April 12, 2013
Comment from Jim MacIsaac, P.E., Bellevue, WA

I believe Light Rail as Sound Transit has been providing it (largely grade separated) is far more than five times more expensive in terms of capital cost than BRT on HOV/HOT lanes – as Sound transit has implemented its Regional Express bus system. However, if we can believe ST's O&M cost estimates, after completion of the ST2 LRT extensions LRT will be 35% less expensive to Operate per Passenger-mile served than BRT on HOV/HOT lanes.

Sound Move thru 2012

I offer the attached tables for consideration. The upper table presents statistics for the Sound Move (Phase 1) regional transit program – those elements that were in operation by 2012. That limits the LRT 'starter line' to 15.6 miles from Westlake to the Airport. The Sounder and Regional Express capital programs were effectively completed by 2012. I have adjusted all capital costs in the first column to 2012 constant dollars (adjusted by the Construction Cost Index) for appropriate cost comparison. The other columns reflect the 2012 annual operating statistics as obtained from the Q-4-2012 *Quarterly Ridership Report* for YTD totals and the *National Transit Database* to estimate passenger-miles and average passenger trip length.

Note that it only cost $167.5 million to provide bus vehicles to serve 22 BRT routes. An additional $955 million was spent on 'Community Connection/HOV' projects. Over half of that capital cost was for six ramp systems providing direct access/egress from I-405 and I-90 HOV lanes (costs that were considered 'highway improvements' and later reimbursed by WSDOT through its 'land swap' agreement. The balance was for transit centers, park-ride lots, and arterial HOV lane improvements. How much of those capital projects were needed to support BRT on HOV lanes is debatable. None of the REx system capital improvements required bonding support (like all low-capital cost bus systems).

Bond financing was needed to help fund the high-cost rail projects. I have split the bond financing costs (Issuance and Interest costs) between Central Link and Sounder in proportion to their total capital costs, and adjusted the financing costs to 2012 constant dollars. As you can see, financing costs are a major element of rail capital costs.

Note the BRT Boardings by 2012 are nearly double the LRT Boardings, and BRT Passenger-miles are nearly four times those for LRT. Yet the LRT capital investment is 25 times greater than the BRT bus investment, or four times the combined Bus and CommConn/HOV investment. The BRT ridership achievements would likely be nearly the same without the CommConn/HOV investments. Finally note for this completed stage of the Sound Move program, The LRT and BRT costs per ride are nearly the same. But since the BRT trips are over twice as long as the LRT trips, the LRT O&M cost per passenger-mile is nearly double that for BRT.

Sound Move + ST2 thru 2024

But as ST admits, the LRT line from Westlake to the Airport is the least rider-productive element of its planned LRT system. The lower table on the attached shows total capital costs of the Sound Move + ST2 programs (in constant 2012 dollars), and operating statistics for year 2025 after maturity of the completed system as estimated in the Draft 2013 Financial Plan model. The model eliminated about 40% of the Sound Move REx bus operations after completion of the LRT extensions and rider diversions to LRT.

To maintain an apple-to-apple comparison, I have adjusted the BRT Boarding and O&M Cost estimates to reflect what would exist by 2025 IF the BRT investment and operation had been maintained. The Bus capital costs thru 2024 include a complete 12-year replacement cycle for all bus vehicles. By 2025 the LRT system is estimated by ST to be serving twice as many Passenger-miles as the BRT system. So, let us assume we would need to double the BRT routes and services to match the Passenger-miles served by LRT – like adding 22 more BRT routes instead of LRT system extensions.

That means a BRT capital investment of $264.3 x 2 = $528.6 million (including a 12-year replacement cycle for all bus vehicles) could produce passenger-mile results comparable to what the LRT system would serve. In constant 2012 dollars, ***the $18.8 billion capital investment in LRT including financing costs is 35 times greater than could be achieved by a hypothetical BRT system on HOV/HOT lanes***.

To the cost of BRT buses, let's add $1.0 billion for a bus tunnel in Bellevue plus another $1.0 billion for BRT stations and HOV/HOT lane access improvements – a $2.5 billion investment in a BRT system on HOV/HOT lanes. If that could be done without finance costs, LRT would be ($18.8b/$2.5 b) 7.5 times greater than BRT on HOV/HOT lanes.

Conclusion

Sorry about this rather complex evaluation. It is offered to show that there is a large difference in BRT costs to merely provide bus fleets to operate on freeway HOV/HOT lanes compared to exclusive BRT lanes/guideways to which Sound Transit tends to compare BRT to LRT. The primary argument ST offers for LRT and BRT on exclusive lanes is 'travel time reliability'. Does it really matter that much to our economy if 1% of our work force is always on time versus 99% sometimes being late and absorbing their added travel time and fuel costs rather than expecting the public to subsidize an exclusive guideway transit alternative?

Sound Move

	Capital Cost 1997-2012 2012 $000s	2012* Boardings 1000s	Pass Miles 1000s	Avg Trip Miles**	O&M Cost $000s	Cost per Boarding	Cost per Pass Mile
LRT - 15.6 line miles	$4,473,899	8,700	62,403	7.2	$52,808	$6.07	$0.85
Capital Cost	$2,912,500						
Bond Interest	$1,561,399						
Sounder - Tacoma-Everett	$2,537,075	2,812	65,889	23.4	$34,418	$12.24	$0.52
Capital Cost	$1,651,631						
Bond Interest	$885,444						
Regional Express (REx)	$1,122,476						
Bus Vehicles	$167,550	15,431	231,712	15.0	$100,454	$6.51	$0.43
Comm Conn/HOV	$954,926						
TOTALs	**$8,133,450**	**26,942**	**360,004**	**13.4**	**$187,679**	**$6.97**	**$0.52**

* From Q-4-2012 Quarterly Ridership Report (YTD Totals).

** From National Transit Database Sound Transit Report.

Sound Move + ST2

	Capital Cost 1997-2024 2012 $000s	2025* Boardings 1000s	Pass Miles 1000s	Avg Trip Miles**	O&M Cost $000s	Cost per Boarding	Cost per Pass Mile
LRT - 50 line miles	$18,832,486	77,332	554,701	7.2	$209,877	$2.71	$0.38
Capital Cost	$12,252,610						
Bond Interest	$6,579,876						
Sounder	$3,551,404	4,700	110,131	23.4	$72,258	$15.37	$0.66
Capital Cost	$2,310,580						
Bond Interest	$1,240,824						
Regional Express (REx)	$1,219,196						
Bus Vehicles***	$264,270	18,792	282,186	15.0	$163,000	$8.67	$0.58
Comm Conn/HOV	$954,926						
TOTALs	**$23,603,086**	**100,824**	**947,017**	**9.4**	**$445,135**	**$4.41**	**$0.47**

* From Draft 2013 Financial Plan Excel Model in YOE$, with one exception:
Reflects REx Ridership and O&M Costs as if no diversion to Light Rail extensions.

** Assumes Passenger Average Trip Lengths remain the same as in 2012.

*** Includes one complete replacement cycle of all bus vehicles after 12 years.

Prepared by James W. MacIsaac, P.E. April 11, 2013