT is a good idea because they take up too much valuable land for the dedicated road and stations. Buses are also noisy and dirty.
- A new Metrorail stop at Potomac Yard is not going to be enough to relieve traffic congestion in the area.

SUMMARY OF PUBLIC MEETINGS OCTOBER 25 & 30, 2001

I. PUBLIC MEETINGS

This Public Involvement Report for the Crystal City Potomac Yard (CCPY) Corridor Transit Alternatives Analysis covers public participation activities for the period between October 18 and November 12, 2001. This includes a summary of the public meetings held on October 25 and 30, 2001, as well as all of the comments received since the meetings. The meetings were held to introduce the public to the study process, to review the candidate list of alternatives for transit in the corridor, and to solicit the public's reactions and preferences.

The first meeting was held in Arlington on October 25, 2001 and was attended by approximately 58 people. The meeting was held in the meeting room in the Crystal Gateway Condominiums. In addition to the Study Co-Chairs, Vice-Chairman Christopher Zimmerman of the Arlington County Board and Mayor Kerry Donley of the City of Alexandria, Virginia Senator Patricia Ticer attended.

The second meeting was held in Alexandria on October 30, 2001 and was attended by approximately 62 people. The meeting was held at Mount Vernon Elementary School. Elected officials in attendance included Mayor Kerry Donley, Alexandria Councilman David Speck, Alexandria Councilwomen Del Pepper and Clare Ebelwein, and Virginia Delegate Marian Van Landingham.

II. MAIN TOPICS BY VENUE

Citizens' Oral Comments: Approximately 22 citizens at Crystal Gateway Condominiums and 20 citizens at Mount Vernon Elementary School provided oral comments at the October public meetings. Attendees at the Arlington meeting expressed concern over the potential loss of open space and the impact on the character of the neighborhoods, especially within Crystal City and Four Mile Run. A number of citizens supported the expansion of existing transit systems such as buses and Metrorail as well as improving the interconnections to other transit systems. A couple of residents expressed concern that a new system would increase congestion along Route 1.

Alexandria residents also expressed concern about the potential loss of open space and the impact on the character of the neighborhoods, especially along Powhatan Street, Powhatan Park and Four Mile Run. Several citizens supported a new Metrorail Station within Potomac Yard, while others supported the expansion of the existing bus service. Attendees at the Alexandria meeting expressed their appreciation of the meeting and website forums for providing information to the public. A couple of citizens requested additional information

regarding cost in order to evaluate the various transit options and asked about the decision-making process.

Comment Sheets: Eighteen comment sheets were received through November 12, 2001. Comment sheets received from the Arlington meeting frequently cited support for the expansion of the existing Metrorail lines followed by light rail transit and then bus rapid transit. Critical issues identified included the cost effectiveness of the selected transit system, the need for sidewalks along the east side of Route 1, and the need for a separate transit lane. Additional comments included concerns about neighborhood and environmental impacts, additional congestion on Route 1, duplication of services, and coordination with other projects and transit systems.

Comment sheets received from the Alexandria meeting frequently cited support for the expansion of the Metrorail system. Critical issues identified included the need for the selected system to be cost-effective, flexible, and adaptable. In addition, the selected system should provide a high quality circulation that optimizes the availability for the most potential riders. Additional comments included concerns over the potential impacts to neighborhoods, businesses and the environment.

E-mail: Five e-mail messages were received through November 12, 2001. Comments mainly supported Metrorail as well as enhancing existing bus service. Additional comments focused on the need to preserve the integrity of existing neighborhoods and the connectivity to other transportation links.

Correspondence: Two pieces of correspondence were received through November 12, 2001, and are summarized in this report.

Telephone Hotline: Two hotline calls were received through November 12, 2001. Both people requested additional information and one person wanted to be added to the project mailing list.

Discussion Forum: Three comments were posted on the project website www.route1transit.com between October 18, 2001 and November 12, 2001, and are summarized in this report.

PUBLIC MEETINGS

Summary of Citizen's Oral Comments
October 25, 2001
Arlington County – Crystal Gateway Condominium

Public meetings for the CCPY Transit Alternatives Analysis were held on October 25 and 30, 2001. Fifty-eight people attended the meeting at Crystal Gateway Condominiums on October 25, 2001 in Arlington, Virginia; approximately 22 citizens provided oral comments at the meeting. Below is a summary of the oral comments. The number to the left of each comment refers to the number of times that specific comment was made.

Alignments/Mode (15 Comments)

3 Concern over the potential loss of open space and neighborhood integrity, especially within Crystal City and Four Mile Run
2 People will only use Metrorail
2 Concern a new service will create additional congestion on Route 1
2 There is already a Metrorail alignment in place
2 There needs to be a more effective way to connect people to existing transit systems and longer high-speed transit
1 Consider expanding existing bus service rather than building a new transit system
1 Don't need any above ground transit in Crystal City
1 Public transit is about convenience; Metrorail is convenient but buses are not
1 This system should serve the existing population and not focus on serving new development

Funding (3 Comments)

1 Need cost information in order to evaluate the different transit alignments for the corridor
1 Concern over residents paying for transit alternative that ultimately will financially benefit Potomac Yard developers
1 What is the cost of the study

Public Participation and Information (5 Comments)

2 Need to have more conversations with the community
1 Need to clarify the expected growth and increase in congestion within the corridor
1 Transit planning should be proactive and not reactive
1 What is the goal of the study

Technology Analysis (11 Comments)

1 Why was VRE taken out of consideration
1 Why was monorail not included

1 Why aren't there more Metrorail stations in Alexandria and Arlington
1 Why weren't existing Metrorail Stations used
1 Why did the study not include Arna Valley
1 Why do you need to build transit
1 To what extent was the existing bus service analyzed
1 To what extent was transit demand with feeders to existing Metrorail Stations evaluated
1 Look at the longer-range corridors such as Columbia Pike, Route 1, Beltway and Route 7
1 Need to coordinate with other development plans in surrounding areas that will affect traffic on Route 1
1 Concern that the study on alternatives may be insufficient

PUBLIC MEETINGS

Summary of Citizen's Oral Comments
October 30, 2001
City of Alexandria – Mount Vernon Elementary School

Public meetings for the CCPY Transit Alternatives Analysis were held on October 25 and 30, 2001. Sixty-two citizens attended the meeting at Mount Vernon Elementary School on October 30, 2001 in Alexandria, Virginia; approximately 20 citizens provided oral comments at the meeting. Below is a summary of the oral comments. The number to the left of each comment refers to the number of times that specific comment was made.

Alignments/Mode (25 Comments)

5 Concern over the potential loss of open space and neighborhood integrity, especially along Powhatan Street, Powhatan Park and Four Mile Run
3 Alternative D is detrimental to residential neighborhoods, especially to the Northeast neighborhood; light rail is not appropriate
3 Need a Metrorail Station in Potomac Yard
2 Consider expanding existing bus service rather than building a new transit system
1 Why not use the designated Metrorail stop that was designated in the Olde Towne Green
1 Original Potomac Yard plan led citizens to believe there would be a Metrorail Station
1 Excellent bus system would cost very little
1 If considering BRT, the plans should not further congest Route 1 by putting another vehicle in existing lanes
1 Light rail doesn't make sense when you have Metrorail there already
1 If running a new transit system through the Corridor, will need a safe place to cross Route 1
1 It would be as mistake if you look at the corridor without looking at what else is going on in the surrounding area
1 A goal of the study should be to protect the residential character of the neighborhoods
1 Better transit will add more value wherever it goes
1 Concern with pollution issues in lower level of Four Mile Run
1 Concern about noise
1 Concern neighborhood streets may be changed from minor arterial to major arterial

Funding (4 Comments)

2 Need cost information in order to evaluate the different transit alignments for the corridor
1 Is there competition for funding at the federal level
1 How are construction costs determined without including some engineering

Public Participation and Information (16 Comments)

4 Appreciate forum for informing people
2 How will the final decision be made
1 Need to have more conversations with the community
1 Invitation to speak at the next Northeast Civic Association meeting

1 Need for additional information prior to making a recommendation for a preferred alternative
1 How will the study team show they took the public's comments into consideration
1 Are the maps posted on the website
1 Concern that the project website does not show alternatives or explain clearly the alternatives under consideration
1 Concern that a number of people do not have access to the website and may not be aware of this study
1 Does the term "regional" include Washington, D.C. and Maryland
1 Need additional information on parking
1 How are you planning to reach people who are not present

Technology Analysis (6 Comments)

1 Why was VRE taken out of consideration; system should tie into VRE
1 Why none of the options include National Airport
1 Will the study team be studying three modes and will a defined right-of-way space be used
1 Why weren't other corridor streets such as Duke Street or Eisenhower Avenue considered
1 Need to include information on parking
1 Concern that the study not be a mere look at justifying density for new development

COMMENT SHEETS

Summary of Comment Sheets
October 25, 2001
Arlington County – Crystal Gateway Condominium

Eleven comment sheets were received from the CCPY Corridor Transit Alternatives Analysis public meeting held on October 25, 2001 through November 12, 2001.

Question 1. Of the 10 alignments (A through J and the Metrorail alignment), which do you find the most attractive? Why? (13 Comments)

2 The use of Metrorail is the most sensible and attractive alternative
2 Alternative H is the most attractive followed by Alternative F
2 Alternative A and D
2 B serves the North Tract and goes through Potomac Yard and minimizes impact on Route 1
1 Alternative F is best north of Four Mile Run
1 Alternative G is best from Braddock Road to Monroe Avenue
1 K is appropriate every one half mile from each building to the station
1 North Tract and Crystal City must be served, as buses can't get in there
1 East of Route 1, alignments most effectively serve existing and planned development

Which do you find the least attractive? Why? (13 Comments)

2 Alternatives A and G north of Monroe Avenue are the worst because they duplicate bus service and fail to take advantage of the new right-of-way.
2 Alternative B and F are the least attractive
1 Alternative A is the least attractive
1 Alternative D is the least attractive option because it would have adverse effects on residential areas
1 Light Rail Transit
1 Light Rail through the Northeast and all alternative alignments through northeast neighborhoods
1 All alternatives that connects the spine road directly to Powhatan Street
1 Anything on South Eads Street
1 Anything through Crystal City
1 Avoid disrupting Metrobus Route 9
1 Jefferson Davis Highway is no place for pedestrians.

Question 2. What are the most critical issues for the study team to consider? (16 Comments)

4 Cost effectiveness; minimize capital and operating costs
2 Transit must be free of traffic congestion in highly developed areas; transit must be separated from car lanes
2 Need a sidewalk from Crystal City to Potomac Yard on the east side of U.S. 1
2 Impact of transit on the neighborhoods
1 Remove congestion from Potomac Yard without dumping into residential areas

1 Integrate with existing Metrorail and with long-haul rapid transit on US Route 1/Route 244/Route 7 inside the Beltway
1 Need Metrorail stop at Potomac Yard
1 Jefferson Davis Highway will come to a gridlock halt according to VDOT projections
1 The type of transit must have a proven success record
1 Metrorail and VRE are not relevant to areas over 3/8 miles from stations

Question 3. What transit technology (Bus Rapid Transit, Light Rail Transit, Metrorail) do you prefer? Why? (14 Comments)

5 Metrorail as expansion of existing lines
3 Light Rail Transit as part of long-haul line with stops at about one-mile intervals
2 BRT as cost effective and transitional
2 BRT makes no sense and costs more than light rail
1 Insufficient information to form opinion
1 Bus lines least intrusive

Question 4. What other issues should we consider as we proceed with the study and what other information should we be aware of that you know about? (14 Comments)

2 The need for sidewalks in Pentagon City
2 Coordinate with other existing plans
1 Consider air pollution, neighborhood impacts, noise, and flexibility before making any decisions
1 Add more Metrorail stations
1 Add express service on existing Metrorail lines
1 Operation of longer rapid transit line from Wilson Bridge to Tysons Corner (US Route 1/Route 244/Route 7)
1 Any transit system through Potomac Yard must have a dedicated right-of-way to work efficiently as a commuter-facilitating device.
1 Circulator/feeder neighborhood mini buses
1 Crystal City residents do not want additional buses or traffic down Crystal Drive
1 Contact all Civic Associations that will be affected by the transit
1 Crystal City has an underground walkway from 12th Street to 25th Street that connects to Metrorail, which gives the people service to Pentagon City area, but not Potomac Yard
1 Ramp Potomac Avenue up to Exit on Airport Overpass from Route 1 to George Washington Parkway

COMMENT SHEETS

Summary of Comment Sheets
October 30, 2001
City of Alexandria – Mount Vernon Elementary School

Seven comment sheets were received from the CCPY Corridor Transit Alternatives Analysis public meeting held on October 30, 2001 through November 12, 2001.

Question 1. Of the 10 alignments (A through J and the Metrorail alignment), which do you find the most attractive? Why? (4 Comments)

2 The use of Metrorail is the most sensible and attractive alternative
1 B serves the North Tract and goes through Potomac Yard and minimizes impact
on Route 1
1 If done right, BRT has the potential to augment a new Metrorail station with an attractive circulator service

Which do you find the least attractive? Why? (6 Comments)

2 Alternative D is the least attractive option because it would have adverse effects on residential areas
1 Any new rail transit service in the corridor is undesirable; as it would compete for other pressing transportation needs in the region and duplicate service (Metrorail and VRE) as well as be too expensive
1 Jefferson Davis Highway is no place for pedestrians
1 There is not enough information to offer a comment
1 All other transit except Metrorail fails to incorporate existing communities

Question 2. What are the most critical issues for the study team to consider? (20 Comments)

4 Cost effectiveness; minimize capital and operating costs
3 Provide a flexible and adaptable system
2 Optimize availability for most potential riders
2 Providing high quality circulation
2 Look at how to improve pedestrian accessibility to Metrorail stations
2 Preserve integrity of neighborhoods
2 Why buses are inadequate or underutilized
1 Work with the developers to integrate Metrorail into the fabric of a Potomac Yard transportation system
1 Resist the temptation to play Alexandria and Arlington off of each other.
1 What to do with the 60-80% of trips that won't be using transit and who are already suffering from congestion on Route 1. A comprehensive set of multi-modal transportation solutions should be considered and articulated as part of your transit study

Question 3. What transit technology (Bus Rapid Transit, Light Rail Transit, Metrorail) do you prefer? Why? (7 Comments)

4 Metrorail as expansion of existing lines
1 Provide superior transportation so people have a real choice
1 Combination of both Metrorail and BRT
1 The cheapest, most effective transit system that will be delivered the fastest

Question 4. What other issues should we consider as we proceed with the study and what other information should we be aware of that you know about? (9 Comments)

2 Consider air pollution, neighborhood impacts, noise, and flexibility before making any decisions
1 Connection to other systems
1 Don't take Powhatan Park or negatively impact Powhatan Street
1 Consider financial impacts to Del Ray and King Street businesses
1 Alignments must effectively serve existing and planned development
1 Consider bicyclists needs--don't diminish existing or planned facilities
1 Use existing bridge to cross Four Mile Run
1 Cost effectiveness and self-sufficiency

E-MAIL

Summary of E-mail Comments

The study team received five e-mail messages for the CCPY Corridor Transit Alternatives Analysis between October 25 and November 12, 2001.

Alignments/Modes (28 Comments)

3 Support one or more Metrorail stations – should not be too far for new residents to walk.
3 Occupants of new development in Potomac Yard and Crystal City must be offered a reliable and attractive feeder service to core public transportation system
2 No additional service beyond Metrorail at Pentagon, Pentagon City, and Crystal City will be required
2 When Potomac Yard was planned it was associated with Metrorail
2 Supplement Metrorail and bus routes with systems like the ART
2 Consider effectiveness and utilization of the current bus routes
2 Transit has to be given preferential treatment throughout the corridor and requires early preparation
2 Critical issues for Crystal City residents would be noise, disruption and a deterioration of the quality of life
2 Crystal City is an attractive urban environment and many of the alignments could remove this landscape
2 Most of the traffic back up in the study corridor is related to the Potomac Yard Shopping Center ingress and egress
2 Consider looking at access to Potomac Yard from George Washington Parkway
1 Least attractive are Alignments A and D which don't go anywhere
1 Any notion of creating an additional link between Braddock Road and the Pentagon through Crystal City must be completely dismissed. Bringing "through-traffic" into the area in the form of a continuous transit line is not the answer
1 Recommend review of the work conducted by the Arlington Potomac Yard Task Force, especially conclusions, recommendations and design guidelines
1 How will the system connect to other transit systems

Funding (2 Comments)

2 Developers should be forced to share the costs

Public Meeting and Information (9 Comments)

3 Clarify the reasons for the study and why there is a need for enhanced transit usage
2 You correctly identified the need in your Purpose and Need
2 Which communities are being served by transit
1 Concern that there was insufficient data on specific transportation demand for public to express opinions and preferences
1 Consider adding "other" transit to the comment sheet

Correspondence

Summary of Correspondence

The study team received two pieces of correspondences between October 25 and November 12, 2001.

Alignments/Modes (11 Comments)

2 Any transit through Potomac Yard must have a dedicated right-of-way to work efficiently as a commuter-facilitating device
2 Residential neighborhoods require low impact transit, which leaves bus as the only alternative for the northeast; light rail through the northeast neighborhood is not appropriate
1 Light rail in sensitive areas should not use catenary – should use single suspension trolley structures such as light or signal poles or by building attachments
1 Potomac Yard light rail line should run straight through the Pentagon to Columbia Pike and Leesburg Pike in accordance with 2020 Plan
1 Light rail is safe, attractive, economical, and quieter
1 Metrobus Route 9 on Jefferson Davis Highway/US Route 1 should be kept in service in the future, as it is the fourth most heavily traveled bus route in Northern Virginia
1 Look for ways to enhance the existing bus service
1 Alternatives that connect the spine road directly to Powhatan Street are inappropriate
1 Transit is essential

Funding (1 Comment)

1 A funding agreement for a Metrorail station in Potomac Yard must be reached

Public Meeting and Information (2 Comments)

1 Greatly appreciate your work to study light rail transit through Potomac Yard and to hold meetings.
1 Displays on Potomac Yard transit, light rail, and bus rapid transit were inadequate

HOTLINE CALLS

Summary of Hotline Comments

The study team received two hotline telephone calls between October 25 and November 12, 2001. The comments are summarized below.

- Please add my name to the mailing list for future meetings and forward any information distributed at the public meetings.
- Please contact me when you schedule a meeting with the Del Ray Civic Association

DISCUSSION FORUM

Summary of Comments from route1transit.com Discussion Forum

A total of three comments were posted on the discussion forum between October 18 and November 12, 2001. The comments are summarized below.

1 Live in Del Ray and would welcome a new Metrorail station at Potomac Yard
1 Do not welcome or encourage increased bus transportation as an alternative
1 Was the light rail plan that was to run on Crystal Drive past the Crystal Gateway Condominium rejected due to intense opposition
1 Concern that cars making a right turn off of South Glebe onto Route 1 often cannot do so because of the jam-up caused by the light at the Jack Taylor intersection.
1 Why is there a traffic light at an empty driveway at the Potomac Reserve

APPENDIX L – Policy Advisory Committee Resolution on the Locally-Preferred Alternative

CHRYSTAL CITY/ POTOMAC YARD TRANSIT ALTERNATIVES ANALYSIS

RESOLUTION OF THE POLICY ADVISORY COMMITTEE

WHEREAS, there is a need for high quality transit in the Crystal City/Potomac Yard Corridor that runs from the Pentagon in Arlington to Braddock Road in Alexandria; and

WHEREAS, over 4.9 million square feet of office space, 1,250 hotel rooms, 232,000 square feet of retail space, and over 3,300 residential units are proposed for the former Potomac Yard site; and

WHEREAS, the Crystal City/Potomac Yard Corridor Transit Alternatives Analysis was initiated in July 2001 by Virginia's Department of Rail and Public Transportation to determine what form of transit best suits the corridor; and

WHEREAS, the Crystal City/Potomac Yard Corridor Transit Alternatives Analysis seeks to:

1. Accommodate increasing mobility demands in the Corridor by increasing the capacity of non-highway modes of travel.
2. Minimize adverse impacts of the locally preferred alternative on existing commuter routes in the corridor.
3. Increase the utility of transit and develop transit service and options that support transit as a preferred mode choice for a wide variety of trips beyond morning and evening commuting trips, thereby enabling and promoting a transit-oriented lifestyle.
4. Provide a high level of circulation and mode choice (transit, walking, biking, and auto) within Potomac Yard and between Potomac Yard and surrounding areas.
5. Optimize use of state and local financial resources.
6. Increase the use of the region's existing rail transit system.

WHEREAS, the Department of Rail and Public Transportation has completed the technical analysis and the Policy Advisory Committee has reviewed the analysis of the study team and concludes that additional transit would offer an attractive, and well-utilized means of travel within the Crystal City/Potomac Yard Corridor, and

WHEREAS, the Crystal City/Potomac Yard Corridor Transit Alternatives Analysis is the first step of a multi-step federal planning process for transit; and

WHEREAS, the Crystal City/Potomac Yard Policy Advisory Committee finds that, a Bus Rapid Transit line, extending between the Braddock Road and Pentagon Metrorail stations, appears to offer a cost effective means of serving the traveling public and creating the transit-oriented development envisioned by Arlington County and the City of Alexandria; therefore,

BE IT RESOLVED, that the Crystal City/Potomac Yard Policy Advisory Committee finds that the projected transit ridership for the corridor provides ample justification to advance the project into the Federal Transit Administration project development process and New Starts Program for further study of transit in the corridor; and

BE IT FURTHER RESOLVED, that the Policy Advisory Committee recommends that an environmental impact study of the transit alternatives be conducted and supports efforts to work with federal and state partners to secure funding for an Environmental Impact Study; and

BE IT FINALLY RESOLVED, that the Policy Advisory Committee recognizes that Bus Rapid Transit, Light Rail Transit, and Metrorail are all viable options in regard to transit ridership for the Crystal City/Potomac Yard Corridor and recommends that all three options should be carried forward into the environmental impact study. The Policy Advisory Committee also recommends that Bus Rapid Transit be advanced as the locally preferred alternative for purposes of the Federal Transit Administration's New Start Evaluation. The selection of this alternative should not preclude future construction of one or more future Metrorail stations in the corridor. Future changes in the corridor beyond those currently envisioned for the year 2025, including changes in the Potomac Yard Retail Center, development of the North Tract, and proposed residential development in Crystal City may render transit capacity, beyond a BRT/LRT operation, necessary.