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How Sound Transit Abused the Planning Process to Promote Light Rail

and also

CETA Comments on DSEIS for Sound Transit's "Regional Transit Long-Range Plan"

by
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This report in its entirety is submitted as one of the Coalition for Effective Transportation Alternatives (CETA) comments on Sound Transit's DSEIS for their Regional Transit Long-Range Plan as solicited in Sound Transit's news release dated Dec. 2, 2004 and on the web as: http://www.soundtransit.org/newsroom/releases/pr_20041202_1.asp

Abstract
Areas of weakness and apparent bias in the planning process behind Seattle's planned "Link" light rail system are identified. Problems with Sound Transit's one and only alternatives analysis – a 1993 FEIS comparing rapid rail and bus alternatives-- are documented. It is concluded that there is no valid alternatives analysis behind Link light rail. Link's performance is summarized using objective data and qualitative comments. Key advantages of BRT are described. Particular attention is given to the issue of rail versus bus capacity, and how it was mishandled in the 1993 FEIS in order to favor rail. Raw cost-effectiveness data in the 1993 FEIS is reformatted and presented in a way that better communicates the relative merits of the rail and bus alternatives. The bus alternative is modified to overcome alleged capacity deficiencies, and then re-compared with the rail alternative. It is found that a modified bus alternative would have had more than enough capacity to meet long-term needs and could have achieved the same ridership as rapid rail, at far lower cost. Results are brought forward in order to estimate the costs of the full regional light rail system envisioned by Sound Transit versus a BRT alternative. It is concluded that switching to the BRT alternative would save the Puget Sound region about $900 million dollars a year over a 30 year period. It is argued that Link is the failed result of a faulty planning process. The effects on public trust in government are documented with newspaper quotes, as are requests made of Sound Transit to consider alternatives to light rail. Detailed recommendations are offered on how to improve the process and conduct the proper alternatives analysis that is still needed.

Funding and Sponsors

This report was written by the author as a community service. There has been no outside sponsorship or funding.

Author's Background

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Web Sites for additional information on Link light rail

http://www.effectivetransportation.org/ (CETA site)

http://www.globaltelematics.com/pitf/index.htm

Copies of this report

Copies of this report can be obtained from Sound Transit since Sound Transit is required to publish comments received on the DSEIS. Copies may also be obtained from CETA. See CETA web site for contact information.

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Key Abbreviations:

ST = Sound Transit, the agency charged with detailed planning, implementation of high capacity transit in the Puget Sound area, known officially as the Regional Transit Authority or RTA.

RTP = Regional Transit Project, the name of the planning project taken over by RTA and whose main product was the 1993 FEIS for rapid rail (the author uses the terms RTA and RTP somewhat interchangeably)

PSRC = Puget Sound Regional Council, the agency responsible for strategic transportation planning, and the regions official MPO

EIS = Environmental Impact Statement, FEIS = Final EIS, as opposed to draft EIS

DSEIS= Draft Supplemental EIS, in this case for Sound Transits "Regional Transit Long-Range Plan"

Specific requests to Sound Transit concerning it's response to these CETA comments on the DSEIS

As Sound Transit knows, CETA members have almost certainly spent more effort over the last several years scrutinizing Sound Transit's light rail plans than any other organization.

Due to the importance of Sound Transit's Draft Long-Range Plan DSEIS a large amount of effort has gone into preparation of this document and CETA would appreciate a commensurately detailed and through response.

Individual and specific responses are requested to the following:

* Parts 1.5 thru 1.15 pertaining to specific deficiencies in the 1993 FEIS
* Parts 3.1 through 3.16
* Each of the eight points in Part 5.4.9
* Each of the reports three key recommendations at the beginning of Part 7.4
* Parts 8.2.2 and 8.3
* Each of the report's main conclusions as listed in the Executive Summary and Part 9.

In responding we would urge Sound Transit to consider not only what existing regulations may or may not require the agency to do, but also Sound Transit's moral obligation to provide citizens and public officials with the sufficient and objective information they need to make intelligent decisions about mass transit.

Executive Summary

Sound Transit's Board is increasingly committing this region to use light rail, as opposed to bus rapid transit, for the region's mass transit backbone. In 1996 voters approved spending $1.8 billion for a 21-mile light rail system. In 2001 Sound Transit admitted their initial cost estimates were wrong and shortened the line to 14-mile miles. However ST still hopes to eventually build over 125 miles of light rail and is taking administrative steps toward doing so.

Sound Transit justified its choice of light rail technology on an alternatives analysis done in 1993 by Sound Transit's predecessor the RTP. That particular study compared a 125-mile rapid rail system costing $11.5 billion against an express bus alternative costing $4.7 billion.

During the course of that study RTP predicted year 2020 ridership for both alternatives, and then evaluated their capacity to handle the predicted ridership. In looking at bus system capacity through downtown Seattle the RTP assumed the bus tunnel could only carry 100 buses per hour in each direction, although six previous studies had concluded its capacity was significantly higher than that.

At this point the RTP had a choice. Either it could verify that 100 was the correct value, and if so, apply one of the remedies that staff had already identified. Or it could penalize the bus alternative. It chose the latter, and proceeded to reduce predicted ridership for the bus alternative and claim it didn't have enough capacity to meet the region's needs. In addition, because the bus alternative now had lower ridership the RTA also down-rated it on all other ridership related benefits, such as its ability to improve mobility and support land use goals.

In short, the RTP compared a robust rapid rail alternative against a deliberately hobbled bus alternative and used the results to rule-out bus technology for the region's main transit spine along I-5. In its recently released Draft Long-Range Plan Sound Transit still relies on that corrupted and now obsolete study to justify proceeding with light rail.

Fortunately, it is possible to estimate what would have happened if RTP had elected to remedy the alleged capacity problem rather than penalize the bus alternative. However, to compare apples-to-apples it was necessary to have two alternatives that are either equal in benefit or equal in cost. Therefore the author elected to modify the bus alternative so it would attract the same ridership as the rail alternative, then compare costs. The first step was to remove the alleged capacity bottleneck using –to be conservative-- the most expensive remedy identified by staff, namely building a second parallel bus tunnel costing $600 million. This allowed the bus alternative to carry its originally predicted ridership, which was 93 % of what the rail system was predicted to carry. To get that last 7% the author used an RTP estimate for the cost of attracting extra riders.

The result is that a modified bus alternative would be $400 million per year less expensive (in 1991$) than the rapid rail system chosen by RTP. This is the picture that the RTP

could have produced using information available at that time. However, RTP chose not to do so because officials wanted rail to win. What can that study tell us today when we are concerned with light rail, not rapid rail?

Today there is every indication Sound Transit's Board wants to build at least 125 miles of light rail. There has never been an apples-to-apples comparison between bus rapid transit (BRT) and any of the different size light rail networks that Sound Transit is contemplating, much less a 125-mile system. However; it is possible to make an approximation.

First, it was assumed that 125 miles of Link light rail would attract as many riders as 125 miles of rapid rail. Clearly, it wouldn't because Link's slower, but this is the conservative approach. The remaining task was to estimate the cost of a 125-mile version of Link and compare that with an all-bus or BRT alternative. The 1993 cost comparison can be reused, but only after adjusting it for the facts that Sound Transit's early rail cost estimates were 44% too low and that many of the HOV lanes needed for the bus alternative have now been completed. The results show that a 125-mile light rail system would cost about $900 million (02$) per year more than a comparable BRT system. This cost differential would continue over the 30-year period needed to repay the construction bonds. It's also likely that BRT could replace the 14- mile Initial Segment or the 21-mile Central Link system for less than half their costs.

This information about a potential $900 million per year savings opportunity is new, and it needs to be published widely so taxpayers can decide whether it makes better sense to abandon Sound Transit's light rail strategy and switch to an equally effective BRT alternative.

It's unfortunate that knowledge of this opportunity has been suppressed. The best explanation may be the major disconnect that exists between what most citizens of this region want (reduced traffic congestion at the lowest possible cost) versus what the members of Sound Transit's Board want (light rail regardless the cost and despite the fact it won't reduce congestion).

To paper-over the gap, Sound Transit has systematically and continually resorted to disseminating biased, misleading, and even false information about the merits of Link light rail in order to bolster public support and justify Federal funding. One result is deterioration in the public's trust in government to spend scarce tax dollars wisely. It's also evidence that the current transportation planning process in Puget Sound is broken. The process is not providing the through and objective information officials and voters need to make multi-billion dollar decisions.

This report finds that the very foundation of Sound Transit's Draft Long-Range Plan is invalid because it's based on one corrupted and obsolete study done in 1993. It recommends that Link be placed on hold until and unless a proper, honest alternatives analysis demonstrates it's superior to BRT and other alternatives. This report further recommends that federal and local officials take steps to fix the process.

Extended Summary

The main purpose of this report is to trigger a reconsideration of Sound Transit's light rail plans, and the FTA's willingness to fund them by challenging the fundamental basis for Sound Transit's entire rail-centric strategy including their recently released Draft Long-Range Plan. A secondary purpose is to trigger improvements to the planning process that will: 1) help ensure taxpayers get the most "bang for the buck" from their investments in transportation, and 2) eliminate deceptive and manipulative practices on the part of agencies such as Sound Transit. Still a third objective is to give planning students and citizens in other cities a case study example of ways in which a transit agency has abused the planning process in order to promote a favored outcome.

There are three key reasons Sound Transits light rail strategy should be reconsidered:

1) Link light rail costs too much for what little it accomplishes. At the same time there appear to be better alternatives such as Bus Rapid Transit (BRT).

2) Sound Transit has never proven in any logical or business-like manner that Link is superior to these other alternatives.

3) Decisions to approve Link have been based on incomplete, misleading, biased, and false information which Sound Transit disseminated in order to garner support for its light rail plan.

These observations are not new. Sound Transit has heard, and ignored, them many times before. What this report adds to the record is a detailed and carefully footnoted analysis of how Sound Transit has abused the planning process to promote light rail, and, for the first time, a dollar estimate of just what pursuit of Sound Transit's light rail strategy would probably cost this region in relation to a bus rapid transit (BRT) alternative.

In short, the reader of this report will be privy to information that has not been available to date. It will show that the emperor (Sound Transit) has no clothes as regards its rationale for proceeding with light rail.

The full story of Sound Transit's abuse of the planning process is beyond the scope of this report. This report focuses on the alternatives analysis and environmental impact study (EIS) that supposedly justified the choice of rail technology over bus technology for this region's mass transit backbone. The alternatives analysis and closely related EIS are equivalent to a "business case" in the transportation-planning arena. They provide just about the only cost and performance information available to those trying to decide whether or not to fund projects like Link.

Background and context—

The Puget Sound Region is becoming committed to a light rail-centric strategy. Sound Transit recently began construction on Links 14-mile "Initial Segment". Sound Transit's

Board is already committed to extending it to Northgate, although they lack the money. In addition, Sound Transit has just published a Draft Long-Range plan which envisions extending Link into a regional system over 125 miles long. Over two billion dollars are already committed to the first 14-mile miles of light rail, and it would take many billions more to construct the full system.

Unfortunately even at this late date there is no solid analysis showing that light rail makes sense. The main failing is that there has never been a proper apples-to-apples alternatives analysis that compares the merits of light rail against an all-bus alternative based on bus rapid transit or BRT technology.

Therefore, even as the region increasing commits to Sound Transit's multi-billion dollar rail strategy, neither public officials nor taxpayers know whether spending X billions on light rail would yield more benefit than spending the same amount on buses, or on other alternatives such as car and van pools, demand management, and so forth. The relevant data needed to make intelligent decisions simply does not exist.

The region is being led unwittingly into a light rail plan that will influence the quality of life in this region for decades and be the largest public works project in local history, without having done the same due-diligence homework that MBA schools teach businesses to use on far smaller investments. The public's trust in government to spend transportation dollars wisely is among the casualties.

This issue is highly relevant at present because Sound Transit is beginning to plan for a Phase 2 that would seek more federal and local money to expand Link's Initial Segment, and because it is still not too late to stop light rail and switch to a to a different strategy if new information –such as in this report-- shows that would make more sense.

The initial stimulus for this report was the fact that Sound Transit's current light rail plan didn't reduce congestion and didn't seem cost-effectiveness as an alternative to driving. Sound Transit's stubborn resistance to all criticism, its misrepresentations, and its failure to resubmit its much altered plan to a public vote of confidence –making all of us feel manipulated--have also been motivators. Perhaps most fundamental, was the knowledge that Sound Transit had abused the planning process by never having done a proper alternatives analysis. This greatly offended this planner's sense of what's right.

Link didn't just happen by accident; it emerged as the end result of a planning process. A key part of that process is the alternatives analysis.

Unfortunately, the alternatives analysis had been rigged to justify rail. In short, the process had been abused. Unfortunately that's not obvious to the casual reader of Sound Transit's 1993 FEIS and alternatives analysis report. It's an impressive and seeming well-written document. Most would assume it was competent and objective. Reluctantly the author came to conclude that the 1993 FEIS was essentially a sham. Something that appeared objective, but wasn't. Something intended more to sell, than to inform.

Part 1: Sound Transit has never done a proper alternatives analysis

In the transportation arena the alternatives analysis is critical. It's equivalent to a business case and is supposed to identify and evaluate the most promising alternatives available to solve a given transportation problem. It's about all that elected officials and voters have to rely on, if they wish to make rational decisions.

Sound Transit maintains that the region's one and only rail/bus alternatives analysis provides adequate rationale for selecting rail rather than express bus for the backbone of the regions transit system. However, for a wide variety of reasons this study – documented in a 1993 Final Environmental Impact Statement (FEIS) prepared by Sound Transit's predecessor the RTA-- is inadequate and misleading. Nothing more up to date or more relevant has been done since, as Sound Transit recently made clear in its DSEIS for the Regional Transit Long-Range Plan.

The 1993 FEIS compared rail and bus technologies for the region's main transit corridors. Four alternatives were studied. One was the baseline or do nothing scenario called "No Build". Next was an extensive system of express buses operating on HOV lanes. This $4.7 billion scenario was called "TSM". A second all-bus alternative – called "Transitway/TSM" and costing $5.5 billion-- was similar to TSM but used exclusive busways in lieu of HOV lanes. Finally, there was a hybrid rail/bus alternative called "Rail/TSM". This $11.5 billion scenario called for 125-miles of rapid rail on a 100% grade separated right-of-way. It also included many of the TSM improvements, except those that would compete with rail.

There are two broad reasons why decisions about Link should not be based on this 1993 FEIS. First, the 1993 FEIS was neither adequate nor honest at the time it was completed. Second, what we are planning today is not what the 1993 alternatives analysis studied. In addition, circumstances have changed in the intervening 12 years.

A fundamental problem with the 1993 FEIS is that it compared alternatives that differed in both cost and benefit. In theory this can be dealt with by careful focus on cost-effectiveness, but RTA botched the job. Essentially, RTA concluded that an $11.5 billion rail alternative would perform better than a $4.7 bus alternative. This was simple-minded, and is essentially like comparing proposals to build a brick wall costing $20,000 with a concrete wall costing $10,000; then deciding bricks are a better technology since the $20,00 wall would be higher than the $10,000 wall.

The 1993 FEIS contained very little on cost effectiveness but what it did contain was presented in a biased fashion. Essentially, it masked the high cost of using rail as a means to increase transit ridership, and thus made the cost of the rail alternative appear more competitive with the bus alternative than it really was. Also it failed to show that the high marginal cost of rail riders was reasonable, or to put them in the context of costs in other cities or of other alternatives. In short, it didn't provide the kinds of information needed to make wise decisions. This topic is expanded in the explanation of Part 6 below.

Another serious shortcoming of the 1993 FEIS is that it didn't quantify or emphasize the impact of the alternatives on traffic congestion. This is critical because polls have repeatedly shown that the public's main transportation concern is reducing traffic congestion.

However, the main fault of the 1993 FEIS is that the bus alternatives were deliberately designed to fail. In particular, the RTA unfairly alleged they lacked sufficient capacity through downtown Seattle and then did nothing to rectify the problem. The RTA used "inadequate capacity" as their primary reason for dismissing the bus alternatives, even though they were more cost-effective. This topic is further pursued in the summary of Part 5 below. The sum, the 1993 FEIS was neither adequate nor fair at the time it was completed.

The 1993 FEIS is even less a valid alternatives analysis for Link light rail.

The 1993 FEIS was an alternatives analysis for rapid rail not light rail. This fact was stated explicitly and repeatedly in the final report, and is not just a matter of semantics. Certainly there were similarities between the rapid rail in the 1993 FEIS and Link today in that the main rail corridors and station locations were similar and the train sizes were identical. However, the train speeds, capacities, rights-of-way, and network sizes were not the same. The maximum speed of the rapid rail in the 1993 FEIS was 70 mph, whereas Link's maximum speed is 55 mph. Rapid rail had an average speed of 36 mph whereas Link's would be 26 mph. The rapid rail system in the 1993 FEIS was asserted to have a maximum capacity of 22,000 persons per hour (pph) whereas Link's maximum is 16,400. The ridership forecasts in the 1993 FEIS were based on a system that was 100% grade separated, whereas Link runs down the middle of the street in the Rainier valley and may have additional at-grade street crossings on the Eastside. These differences obviously affect ridership, reliability, and safety. In all these respects the Link system is different from, and inferior to, the rapid rail system studied in the 1993 FEIS.

In addition, the 1993 FEIS evaluated only one particular 125-mile long rapid rail network. This does not provide a comparison between the 14-mile system Sound Transit is presently constructing, or the 21-mile system approved by voters in 1996, versus BRT alternatives. Nor does it provide a comparison with any of the various networks that may emerge from Phase 2 planning: like Central Link extended to Everett and Tacoma but not to the eastside, or Central Link extended to the Eastside but not Everett and Tacoma, or to all those but not to Issaquah and Totem Lake. The 1993 FEIS did not even compare the ultimate light rail system envisioned by Sound Transit in their recent Draft Long-Range Plan. That Plan includes a curious, never before contemplated loop following the monorail from downtown Seattle to Ballard and then east to the University District. It also contains light rail along I-405 in spite of prior decisions that BRT be used in that corridor.

Since it's not clear how much light rail it makes sense to build, how much is affordable, or how much voters would ever approve, it is not adequate that the only rail/bus alternatives analysis this region has to rely on studied just one particular 125-mile long

configuration. In fact, rational decision-making requires that a range of possible light rail networks –any of which might represent the optimum or final configuration—be compared against BRT alternatives.

An important circumstance that has changed dramatically since the 1993 FEIS is the assumed cost of constructing light rail. In the material handed to voters at the time of the 1996 ballot Sound Transit said: "Sound Move is based on extremely conservative cost and ridership assumptions and methodologies reviewed by an independent expert review panel appointed by the governor, the state Legislature and the state Transportation Department." However, this became front-page scandal in 2000 when Sound Transit was forced to admit this was all-wrong, and had to increase the project budget by over one billion dollars, or roughly 44%. For this reason any rail cost assumptions made prior to 2000 were probably grossly underestimated. This fact alone makes the 1993 FEIS, as it stands, obsolete and misleading.

Still another reason the 1993 FEIS is obsolete is that over half the HOV network --whose costs were included in the TSM or bus alternative—has since been completed. Those are sunk costs. Thus the all-bus alternative is now less expensive than it was in 1993.

The net effect of the underestimated rail costs and partial completion of the HOV network is to make the cost difference between the rail and all-bus alternatives even greater today that it appeared to be in 1993. To be even roughly relevant today, the 1993 FEIS cost estimates would need to be updated. They haven't been. In fact Sound Transit hasn't even published an updated cost estimate for the 21-mile system approved by the voters in 1996.

Sound Transit's recent release of a Draft SEIS states quite clearly that its Long-Range Plan is based on the 1993 FEIS. However, since the 1993 FEIS was not a valid exercise in the first place, and is now obsolete, the entire foundation for Sound Transit's Long-Range Plan –not to mention the part already under construction-- is faulty. The FTA should recognize this and force Sound Transit to conduct the proper alternatives analysis that is long overdue and which is recommended so often throughout this report.

Part 2: Sound Transit morphed rapid rail into light rail

Sound Transit has not wanted to do an alternatives analysis for Link, so they have maintained that the 1993 FEIS for rapid rail was really about light rail. In one recent presentation the agency falsely states that the 1993 FEIS compared light rail and BRT. In fact the 1993 FEIS never mentioned BRT, but it did address light rail (LRT) in a cursory fashion along with monorail and other alternatives the RTA wasn't interested in. This is what the FEIS said about light rail.

> "Surface LRT options were analyzed to the point that it became clear that these options did not adequately serve the goals and objectives of the Regional Transit Project. Because of the superior performance of the grade-separated RTP system in terms of consistency with land-use objectives, level of service, and ridership, it was recommended as the rail technology in the recommended draft Systems Plan." (Ref 1: page 2-61)

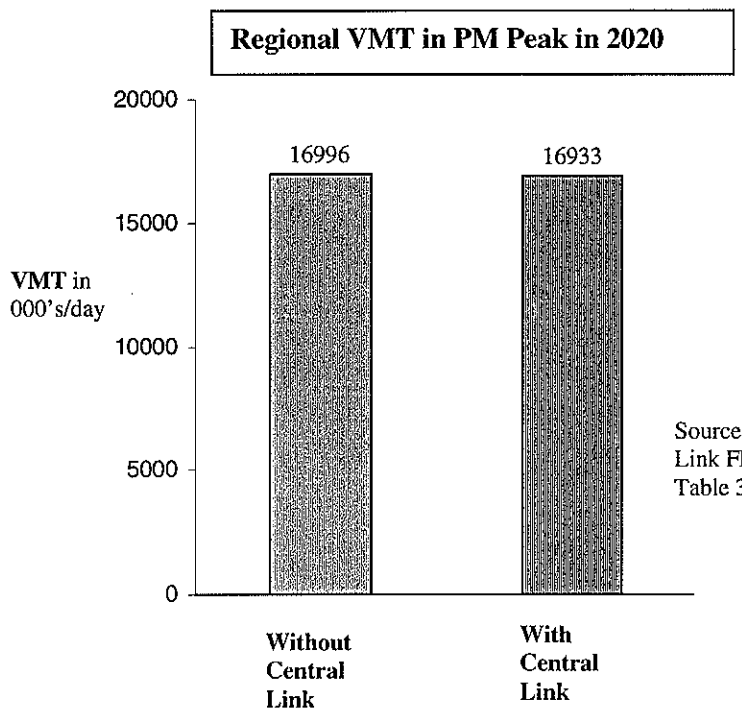
In spite of their one and only alternatives analysis having recommended against it, Sound Transit plans to put some "surface LRT" into the very backbone of the light rail system they are building. How then is it possible for Sound Transit to claim that the 1993 FEIS supports their decision to make light rail the technology of choice?

Part 3: The shortcomings of Link Light Rail

Light rail has many appeals to the superficial observer. It promises fast effortless trips bypassing congestion. Many hope it will lure others off the road thus leaving more room for them. Some believe it's a way to control sprawl, clean the air and reduce energy consumption. As visitors we've all benefited from riding rail systems in other cities. Civic boosters think Seattle can't be world class without rail. Unfortunately, at least in the Puget Sound setting, light rail is one of those things where the less you know about it; the better you probably like it.

Link's fundamental problem is that it costs too much and does too little.

Polls consistently show that traffic congestion is one of the public's highest concerns. Link was sold to voters by implying it was a solution to traffic congestion. Yet Sound Transit's own studies prove Link would have almost no effect. The FEIS for the 21-mile Central Link shows that the $2.6 billion (in 95$) system would only reduce road traffic about 1/3 of one percent. This is equivalent to taking two and a half cars off a lane on 520 that is packed bumper to bumper with cars from Montlake to the east shore of Lake Washington. It's hardly noticeable, as the bar chart below illustrates.



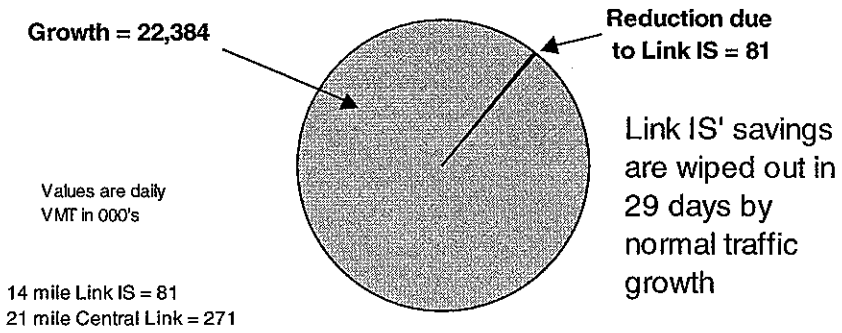
Source: Central Link FEIS, Table 3.1-4

The $1.5 billion (95$) Initial Segment now under construction would accomplish even less. It would only reduce traffic 1/10th of one percent.

Even auto traffic into the Seattle CBD is minimally impacted.

It turns out the miniscule traffic reduction effects of Link's 14-mile Initial Segment would be wiped out within 29 days of its opening by the normal growth trend in regional traffic as the following chart shows. The 21-mile Central Link has greater ridership, but its traffic reduction effect would be wiped out in about three months.

LRT effect on daily regional VMT growth between 1998 and 2020 [9]



Sound Transit has repeatedly implied that Link would reduce traffic congestion even while knowing it wouldn't. This was done with pictures, innuendo, and carefully chosen wording so there was never any direct statement that could be challenged legally. It was done extensively during Sound Transits pre-vote marketing campaign and continues today. The statements that Link will not reduce traffic congestion are brief and don't stand out in the EIS's, which very few voters read anyway. Sound Transit never acknowledged publicly that light rail wouldn't reduce congestion until, in December 2000, the author used Sound Transit's own data to publicize that knowledge in a Seattle Times OP ED. Unfortunately Sound Transit's admission came years after the 1996 vote.

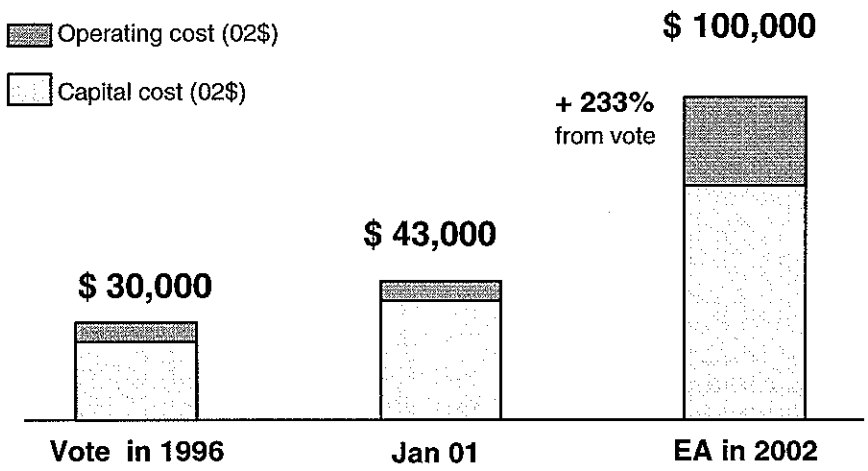
> **Light rail: There will never be a better time** Richard Harkness got one thing right in a guest column (The Times, Dec 22): Light rail will not ease traffic congestion. Yes, that's a fact. (Dave Earling, OpEd, Seattle Times, Dec 26, 2000)

The effects light rail could have on environmental issues like air pollution or energy use are proportional to its impact on traffic, and thus similarly miniscule.

As a way to get cars off the road Link is notably costly. If that's the primary aim of the project then it's fair to divide the project's cost by the number of cars it removes to get a sanity check on Link's cost-effectiveness. The result is that it would cost taxpayers $100,000 per year for each car which Link IS removes from peak period traffic. This cost would continue every year until the bonds were paid off in about 30 years.

The chart below shows how much this particular cost metric increased from the time voters approved Link. The left bar is based on Central Link costs at the time of the vote. The center bar is based on Central Link costs after Sound Transit admitted having underestimated them and raised Link's cost by $1 billion in Jan 2001. The right bar is based on Link IS costs as reported in the Feb. 2002 Environmental Assessment.

Annual cost per vehicle removed from peak period traffic



In stark contrast, a recent Seattle Times article reported on a company that had significantly increased car pool use by giving employees just $75 a month per person to carpool. And, for $100,000 per year, it may be cheaper to simply pay people to quit their day jobs and stay home.

Once the congestion reduction myth was publicly debunked, rail advocates –such as King County Executive and Sound Transit Board Member Ron Sims-- switched to claiming that light rail offers an alternative to driving. They said it provides "choice". Indeed it does offer choice to a favored few, but again that gift costs society roughly $80,000 per year for each individual who –according to Sound Transit's ridership estimates for 2020-- would find Link IS attractive enough to stop using a car. In this case the cost of choice is huge. To paraphrase Winston Churchill: Never in the region's history will so many, have paid so much, to benefit so few.

Link light rail has other deficiencies beside cost-ineffectiveness. It is highly inequitable in that it provides service to a relatively narrow corridor while the cost is borne across a wide region. Capacity on the south line –due to the decision to run on the surface along Rainier Avenue—is only one third the capacity of the north line, and thus forever shortchanges the entire south Puget Sound area.

The Initial Segment serves only one of the region's 21 designated urban growth centers. Even a full 100+ mile light rail system –which is not guaranteed and which the region may never be able to afford-- would bypass many important commercial and employment centers such as South center, Renton, Bothell, Tukwila, West Seattle, south Lake Union, Bell town, Seattle Center, Ballard, Magnolia, south Seattle below the stadiums, West Seattle, key Boeing sites, the Sammamish plateau office park, the emerging biotech area on Elliott Bay, and so forth.

Link's central control system and extensive tunneling make it vulnerable to power outages and terrorism.

If Link is not extended into a full regional system its preemption of the Downtown Seattle Transit Tunnel would compromise the remaining express bus system and dim prospects for a regional BRT system.

Some of the region's most precious resources are its preexisting rights-of-way (ROW), and those should be used efficiently. Having the center lanes on I-90 devoted solely to the occasional light rail train is not a good use of ROW since it would reduce the total people moving capacity of the bridge relative to having a mixture of BRT buses, car and vanpools, emergency vehicles, etc. use those lanes. Adding light rail would actually reduce capacity in this corridor.

Currently over ten times more daily trips are made by car pool than by mass transit in this region. (283,000 by transit, versus 3,554,000 by car/van pool) Arguably it is far more important to maintain and expand car/van pooling than to expand an already excellent mass transit system. Displaced them into less protected lanes than they have today is not progress.

In short, upon close inspection of the facts, Link light rail doesn't seem to be a good idea, or to be worth the money. This would be true even if there were no obvious alternatives.

In economic terms, one must examine the "opportunity costs" of going with light rail when there appear to be less costly ways to achieve much the same benefit. What else could the region do with the money that could be saved? Alternately, if taxpayers are willing to spend the same amount, how much further might we get toward reducing congestion and improving the environment if some more cost effective technology were employed? What if we could have 200 route miles of BRT for what – according to the GAO study-- 14 miles of light rail is costing? What if some of the light rail money could be diverted to accelerate the Alaska Way viaduct and 520 bridge replacements?

Part 4— BRT and Other Alternatives to Light Rail

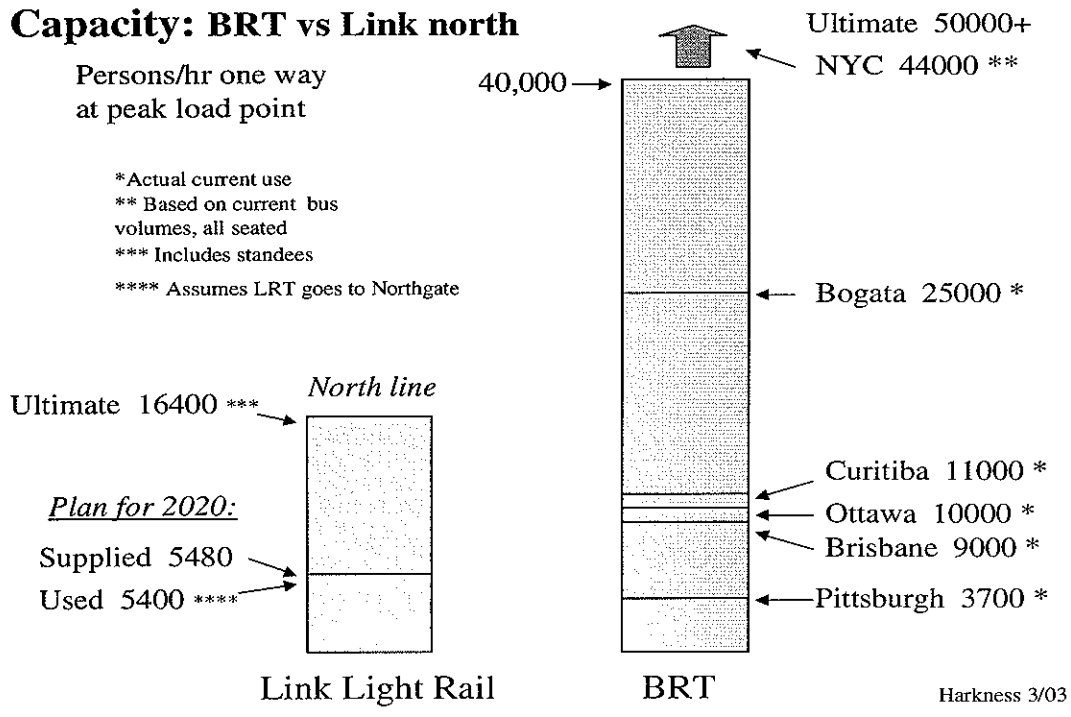
If the objective is to reduce congestion or travel delay, the author has identified about 50 alternatives to light rail. They include things like widening roads, increasing car and vanpool usage, telecommuting, and clearing accidents and breakdowns faster. However, if only various forms of mass transit are of interest, then bus rapid transit or BRT is the most likely contender to light rail. If light rail is "Plan A", then BRT is "Plan B".

BRT is actually a systems solution comprised of several elements. The core would be express buses operating on HOV lanes, essentially what we have today, but more and better. Dedicated busways are possible but probably not necessary. Service frequencies would match that of rail. A BRT alternative would also involve bus priority lanes on certain arterials, bus priority signalization, off-bus fare collection, direct access ramps, and a range of other things all intended to make bus travel more rapid and attractive.

BRT hasn't gotten much publicity here in Puget Sound. However, BRT has been implemented elsewhere, particularly overseas, with great success. The U.S. General Accounting Office published a report comparing it to light rail and encouraging cities planning light rail to give BRT serious consideration as a less expensive alternative. It's proven technology and the advent of hybrid buses makes it even more attractive.

There is no question that BRT has enough capacity to handle the regions mass transit needs. As shown in the chart below, BRT routes operating in other countries already carry far more people than Link could carry, or that Sound Transit estimates Link would need to carry.

Figure 5.12a



In terms of ability to meet future needs it is worthwhile to note that there is no way to increase the capacity of Link light rail since train lengths would be limited by stations already in place and headways can't be reduced. For these reasons even a second rail tunnel through downtown in some distant year wouldn't help. In other words the limits on rail system capacity are systemic and not subject to local remedies. In contrast bus capacity can be increased by building short parallel paths around local bottlenecks, and then only when needed.

Based on ST's 1993 FEIS the highest volume that a BRT system would need to carry by 2020 is 12,000 persons per hour between downtown Seattle and the U District. This volume could be handled by about 110 articulated buses per hour. This volume of buses would use about 10% of the capacity of a single express lane along that stretch. Elsewhere BRT would need much less than 10% of the capacity of an HOV lane.

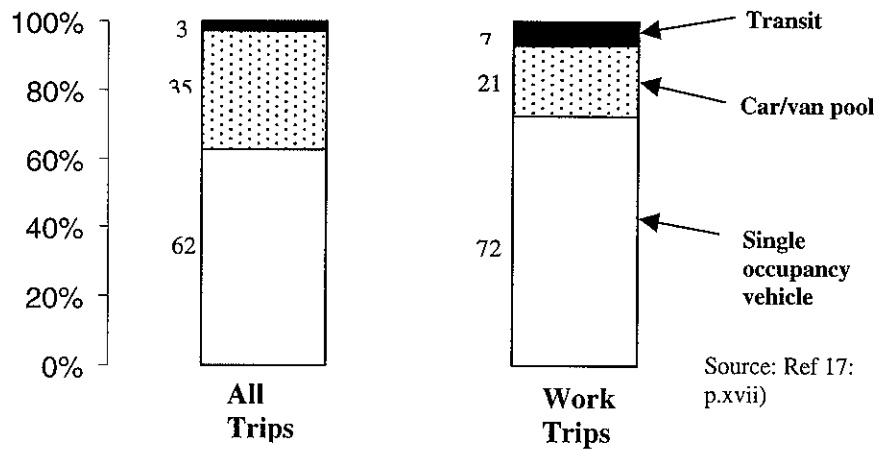
BRT should also be faster. BRT buses can operate in express non-stop mode once loaded whereas light rail must stop at every station.

BRT would probably require fewer transfers. Buses can circulate in neighborhoods picking up passenger before entering the HOV lanes for non-stop travel to major destinations.

Still, the most compelling reason for BRT is that much of the "guideway" needed for BRT already exists in the form of the region's 200 miles of HOV lanes. And every investment made in expanding or improving these guideways for BRT has the double benefit of encouraging more car and vanpooling.

Car and Van pooling—This report focuses on BRT versus light rail. However, car/van pooling is probably even more cost effective than BRT, and should be among the alternatives considered most carefully as the region charts its transportation strategy. There are currently about 250,000 people car or van pooling to work. Car and vanpools are already far more effective in getting people out of single occupancy vehicles than is mass transit, as the following chart based on PSRC data makes clear.

Mode Share for Trips in Puget Sound Region in 1998



Source: Ref 17: p.xvii)

If the number of people car or van pooling to work could be increased by just 5% it would take the same number of cars off the road as would building the 21-mile Central Link light rail system.

At last estimate Central Link would cost $2.6 billion in 02$. Simple calculations show it would cost $43,000 per year to take a car off the road using Central Link. Many people who don't car pool today could probably be induced to do so for considerably less than $43,000 per year. If so, car and van pooling would be a far more cost-effective way to relieve traffic congestion than building Link light rail.

Part 5—The capacity issue

Part 5 investigates the capacity issue in depth because back in 1993 the RTP alleged that buses had insufficient capacity to meet the regions needs and dismissed bus alternatives largely for that reason. Ever since, buses or BRT have remained off the table as far as the core portion of the regional transit network is concerned.

RTP's treatment of the capacity issue in the 1993 FEIS appears to have been deliberately manipulated to favor rail. Basically, RTP postulated an all-bus alternative called TSM and compared it against a hybrid rail/bus alternative called Rail/TSM. During their evaluation RTP estimated year 2020 ridership for both alternatives and concluded that the Downtown Seattle Transit Tunnel (DSTT) could not handle the number of riders the bus alternative would attract. RTP's response was to reduce the predicted ridership of 518,000 daily riders to what they said the tunnel could handle, namely 474,000. This significantly degraded the cost-effectiveness of the bus alternative as well as reduced other ridership dependent benefits, such as impacts on air pollution.

What the RTP did not do –after recognizing that a capacity problem might exist—was to verify the assumptions they had made about tunnel capacity and/or seek ways to modify the bus alternative so as to eliminate the alleged capacity problem. In short, RTP put a knowingly and deliberately hobbled bus alternative into competition with the rail alternative.

The key assumption that RTP did not verify concerned tunnel capacity. There had been six prior paper studies that each reached different conclusions, ranging from 125 to 192 buses per hour in each direction. The RTP chose to assume 100, a value based on operating buses inefficiently. About 135 buses per hour were needed to carry the predicted demand. Why --when capacity was so critical-- didn't RTP assume the tunnel would be managed efficiently? Why --with the whole multi-billion dollar rail vs. bus decision hanging in the balance-- didn't RTP take the trouble to verify the tunnels true capacity with real world trials? This could not have been oversight or incompetence, it must have been deliberate.

If the RTP had properly verified tunnel capacity and still found it below 135 buses per hour they could, and should, have found other remedies so capacity problems in this 1.5-mile segment of a 125-mile network didn't become the tail that wagged the dog.

In prior studies, a range of fixes had been identified. They ranged from increasing bus capacity on downtown streets to building a second parallel bus tunnel, which RTP staff had estimated would cost $600 million. As a worst case, RTP could have added this second tunnel to the bus alternative thus completely eliminating the downtown bus capacity problem. Failure to do so was apparent bias or manipulation. It seems especially egregious since the RTP elected to provide 20 miles of tunnel for the $11.5 billion rail alternative yet was unwilling to provide even a mile or two for the $4.7 billion bus alternative.

In short, had RTA resolved the alleged bus capacity constraint –either by finding it didn't exist, or fixing it-- the RTA could not have claimed the bus alternative was unable to handle its predicted ridership, and –able to carry its full ridership-- the TSM alternative would have been much more competitive in its comparison against rapid rail.

Part 5 also addresses ridership forecasts that appear to conflict. In 1993 RTP estimated that by 2020 the peak load on the rail system would be 15,000 persons per hour at the peak load point just north of the DSTT. Sound Transit still asserts the long term demand for rail transit would create a peak load point demand of 15,000 persons per hour on the north line, and that we need a system able to handle it. However, the much more recent forecast for Central Link predicts a peak load of only 5415 persons per hour. This discrepancy is something the large difference between the 125 and 21-mile systems does not appear to explain.

This is an important issue in that <u>if</u> 15,000 is the correct number it appears that Link would run out of capacity soon after 2020 and is therefore not a long range solution for the region's capacity needs. Indeed one of the reasons RTA gave for choosing rapid rail in 1993 was that its assumed capacity of 22,000 gave it headroom for growth well beyond 2020. In addition, <u>if</u> 15,000 is correct, Link may not be enough capacity on its south line to even meet demand in 2020.

On the other hand if 5415 is correct, it is possible that system ridership is simply lower than originally thought.

It seems that no matter which forecast is correct, Sound Transit faces an embarrassing situation. If the higher forecast is correct, light rail is inadequate. If the lower forecast is correct, it completely destroys Sound Transit's claim that buses lack sufficient capacity through downtown, even if the tunnel could only handle 100 buses per hour.

Sound Transit's claim that light rail "would provide the same people moving capacity as a 12 lane highway" is simply false. Just one freeway lane pair full of buses could carry far more people than Link. Rather than compare what these systems could carry, it is more meaningful to compare what highways <u>actually</u> carry on a daily basis versus what light rail is actually expected to carry. Sound Transit's ridership forecasts for Central Link –at the ship canal where it is heavily loaded-- show it would carry only slightly more people in 2020 than a single lane pair on I-5 carries today. Along the bulk of its

route Central Link would carry only a fraction of what one lane pair on I-5 is now carrying.

Part 6: The cost issue

Part 6 has two broad objectives. One is to demonstrate how the 1993 FEIS was inadequate and biased in the way it addressed cost-effectiveness. The second objective is to use the raw data in the 1993 FEIS and related documents to produce an estimate of what Sound Transit's current rail-centric strategy might end up costing this region in relation to the all-bus alternative they rejected.

The 1993 FEIS gave very little attention to either cost or cost-effectiveness. Almost everything that large report had to say was contained in a single small table listing cost and ridership totals for each of the four alternatives. (Table 4 in the 1993 FEIS)

Table 4. Summary of System Alternatives Characteristics.

Alternative	Capital Cost (billions of 1991 $)	Operating and Maintenance Cost (millions of 1991 $)	Daily Ridership (Year 2020)	Annual Ridership (year 2020) (millions)	Cost per Rider (1991 $)	Cost per New Rider (1991 $)
No-Build	$1.2	$274	388,500	109.4	3.67	N.A.
TSM	$4.7	$399	473,900	133.7	5.92	N.A.
Transitway/ TSM	$5.5	$406	480,000	135.4	6.36	11.39
Rail/TSM (includes Commuter Rail)	$11.5	$492	560,500	157.3	7.94	12.52

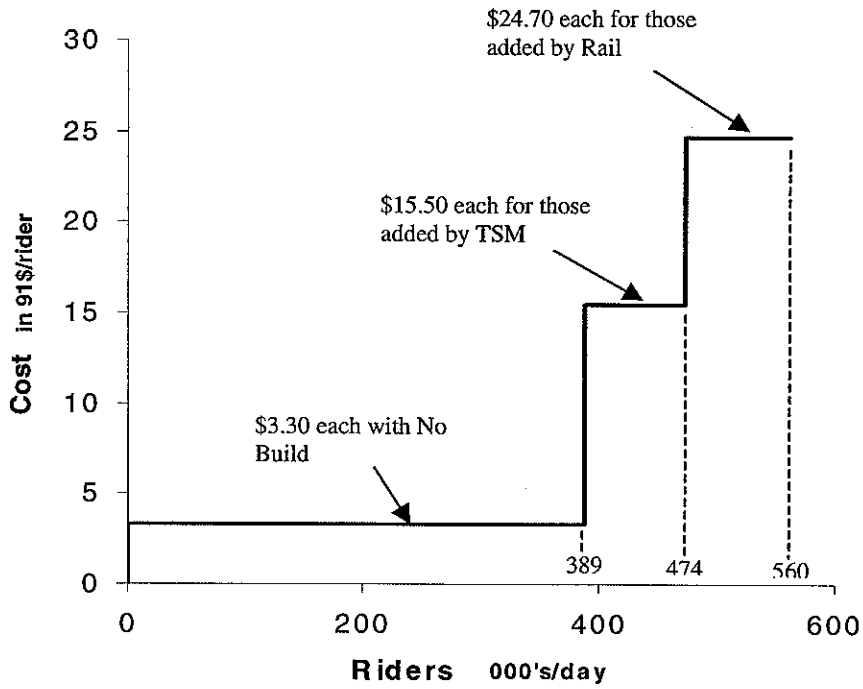
[redacted]

This form of presentation was deceptive. The difference between the rail and bus alternatives, shows in the numbers, but it doesn't appear dramatic. This author, probably like many others, saw that table and felt that while the bus alternative was more cost effective, it was not dramatically so. This was because the cost per rider figures RTP chose to present were averaged across all riders and thus did not allow the cost-effectiveness of the rapid rail element to be separated out and examined for reasonableness. It could be claimed this information was deliberately hidden.

To better illustrate what could have been done, and what should have been done, the data in that FEIS Table 4 has been reformatted into Figure 6.1 below. Remember, this is the picture as it would have appeared in 1993, with all costs in 91$ and before the rail cost estimates were found to have been underestimated.

This chart conveys a very different message. Not only would it cost much more than we are paying today to increase transit ridership by implementing TSM, but it would cost dramatically more still for those additional riders that rapid rail could add above and beyond what TSM could attract on its own.

Figure 6.1



As to the detail, transit would attract 389,000 daily riders by 2020 if we did nothing but grow the existing bus system. RTP called this the "No Build" alternative. The chart shows that society is now paying about $3.30 for each one-way bus ride, less the 80 or so cents recovered at the fare box. (The transit industry calls a one-way ride a "rider".) Next, it shows that implementing just the TSM alternative would increase daily transit ridership by about 80,000, and that these extra 80,000 rides would cost society about $15.50 each. Finally, it shows that if we build the 125-mile rapid rail system it would attract an additional 85,000 riders above and beyond what the all-bus TSM alternative could achieve. However, these extra rides would cost $25 each.

If the RTA had elected to fix the alleged capacity bottleneck by building a second bus tunnel this cost picture would have changed to that shown in Figure 6.2c.

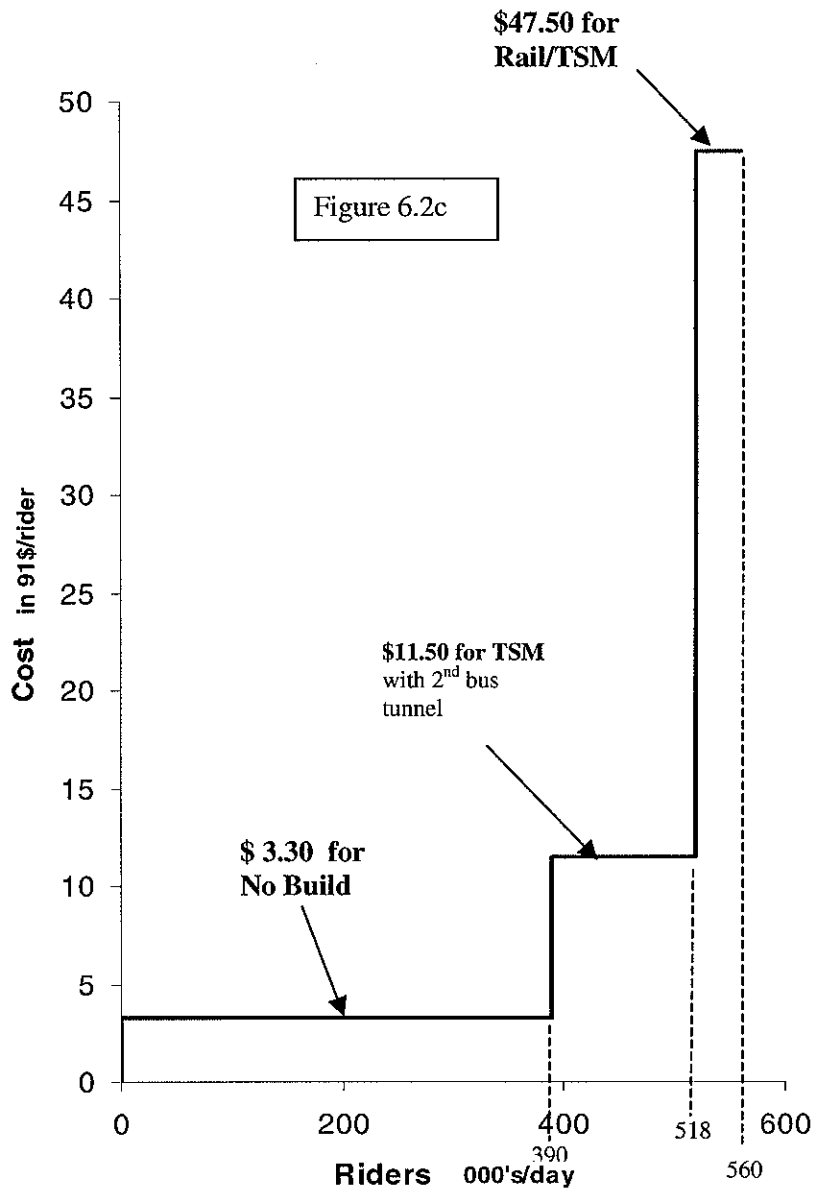
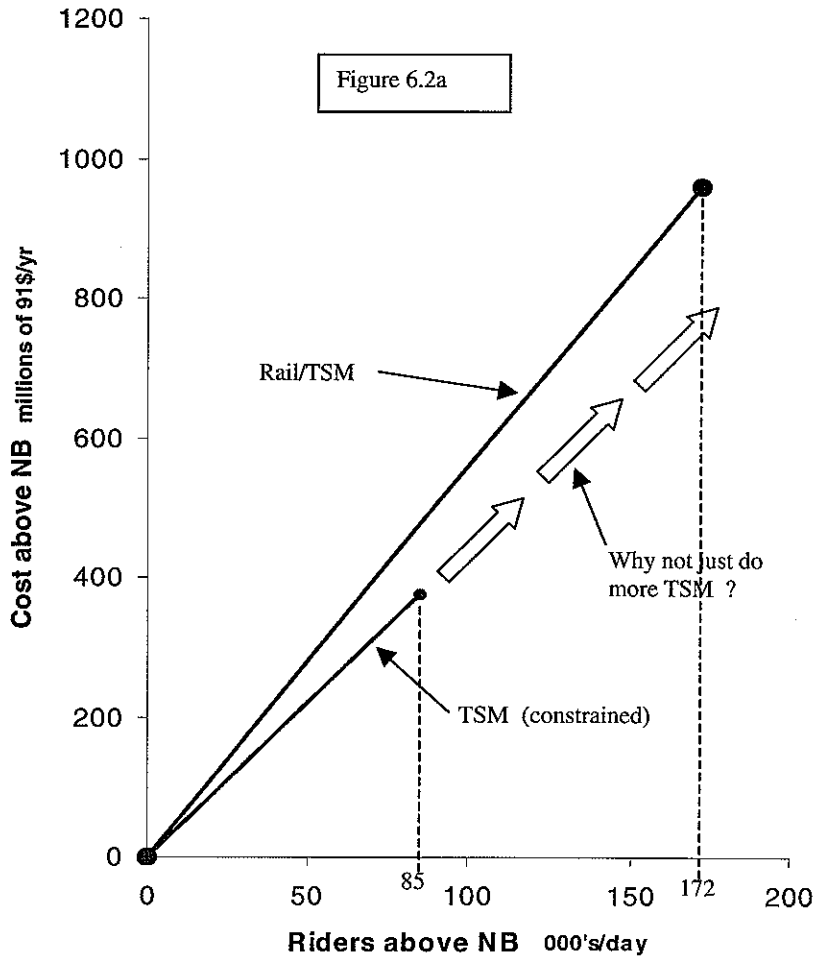


Figure 6.2c emphasizes the point that society would need to spend far more to attract these new riders than it has been willing to spend in the past. The upsweep of the bars illustrates very dramatically the law of diminishing returns. Once those with relatively little choice have gotten aboard, it becomes increasing expensive to improve transit service enough to attract others. This raises the questions of affordability and reasonableness. There is some point where the cost of making transit more attractive so it will attract more riders begins to exceed the benefits. To make rail worthwhile the benefits of each rider it adds would need to exceed $47.50 per one-way ride. Again, that

is what would have been visible in 1993. After accounting for ST's underestimated rail costs, and inflating to current dollars, that $47.50 becomes $93. The 1993 FEIS did not get into any of this, perhaps because they felt it would have worked against their desire to promote rail.

Figure 6.2a is another chart –based on Table 4 in the FEIS--that would have been helpful.



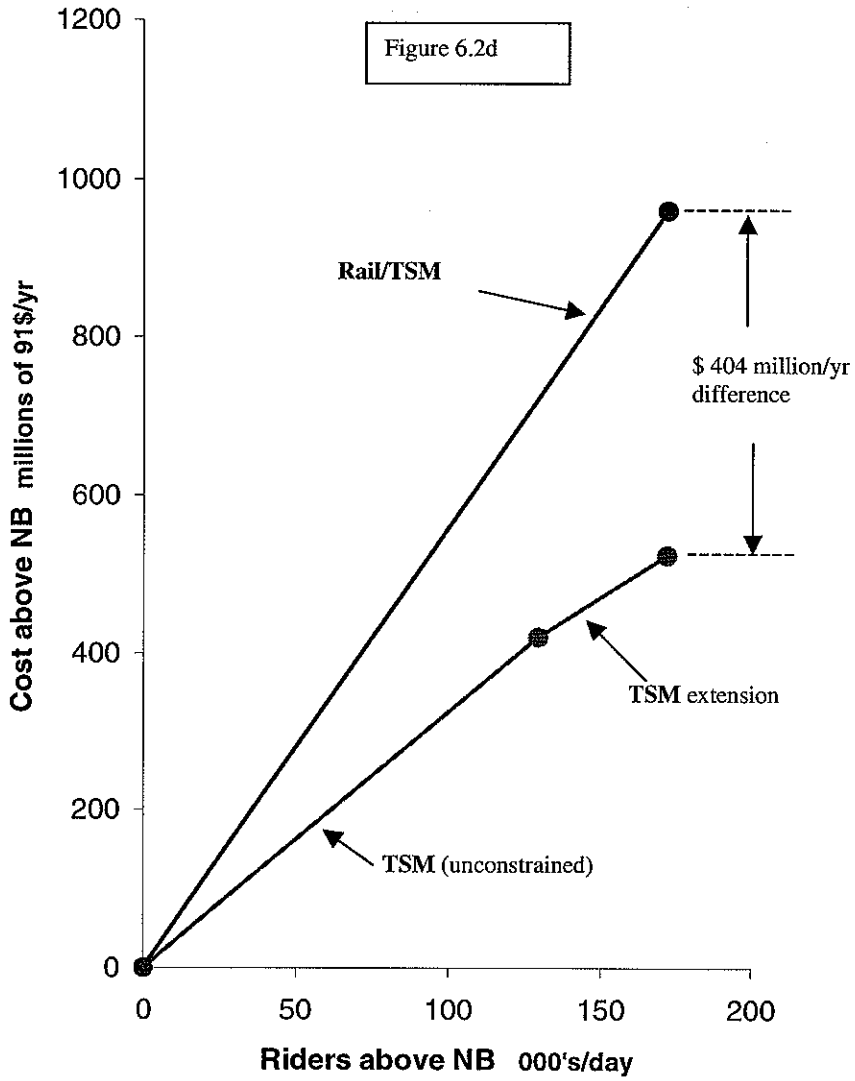
The cost ($960 million/yr) and ridership (172,000/day) of the Rail/TSM alternative is represented by the dot at the end of the Rail/TSM line. The same is true of the TSM line. This chart shows that while the Rail/TSM alternative costs more and does more, the TSM alternative is actually more cost effective since its "trend line" is not as steep.

NOTE: If the RTA's goal had been to increase ridership by just 85,000 above the NoBuild baseline, rather than 172,000, this chart shows that the original TSM alternative would have had adequate capacity, as well as being less expensive. Alternately if the goal had been to reach 300,000 riders the rapid rail alternative itself would have failed for lack of capacity. Thus, where the goal is set can sometimes determine which alternative wins. Planners can manipulate this to get the answer they want. In the case of the 1993 FEIS the goal was set high enough to (allegedly) break the bus alternative but not high enough to break the rail alternative. This is one reason Part 8 calls for a range of different size rail networks to be compared with bus alternatives.

Presenting the data with a chart like Figure 6.2a is useful because it graphically suggests the following: Why not just intensify or extend the TSM alternative until it achieves the same ridership as rail, because it looks as though the savings would be worthwhile? In other words, whatever we were doing in the TSM alternative, just do more of the same. In practice this would have meant more frequent bus service, more routes, and perhaps more HOV lanes, direct access ramps, and park & ride lots. The arrows suggest this idea. RTP staff was aware of this option and had already estimated its cost.

However, the TSM alternative can't be extended until the alleged bus capacity constraint in downtown Seattle is dealt with. Maybe the RTAs assumption about tunnel capacity was wrong and there really isn't any bottleneck. However, to be conservative the author assumed that the bottleneck was real, and that it takes the most costly of the available remedies –namely a second bus tunnel—to fix it. This was an option that RTA staffers had already identified and estimated would cost $600 million. The RTA had also estimated the cost of extending TSM services so as to achieve greater ridership. It short the RTA had shown how the TSM alternative could be extended to achieve more ridership, and they had estimated the costs of doing so. However, all this information was hidden in backup technical reports and none of it was used to fix the bus alternative's alleged capacity problem. Instead the 1993 FEIS presented a hobbled bus alternative unable to match rails ridership or achieve its other benefits.

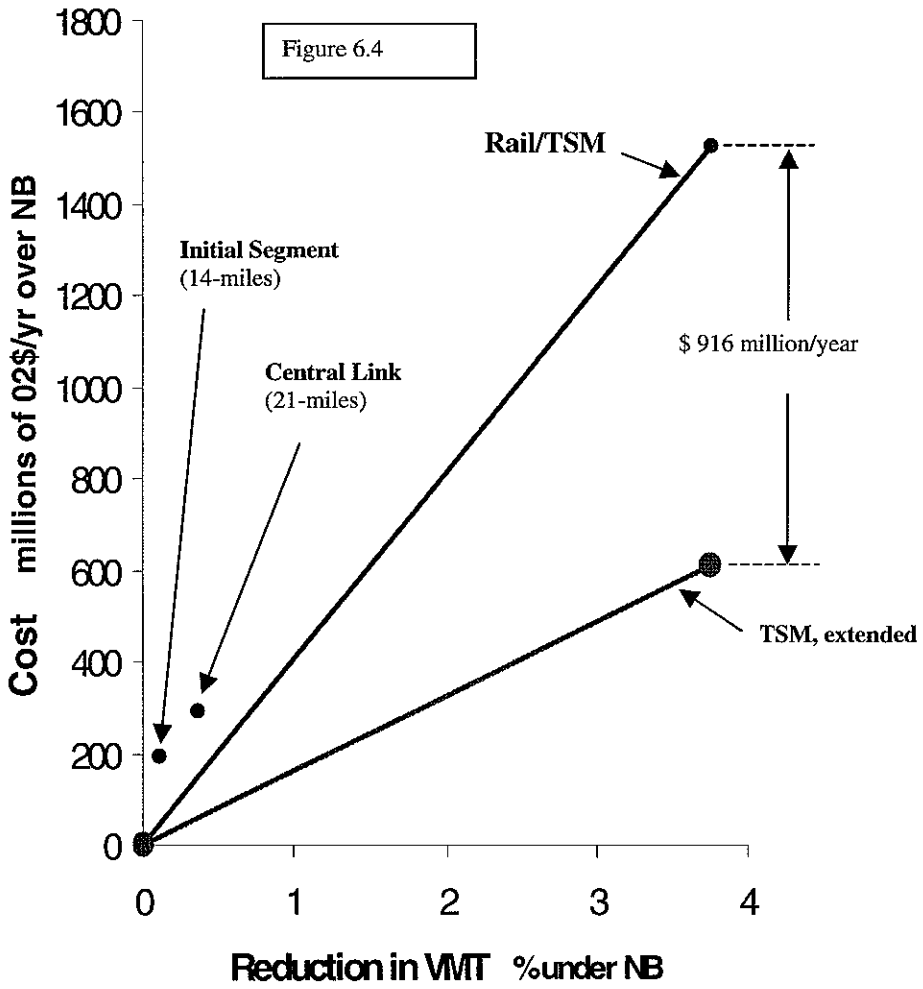
The chart below shows what would happened if the RTP had un-hobbled the bus alternative. The first part of the TSM trend line shows the result of including $600 million for a second tunnel, which allows TSM to achieve the "unconstrained" ridership forecast by the RTP. The second part of the line is based on RTP's cost estimate for extending it so as to attract and handle as many riders as the Rail/TSM alternative.



At this point it is apparent that fixing the alleged TSM capacity constraint and extending TSM is a good idea. It would save taxpayers about $400 million (in 91) per year. The RTP could have done this analysis and included it in the 1993 FEIS. Was their failure to do so a matter of incompetence, or of deliberate bias? Again, this is the picture that RTP should have presented in 1993. But what does it mean for Link light rail today?

The above analysis can be updated and used to show the implications of proceeding with Sound Transit's light rail-centric strategy, which calls for building as much as 125 miles of light rail along with supporting TSM elements such as bus feeders, HOV improvements, and park and ride lots. In other words the RTP created and evaluated a

"Rapid Rail/TSM" alternative with 125 miles of rapid rail. What the author does in this report is create a "Light Rail/TSM" alternative with 125 miles of light rail, and then compare it against an all-bus or TSM alternative using BRT. Figure 6.4 shows the result.



It now appears that Sound Transit never intends to make this comparison, but it's essential information because the region's at a fork in the road. It can either proceed to implement Sound Transit's light rail-centric strategy, working out along the Rail/TSM line in Figure 6.4 to build as much light rail as possible. Or it can switch to an equally effective all-bus or BRT strategy while there's still time. The public needs to understand the dramatic difference in cost.

Thus Figure 6.4 compares the cost of Sound Transit's light rail-centric strategy with the cost of an all-bus or BRT alternative able to reduce regional Vehicle Miles of Travel or VMT by the same amount. (Reduction in VMT is a better metric for comparing benefit or effectiveness of the alternatives than is transit ridership. Travel delay would have been a better metric yet, but the RTP did not provide that data.)

Figure 6.4 is based on conservative assumptions. For instance the author assumed that a 125-mile light rail system would attract the same ridership as the 125-mile rapid rail system studied by RTP. Actually, light rail would probably attract fewer riders since it's slower. On the cost side, Figure 6.4 is based on light rail costing an average of $120 million/mile whereas Link IS is actually costing $138 million/mile and Central Link is expected to cost $158 million/mile. (All these are in 02$) Also, it was assumed that the all-bus alternative would require a second bus tunnel costing $600 million (91$) through downtown Seattle, although the existing bus tunnel may well suffice, and if not there are probably less expensive remedies than a second tunnel. In other words, the Tail/TSM line in Figure 6.4 is probably steeper than shown, the TSM line is probably flatter, and the difference between them is probably greater than $900 million/yr.

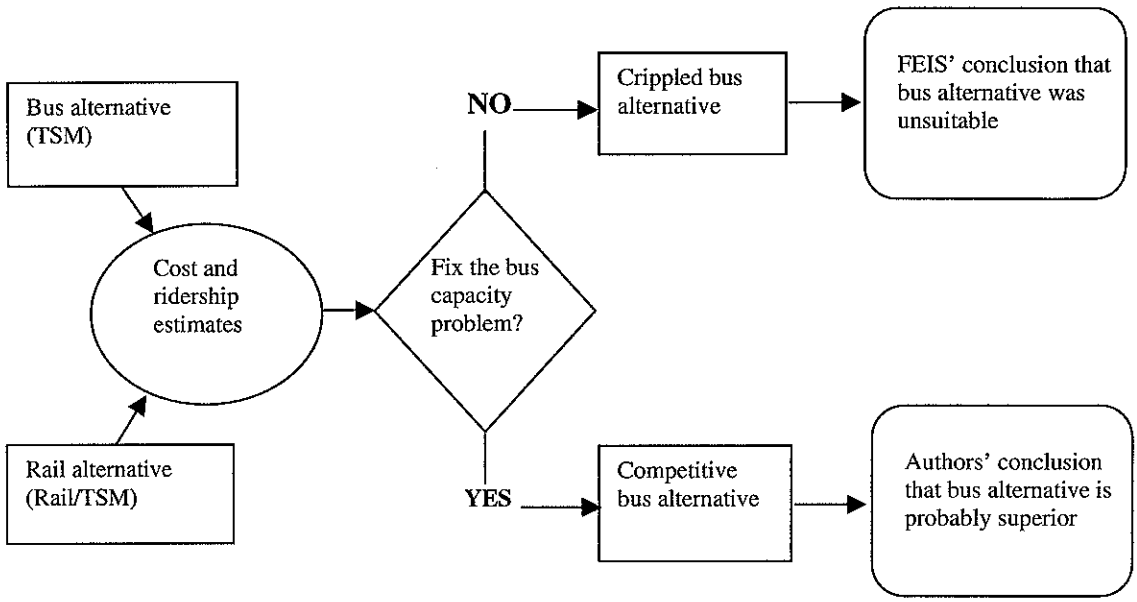
As to details, the RTP originally estimated the 125-mile rapid rail system would cost $7.9 billion in 91$. The construction bids Sound Transit received a few years ago showed that actual costs were 44% higher than originally estimated. Figure 6.4 assumes the 125-mile light rail system would cost 1.44 times that $7.9 billion, or $11.4 billion in 91$. In 02$ the 125-mile light rail system would cost $15 billion. (This is probably the best estimate publicly available today for what the light rail system in ST's Long-Range Plan might cost) The original TSM costs were updated in two ways. The cost component allocated for building HOV lanes was cut in half since half the HOV network has now been completed. Second, $600 million was added for the second bus tunnel. All capital costs were annualized by assuming a 30-year, 6% bond. Annual O&M costs from the RTP table were included without modification. Finally, cost totals were inflated from 91$ to 02$ to make them more timely.

The dots at the end of the Rail/TSM and TSM lines show the annual cost of these two alternatives. For instance it would cost about $1.5 billion per year to fully implement Sound Transits light rail-centric strategy by building 125 miles of light rail. The lines from the origin to the dots give some rough indication of the costs of smaller systems. For instance, a system with 63 miles of light rail rather than 125 might cost about $750 million per year. By the same token a BRT system able to achieve the same VMT reduction might cost about $300 million per year. The actual cost and performance of Link IS and Central Link are shown for reference.

Figure 6.4 is probably the most important chart in the entire report. What does it tell us? It shows that to achieve the same level of transit ridership estimated for a 125-mile rail system, switching from light rail to an all bus strategy would save taxpayers about $900 million per year. This would continue over the 30-years life of the bonds.

The huge cost difference between Link light rail and BRT simply reflects the fact that the best technology for one region is not necessary the best for another. Light rail doesn't have an easy fit in this region because we lack the abandoned railroad rights-of-way or flat terrain that makes constructing light rail relatively easy in other cities. On the other hand our excellent bus system and extensive HOV network makes BRT particularly attractive.

The diagram below attempts to clarify any remaining confusion as to how the RTA concluded buses were unsuitable while the author reached the opposite conclusion.



The flowchart reads as follows. The RTP started by designing an all-bus alternative called TSM and a 125-mile rapid rail plus feeder bus alternative called Rail/TSM. Consultants then estimated the cost and ridership for each alternative. At that point it became apparent that predicted bus ridership would exceed RTP's assumption for tunnel capacity. RTP elected not to fix the capacity problem using any of the remedies that staff had previously identified. This resulted in a crippled bus alternative being compared against the rail alternative, and thence to RTP's conclusion that buses couldn't meet the regions needs, whereas rapid rail could.

In this report the author starts with RTP's bus and rail system designs, and with RTP's cost and ridership forecasts, but reaches a different conclusion. He did that by adding a second bus tunnel to "fix" the alleged bus capacity bottleneck downtown, then adding more bus service so it would attract the same ridership as the rail alternative. The cost of these modifications was added in. He then concluded that the modified bus alternative could equal rail in ridership, have sufficient capacity for long-term growth, and be much less expensive.

Part 7: Evaluation and recommendations

Part 7 tries to explain why things have gone astray, and some of the broader implications that Sound Transit's preoccupation with light rail is having on public trust and on competing uses for scarce tax dollars. This report presents new information that will hopefully trigger action. Part 7 recommends several specific actions that seem appropriate based on this new information.

Why things went wrong- There is a huge disconnect between the problem (traffic congestion) and the proposed solution (light rail).

This disconnect shows that what drives officials and decisions in this arena was not an honest attempt to find congestion remedies based on solid analysis. Instead, what has happened is best explained by some complex mixture of myth, fact, wishful thinking, uninformed opinion, altruistic and not so altruistic motives, hard-ball politics, ego, psychology, bureaucratic maneuvering, and most of all, money. When all this enters the mix it is not surprising that actually spending taxpayer money wisely so as to make the most progress against traffic congestion fell by the wayside.

As to motives, one must acknowledge the superficial appeal of rail transit. Emotionally rail seems like a simple "silver bullet" solution for a complex and intractable problem. Promoting it appears to be "doing something".

But elected officials have another set of reasons to favor rail. They revolve around power and money. If it proceeds, Link light rail will be among the largest public works projects in Puget Sound history. Billions of dollars will be spent. Officials can feel important making decisions about how billions are spent. They can proudly leave a legacy of concrete and steel. They can please certain powerful parties on the receiving end of those billions. They can be seen as providing jobs and stimulating the economy. Perhaps most of all they can be seen as bringing in "free" money from Washington D.C. Fundamentally Link is a "pork barrel" project.

In terms of who pays and who benefits, Link is a clever way to transfer money from the pockets of many to the pockets of a few. Not enough is taken from the pockets of the average taxpayer (in the form of sales tax and auto registration tax) to cause him or her to 'fight city hall'. On the other hand the relative few directly benefiting from Links design, financing, and construction maintain a behind-the-scenes pressure to keep Link going.

Another reason Sound Transit's a clever mechanism for wealth transfer is that taxpayers have practically no way to stop it. The State Legislature created Sound Transit, but forgot to make Sound Transit's Board members directly elected, and they forgot to give voters in the Sound Transit taxing district any practical control over Sound Transit via initiative. As a result the only way local voters can control Sound Transit is by mounting a costly statewide initiative. This self-confidence in its own untouchability gave Sound

Transit's attorney the hubris to say in open court that Sound Transit recognized no limits on how much it could spend or how long it could take building light rail.

Key officials have long wanted a rail transit system in Puget Sound, period. In the early 1990's consultants were hired to prepare the necessary paperwork in order to get federal funding and meet state law. Although alternatives analyses are supposed to be objective studies, consultants are generally fairly astute at figuring out what the client really wants, and repeat business means delivering it. The client wanted rail. As a result the 1993 FEIS or alternatives analysis became a pro forma exercise meant to justify this preordained conclusion.

In short, the 1993 FEIS is a sham; a document meant to satisfy legal requirements, but almost totally useless in providing objective information that would help officials or the public make a wise decisions about spending billions of dollars.

The FTA colludes with Sound Transit in these abuses of the planning process. FTA overlooks faulty work such as the 1993 FEIS, and their requirements for funding projects like Link appear lax. FTA is probably among those Federal agencies that have been accused of being in bed with the organizations they are supposed to regulate.

It is also clear that Sound Transit's board has little concern for spending tax dollars efficiently. In other words achieving the "most bang for the taxpayer buck" is not a high priority with that group. If the Sound Transit Board really wanted cost effective solutions they would have scrutinized the 1993 FEIS in the way the author has done and probably chosen BRT, since it appears BRT would save billions. After finding that Link's costs had been underestimated and needed to be increased by 44%, they would certainly have revisited their choice of rail, rather than simply looked for additional money. They would have published and agonized over, rather than hidden, the high cost-per-rider data for Sounder and Link. They would have calculated the approximate cost of fully implementing their current rail centric strategy and compared that against BRT. These are the minimum things a board really concerned with spending tax dollars wisely would have done.

The Puget Sound Regional Council (PSRC) must also take considerable blame. If that organization were sincerely concerned with getting the most bang for the taxpayer buck it would have eagerly embraced and practiced Least Cost Planning –as State Law requires-- rather than trying so hard to avoid it. It would have analyzed Sound Transit's light rail plans and ensured they were cost effective relative to other alternatives rather than simply downloading them intact into the Metropolitan Transportation Plan (MTP). It would consider van and car-pooling as a major stand-alone alternative to investing billions in mass transit and highways, rather than just as window dressing attached to the main transit and highway alternatives.

In fact, it is not exaggerating to state that if the PSRC had obeyed the law as regards Least Cost Planning (LCP), Sound Transit' light rail plan would probably never gotten this far.

The importance of trust-- It has become increasingly clear that voters don't trust Sound Transit and Sound Transit doesn't trust voters. In fact, Sound Transit has become the poster child for why voters distrust government to spend their transportation tax dollars wisely. There are good reasons for this mistrust.

Voters overwhelmingly voted to rescind Sound Transit's tax on vehicle registration, but ST still fights to overturn that expression of public will in the courts. ST changes the project greatly from what voters approved in 1996 but vigorously fights a lawsuit that would have put the much altered plan back on the ballot for a vote of confidence.

Sound Transit wants more money. However, while claiming it has a public mandate and support for light rail, ST is deathly afraid to ask voters to increase the existing light rail tax. Thus ST supporters used political strong-arm tactics to force light rail into a broad package of regional transportation projects where voters couldn't reject it without rejecting everything else as well.

On this November's advisory ballot voters were asked if they supported that package, which the ballot explicitly said was intended to reduce congestion and improve safety. Since Sound Transit had already admitted Link wouldn't reduce congestion, putting it into that package was a remarkable example of cynical manipulation and deception.

The problem is magnified since that ballot –which still implies Link would help reduce congestion-- was seen by millions, while few have seen the truth.

When one party has the funds to broadcast misleading statements through a megaphone while their critics have only the occasional Op-Ed or letter to the editor to whisper a rebuttal, there is simply no way the public will get a balanced story. Critics, such as CETA, have found the facts don't matter when there's no money to get them disseminated. This has been a fundamental structural problem throughout the entire light rail debate here in Puget Sound.

The role that trust, or lack thereof, plays in reaching any solution for Puget Sound's transportation problems is hard to overstate. Part 7 contains a long list of newspaper quotes like the following:

> **Sound Transit: a matter of trust** The 10-year plan for increasing transportation system capacity in the Central Puget Sound area was dubbed "Sound Move" by its creators at the regional transportation authority, Sound Transit. ...
>
> ....Half of those ten years are now past, and the Sound Move plan has fallen well short of its billing. The most visible culprit of course is the light rail project, which is $1 billion over budget, three years behind schedule and the subject of a federal audit.
>
> ...It's the sort of indecision that makes one wonder, despite the agency's official denial, just how much of the 10-year plan was completed in a vacuum, without input from the very people is meant to serve. It's the kind of day to day waffling and mismanagement that wastes time, overruns budgets and over time, causes people to lose trust. Some of us in the Legislature have noticed the loss of trust in Sound Transit.

... Why should taxpayers support long term financial commitment to transportation when Sound Transit provides such a convenient example of a commitment gone sour?

...The second offers revote on the grounds that the Sound Transit board's actions have significantly altered the proposition citizens approve in 1996.

...Because of Sound Transit's lackluster performance so far, any taxes directed toward transit and transportation projects from here on out need to be the best spent money in state government.

....At the heart of the public trust , President Abraham Lincoln once wrote, is trusting the public. Government should not be – and cannot afford to be- afraid of letting the people judge how well their money is being spent. Let's Vote. (Op Ed by 15 members of the State Legislature, Seattle Times, Feb. 20, 2001)

Requests that Sound Transit consider alternatives- There have been numerous requests that Sound Transit reconsider its light rail plans. Again this story is told via articles quoted from local newspapers. Two examples are:

Sound Transit Board: It's time to do your job After the overwhelmingly negative wave of recent events, you would think a board that calls itself "Sound" would stop shelling out our money to move forward on such a monumental undertaking as a $4.2 billion light rail plan. You would think they would call a timeout not just to patch up the holes that have been revealed, but a timeout to actually rethink whether this flawed vessel, light rail, is going to get us to the vital goal of reducing traffic congestion in central Puget Sound. Yet in response to the damaging report issued last week by the US Inspector General's office... all we get here at home is more patch-up.

... My response is this: Is there *any* event or combination of facts, any misgivings about cost, funding, ridership, or concerns over the Inspector General's criticisms, *anything* at all that would finally cause the Sound Transit Board to ask, "Is proceeding with light rail still a good idea?" It seems no issue exists that's significant enough to prompt the board's serious review of alternative solutions.

...The board's irresponsibility is found in the decision to remain silent despite their growing awareness of that misinformation, including possession of significant evidence that light rail may not be a cost-effective transit alternative.

Civic groups, critics and other elected officials are calling ever more loudly for a complete review of the project including available alternatives... (Booth Gardner, former Governor Washington State, Op Ed Seattle Times, April 11, 2001)

Full speed ahead for light rail In a hasty attempt to secure $500 million in federal funding before the Clinton administration steps down, Sound Transit will move forward with light rail despite mounting objections about costs, the agency's leaders say.

...But Sound Transit Executive Director Bob White and board Chairman Dave Earling say they already know what the board will decide on that pivotal day: The agency will not explore alternatives to light rail... (Chris McGann, Seattle P-I, Jan. 5, 2001)

Recommendations-- This report recommends the following actions:

> **1) The FTA should reject the DSEIS for Sound Transit's Long-Range Plan and should withhold any additional money for Link until a proper alternatives analysis has been completed, its results fully communicated to the public, and a public vote of confidence confirms voter support for continuation of Sound Transit's light rail strategy. Part 8 of this report outlines key requirements for conducting a proper alternatives analysis.**
>
> **2) The Sound Transit Board of Directors should voluntarily undertake the above actions with or without the FTA requiring same. They should do this to confirm they are on the right path and to restore public trust.**
>
> **3) Congress should investigate the manner in which mass transit grants are approved to ensure that FTA controlled planning processes are not abused in the ways chronicled throughout this report. They should investigate Sound Transit as one case example. Congress should insure that the process is redesigned to obtain the most "bang for the taxpayer buck". That is: greatest improvement in transportation at least cost to Federal and local taxpayers.**

The Sound Transit Board has no good reason to balk at taking these actions. If Board members are confident they are on the right path, a proper alternatives analysis can do nothing but confirm it, silence the critics, and help restore public trust. There is no reason why Link can't be put on hold since its completion wouldn't have much beneficial effect.

Vetting-- Authorities should immediately cause this report to be reviewed by an objective team of experts to confirm or refute the logic, calculations and conclusions herein. This could be done in about six weeks. If those are upheld by the team of experts then there would exist reasonably credible, but still not conclusive, evidence that a an all-bus strategy could achieve much the same benefits as light rail, and do so at a far lower cost. Such vetting would justify temporally halting construction on Link until a full-fledged alternatives analysis is complete in 12 to 18 months. Finally, Link could be restarted if the full-fledged analysis is favorable, or terminated if it is not.

Does it matter if the region spends billions more on mass transit than it needs to?-- This report concludes that pursuit of Sound Transit's light rail strategy could end up costing the region roughly a billion dollars a year more than switching to an all-bus alternative.

So what? Does anyone care?

The answers are not obvious. It will be interesting to see if anyone gets concerned enough to act. Perhaps the best way to make the cost of Sound Transit's rail plans meaningful is to list some of the other good projects that are being shortchanged because they are, in the ultimate analysis, competing with light rail for limited tax dollars.

School-renovation fund $11 million short A Seattle School District review shows that its school-renovation programs are running deficits that could mean some projects will be delayed, trimmed or eliminated. (Sanjay Bhatt, Seattle Times, Aug. 4, 2004)

$878 million more sought by Bergeson for schools Terry Bergeson, state superintendent of public instruction, yesterday asked for an additional $878 million for public schools over the next two years, an amount she says is essential to reach the goals of the state's decade old education reform law. (Linda Shaw, Seattle Times, Sept. 23, 2004)

Legislators Brace for Extra-Hungry Interest Groups ...There will be pressure to expand colleges and universities and pay for multibillion-dollar transportation projects such as replacing the Alaskan Way viaduct.

Much of this year's problem is pent up demand. Colleges, for instance, have not kept pace with population growth and many state workers have gone years without a pay increase. But it comes at a time when the state projects an budget deficit of around $1.8 billion, after already struggling through several years of huge shortfalls. (Seattle Times, Jan. 10, 2005)

Sound Transit's 2004 Financial Plan says that $2.437 billion will be spent on Link's Initial Segment between 1997 and 2009. In 2004 alone Sound Transit will collect $271 million in taxes.

The amount of money going to even the Initial Segment of Link light rail would make a big dent in the funding needed to reconstruct the Alaska Way viaduct and rebuild the 520 bridge. But the Initial Segment is just the first step in Sound Transit's ambitions for light rail. Clearly the $900 million per year difference between a 125-mile version of Link versus an all-bus alternative would be more than enough to pay for both projects.

In short, the money that might be wasted on Sound Transits rail-centric strategy is not an abstraction; it comes at the expense of opportunities foregone, and of other good ways to spend tax dollars.

Nor is the impact on the Federal budget, of questionable projects all across the country like Link, something to ignore.

Congress lift debt ceiling **New borrowing to avert default**
Congress last night sent President Bush an $800 billion boost in the federal borrowing limit, spotlighting how the budget has lurched out of control in recent years and how difficult it will be to afford future initiatives. ... "I want someone to explain to me how it can be moral for a father to stick his kids with his bills," said Rep. Gene Taylor, D-Miss. (Seattle Times, Nov. 19, 2004)

Part 8: Guidelines for a proper alternatives analysis
Sound Transit is beginning to plan for Phase 2 of Link light rail. The DSEIS Long-Range Plan shows this will include a limited version of an alternatives analysis, but the only alternatives being looked at are the alternative ways to expand HCT above and beyond the 24-mile Central Link line which Sound Transit is taken as a given. Limiting Phase 2 to just consideration of ways to expand Central Link does not provide voters and officials a full view of the alternatives before this region. Since Link construction has hardly begun, one option is to halt its construction and shift to a more cost effective alternative like BRT. Another is to build Link IS but truncate it south of the bus tunnel so it wouldn't interfere with a regional BRT system. Still another option concerns the full 100+ mile version of Link called for in Sound Transit's draft Long-Range Plan, and in PSRC's Metropolitan Transportation Plan. This 100+ mile version of Link needs to be compared apples-to-apples with a BRT alternative that is either equal in cost, or equal in benefit.

Part 8 describes these and other options in more detail along with technical guidelines to ensure the rail/bus comparisons are done objectively.

Early indicators for Phase 2-- Part 8 concludes with a litmus test that will give voters an early indication of whether or not Sound Transit plans to conduct an adequate and objective alternatives analysis as part of their Phase 2 planning.

Part 9: Main conclusions of this report:

1) The existing planning process is not producing the kind of information needed by officials and the public to make intelligent decisions about major mass transit projects. Important information is missing or obscured. Promising alternatives are ignored. Reports seem intended more to sell than to inform.

2) Sound Transit and its predecessor agency the RTA have abused the planning process in order to promote light rail. They biased key studies by making inappropriate assumptions and masking key information. They compared a robust rail alternative against a deliberately hobbled bus alternative. They disseminated misleading information to the public.

3) ST justifies its choice of light rail on the one and only rail vs. bus alternatives analysis conducted here since the 1980s. However, that study was deliberately biased to favor rail. When that bias is removed the underlying data shows that an all-bus solution could probably achieve the same level of benefit at far lower cost.

4) ST and RTP dismissed bus alternatives largely on false claims that buses lacked adequate capacity. Their analysis was deliberately manipulated to support these claims. BRT has more than adequate capacity to meet the region's long-term needs. Light rail has less capacity than BRT and is therefore less strategic.

5) As construction begins on Link there is still no study which compares the benefits of spending $X billions on light rail plan versus spending the same amount on bus rapid transit.

6) If the money now intended for light rail were instead redirected toward other projects such as BRT, car and vanpool enhancement, and other transportation projects the region could probably make considerably more progress in solving our transportation problems, because these other alternatives are more cost-effective.

7) By objective measures Link does not seem like something worth pursuing. Among other faults it would have almost no effect on traffic congestion and is not cost-effective as an alternative to driving.

8) BRT is a viable alternative to light rail in the Puget Sound Region. It could achieve the same benefits at a much lower cost and has more than adequate capacity to handle long term growth.

9) Link is the failed result of a faulty planning process. The process can and has been manipulated to favor preordained outcomes. It is not objective. It does not produce the type of information needed to make intelligent decisions. It fosters distrust. It is a process that needs to be fixed. This would take local and Federal action.

10) The region is embarking on a rail-centric mass transit strategy, which could result in over 125 miles of light rail. If fully implemented, that strategy will probably cost the region about a billion dollars per year more than an all-bus (BRT) strategy having the same level of transit ridership and related benefits. Meanwhile Link IS and Central Link are probably costing over twice what comparable all-bus alternatives would cost.

11) Link light rail is an example of the "waste, and abuse" that is driving up the Federal budget deficit, because it was sold on the basis of misleading information and because there are more cost-effective alternatives.

12) There has been insufficient public discussion about the merits or consequences of committing the region to this multi-billion dollar rail-centric strategy, and there is no solid analysis demonstrating it's the best strategy.

13) Transportation planning in the Puget Sound region has not placed a high priority on spending taxpayer money efficiently or in finding the lowest cost solutions.

14) Link should be put on hold and further Federal funding withheld until and unless a new and honest alternatives analysis is completed, and that analysis demonstrates that light rail is superior to BRT and other options. On the basis of available evidence, such a conclusion seems unlikely.

15) The FTA should review, and if appropriate withdraw, its prior acceptance of the 1993 FEIS as meeting FTA requirements for a proper alternatives analysis, since that particular analysis is faulty in so many respects and contains no apples-to-apples comparison between Sound Transit's light rail plans and all-bus alternatives. By the same token FTA should not allow Sound Transit to proceed with any Phase 2 planning until a new and proper alternatives analysis has been completed.

16) Sound Transit's planning process for Phase 2 will not provide the information needed for this region to make intelligent decisions about massive investments in mass transit unless the recommendations listed in Part 8 of this report are adopted.

17) The PSRC should be forced to obey the State Law requiring Least Cost Planning because imposition of that planning technique is the single most important thing that can be done to help ensure that scare transportation tax dollars are spent wisely.

18) Sound Transit's latest Long-Range Plan should not be approved because it's very foundation, the 1993 FEIS, is obsolete and corrupt.

--end--

Part 1: Sound Transit has never done a proper alternatives analysis.

1.1 Overview

Part 1 will document the fact that Sound Transit has never conducted a proper alternatives analysis for Link light rail". In particular Sound Transit has never done an apples to apples comparison of the light rail system they intend to build against other alternatives such as bus rapid transit. As a result there still exists no factual basis for asserting that light rail is a better solution for this region than other alternatives might be. In fact, Parts 3,4,5 and 6 will provide strong indications to the contrary.

To be even more specific there exists no apples to apples comparison between:

a) The 14-mile Link "Initial Segment" (Ref 2) now under construction versus an all-bus alternative

b) The 21-mile Central Link (Ref 18) voters approved versus an all-bus alternative

c) The 24-mile Central Link to Northgate version of Link (Ref 2) versus and all-bus alternative

d) The 100+ mile, fully built-out version of Link described in Sound Transit's Long-Range Vision (Ref 49), Draft Long-Range Plan (Ref 65), and in the PSRC's Metropolitan Transportation Plan (Ref 17: p. 73) versus an all-bus alternative

At the time of this writing Sound Transit has just released diagrams of the alternatives it plans to evaluate for Phase 2. One alternative is a light rail network that includes all of Central Link plus extensions to Northgate, Totem Lake, Redmond, and to the east of Issaquah. It appears to involve between 50 and 70 route miles of light rail. There will be two rail/bus alternatives, one using busways, the other using HOV lanes.

Sound Transit intends to conduct an alternatives analysis of the rail extensions per se, but not the entire rail network. In other words they plan to take the core light rail network from SeaTac to Northgate as a given in all three of the alternatives they plan to examine for Phase 2. Thus when this Phase 2 planning exercise completes there will also be no apples to apples comparison between:

e) The 50 to 70 mile (Phase 1 + Phase 2) version of Link versus an all-bus alternative.

Because none of these alternatives analyses have been done, Sound Transit has no scientific or analytic basis for its choice of light rail. Neither elected officials nor the public has the data needed to see whether or not Sound Transit's preoccupation with light rail makes sense.

In lieu of a proper alternatives analysis, what Sound Transit uses to justify light rail is an outdated, irrelevant and biased FEIS/alternatives analysis completed in 1993. (Ref:1) That study compared a 125-mile, fully grade separated rapid or heavy rail system against two bus alternatives. It is referred to frequently throughout this report as the "1993 FEIS". See the attached Maps for the rapid rail and bus alternatives studied in the 1993 FEIS.

There is apparently no other, or more recent, alternatives analysis. The PSRC's "Summary of Prior All-Bus and Integrated Rail/Bus Alternatives Analysis" dated April 5, 2001 states: "The most recent and comprehensive system-wide analysis that evaluated the relative costs and benefits of a rail/bus alternative and an all-bus alternative was conducted as part of the Regional Transit System Plan (RTSP), completed in 1993." (Ref 28, p.2)

Nor are any other alternatives analyses mentioned in "Documentation of Major Investment Study", dated March 12, 1996 (Ref: 3), or in a short report called "Sound Transit Link light rail project, Transit Technology Review" dated 2/2/99 (Ref: 5), or in a comprehensive listing of all high capacity transit studies conducted from 1967 to June 2001. (Ref 36, Appendix P) Moreover a very recent Sound Transit presentation called "SEIS/Long-Range Plan Scoping Summary Report and Definition of Phase 2 Alternatives", Office of Policy and Planning, June 24, 2004 points back to the 1990-1993 alternatives studies but mentions nothing more recent. (Ref: 8) Finally, the just released DSEIS for ST's Long-Range Plan states definitively that it's based on the 1993 FEIS.

In short, the 1993 FEIS is the one and only rail versus bus alternatives analysis this region, and Sound Transit, has to rely on.

Unfortunately the rapid rail system studied in the 1993 FEIS is not like the light rail system Sound Transit plans to build. The sizes of the networks are different, the speeds of the trains are different, the capacity and levels of service are different, and the cost estimates have proven wrong. In addition, the bus alternatives considered in 1993 were not well designed; in fact they were designed to fail.

In short, the 1993 study does not provide adequate rationale as to why light rail should be Sound Transit's technology of choice, nor does it demonstrate that Sound Transit's plan to spend about $2 billion on a 14-mile Initial Segment of light rail is more beneficial than spending an equivalent amount on some other alternative such as bus rapid transit. The public needs to know. Public officials need to know. It is the essential and fundamental question that the millions spent on planning should have answered. Yet it remains unanswered as Sound Transit begins construction on Link's "Initial Segment".

Sound Transit is now beginning "Phase 2" planning that would extend that 14-mile initial segment, and it appears the agency plans to rely again on that same irrelevant, obsolete 1993 study. That must not be allowed.

Before beginning any Phase 2 planning, and indeed before spending any more on Phase 1, our region needs an honest apples to apples comparison wherein Sound Transit's plan to spend $X billion on light rail is compared with spending the same amount on BRT and/or other alternatives. (Or alternately the costs of achieving a given level of benefit using different plan alternatives are compared.) Equal cost or equal benefit is what is meant by apples-to-apples.

The author believes the way Sound Transit has abused good planning practice is not unique and has happened elsewhere. If so, what's needed at the national level is a change in FTA regulations or enforcement thereof that forces transit agencies to conduct honest and adequate alternatives analyses whenever new rail systems or extensions are contemplated. For information on abuse in other cities, see References 12, 13, 21, 24 and 50.

Having a proper alternatives analysis is not the only requirement for a good planning process, but it's an essential one. If there is one part of the process that should be singled out and fixed, this may be the one with the highest leverage. That's why it's the focus of this report.

1.2 Alternatives analyses are required

According to the FTA's Office of Planning and Program Management:

> "FTA's FY 2003 Strategic Business Plan identifies a commitment to delivering the highest value for Americas investment in public transportation..." (Ref 31, p. 3)
>
> "The name "alternatives analysis" has as its basis the New Starts planning provisions contained in federal legislation..." (Ref 31, p. 10)
>
> "Regardless of what the study is called, its intent is the same: to identify and compare the costs, benefits and impacts of a range of transportation alternatives as a means of providing local decision makers with the information necessary to implement the most appropriate transportation solutions in priority corridors." (Ref 31, p. 10)

Additionally, common sense, taxpayer interest, the principles of business analysis, and urban planning techniques taught in graduate schools all require proper alternative analyses. Decision makers and taxpayers need to know what options are available for solving their transportation problems. And, they need some way to compare the costs and benefits of the different options so as to spend money wisely.

Much of this report is devoted to detailing the deficiencies in the 1993 FEIS which is Sound Transits one and only alternatives analysis and apparently the one with Sound Transit submitted to the FTA in support of their full funding grant agreement for Link. The FTA apparently accepted this flawed document because their formal acceptance of the grant states:

WHEREAS, the Government has determined that the Project is based on the results of an alternatives analysis.... (Ref 60)

This author is not familiar with the details of FTA requirements as to how alternatives analyses should be conducted. He does not know if they are so loose that practically anything that a transit agency says is an alternatives analysis will be accepted by the FTA; but considering what Sound Transit has been able to get away with that must be the case. I leave it to others to determine whether or not Sound Transit has met the "letter of the law" in terms of FTA's formal requirements. It's clear they have not met the sprit of the law, or the needs of those wanting objective information.

1.3 Author's definition of a minimal alternatives analysis

In this letter I define an alternatives analysis as a study wherein one fairly detailed transit system plan is compared against other detailed transit or non-transit system plans such that the costs and benefits, including environmental impacts, of each alternative are quantified. The systems plans must be detailed enough to show routes, stations, and frequency of service. The analysis must include running mode split and other models so as to predict transit ridership, impacts on road usage, and other relevant impacts and benefits. These are what I consider the minimal requirements for something to be called an alternatives analysis.

A qualitative description of the pros and cons of different alternative technologies does not comprise an alternatives analysis. Sound Transit and the RTA have produced a number of these. Most are very short. See for instance the Appendix in Ref 5.

Using my definition there has been only one alternatives analysis relevant to major regional mass transit planning in the Puget Sound region since 1990; namely the Final Environmental Impact Statement Regional Transit System Plan, dated March 1993. (Ref: 1) It was produced by Sound Transit's predecessor, the Regional Transit Authority or RTA.

1.4 Author's definition of a proper alternatives analysis

To be a proper alternatives analysis other common sense requirements apply. For instance the systems alternatives compared should include the one actually planned to be built not some obsolete or irrelevant plan, the cost data should be timely and not proven wrong, the analysis should be objective and not biased, the analysis should show how well each alternative contributes to solving the main transportation problem the community wants solutions for, a decent range of alternatives should be considered, and so forth. In a nutshell the alternatives analysis should attempt to seek out the best solution to the problem based on objective performance criteria, not serve as a sales pitch or biased justification for some politically predetermined outcome.

In other words it should actually and honestly seek to: "delivering the highest value for Americas investment in public transportation" (Ref 31, p. 3)

Using this definition Sound Transit has never conducted a proper alternatives analysis for the light rail system they plan to build.

The specific reasons that the 1993 alternatives analysis (Ref 1) should not be accepted as the basis for Sound Transit's light rail planning are detailed in the remainder of Part 1. They fall into two general categories. First, the 1993 FEIS was in itself flawed and did not even constitute a proper alternatives analysis for the rapid rail system being proposed in 1993. Second, about 12 years have passed since the homework behind the 1993 FEIS was completed. In the interim Sound Transit has switched from rapid rail to light rail, initial cost estimates have proven wrong, and a host of other things have changed. All these factors would render the 1993 FEIS obsolete and irrelevant to today's situation, even if it had been done correctly back in 1993.

1.5 The 1993 alternatives analysis is irrelevant because it addressed heavy or rapid rail, not light rail.

The 1993 alternatives analysis that ST has used to justify its light rail plans was not an analysis of light rail vis-a-vie other alternatives, but rather an analysis of heavy or rapid rail, which has significantly different characteristics.

There can be no doubt that the 1993 FEIS evaluated rapid or heavy rail since the term was used so widely and defined so precisely: (underlining by author)

> "The fifth plan element is a regional rapid transit system..." (Ref 1: p.xiii)
>
> "This (Rail/TSM) alternative includes about 125 miles of rapid rail running on an exclusive, grade-separated right-of-way and a 40-mile diesel-operated commuter rail line. For planning and modeling purposes it has been assumed that the rapid rail system would have operating characteristics similar to recently built system in other cities and that it would have similar environmental impacts. Within the range of other North American rail lines, the rail system that is proposed would fall into the definition of "heavy rail", since it would have a relatively high capacity and would operate almost entirely on an exclusive guideway completely separated from automobile traffic." (Ref: 1, page xxxii). *In contrast, parts of Sound Transit's light rail will operate at grade in the Rainier valley thus limiting its speed and capacity. It also has different safety characteristics than the grade-separated system in the 1993 FEIS.*
>
> "A rapid rail line operating in exclusive right-of-way has the theoretical capacity to carry over 22,000 persons per hour in each direction past a single point. These numbers represent the rail capacity of the downtown Seattle transit tunnel; capacity would be higher in segments with less frequent station stops." (Ref: 1, page xviii) *In contrast, the maximum capacity of Link light rail is claimed to be 16,000 pph in downtown Seattle and on the north line. South and east lines would have a much lower capacity.*
>
> "The capital improvements analyzed in the system Plan FEIS include a proposal for a rapid rail system..." (Ref 1: p. 1-2)
>
> "A rapid rail line with 4-car trains...." (Ref 1: p.1-10)

"**2.2.3 Rail/TSM Alternative** The Rail/TSM alternative overlays an extensive rapid rail system and a commuter rail line onto...." (Ref 1: p.2-24)

"**2.2.3.1 Technology** This alternative would be based on an rapid rail system on exclusive, grade separated right-of-way...Maximum speeds would be 55 to 70 MPH, with average speeds (including station stops) around 35 to 40 MPH." (Ref 1: p.2-24)

Because the 1993 FEIS compared rapid, not light, rail with bus alternatives it does not constitute an adequate alternatives analysis for Link, in spite of Sound Transit's assertions that it does. It offers no proof that spending $X billion on light rail would bring more benefit to the region than spending the same amount on other alternatives such as bus rapid transit.

1.6 Link light rail is much slower than the rapid rail studied in the 1993 FEIS.

The rapid rail in the 1993 FEIS had an average speed of 36 MPH whereas Link will have an average speed of only 26 MPH. (Ref 38: p.16 and Ref 1: p. 2-58) The rapid rail in the 1993 FEIS also had a higher top speed. "Maximum speeds would be 55 to 70 mph, with average speeds (including stations stops) around 35 to 40 mph." (Ref 1: page 2-24) In contrast Links maximum speed is 55 mph. (Ref 2: page 3-9).

As another point of reference, WASHDOT policy requires that HOV lanes be managed so average speeds equal or exceed 45 MPH.

The fact that Link is slower than the rail system in the 1993 FEIS means that all the benefits asserted for rail in that study would be diminished if light rail were used instead of rapid rail. In other words, the 1993 FEIS makes the "rail" alternative look better than it should be, if rail now means light rail whereas before it meant rapid or heavy rail

Because it is slower Link would attract fewer riders than rapid rail, even if the routes and stations were the same. With fewer riders the cost-effectiveness measures computed in the 1993 FEIS would not apply to a fully mature 100+ mile version of Link. Link would look worse.

In addition, all the other benefits that are related to ridership, such as impacts on traffic, air pollution, energy consumption, and the degree to which the alternative supports land use goals would be lower.

The fact that Link is slower will diminish whatever advantage the 1993 FEIS asserted that rail would have over bus. Perhaps it would disappear entirely. In other words, if Link speeds were plugged into the models used to estimate ridership in the 1993 FEIS, perhaps the bus alternatives would have attracted MORE riders than the rail alternative and left no basis to claim rail was superior.

In sum, by basing today's decisions on a dated alternatives analysis that makes rail look better than it should, we are not making rational decisions based on relevant data.

1.7 The rail network used in the 1993 alternatives analysis differs considerably in size and routing from the network options Sound Transit intends for Phase 1 and 2.

A proper alternatives analysis needs to compare the actual configuration an agency plans to build against other feasible alternatives, rather than compare hypothetical or irrelevant configurations. If an agency is allowed to compare hypothetical network configurations it might as well also compare them in the context of hypothetical land use patterns or even use comparisons from other cities. Clearly there are places in the world where heavy rail is clearly superior to light rail, or where light rail is superior to bus rapid transit, or where bus rapid transit is superior to light rail. It all depends on the specifics, including the size and shape of the proposed networks.

The 1993 FEIS compared one specific 125-mile rail network with several bus-based alternatives.

This network is not similar in size or shape to any of the light rail networks that Sound Transit may end up with. Currently, Sound Transit only has FTA approval to build a 14-mile starter system. That may be all that ever gets built. Or maybe it will be extended to SeaTac but not to the U District, or vice versa. Or maybe to Northgate. Or maybe it will be extended across Lake Washington, perhaps with a branch to Issaquah, or maybe not. The merits of these potential end-state LRT networks vis-a-vie BRT are not addressed by a prior study of one particular 125-mile rapid rail network. See attached Maps for details.

Common sense argues that there should have been an alternatives analysis comparing Central Link with other alternatives before ST asked voters to approve it in 1996. They would have been better informed. And it should have been required before the FFGA was approved for the starter system. One could also argue that the current FFGA is invalid because a proper alternatives analysis was never completed. The need for one remains as long as the community could still change its mind and Phase 1 contracts be cancelled, or as long as it is still possible to terminate the Initial Segment south of the DSTT.

Phase 2 planning is now started and Sound Transit must not be allowed to maintain that the alternatives analysis has long since been completed, as they do in the Draft Long-Range Plan. Instead, common sense argues that we should now have an alternatives analysis for each of the main end-state scenarios that may emerge so we can determine which if any make sense. Thus we should have an apples to apples comparison of at least the following light rail scenarios vis-a-vie an equal amount spent on other alternatives:

1) a truncated Initial Segment that stops south of the Downtown Seattle Transit Tunnel so it doesn't interfere with a regional BRT system.
2) 14-mile Initial Segment as currently approved
3) 21-mile Central Link
4) 24-mile version of Central Link going to Northgate
5) ?-mile version of Link from Everett to Tacoma

6) the 125+-mile light rail system that constitutes Sound Transit's fondest dream for Phase 2 (see Ref 8: page 4 and Ref 65) See also PSRC's MTP which envisions 125 miles of light rail. (Ref 17: p.73)

All these potential light rail end-state scenarios should be studied since, while a short starter system may not make sense, perhaps a more extensive system would. Alternately, perhaps a larger system would exceed the point of diminishing returns, whereas a short "skim the cream" system would make sense. If light rail makes sense at all, there will be an optimum balance between that part of the transit network served by rail versus that best served by bus. This sweet spot can only be located by bracketing it with the evaluations of various end-state scenarios such as outlined above.

Beside route length, the layout of the 125- mile rail network used in the 1993 Plan differs substantially from the light rail network ST now envisions for Phase 2. For instance the 1993 rail alternative included a North-South line running east of lake Washington from Everett to Sumner, whereas Phase 2 "Development Options" include no such route. (Ref 2: Figures 2-10 and 3.20) (Ref 8: page 4) The alignment chosen for estimating ridership in the 1993 FEIS may also have been the Duwamish alignment, although that isn't clear. (Ref 2: page 2-32) If the Duwamish alignment were used, that would be another difference between what was studied in the 1993 FEIS and what Sound Transit wants to build.

In sum, the cost, ridership, and impact data collected in the 1993 FEIS are not relevant to impending decisions about building or extending light rail because the shape and size of the rail network analyzed in the 1993 FEIS is not equal to any of the Link's network scenarios. It is therefore necessary to conduct an alternative analysis, in other words a mode against mode "fly-off", for each potential end-state scenarios for light rail to determine which, if any, make sense.

1.8 The bus alternatives in the 1993 FEIS don't reflect the best design for bus alternatives. They are obsolete in terms of what can now be done, and may have been designed to fail.

There are several reasons why the bus designs in the 1993 FEIS do not reflect the best that buses could do today, and therefore render the 1993 FEIS obsolete.

First, the 1993 FEIS makes no mention of BRT. Therefore the bus alternatives in that study are unlikely to have incorporated all the recent innovations in Bus Rapid Transit. As explained in the extensive BRT literature these include a host of ways for making bus service more efficient and attractive. (see References 9, 10, 11, 12, 13, 14)

Second, there was no knowledge at the time that the Alaska Way viaduct needed to be replaced due to earthquake vulnerability, nor that there would be a major effort to redevelop the south Lake Union area. These offer the opportunity to build an elevated "BRT/HOV way" that would branch off the I-5 HOV lanes at Mercer St., cross the south

Lake Union Area, tie into SR 99, and head south along what is now the Alaska Way viaduct. Just one story up, this "BRT/HOV-way" could probably be architecturally integrated into the planned new buildings so wouldn't be visually intrusive.

Providing another major new N-S transit/HOV corridor through the city would remove much of the capacity limitation held against the TSM option. With a south Lake Union station this new busway could provide high quality transit service to this emerging employment center. In addition, by heading west toward the Seattle Center then south along the waterfront this BRT route could improve transit service to Ballard, Belltown, the biotech development on the north shore of Elliot Bay, the commercial/industrial area south of the stadiums, the Duwamish valley, and West Seattle. These areas are all ignored by light rail. The attractiveness of this addition would not have been apparent in 1993 and is another reason the 1993 FEIS is obsolete in terms of the light rail versus BRT choice facing us today.

Third, the 1993 FEIS claimed that bus alternatives didn't have enough capacity thru downtown Seattle. However, the RTP failed to consider a scenario where through buses would be accommodated by extending the I-5 HOV lanes through downtown, or solve the capacity problem in a variety of other ways that staff had already identified. In this respect the bus alternative in the 1993 FEIS was a strawman alternative deliberately designed to make the bus alternatives look bad. This complex subject is treated in detail in Part 5 of this report.

The point here is that Sound Transit's choice of light rail over bus cannot legitimately be based on an alternatives analysis wherein the bus alternatives were deliberately designed to fail. For this reason alone the FTA should have refused to accept the 1993 FEIS when processing Sound Transits request for a Full Funding Grant Agreement (FFGA).

Fourth, the 1993 FEIS did not contemplate the hybrid bus technology that is now available. The availability of this technology has operational, cost, and environmental implications different from buses evaluated in the 1993 FEIS.

In sum, the bus alternatives in the 1993 FEIS are dated, biased, and do not represent bus technology at its best. The 1993 FEIS is therefore irrelevant to impending decisions about if and how to extend Link light rail. To be relevant in today's environment, new alternative analyses -- that compare Sound Transit's light rail plans against several modern well-crafted BRT alternatives-- are needed. This is a most fundamental point.

1.9 The 1993 alternatives analysis is irrelevant because it is based on obsolete and incorrect cost assumptions

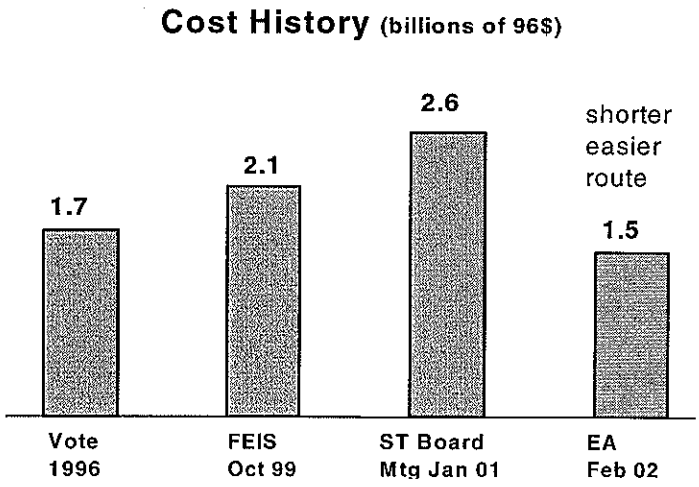
Since virtually any transit technology can be made to work, one of the most important reasons for doing an alternatives analysis is to determine relative costs.

Officials currently leaning on the 1993 FEIS to help justify their choice of light rail over bus are looking at obsolete and incorrect cost data. History shows that cost per mile assumptions made in the early 1990s were wildly optimistic. Since time has proven that the cost assumptions in the 1993 FEIS were incorrect, that document is not relevant to today's decision making.

The author would like to show the magnitude of this error, in other words quantify the difference between rail costs assumed in the 1993 FEIS and the latest figures based on actual construction cost bids, which in turn reflect a much greater level of engineering analysis than had been done in 1993. Unfortunately this is very difficult for several reasons. First Sound Transit has not stated all their cost estimates in a consistent manner, such as 1995$. Second, they have started using YOE$ which appear to vary depending on the latest implementation schedule. Third, some estimates include reserves and other relevant expenses whereas others do not. Fourth, the "plan" has changed from the 125-mile system, to a 21-mile system to a 14- mile system so it is difficult to say what would now be the cost of the original 125-mile system. What follows are the best indications of percentage cost escalations since the 1993 FEIS that the author has been able to locate.

First, some data in constant dollars: When voters approved the original 21-mile light rail plan in 1996 the cost was estimated to be $1.736 billion (in 95$), or $86 million per mile. (Ref 2: p. S-49) (Ref 15: p.34). Sound Transit's May 1996 Sound Move brochure said: "Sound Move is based on extremely conservative cost and ridership assumptions." (Ref 15: p. 31) Voters no doubt relied on that statement.

However, by the time the FEIS for Central Link was published in November 1999 the cost had risen to $2.1 billion (95$) or $100 million per mile, and by Sound Transit's board meeting in Jan. 2001 it was up to $2.6 million (95$) or $123 million per mile, a full 44% higher than what voters approved. (Ref 2: p. S-49) (Ref 27, Section 13, p.1-8) Then, since the original plan was no longer affordable, Sound Transit decided to shorten the route and eliminated the most costly portions. In short, these sources show costs increased 44% (in 1995$) from the mid-1990's to January of 2001. An earlier chart by the author shows this visually:



Second is a view in YOE$: On 2/2/01 Sound Transit published a table labeled "Updated 2001 Financial Plan". (Addendum G) The table shows that light rail (the Phase 1 system to NE 45th) changed from $2.161 billion (YOE$) in the Sound Move plan to $4.0 billion in the 2001 Updated Financial Plan. The $4.0 billion figure also appears in the Central Link Board Briefing Book dated Jan 11, 2001. (Ref 27: Section 13, p. 7-8) In sum, this YOE data shows the costs of Central link jumped 85% during the period from 1996 to 2001.

Third is a June 2004 analysis by transportation planner Jim MacIsaac: Mr. MacIsaac found that the total cost for the 24.8-mile Central Link has risen from $2.3 billion at the time of the vote to somewhere between $5.335 billion and $6.75 billion. These are YOE$. This means cost per mile has doubled or tripled from $93 million per mile back in the 1996 timeframe to somewhere between $215 and $272 million per mile today. Mr. MacIsaac's table is inserted below.

Link Capital Cost Estimates Excluding all Reserves and Financing Costs

Segment	Length (miles)	Sound Move	Capital Cost Estimates 2001 Est[1] (YOE$)	Capital Cost Estimates Current[2] (YOE$)	Cap Cost per Mile	MacIsaac Estimates 2009$[8]	MacIsaac Estimates 2012$[9]
Link North:		(YOE$)					
Northgate - U-District[3]	3.2		$600	$775	$242	$937	$1,070
U-Dist - CPS (Montlake)[4]	4.9		$1,720	$1,945	$397	$2,353	$2,685
CPS - Lander & Maint Base[5]	3.1	$1,871	$680	$715	$231	$790	$790
Lander - McClellan[5]	1.0	13.8 mi	$300	$300	$300	$330	$330
McClellan - Boeing Acc[5]	4.8		$580	$680	$121	$640	$640
Total North	**17.0**	**$1,871**	**$3,880**	**$4,315**	**$254**	**$5,050**	**$5,515**
Link IS North Only	8.9		$1,560	$1,595	$179	$1,760	$1,760
Link South:							
Boeing Acc - S.154th (Link IS	4.9		$480	$610	$124	$670	$670
S.154th - Airport Term[7]	1.7	$427	$250	$210	$124	$255	$290
Airport Term - S.200th	1.2		$200	$200	$167	$245	$275
Total South	**7.8**	**$427**	**$930**	**$1,020**	**$131**	**$1,170**	**$1,235**
TOTAL CENTRAL LINK	**24.8**	**$2,298**	**$4,810**	**$5,335**	**$215**	**$6,220**	**$6,750**
Link IS Extensions only	11.0	(21.2 mi)	$2,770	$3,130	$285	$3,790	$4,320

[1] ST April 2001Capital cost estimates in YOE$ based upon 2009 opening (excluding all reserves and financing costs).

[2] Most recent estimates per 2004 financial plan for Link IS; per footnotes 3-7 for extensions (assumes all completed by 2009).

[3] 40% of CPS to U-District segment, per ratio of Base Construction estimates presented in North Link DSEIS.

[4] May 2004 ST disclosure of total capital excluding reserves = $1775 in 2002$ x 1.095 to YOE (2006)$.

[5] CPS - Boeing Access = $1534m in YOE$ per ST 2004 Link IS estimates. Add $61 for DSTT ROW. Broken down into three subsegments by JWM estimates aided by the ST 2001 breakdowns.

[6] The 2001 estimate reflected alignment in median of SR-99. Since changed to mostly elevated "Tukwila route".

[7] This segment was originally to be elevated. The revised POS drive plan now makes it possible to build much at-grade.

[8] Includes 10% project reserve for all segments plus inflation factor of 1.1 for 3-year delay of all Link IS extensions.

[9] Includes an inflation factor of 1.2 for 6-year delay of all Link IS extenxions plus 15% project reserve for extensions.

It is clear from the record that between May1996 and January 2001 Sound Transit had learned enough --from more detailed engineering and input from construction firms-- to realize their initial cost estimates were off by about 44%. What we don't know is whether or not Sound Transit learned anything before May 1996 or after January 2001 that would have also changed their cost estimates. In other words were the underlying unit cost assumptions used in the 1993 FEIS the same as those used to estimate the cost of Central Link in the Sound Move brochure, and are the unit costs used in Jan 2001 still valid today? If there were increases during those periods they would be in addition to the 44%. A new alternatives analysis based on the latest unit cost data is needed in order to get a reasonably accurate estimate of what the 125-mile system would cost today.

However, in the meantime the author will simply assume --for the analyses in Part 6--that the only change is 44%. In other words, the author will assume that the cost of the 125-

intersections would likely remain the same compared to the No-Build Alternative." (Ref 18, p.23)

The way in which Sound Transit uses traffic congestion as a driving rationale yet fails to say specifically whether or not light rail reduces it is neatly illustrated in Appendix B of the Dec 2000 Sound Transit Board briefing book. (Ref 27, Appendix B) Here, under "Why Link", Sound Transit lists its reasons why "Light Rail is critical for Central Puget Sound". None of the reasons listed include anything about reducing traffic congestion. Yet three pages later they describe a public opinion poll finding that "Reducing Traffic Congestion" is the third highest regional priority, outranked only by providing a quality education and maintaining a strong economy. In short, there is a serious disconnect between what people want, what Sound Transit would like them to believe they are getting, and what Sound Transit knows it's delivering.

It is also interesting to note how the "purpose and need", or "goal" of the rail project has evolved away from trying to help solve the congestion problem. The 2002 EA now says: "The purpose of the project is to construct and operate an electric light rail system connected to the region's major activity centers." (Ref 18, p. 2) This is tantamount to saying the purpose of the project is to build the project.

In sum, the 1993 FEIS cannot be considered a proper or relevant alternatives analysis since it did not quantify the degree to which each alternative helped solve the region's primary transportation problem, namely traffic congestion. Additionally, Sound Transit continues to manipulate thinking by citing traffic congestion as a rational for action while at the same time protecting themselves legally by not committing in writing that light rail will do anything about it.

1.12 The cost data in the 1993 FEIS is now obsolete because much of the HOV network needed for the bus alternatives has since been completed and represents a sunk cost.

The 1993 FEIS estimated the capital cost for each of the four major alternatives. (Ref 1, p. xxxiii) The cost to "complete, expand, and enhance" the HOV network was included in the cost of TSM for each alternative. (Ref 1, p. 2-7)

The three build alternatives each included $1.5 billion to complete the HOV network. (Ref 1, p. xxx) However, because much of the HOV work has since been completed some or all of that $1.5 billion can now be subtracted from the cost of the alternatives. That shifts the relative costs of the rail versus bus alternatives making the bus alternative --which was half the cost of the rail alternative-- even more attractive. (see Ref. 1, Table 4, p. xxxiii for specific values). Having better data on relative costs is germane. This is another reason the 1993 FEIS is obsolete and irrelevant in making a light rail vs. BRT modal choice in today's environment.

1.13 The 1993 FEIS, and the FEIS's for Link IS and Central Link, are all seriously flawed because the stated "Purpose and Need" was either vague or not tied directly to solving the regions main transportation problem, which is traffic congestion.

1993 FEIS: First, the statement of purpose is not clear. There is no sentence in the Purpose and Need section that clearly and unambiguously says: 'The purpose of the Plan is to....'

Instead, under Purpose and Need the 1993 FEIS begins by stating:

> "The System Plan presents an effective mass transit alternative to problems associated with automobile use..." (Ref. 1 ,xvi)

One can get very confused trying to parse this poorly written phrase and determine what it really means. I would simply say that such a vague and undefined statement of purpose is not adequate to justify a multi-billion dollar project.

A much clearer expression of purpose could have been made, and should be required. For instance the Purpose could have been: 'reduce traffic congestion by diverting auto users onto mass transit' or 'improve mobility for the young, old, and poor by improving public transit service', or whatever.

Secondly, the Purpose for the region's largest transportation project is not linked to the regions major transportation problem. The Purpose and Need section lists three problems, which are held forth as justification for the Plan. Congestion is the common element in each:

> "Congestion constricts travel on most major freeways..."
>
> "Slower and less predictable travel times result from congestion"
>
> "Transit and HOV modes are caught in congestion..."

Again, if congestion is the acknowledged problem should not the main Purpose of the Plan be that of reducing congestion? If the Plan is directed toward solving some lesser problem that should be made clear and the project should be of lower priority.

It should not be acceptable that an FEIS seek justification and support by, on the one hand, pointing to a problem of great public concern --and thus implying that somehow the Plan is a solution to that problem--, while on the other hand refusing to make clear just how the Plan helps solve the problem or officially commit that it will do so.

In sum, the Purpose and Need section in the 1993 FEIS is defective in two ways:

> First, the "Purpose and Need" statement does not make clear either the problem the Plan is intended to help solve or the way in which the Plan (or project) would help solve it. It says there is a problem, and it says there is a Plan. What it does not do

is show the relationship between them. In other words it does not commit that the plan will solve, or help solve, the problem.

Second, the "Purpose and Need" does not commit the Plan to help solve the regions most pressing transportation problem, which in this case is traffic congestion. A project that is not so committed should have a relatively low priority for FTA funding.

Central Link FEIS: The "Purpose and Need" section in the 1999 FEIS for Central Link starts out with a very clear albeit useless statement: "The purpose of the proposed light rail project is to construct and operate a starter electric light rail system designed to connect several of the regions major activity centers:..." (Ref 2: p.1-1)

This is tantamount to saying the purpose of the project is to build the project. This ridiculous statement does not commit the project to solving any particular problem or adding any particular benefit. However, if Sound Transit can get away with such a statement they are legally or perhaps morally bound to deliver nothing other than a completed project.

Subsequent paragraphs say the plan "would deliver substantial time savings", "would greatly improve transit capacity" "would connect Northgate to the University District" and so forth. (Ref 2: p. 1-6 thru 1-8) These are purported benefits but they are not stated as the Purpose for project and presumably Sound Transit is not promising or committing that they will result.

Link Initial Segment: Under Purpose and Need the 2002 EA for Link IS says: "The purpose of the project is to construct and operate an electric light rail system connecting the region's major activity centers." (Ref 18: p.2)

Clearly Sound Transit's lawyers missed this one because it says rather directly the purpose is to "connect the regions major activity centers". There are about twenty officially designated Urban Growth Centers in the Puget Sound region. Link IS does not even connect two of them together. Per the FEIS, Link stops at South 154th street, which is north of the SeaTac airport and north of the SeaTac Urban Growth Center. The South 154 street station is within about a half mile of the South Center Urban Growth Center but separated by a freeway and completely inaccessible. See attached maps.

However even if the purpose statement was just an innocent mistake, the larger criticisms apply; namely: As it reads the Purpose of the project is to build the project, and the Purpose does not commit to helping solve the traffic congestion problem.

1.14 The 1993 FEIS mishandled the capacity issue in a way that penalized the bus alternative.

This was a critical deficiency in the 1993 FEIS that has had serious consequences. However it is a complex subject, which is addressed at length in Part 5 of this report.

1.15 The 1993 FEIS mishandled the cost-effectiveness issue in a way that penalized the bus alternative and hid important information from officials and the public.

This is also a complex point. Part 6 is devoted to explaining it. Part 6 also takes data from the 1993 FEIS and uses it to project the cost of building a mature 100+ mile version of Link versus the cost of building a BRT system having comparable transit ridership and ridership dependent benefits.

Part 2: Sound Transit morphed rapid rail into light rail.

2.1 The 1993 alternatives analysis specifically dismissed light rail as not being suitable for the region.

Light rail was, along with other technologies like monorail, given cursory consideration in the 1993 FEIS, then dismissed as inappropriate. The FEIS contained the following statements:

> "A surface LRT system like MAX in Portland would operate at average speeds of 18 to 20 mph, relatively slow compared to the grade-separated Rail/TSM Alternative, which would average 35 to 40 mph." (Ref 1: page 2-50)

> "Surface LRT operating across intersections is typically limited in terms of train length and frequency. ... Conventional transit practice and highway standards suggest that when train frequencies are under 6 minutes, cross traffic on arterials well be affected to the extent that grade separation is necessary....These constraints limit the capacity of surface LRT systems, as compared to grade-separated systems." (Ref 1: page 2-50)

> "While surface LRT has been very successful in some systems due to low-cost right-of-way or a very dense urban setting, its operating performance relative to grade-separated systems is generally characterized by slower speeds, lower ridership, lower capacity, and lower reliability. These characteristics mean that surface LRT is unlikely to satisfy the demand of a three-county system." (Ref 1: page 2-50)

At the time of the 1993 FEIS a group called the Puget Sound Light Rail Society or PSLRTS proposed a 78-mile light rail system as an alternative to the 125-mile rapid rail system favored by the RTP. Pages 2-51 through 2-61 discuss that alternative. The RTP concluded that:

> "Surface LRT options were analyzed to the point that it became clear that these options did not adequately serve the goals and objectives of the Regional Transit Project. Because of the superior performance of the grade-separated RTP system in terms of consistency with land-use objectives, level of service, and ridership, it was recommended as the rail technology in the recommended draft Systems Plan." (Ref 1: page 2-61)

See also the RTP's disparaging remarks about a light rail system -proposed by R2B2- that included a route in Rainier Valley. (Ref 1, p.2-62)

The term "rapid rail" was used consistently throughout the 1993 FEIS to describe the Rail/TSM alternative. Thus there can be no question that's what the 1993 FEIS analyzed in the form of the Rail/TSM alternative.

It is curious, if not indeed disingenuous, that Sound Transit should so disparage light rail in their one and only alternatives analysis, only later to say --as they do in the Long-Range Plan-- that this same analysis now justifies their selection of light rail as the technology of choice. (Ref 65)

The distinction between the "heavy" or "rapid" rail studied in the 1993 FEIS and "light" rail is not just semantic. Sound Transit will argue that some of the characteristics of the rapid rail in the 1993 FEIS, such as train length, are identical to that of the light rail now being planned. That's true. However, the rapid rail in the 1993 FEIS never ran at grade down the middle of a street whereas parts of Link light rail does. Not all the way, but far enough to affect headways and capacity on the entire south route and forever shortchange the entire south end in terms of capacity. Nor are we certain that proposed Phase 2 Link routes east of Lake Washington would be entirely grade separated as they were in the 1993 FEIS. All the ridership projections, and the cost effectiveness measures in the 1993 FEIS were based on a 100% grade separated network.

Surface running light rail will result in more accidental deaths and injuries, and have different impacts on street traffic that would the rapid rail in the 1993 FEIS. What was said or not said in the 1993 FEIS about these topics would not apply to Link. There are also differences in speed and capacity between the rapid rail in the FEIS and Link light rail. In short, the "rapid rail" in the 1993 FEIS was not just light rail under a different name.

In sum, the 1993 alternatives analysis for rapid rail does constitute a valid alternatives analysis for Link light rail.

2.2 Sound Transit morphed the heavy rail it studied into the light rail it wants.

State, Federal, and common sense all require that ST have an alternatives analysis for Link. But the way ST has handled this requirement was to begin asserting that the 1993 alternatives analysis for rapid rail was actually an alternatives analysis for light rail. They morphed an alternatives analysis for rapid rail into one for light rail. This was not done by actually modifying or redoing parts of the 1993 FEIS to account for the difference, but rather just by changing what they said.

This has been an effective tactic, sometimes called the "big lie". History has some chilling examples. The big lie is that when supposedly knowledgeable and credible persons or organizations repeatedly assert that something is true, many people will come to believe it's true, even if it isn't. Thus when Sound Transit and RTA assert the 1993 FEIS was an alternatives analysis of light rail, many will accept that as fact. Some example quotes where the term light rail is being used to describe the rapid rail system studied in the 1993 FEIS:

> **"Regional Transit Project (RTP)** ...The analysis recognized the limited ridership potential because of the shoreline location of the rail line, especially in comparison with the high cost, fully grade-separated light rail alignment along I-5 between Northgate and Everett." (from RTA report dated 1997, Ref 3: p. 20)

"1992 Regional Transit Project—Transit Technology Overview. Recommendation: Light rail, commuter rail and buses." From a Sound Transit brochure called FACT dated Aug 2002 (Ref 6)

"3.1 Conclusions of Past Systems Planning Work
All previous work leading to the adopted Long-Range Transit Vision generally concluded that, outside the corridors with existing rail lines where commuter rail or DMU technologies were possible, the most viable HCT options for the region were LRT and BRT." (from a 2004 ST report, Ref 7: p.7)

The most important "previous work" was the 1993 FEIS, which specifically dismissed light rail. See the actual quote in the following subsection. The deceit continues in a Sound Transit presentation where one slide said:

"1990-1993 System Alternatives
* Final Alternatives:
  * Enhanced bus,
  * Transitway/Busway (BRT)
  * Rail
    * Commuter
    * LRT" (on a slide presented June 24, 2004 by Sound Transit) (Ref 8)

This slide is particularly egregious since it clearly refers to the 1993 FEIS and it clearly says one of the final alternatives was light rail (LTR). That's just not true.

There is another deception in the above-mentioned slide where it says "Transitway/Busway (BRT)" was also one of the final alternatives. In fact BRT, while similar in many respects, is not synonymous with the Transitway/TSM alternative constructed by the RTP. BRT can include a host of innovations designed to make buses more attractive. See References 9, 10, 11, 12, and 13. The 1993 FEIS never mentions the term "BRT" and thus is unlikely to have incorporated all these innovations. It is therefore also deceptive for Sound Transit to state in this slide that their one and only alternative analysis considered BRT.

In short, this 2002 Sound Transit slide says that light rail and BRT were given a competitive "fly-off" back in the 1990 to 1993 period. Unless there was a phantom alternative analysis done between March of 1993 and YE 1993, this is an outright lie. Albeit in light of similar "misstatements" by Sound Transit it's not surprising.

The PSRC has also written deceptively in this regard:

2. What elements were included in the Regional Transit System Plan (RTSP) adopted by the JRPC in 1993? ... Overall, the long-range RTSP, as subsequently modified into Sound Transit's long-range "Vision Plan", proposed the following components for the regional transit system:
  * approximately 125 miles of light rail....(Ref 28: p.2)

The Regional Transit System Plan (RTSP) published in March of 1993 did not include any light rail, it actually denigrated light rail. (Ref 2) What it did propose was 125 miles of rapid or heavy rail as the quote below clearly states:

"**Elements of the System Plan** ...The fifth plan element is a regional rapid transit system, with either buses running on a combination of HOV lanes and transitways...or a regional rapid rail system... (Ref 2: p. xiii)

Sound Transit, with some help from the PSRC, has a behavior pattern of slowly morphing the record into showing what it wants, and misleading officials and the public into thinking something other than the truth. Its latest attempt, as of August of 2004, is to change the definition of high capacity transit (HCT) to mean transit running on an exclusive right-of-way. Exclusive right of way is not a necessary condition for HCT. In fact, BRT intermixed with car and vanpools could carry far more passengers than Link light rail. (See Part 5 for details.)

If Sound Transit is successful in so redefining HCT it will be a clever trick for ruling out any alternative that would mix BRT buses in with car and vanpools on, for example, the I-90 center lanes. It will nicely dovetail with Sound Transit's other current maneuver to officially re-designate those lanes for exclusive use by HCT only. The consequence of these seemingly innocuous maneuvers is clear. If HCT means exclusive right-of-way and I-90 center lanes are dedicated to HCT, then all alternatives that would mix BRT with car and van pools are simply taken off the table and never even studied. This will help make the selection of light rail across Lake Washington almost a foregone conclusion of the Phase 2 studies. This appears to be Sound Transit's intent.

2.3 Why did the FTA let Sound Transit finesse the alternatives analysis?

The author has no direct knowledge of the answer and hopes the Congress will investigate. However, to an outsider it seems that the FTA would be motivated to increase its statement-of-work and thus budget by establishing and moving applicants through the most elaborate planning process possible. This keeps staffs happily employed. However, at the end of the day the FTA would have no incentive to deny marginal projects and return money to the treasury. All bureaucratic incentives for agencies like Sound Transit and the FTA would seem to mitigate against finding the most cost-effective solutions, but rather would encourage pursuing the most expensive projects sellable to the public. Hence Sound Transit's refusal to conduct a proper alternatives analysis. Hence FTA's failure to demand one. At root it boils down to pork barrel politics at taxpayer expense. Harsh words perhaps, but a plausible explanation for observed behavior.

References 12,13, 21, 24 and 50 discuss this matter from a national perspective. They show that Puget Sound is not alone in the way rail boosters and transit agencies have abused the planning process. The author highly recommends Martin Wachs excellent article on the ethics of forecasting. (Ref 24) Part 7.1 of this report ends with a long and interesting quote from that article.

Part 3: The shortcomings of Link Light Rail

All would agree the vision of a rail system whisking people from place to place is appealing. However, many other things are appealing too: things like replacements for the Alaska Way viaduct and the 520 bridge, things like more and better paid teachers, things like more parkland, things like fixing Seattle's deteriorating streets or the Mercer mess. There is never enough money to satisfy all the region's needs so the main issue is not whether light rail is appealing, but rather whether it is appealing enough to be worth its enormous cost. In other words, is light rail the least cost way to help solve the regions transportation problems? It's doubtful. Analysis shows there is good reason to question Link's cost-effectiveness relative to other alternatives. As former Washington State Governor Booth Gardner said about Link:

> "It costs too much and does too little" (Op Ed, Seattle Times)

Beside being critical of Link per se, the author is of course critical of Sound Transit for not providing the public with objective information about Link's performance. In the sections below the author presents some of that information, using bar charts to graphically explain the points.

Sound Transit has tried to hide this type of information. The skeptical reader is invited to try to find the performance measures revealed below (such as cost per car removed from traffic) in <u>any</u> of Sound Transit's Environmental Impact Statements or brochures. What little information ST provides about effectiveness or cost-effectiveness is hidden in technical tables far back in Environmental Impact Statements. There are no bar charts communicating the main points so they stand out and can readily be grasped. It is clear by their absence that Sound Transit does not seek to inform the voter and help him or her reach rational decisions. Instead most of what ST publishes is marketing material meant to sell and manipulate.

Link light rail is one of those things where the less you know about it, the better it appears. What follows is a list of Link's specific shortcomings. They support the notion that Link is the failed result of a faulty process.

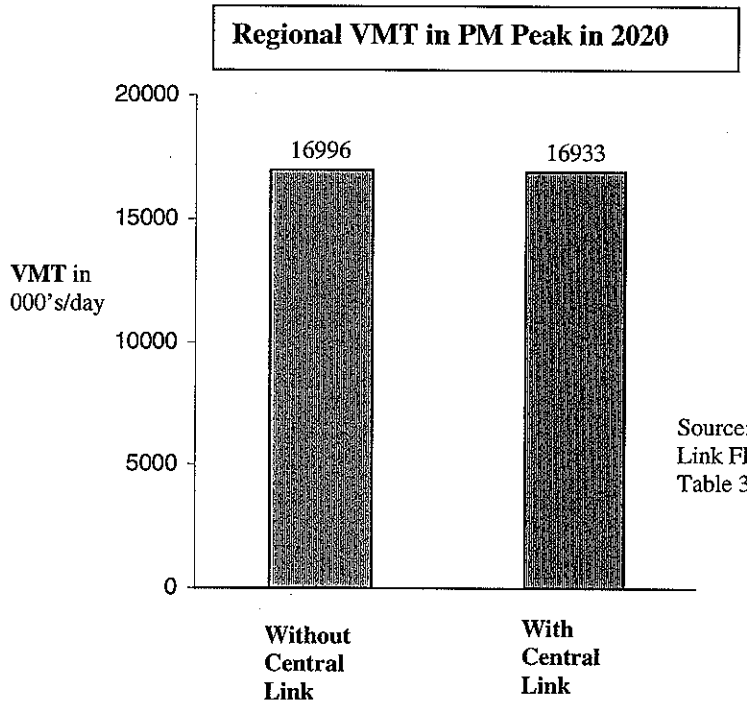
3.1 Link does almost nothing to reduce congestion

Data in Sound Transit's EIS's show that Link light rail system won't even make a dent in Puget Sound's traffic congestion problem.

Given that Sound Transit says "traffic congestion is the problem", one might expect the agency to publish data showing how much Link would contribute toward solving the congestion problem. However, Sound Transit did not publish in their EIS's any estimate of Links effect on traffic congestion, or on travel delay, which is a fairly good proxy for congestion. Instead we are left to infer Links effect on traffic congestion from the only relevant measure ST does provide; namely, Links effect on regional vehicle miles of travel or VMT. To the extent Link reduces the load on the road system, in other words

reduces VMT, then delay and congestion should drop also. (This is an admitted oversimplification since congestion is a complex phenomenon involving latent demand, long term home and work location decisions, and other behaviors.)

Without light rail, PM peak period traffic on area roads and freeways is forecast to be 16,996,000 vehicle miles of travel (VMT) in 2020. With Central Link light rail this would be reduced to 16,933,000 VMT. (Ref 2: p.3-4) These figures are accurately plotted in the chart below. Central Link would reduce peak period traffic a little over one third of one percent. It is equivalent to removing one car of every 370. These VMT figures are the best available measure of Central Link's ability to help solve the region's vexing traffic congestion problem.

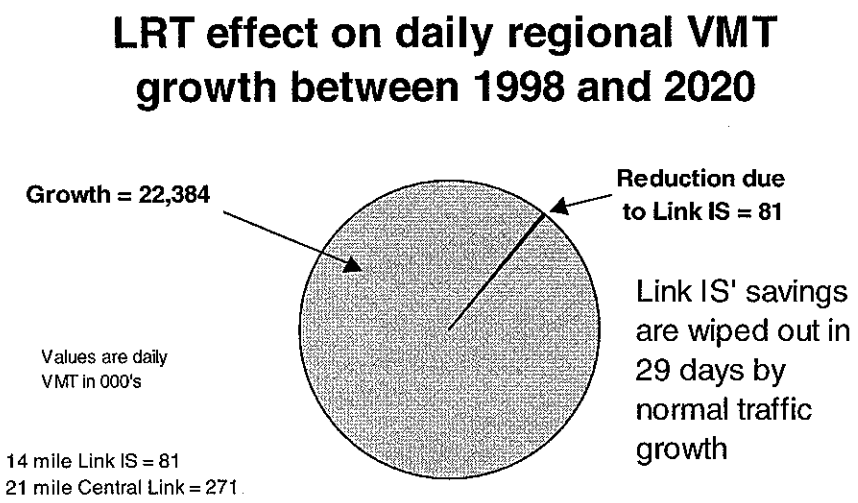


Source: Central Link FEIS, Table 3.1-4

One way to put 1/3 of 1% into perspective is imagine the 2.75- mile long Evergreen Point bridge, covered with cars stopped bumper to bumper from the Lake's eastern shoreline to Montlake Blvd. At 20 feet per car there would be about 725 cars in each lane. Reducing traffic by 1/3 of 1% is equivalent to removing about two and a half cars from each lane.

Even where rail should have its greatest impact, the numbers are disappointing. For instance, the number of peak hour vehicles crossing the ship canal in 2010 would only decline from 45,789 to about 45,740. The number of peak period auto trips leaving downtown Seattle would only drop from 30,800 to 30,100. Both are incredibly small impacts.

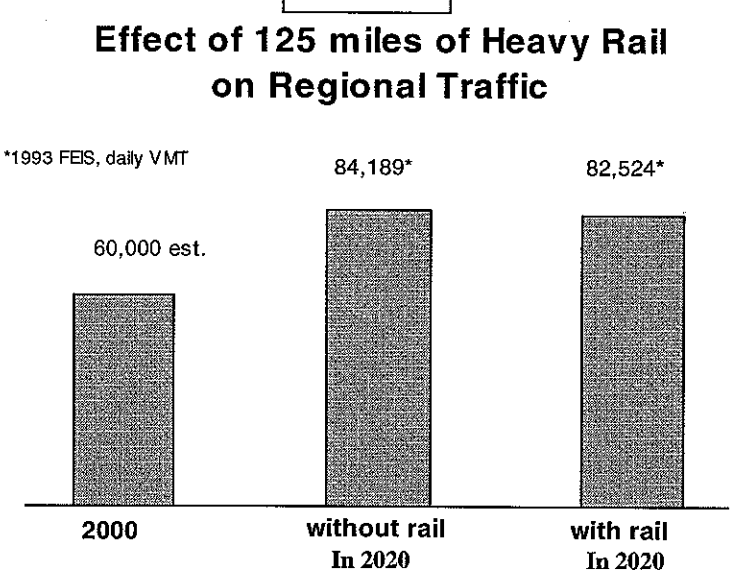
Figure 3.1.2 is another way to put Link's minuscule effect on traffic congestion into perspective. The total "pie" represents the amount by which regional travel, measured in VMT/day, is expected to grow between 1998 and the year 2020; namely by 22,384,000 VMT. This is due to population growth and other factors. The small wedge shows how much of that growth increment would be taken away by drivers giving up their cars to ride Link IS. Basically Link IS would reduce the growth in VMT by 81,000 daily VMT. Unfortunately, this savings would be wiped out in only 29 days by the normal growth in regional traffic. In other words, after spending about 13 years (1996 to 2009) and $1.5 billion (02$) building Link IS, travel will be back to pre-Link levels only a month after the system opens for business.



Central Link would reduce traffic by 271,000 daily VMT, so its effect would take about three months for growth to overcome.

Some argue Link's Initial Segment is only a starter system, which will grow and eventually produce more meaningful results. Here again the data show otherwise. The 1993 EIS prepared for a $11.5 Billion (in 91$) transit plan shows a 125-mile rapid or heavy rail system would only reduce 2020 traffic volumes 1.9% more than a bus solution costing a fraction as much. (Ref 1: Table 3.9.3) Figure 3.1.3 illustrates this graphically. If the reader can't see the difference between the "rail" bar and the "without rail" bar, it's apparent that drivers wouldn't notice any difference on the roads either.

Figure 3.1.3



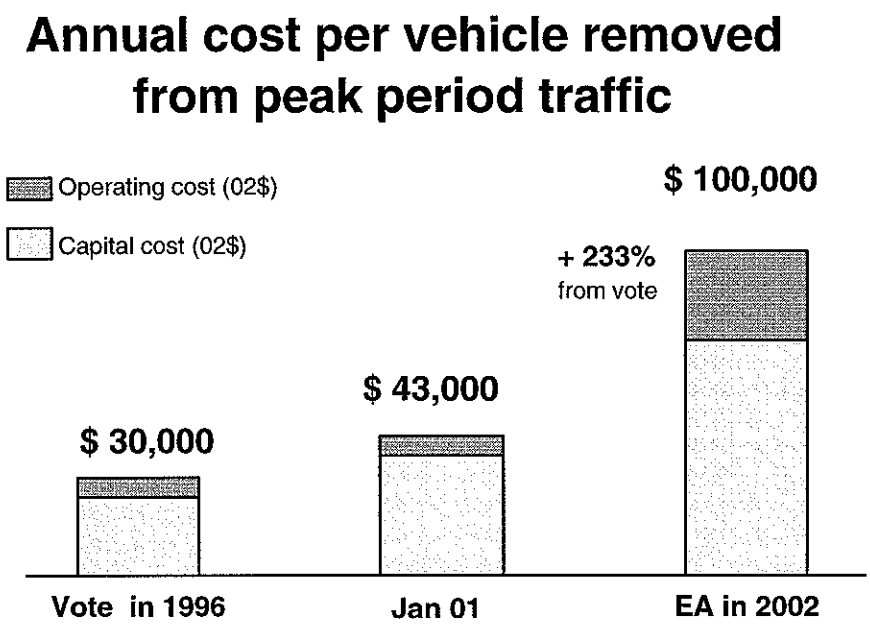
3.2 Light rail is not a cost-effective way to get cars off the road.

Sound Transit continually states that Link is cost-effective, as for example in a press release/handout entitled "Light Rail Benefits" wherein one of the six benefits listed is "Cost Effective Transportation" (Ref 64) This seems quite deceptive in light of the following.

Capital and operating costs for Central Link total $291 million/yr in 02$. (See Tech Notes for details) Central Link would remove about 6320 cars from peak period traffic in 2020. (See Tech Notes for details). If the main objective of Link is to remove cars from peak period traffic then it's fair to assign Link's full cost to that benefit. Doing so means it would cost $46,000 per year for each car Central Link removes from peak period traffic. This per year cost would continue for the 30-odd years it would take to pay off the construction bonds.

Capital and operating costs for Link IS total $191 million per year in 02$. The Initial Segment would remove 1890 cars from peak period traffic. This means it would cost $101, 000 per year for each car Link IS removes from peak period traffic.

Figure 3.2 shows these costs graphically; however, values in the figure came from an earlier study by the author and differ slightly from those given above. The "vote" bar is for Central Link and is based on the cost estimates Sound Transit published at the time the vote was taken in 1996. The "Jan 01" bar is based on the latest cost estimate for Central Link, which was made in Jan 2001 and which was $2.6 billion in 02$. The "EA" bar refers to Link IS. The chart shows that the cost of one of Link's main benefits (i.e.: taking cars off the road) increased 233% over what voters approved, yet the Sound Transit Board has never agreed to go back and ask voters if they still wanted to proceed.



The idea of paying $46,000, or even $100,000 per year for each car Link removes from traffic is clearly a ridiculously expensive way to reduce traffic congestion. It is ridiculous because the Seattle Times reported on a local company that increased carpooling by offering their employees just $75 a month to carpool. It is ridiculous because one can imagine how many people would car or van pool if offered , to pick a number, just $500 a month or $6000 a year. It is ridiculous because it would simply be cheaper to pay people to quit their jobs and stay home.

In spite of Link being one of the most expensive light rail systems in the country and costing tens of thousands of dollars a year for each car it removes from traffic we still have curious statements like the following from Sound Transit Board member and Wash. State Secretary of Transportation Doug MacDonald in a memo to Norman Mineta, Secretary of U.S. Dept. of Transportation:

> "Every transportation investments in our region must be tested for its cost-effective long range contribution to moving people and goods in the region. Link Light Rail meets that standard." (Ref 58)

3.3 Light rail is not cost-effective as an alternative to driving.

Some officials, like Ron Sims former chair of the Sound Transit Board, trumpet that light rail provides an alternative to driving. Indeed it does for the relative few that, according to Sound Transit's ridership forecasts, would give up driving to ride light rail.

Each car taken off the road takes about 1.25 people off the road. Thus the 6320 cars that Central Link would take off the road by 2020 would be providing about 7900 peak period commuters an alternative to driving. This is only two-tenths of one percent of the 4,100,000 people forecast to live in the Puget Sound region by 2020. (Ref 2: p1.3).

If the main objective of Link is to give people an alternative to being stuck in traffic like everyone else then it's fair to assign Link's full cost to that benefit. This means it would cost taxpayers $37,000 per year for each commuter who gives up using an automobile to ride Central Link.

It is questionable whether the 4,100,000 persons living in Puget Sound would like to build a $2.6 billion rail system just so 7900 would have a way to bypass congestion. If so, to paraphrase Winston Churchill: never before will so many, have paid so much, to benefit so few.

These figures look even worse for Link IS since it has only one third the predicted ridership of Central Link. The per-person cost for the 2365 auto users that would switch to Link IS comes to $81,000 per year.

In this, as in many other areas, Sound Transit seeks to deceive the taxpayers. On the one hand they say a main objective of light rail is to provide people with an alternative to driving. On the other hand they do not say how many people will take advantage of this benefit or what this benefit will cost everyone else.

3.4 Link is far more expensive than a bus rapid transit (BRT) system having comparable benefits

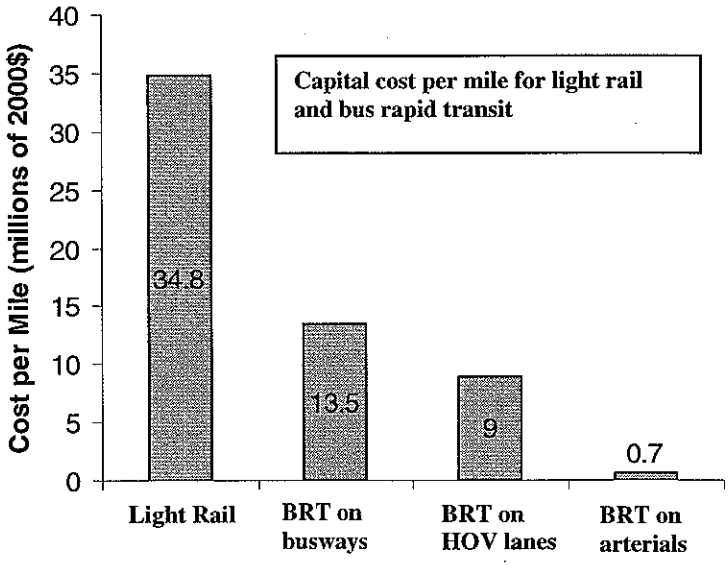
This conclusion is mainly based on the detail provided in Parts 5 and 6 of this report. Part 5 establishes in considerable detail that an all-bus alternative based on bus rapid transit (BRT) could attract and carry the same number of transit riders as light rail. This is true whether the light rail system be a short one such as the 14-mile Initial Segment of Link, or a fully mature version of Link extending over 100 or more route miles.

Part 6 establishes that a fully mature version of Link would probably cost Puget Sound taxpayers about $900 million per year more than an all-bus system capable of attracting and carrying the same number of riders, and thus having comparable benefits.

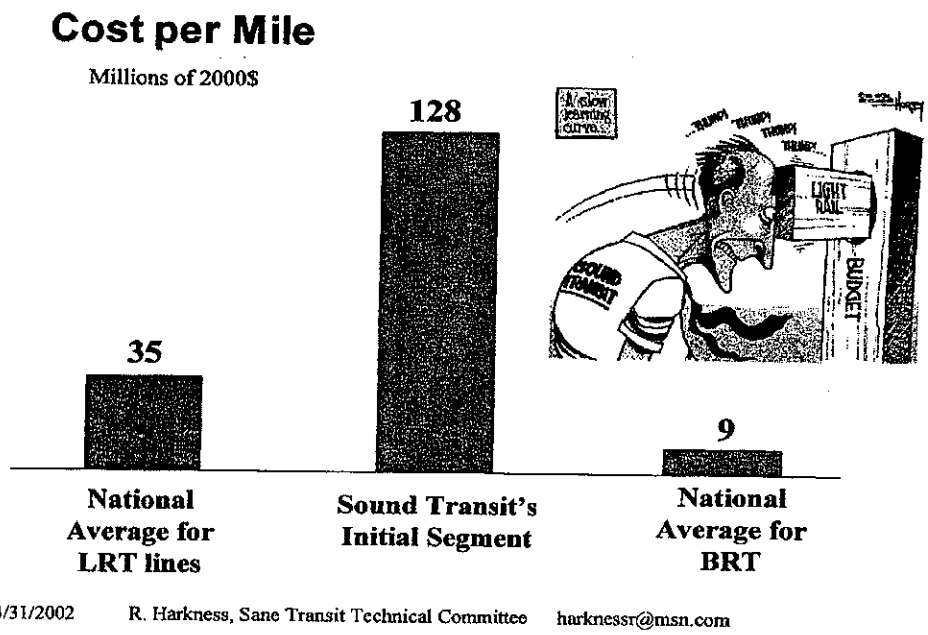
What follows is some information from a completely different source that confirms this reports conclusion that BRT is less expensive than light rail.

Studies, such as one by the US General Accounting Office, have concluded that BRT is usually less expensive than light rail and should be taken more seriously as an alternative to light rail.(Ref 9) Figure 6 from the GAO report is reproduced below as Figure 3.4. To build this chart GAO surveyed 18 light rail lines built since 1980, 9 busways, and 8 HOV facilities. It shows the average light rail system costs about $35 million per mile.

Figure 3.4a



The following presentation slide compared the cost of Link's Initial Segment with the national average for light rail systems and BRT using data from the GAO report. It included a cartoon by Seattle area's outstanding cartoonist Dave Horsey, which along with other articles of that period, called public attention to Link's high cost.



3/31/2002 R. Harkness, Sane Transit Technical Committee harknessr@msn.com

This slide simply illustrates that Link IS, at $ 128 million per mile, is far more expensive than the national average for light rail; perhaps because Puget Sound's terrain is not "light rail friendly". We have water barriers and hills that require extensive tunneling. Additionally, we do not have the abandoned railroad rights-of-way that make constructing light rail in other cities relatively economic.

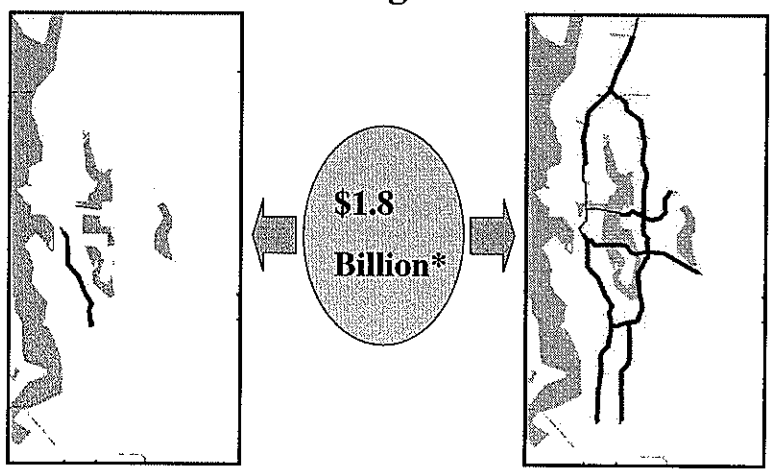
What the Puget Sound region does have, however, is an extensive HOV network. There were 191 lane miles of HOV open to traffic as of Jan. 2001, and another 100 miles are in various stages of construction or planning. (Ref 46: p.2)

These completed HOV lanes are the region's most precious transportation resource. They provide an already paid for "guideway" for bus rapid transit, as well as a guideway for car and van pools, school buses, emergency vehicles, and other multi-occupant vehicles. They can be managed so traffic flows at a relatively high speed, and they have enormous people moving capacity. Unlike the "guideways" for Link light rail that will take years to build, these HOV "guideways" already exist, and BRT service on them could be implemented fairly quickly. In fact, some BRT service already exists in the form of express bus routes.

Figure 3.4b helps visualize the tradeoff this region is making by going with light rail. The figure shows that we could have about 199 miles of BRT on the regions HOV lanes for about what the 14-mile Initial Segment of Link is costing.

Figure 3.4b

Benefit of Switching from LRT to BRT



14 miles of Light Rail

199 miles of BRT on HOV lanes**

* Cost of Initial Segment in 2000$

** based on $9 Million/mile in GAO report

Of course, the $9 million per mile figure cited by the GAO might not apply here, so this is a very rough approximation. (The data in Part 6 is considered more accurate) It does however suggest the wisdom of conducting a proper alternatives analysis to see just how extensive a BRT system could be built for what Link IS is costing. Certainly 199 miles of freeway BRT would attract far more transit riders and do much more to reduce congestion, clean the air, control sprawl, etc. than would 14 miles of light rail.

3.5 Link will require more transfers

Express bus or BRT routes will typically circulate through residential areas picking up riders, then enter an HOV lane for a non-stop trip downtown. In many cases riders do not need to transfer. If Link is built many of the express bus routes will be redirected to feed riders onto light rail. This will increase the number of riders who need to transfer.

3.6 Many of the regions employment centers and key destinations would not be served by Link.

The Puget Sound Region has over 15,000 miles of local roads and streets and 185 miles of freeways.(Ref 43: p.A4:3) In contrast the Link network would be somewhere between 14 and 125 miles in length. With such a sparse network Link will not be able to provide convenient service to many of the regions employment and activity centers.

For instance, 14-mile Link IS, which runs from Westlake Station to South 154th Street, only serves one of the region's major employment centers: downtown Seattle. 21-mile Central Link would serve only downtown Seattle, the University District, and SeaTac.

However, Central Link will not serve a host of other important places including: West Seattle, Bellevue and the entire eastside, Renton, Southcenter, Magnolia, Ballard, Bothell, the south Seattle industrial area along the Duwamish, Harbor Island, the emerging south Lake Union biotech center, the north Elliott Bay biotech center, and so forth. None of Boeing's plants or offices will be served: not Auburn, not Kent, not Renton, not Plant 2, not the Longacres complex, not Bellevue, not even Boeing Everett.

Even if Link is someday extended into the mature network Sound Transit envisions, it will still bypass many of these locations.

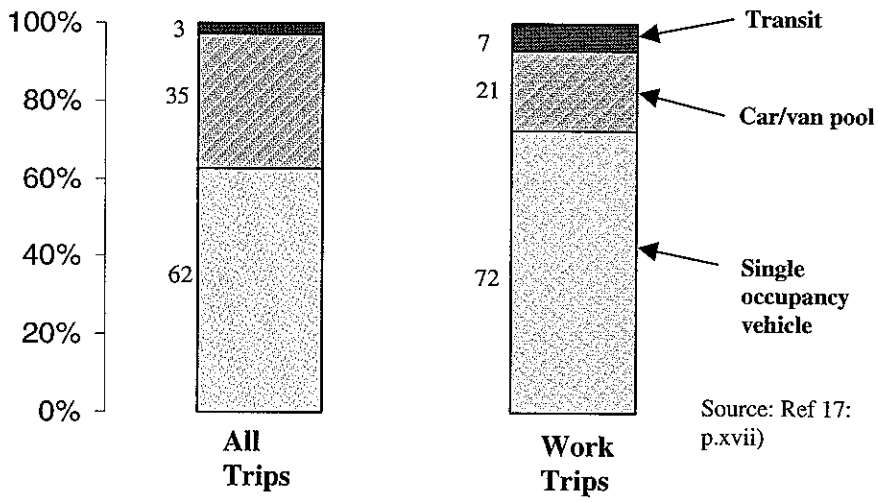
NOTE: References 8, 43 and 49 have maps showing where Sound Transit plans to extend "high capacity transit", which officially could mean either light rail or BRT. In practice, there is little doubt that Sound Transit officials have already decided informally that HCT really means light rail. One piece of evidence is that Sound Transit has been maneuvering to have the center lanes on I-90 designated for exclusive use by HCT, even before doing an alternatives analysis. However, if the agency were objective it would not ask for exclusive use until that alternatives analysis is complete, because if the answer were BRT, exclusive use would not be needed, indeed it would be counterproductive.

Another piece of evidence is that the baseline Technical Report for PSRC's 2001 Update to the Metropolitan Transportation Plan makes the assumption that the HCT network will be almost entirely light rail. (Ref 30: p. 75) Finally, there is the Fleet Management Plan for Central Link which says: "While design work is progressing for the initial system from NE 45th Street to S 200th Street, plans for rail system extensions are underway. ...Additional extensions include an Eastside extension to Bellevue and surrounding communities." (Ref 38: p.10)

3.7 Investments in Link do nothing to encourage car and van pooling.

Car pooling and van pooling are actually more effective than mass transit as a way of reducing the number of peak period cars on the road. Figure 3.7 shows modal share in the 3-county area in 1990 and 2000.

Figure 3.7 **Mode Share for Trips in Puget Sound Region in 1998**



Source: Ref 17: p.xvii)

Building light rail does nothing to encourage car and vanpooling. On the other hand, implementing an all bus alternative would include not only finishing the HOV lanes, but spending a considerable sum to build HOV to HOV connector ramps at major freeway interchanges, and to build flyovers so HOV vehicles could enter and exit the HOV lanes without cutting across several general purpose lanes. All this concrete will not only benefit BRT, but would also make car and van pooling more attractive.

In other works the investment in HOV lanes, which are the "guideways" for BRT, has a double payoff. This incidentally, is just one more thing that that the 1993 FEIS ignored and that a new and proper alternatives analysis should address.

3.8 Placing Link on I-90 would reduce bridge capacity, compromise safety, and impair car/van pooling.

Right-of-way is perhaps the scarcest resource in Puget Sound, and there is a need to get the highest utilization out of it.

This topic of I-90 capacity will be treated in more detail in Part 5.16. However, the short version is that the I-90 bridge will have more capacity if the center lanes are used for a mixed stream of BRT buses, carpools, van pools, school buses, etc. than if they are turned over to light rail. This is true because mass transit, whether BRT or rail, will have a relatively light loading on I-90. Neither can really keep the center lanes fully occupied. Even in peak periods there will be either the occasional train, or the occasional BRT bus. Best to use a technology where car and van pools can fit in between transit vehicles.

Sound Transit is currently pushing for a reconfiguration of the lanes on I-90 from Bellevue into Seattle that would not only preempt the reversible center roadway for mass transit but also add a pair HOV lanes into the space now occupied by 6 general purpose lanes. To do this the 6 GP lanes would be narrowed and re-striped into 6 GP and two HOV lanes. Lane width would drop below interstate standards and shoulders would be narrowed. This in turn would have two deleterious effects. First, the narrower lanes would compromise safety for all bridge users. Second, the narrower HOV lanes and inability to provide a buffer strip between the GP and HOV lanes would slow car and van pools and thus make them less attractive. (See Reference 33 pages 6-16 and C-1 for leads into the technical literature relative to HOV lane design and related safety issues.)

3.9 If not extended, Link could result in underutilization of the DSTT

This is a risk with light rail, not a certainty. The issue is getting maximum people moving benefit from King County's investment in the DSTT. If light rail does not go across Lake Washington the DSTT will be able to deliver a maximum of about 21,000 persons into downtown during AM peak hour (or out in the PM). This would be comprised of 16,400 from the north and 5500 from the south. In contrast buses in the tunnel could move about 32,000 persons per hour into the downtown, half from the north and half from the south and east. This topic, of potential interest to property owners in downtown Seattle, is treated in more detail in Part 5.17.

3.10 If not fully extended, Link will compromise the regional BRT system.

The Downtown Seattle Transit Tunnel is critical for either a regional light rail system or a regional BRT system. But the tunnel can't easily serve both.

If Link's Initial Segment is all the light rail that ever gets constructed, Link will simply become a local intra-Seattle people mover. By default the regional HCT solution will become an extension of the existing regional express bus system, in other words BRT. However, if Link IS operates in the DSTT, the regional bus system will be compromised.

Either BRT buses will be forced onto surface streets, or not as many will be able to use the DSTT as may be required.

This is a good reason for keeping light rail out of the DSTT until it is absolutely certain that taxpayers are behind extending Link into a full regional system. The cost of extending Link into a full regional system is given in Part 6 of this report. It is so large that voters may not approve the necessary tax increases.

3.11 Light rail would be less effective at controlling sprawl than an all-bus system

Assertions in the 1993 FEIS that rapid rail supports the goal of reducing sprawl seem questionable. One assertion prominent in the FEIS's executive summary was:

> "The Rail/TSM Alternative would also fully support regional land-use plans limiting urban sprawl and concentrating new growth in existing centers." (Ref 1: p.xxxv)

The RTA provided no rationale, cited no sources, to justify the notion that rail transit helps limit sprawl. What follows is a very brief analysis.

First, there is the question of just why rail is said by some to be a means of controlling sprawl. History shows that rail can actually cause sprawl. Anyone familiar with the bedroom communities that have grown up along the rail lines radiating from Manhattan or Chicago knows that building these lines enabled or encouraged people to move to rural areas and create the suburbs. The same is true with BART's extensions over into the east bay. By the same token building light rail to Redmond or Issaquah would encourage sprawl by making it convenient for people to move to the Sammamish plateau or Northbend, then drive to the end of the light rail line for a commute into Seattle. Logic says that anything that makes road or transit travel easier will probably lead to the spread of housing and economic activity. The 1993 FEIS admitted this:

> "Stations with park and ride lots located near the urban growth boundaries many encourage some urban sprawl." (Ref 1: p. 3-130)

The only scheme whereby an improvement in transportation would seem able to limit sprawl is if road and transit travel within the urban growth boundaries were made easy, while travel outside the urban growth boundaries were made difficult. Presumably this would be an incentive to live within the urban growth boundary. Of course, under current law there would be nothing to stop people living outside the boundary to drive over the boundary line and enjoy the same travel benefits as those living within. And the idea of not improving roads outside the growth boundary, or preventing those outside from driving across the boundary line is politically impractical. In other words, this whole scheme seems unworkable. What then is the mechanism by which mass transit might control sprawl?

Rail fans claim that high-density development will occur around rail stations. Research questions the accuracy of that, finding that high densities are more the result of tax incentives than the existence of rail transit. However, assuming it were true, why would

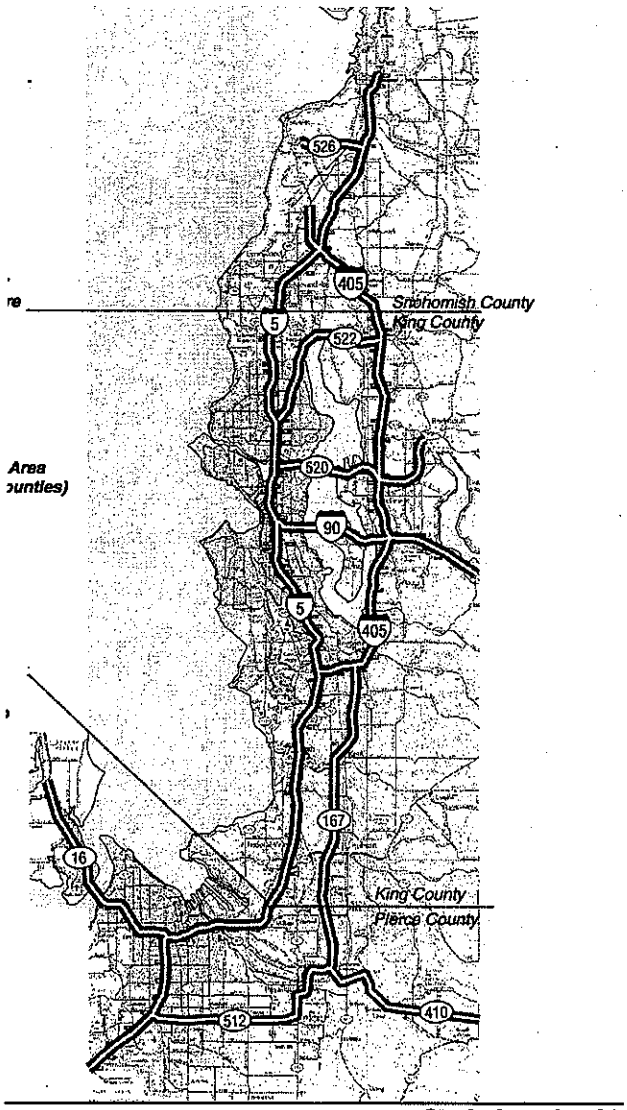
more development occur around a rail station than would occur around a BRT stop? An even bigger question is why would high-density development around a mass transit stop or station be of any significance in controlling sprawl? Presumably the issue with sprawl is the expansion of housing and other development outside the urban growth boundary and into rural areas. If so, then whether the new development occurs as high-rises adjacent to mass transit stations, or as moderate density development spread throughout the urbanized area, makes no difference.

In conclusion, it appears that any improvement in transportation, including building light rail, will allow if not encourage sprawl. The possibility that high capacity transit might encourage development to occur in high rise clusters strung like beads along a rail or BRT route, as opposed to letting that development spread out within the designated urban growth boundary, seems somewhat irrelevant.

There is one additional point to make along this line. If society wants development to cluster in high rises along transit lines, what difference does it make if the transit is steel wheeled light rail or rubber tired BRT? A mature light rail network would probably have about the number of route miles, and follow the same corridors, as a mature BRT network.

This is illustrated by comparing a map of Sound Transit's vision for a fully mature light rail network with a map of the region's HOV network. (The left-hand map below shows the region's freeways. HOV lanes are either in place or planned for most freeways. The right hand map shows the rapid rail network studied in the 1993 FEIS. A fully mature light rail network would be similar. Ref 49: p. 10-11 maps it, but the map was too large to scan into this report.)

Figure 3.11



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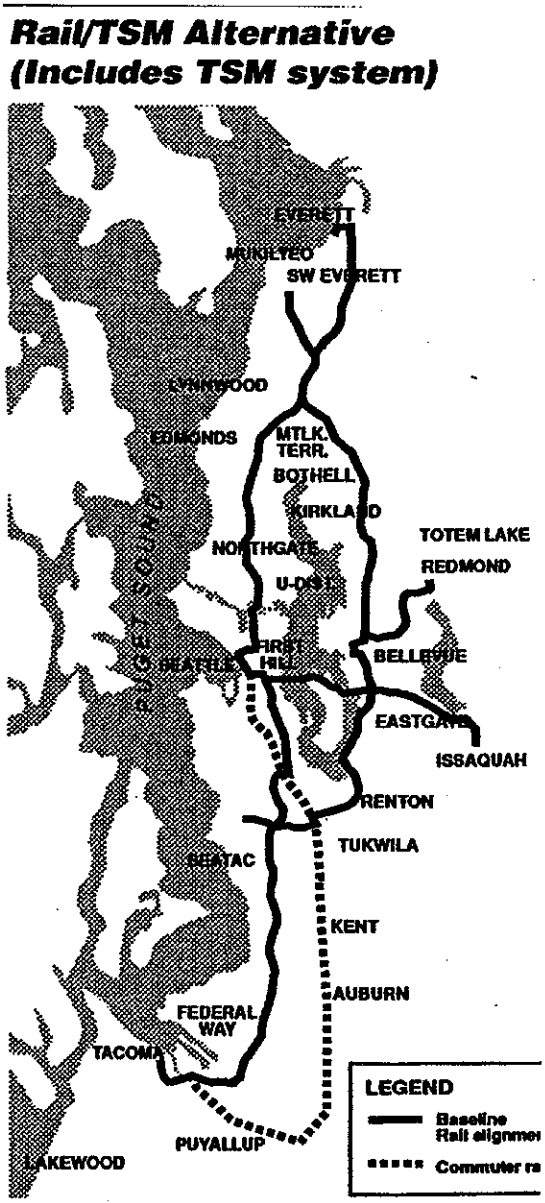

The second line of reasoning has to do with timing. Voters approved light rail in 1996. It is now 13 years later and not an inch of rail has been laid. It will be 2009 before even the first 14 miles of light rail becomes operational. There are serious funding problems to overcome before Link could even be extended to Northgate. (Mr. MacIsaac has written about the financial impediments to expanding Link.) Yet more years will pass before

Link could be extended into the full regional network Sound Transit envisions. Even if a mature version of Link were able to control sprawl, much more sprawl will have occurred before Link could become that mature network and begin to reduce it.

Here BRT has an advantage. The guideways for BRT are partly in place. BRT-like service already exists and could be intensified into a fully functional BRT system fairly quickly.

This leads to the following conclusions:

1) There is no apparent reason why either light rail or BRT would help limit sprawl outside Puget Sound's designated urban growth boundaries.

2) There is no apparent reason why a light rail network would control the pattern of density within the urban growth boundary (e.g.: make beads of high density development along transit lines) any better than a BRT network having about the same number of route miles and serving the same corridors.

3) The higher cost for light rail means that the region is more likely to build a large BRT network than to build a large light rail network, and more likely to build X-miles of BRT years sooner than X-miles of light rail. Therefore in the foreseeable future pursuing BRT would probably have more effect in concentrating development along transit lines than would pursuing light rail, again assuming it has any effect at all.

3.12 Link is inequitable in whom it taxes versus whom it benefits

Sound Transit taxes everyone within the "RTA District", which comprises most of the urbanized areas within Snohomish, King, and Pierce Counties, stretching from Ft. Lewis to Everett. (Ref 49: p.6 has map) Yet Link's benefits are largely confined to the narrow corridor along which Link runs. Thus many of the people who are taxed for Link will not benefit, either directly or indirectly. They will not benefit directly since Link routes will not come near their communities, West Seattle and Capital Hill being good examples. They will not benefit indirectly since Link will have almost no effect on traffic congestion.

3.13 Link is inequitable in where it provides for safe operation and where it does not.

When the Sound Transit Board decided to provide tunnels for Link's north line but not provide tunnels in the Rainier Valley they established an inequity in terms of safety. The history of light rail has been characterized by collisions between trains and pedestrians, and between trains and cars. Sound Transit has plans to mitigate such accidents, but they will still occur, and that harm will occur to Rainier valley residents, not residents of north Seattle. Transportation consultant John Niles has investigated and written about this matter, but Sound Transit shrugs it off.

3.14 Link is susceptible to terrorism, power outages and earthquakes.

Link is susceptible to single point failures, bus systems are not. Link will have a complex control system, rails and tunnels all of which could be disabled relatively easily by terrorists. A couple pounds of explosives or a few cut wires would bring the entire system to a standstill. An area wide power outage would take the system down. An earthquake could damage rail and BRT structures, but rail would be more susceptible because damage to underground tunnels would take a long time to repair and the trains have no way to drive around problem areas. Any train that stalls on the track, for whatever reason, blocks the entire line.

In contrast, bus systems are comprised of independent little units called buses. They don't rely on a centralized control system. They contain their own power source. They can drive around obstacles.

3.15 Link is a whole new technology to manage and maintain.

It will take a whole new and different maintenance infrastructure, and a different set of skills, to support light rail. This will be expensive. In contrast, BRT would simply mean an incremental expansion of the bus maintenance infrastructure already in place. ST's consultants said the following about automated guideway technologies but it applies equally well to light rail.

> "Potential expansion of ST's various lines of business will require expansion of supporting facilities. ...any new technology such as automated guideway that is beyond what is currently in place within ST's service area will require more substantial supporting efforts. These supporting efforts will include major new facilities such as maintenance bases, layover track, control center, etc. In addition the interfaces between any new technologies and ST's existing system will require expensive infrastructure to allow passenger transfer between the modes. ...Introduction of automated guideway technology would require a new layer of administrative support...." (Ref 7: p.3)

3.16 Light rail is not compatible with Puget Sound's topography and local circumstances

Steel wheel on steel rail limits light rail to a maximum of 5% grades. The author has seen the route profiles for Link. The 5% grade limitation forces Link to be far below the surface on Capitol Hill so it can climb up from the DSTT then dive deep enough to go below the unconsolidated glacial till at the bottom of the ship canal. It then struggles to climb the hill in the University District, but can't handle the grade so again requires deep underground stations in the U District. In other words light rail is fighting our relatively unique terrain.

The turn radius of rail system is larger than bus and thus rail systems cannot be routed around buildings and other obstacles as easily as bus routes.

Puget Sound also lacks the abandoned railroad rights of way that light rail has benefited from elsewhere.

These factors are probably responsible for light rail costing more here than in other cities. For instance, according to Joni Earl, ST's Executive Director: Portland's light rail cost $54 million per mile, Denver's $20 million per mile, Sacramento's $35 million per mile, Dallas' $41 million per mile, and San Diego's $61 million per mile. (Ref 39) In contrast Central Link would cost $150 million per mile.(Ref 39). (Reference 9 also contains cost comparisons.)

In short, just because light rail was an easy fit in some cities does not make it the right technology for Puget Sound's unique conditions.

3.17 Dedicating the center lanes on the I-90 bridge would compromise traffic flow and apparently disadvantage pedestrian and bike users.

Sound Transit is actively maneuvering to have the lane configuration on the I-90 bridge drastically altered so as to free up the center roadway for light rail. ST has published diagrams of the various options. (Ref 59) According to those diagrams the westbound roadway is currently 52 feet wide and has three 12-foot wide traffic lanes. However Sound Transit wants the R8a option, which calls for the roadway to be 58 feet wide, and for it to be divided into 4 lanes. The extra 6 feet would apparently come from making the pedestrian and bike path narrower.

The width of the lanes would not be consistent; some would be 12 feet while others would drop to a sub-standard 11 feet. That should cause some confusion, especially as trucks shift from one to the other. Shoulders would also be narrowed.

The ST handout also warns (in very small type font) about traffic problems that may result from these narrower lanes and shoulders:

> "A number of operational strategies to address safety concerns associated with reduced-width travel lanes and shoulders will be evaluated. These include speed management through variable posted speeds and/or reduced speed limits, shoulder rumble strips,...." (Ref 59)

What ST is admitting is that automobile traffic will be adversely impacted, both by forcing speed reductions and by introducing the kinds of safety issues that call for rumble strips.

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Part 4: Bus rapid transit (BRT) and other alternatives

4.1 Some background

4.1.1 A brief definition and rationale for BRT

Scott Rutherford, Professor of Civil Engineering at University of Washington, along with others, has offered the following:

> "Bus Rapid Transit (BRT) is growing in popularity throughout the world The reasons for this phenomenon include its passenger and developer attractiveness, its high performance and quality, and its ability to be built quickly, incrementally, and economically. BRT also provides sufficient transport capacity to meet demand in many corridors, even in the largest metropolitan regions. In the United States the development of BRT projects has been spurred by the Federal Transit Administrations BRT initiative. These projects have been undertaken, in part, because of the imbalance between the demand for "New Starts" funds and available resources.
>
> Decisions to make BRT investments should be the result of a planning process that stresses problem solving, addressing needs, and the objective examination of a full range of potential solutions, of which BRT is only one.
>
> ...The FTA defines BRT as a "rapid mode of transportation that can combine the quality of rail transit and the flexibility of buses"
>
> A more detailed definition, ..., is:
>
> BRT is a flexible rubber tired rapid transit mode that combines stations, vehicles, services, running way, and ITS elements into an integrated system with a strong positive image and identity. ... In many respects, BRT is rubber tired light rail transit (LRT), but with greater operating flexibility and potentially lower capital and operating costs." (Levinson, Zimmerman, Clinger, Rutherford, "Bus Rapid Transit: An Overview", Journal of Public Transportation, Vol 5, No.2 2002)

4.1.2 Seattle is not alone in ignoring the bus alternative.

Consider the following:

> "Strong views exist on the merits of light rail as a preferred alternative to dedicated bus-based transitway systems. Why did many of these cities supporting and building light rail not consider having a very flexible bus system on the dedicated alignment, which has the capability of offering much better door to door service than a very inflexible fixed rail system? The answers are relatively simple -- the adage that 'trains are sexy and buses are boring' (quoted from the Mayor of Los Angeles) says it all. We have previously described this as 'choice versus blind commitment' (Hensher and Waters 1994).
>
> When the evidence suggest that one can move three times as many people by dedicated bus-based transitway systems for the same cost, or the same number of people for one-third the cost as light rail, one wonders about the rationality of urban planning. For example, Wentworth (1997) concludes, from a review of the proposal to extend the light rail system in Sydney between Central Railway and the Circular Quay that a redesigned bus system would provide a better immediate result at a greatly reduced cost. He asks:

...perhaps the investors themselves may have been taken for a ride by professional promoters... Or is it just an innocent mistake? The only thing clear is that there is something fishy about the whole affair." (Ref 23; p.5)

4.1.3 BRT is proven technology.

The reader is referred to Addendum I for an excellent overview of bus rapid transit or BRT, and how it would fit in the Seattle context. The US General Accounting Office (GAO) has published a report, which describes BRT and compares it with light rail. (Ref 9) The Transportation Research Board has a short brochure entitled: BRT: Why more communities are choosing Bus Rapid Transit. (Ref 11). The Journal of Public Transportation devoted an entire issue to BRT. (Ref 14) A BRT versus light rail case study was conducted in Los Angles and reported in the Transportation Research Record. (Ref 12)

Here in Puget Sound King County Metro developed a "Six year Transit Development Plan" for BRT. (Ref 48) Unfortunately there must have been political pressure on Metro to avoid studying any BRT routes that would have competed with Sound Transit's light rail. Thus Metro's report says: "Would the BRT service compete for riders with current or planned future Sound Transit Express bus, commuter rail or light rail...? Corridors that do or would compete were eliminated." (Ref 48: p.4)

As a result Metro only studied a number of innocuous locations for BRT, mostly on arterials. Still the report is useful because it shows there is local familiarity with BRT, and because it describes what can be done to make arterials BRT friendly. This is important because BRT not only provides a high level of service along the high volume parts of the route where light rail might be used, but it also provides a higher level of service than traditional local buses after it branches onto arterials and into neighborhoods. Put another way, a mature light rail network might have 100 route miles, whereas a mature BRT network might have twice or three times that.

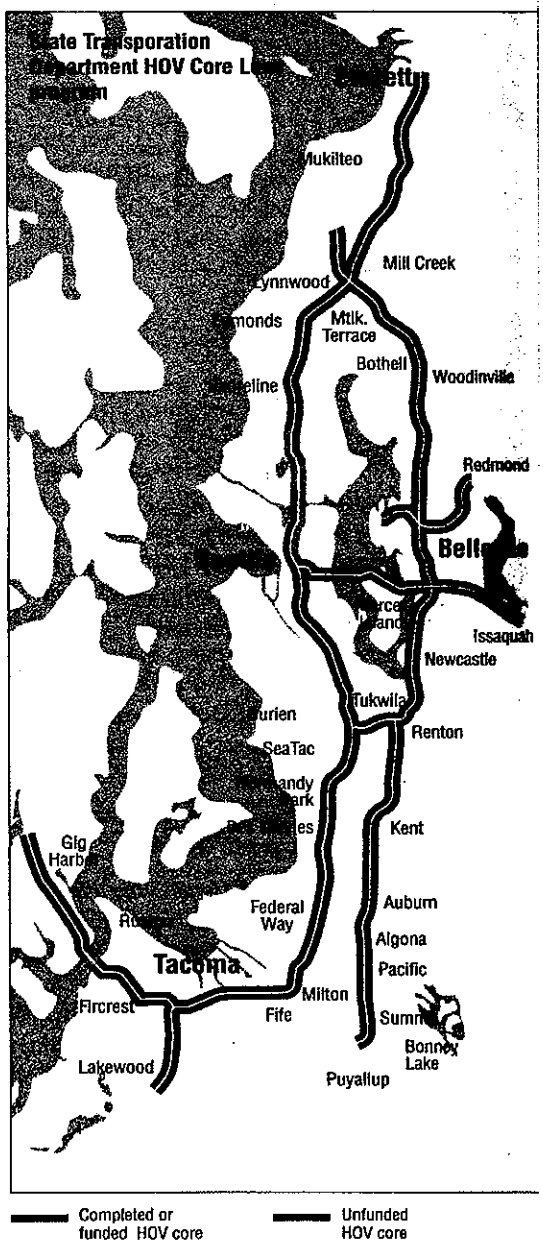
4.1.4 The key advantage of BRT is that much of the "guideway" already exists and is already paid for.

As of January 2001 Puget Sound had 191 HOV lane miles open to traffic. The total "core HOV" system will have 297 lane miles when complete.

The central Puget Sound region has one of the most extensive HOV systems in the world." (Ref 47: p.6)

If the region implements light rail almost every inch of "guideway" (tunnels, elevated structures, rails and surface right-of-way) must be constructed from scratch, or taken from its current users (e.g.: the DSTT, the center lanes on I-90) Even in the DSTT the existing rails must be replaced because they were designed incorrectly.

BRT can use existing and already planned HOV lanes. Below is a map of those lanes.


Mukilteo
Mill Creek
Lynnwood
Mtlk.
Terrace
Bothell
Woodinville
Redmond
Issaquah
Newcastle
Tukwila
Renton
SeaTac
Kent
Auburn
Algona
Pacific
Federal
Way
Tacoma
Milton
Fife
Lakewood
Puyallup
Completed or
funded HOV core
Unfunded
HOV core

4.2 The BRT alternative

Plan B or the BRT alternative to Link light rail would build on the existing express bus system. It might employ a large number on the new hybrid buses. It would operate on existing HOV lanes and be similar in many respects to the TSM alternative studied in the 1993 FEIS.

Plan B would probably start out with a fairly extensive BRT route structure, first because the express bus network is already fairly extensive, and second because for what even the Initial Segment of light rail is costing, a rather large BRT system could be built right away.

BRT would continue to use the DSTT as express buses do today. Chapter 5 describes a number of alternatives for increasing bus capacity through downtown Seattle if that becomes necessary. The most extreme of those is to construct a second bus tunnel parallel to the first. This would probably not be needed for years.

South Lake Union busway?-- The south Lake Union area is poised for major redevelopment as a important employment/residential center, but Link light rail ignores it completely. But it could be well served by BRT, and vice versa. One intriguing possibility would be to construct an elevated bus way for BRT from the Mercer Street express lane exit, across the south Lake Union area, and tying into SR 99. BRT buses could then proceed south using the Alaska Way viaduct or its replacement.

Such a busway, including a south Lake Union station, could probably be physically integrated into the new buildings. As such it would not be a visual blight, and would definitely make the area more accessible.

In addition, some of the BRT buses crossing the busway might continue west to serve two other important destinations, which Link ignores; namely, Seattle Center and Belltown.

Clearly if the region decided to scrap Sound Transit's light rail strategy, there would be plenty of money for such a busway. In addition, Link money, being transit money, could probably be used to fund HOV lanes in the tunnel proposed to replace the Alaska Way viaduct. That infusion of money might help accelerate the project.

Network Size and shape-- The high speed portion of a fully mature BRT network would probably use most of the region's HOV lanes and thus have the general shape shown in Figure 4.1.4. However, there could be other major extensions such as the abovementioned south Lake Union busway, BRT on SR 99 in south Seattle, and BRT over into West Seattle. In addition, the BRT system would extend out along various arterials. The idea would be to pick up riders in the neighborhoods, then use the HOV lanes to make fast trips to various employment centers.

Because BRT has a different cost structure than light rail the BRT network might start out being very extensive, whereas light rail would start out with just the 14-mile Initial Segment and grow slowly thereafter. What might change over time with BRT, as more money is spent, is not network size but rather network quality and service frequency. In, other words over time the quality (or speed) of the BRT network would be increased by adding more HOV to HOV interconnections, and more flyovers that give HOV's direct access to HOV lanes. Network quality could be increased on arterials with a variety of relatively mundane signal and lane improvements that would increase bus speeds. The frequency of service is just a matter of buying more buses and operating them more frequently.

What this means in terms of the alternatives analysis called for in this report is as follows. Per Part 8 of this report, it is proposed to create a number of light rail alternatives that differ either in cost or in the degree to which they reduce delay, then design a BRT alterative with comparable cost or benefit to each of the rail alternatives. If the pairs of alternatives were designed to be equal in cost we would be looking for how they differed in benefit. If they were designed to have equal benefit we would want to know how their costs differed.

The rail alternatives are likely to differ in the length of the light rail line, so there would be one alternative having 14-miles of light rail, one with 21-miles, and so forth up a fully mature scenario having 100+ miles of light rail. However, we would not be creating a BRT alternative with 14-miles of BRT to compare against 14-miles of light rail. Instead, all the BRT alternatives would probably have a very extensive (100+ route miles) BRT network since the "guideways" already exist. The difference between a low cost or low benefit BRT alternative and a high cost or high benefit BRT alternative would be in network quality and service quality. For example, a BRT alternative designed to cost the same as Link IS ($1.5 billion 02$) might have 150 route miles of BRT but no additional HOV to HOV connectors and relatively infrequent bus service. In contrast, a BRT alternative designed to cost the same as a 60-mile version of Link (roughly $6 billion) might have the same 150 route miles, but include HOV to HOV connectors everywhere, lots of flyover direct access ramps, and very frequent service.

In other words these alternatives analyses would not be comparing a 14-mile light rail alternative against a 14-mile BRT alternative. Instead they might compare a $1.5 billion dollar light rail alternative against a $1.5 billion BRT alternative. The $1.5 BRT alternative might have 100 route miles of BRT, but perhaps fewer HOV to HOV connectors and perhaps a lower number of buses and thus less frequent service than might be possible.

4.3 The "buses will be stuck in traffic" issue

Critics of bus solutions claim BRT will be stuck in traffic and therefore not able to compete with light rail able to move freely on its own dedicated guideway. Is that criticism valid?

The first thing to note is that transit networks come in two parts, the line haul sub-network, and the feeder sub-network. The line haul sub-network for light rail is of course the light rail system itself, but light rail must be fed by bus routes that operate on arterial streets. The line haul sub-network for BRT is where buses operate on freeway HOV lanes. The feeder sub-network for BRT is when the buses depart HOV lanes to operate on arterials. Actions that can be taken to speed BRT on arterials could be taken to speed buses feeding light rail. Clearly there is no intrinsic difference between bus and rail feeder networks, both are equally susceptible to being stuck in traffic.

As to the line haul sub-network, it is true that HOV lanes need to be kept moving at a good speed to make BRT competitive with light rail. That can be done by policy. It may mean changing the minimum carpool occupancy from 2 to 3 persons sometime in the future. If such a change is needed it would not just be needed for BRT, but also to keep car and van pooling attractive.

Current DOT policy is to manage HOV lanes to maintain an average speed no less that 45 mph during the peak commuting hours. Many of the BRT buses would be express buses that would make few if any stops once entering the HOV lanes. Thus their average speed would be about the same speed as the HOV lane is moving.

On the other hand light rail must stop at all stations. Thus while Link has a maximum speed of over 50 MPH, it will only average 26 MPH. (48 minutes from NE 45th to South 200th per Ref 38: p.16)

In short, the feeder buses for light rail, and the feeder buses for BRT are equally susceptible to being stuck in traffic. The line haul portion of the BRT network will not be stuck in traffic because the HOV lanes can be managed to flow at a reasonable speed.

But all this is not something people should be arguing about. It is an argument about engineering details at the 5000-foot level akin to arguing whether steel wheels are better than rubber tires. The correct thing to do is go up to 40,000 feet and look at what the models predict in terms of ridership and effect on travel delay. The models take into consideration the speed with which HOV lanes operate, bus speeds on arterials, the delay while loading and unloading at stops or stations, maximum vehicle speeds, acceleration rates, any inherent preference people may have for rail, and a whole raft of other factors. These models are calibrated with data from actual systems in other cities. When the model says X people will ride light rail, or Y people will ride BRT, things like the degree to which buses are stuck in traffic will have already been included in the analysis. As will be explained in Part 5, Sound Transit's predecessor the RTA, did model an extensive BRT like bus network and found it would attract 518,000 daily riders in 2020. (Ref 42: p. 3-8) This would not have been possible if "buses were stuck in traffic". In contrast, Central Link is estimated to attract 133,000 daily riders in 2020. (Ref 2: p.7-11)

In conclusion, the claim that "buses will be stuck in traffic" is an irrelevant red herring. Run the ridership models, and do it honestly. If any buses are stuck in traffic that will

have been cranked into the models, and will have affected the predicted ridership. If the ridership looks good, one can ignore all the low level issues.

4.4 Plans C, D, and E

If the objective is to increase transit ridership the only alternatives are probably light rail, heavy rail, monorail, and bus. But if the objective is to reduce travel delay there are many other alternatives to consider, such as car and van-pooling, transportation demand management (TDM), and road improvements. Should these be plans C, D, E and so forth?

There are two ways these other alternatives can be considered. One is to construct hybrid alternatives, which combine BRT and one or more of these other alternatives. For instance, construct a $2 billion alternative where $1.5 billion goes to BRT and $500 million goes for van pools. The other alternative is to construct pure alternatives where all the money in a given alternative goes for one type of remedy, such as van pools.

To make a long story short, the thing the region should really do is apply "least cost planning" or LCP. The essence of LCP is to take an objective like reducing travel delay and determine the least cost way to achieve it. Probably that least cost way would be a market basket of different remedies; for instance an optimized mixture of BRT, car and van pools, TDM, and selected road improvements. However, in theory, it could be 100% van pools, or 100% roads. (See description of LCP and end of this report)

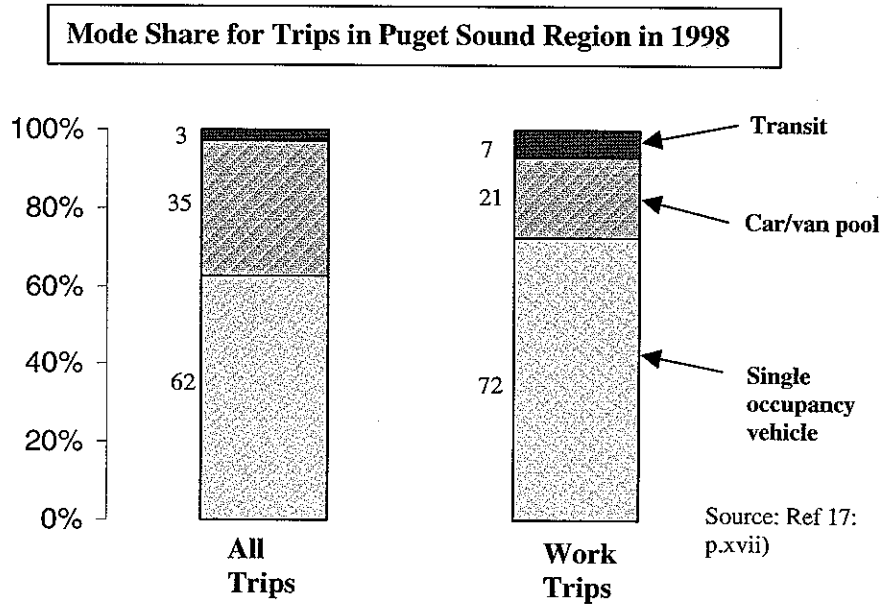
If the region decides to force ST into conducting a proper alternatives analysis, one of the scenarios or alternatives that must be evaluated is Sound Transit's vision for a fully mature 100+ mile light rail system. Such a system would cost roughly $15 billion. If it were decided to do an "equal cost" alternatives analysis that would mean designing a BRT alternative also costing $15 billion. It is hard to imagine how $15 billion could be spent on BRT no matter how large the network or how lavish the service. Thus if an equal cost approach is used, the only practical thing to do would be to construct only hybrid scenarios where BRT is combined with car and van pools, and other remedies so as to get up to the cost of the rail alternatives.

In sum, the alternative to light rail or "Plan B", may be pure BRT, but it is more likely an optimized combination of BRT and other remedies. The best approach is to use Least Cost Planning to find the optimum combination of remedies.

4.4.1 Car and Van Pooling

This report focuses on the bus versus rail issue because that has been the focus of most planning activities to date. However, BRT is not the only alternative. Car/van pooling is probably even more cost effective than BRT and should be among the alternatives considered most carefully as the region charts its transportation strategy. This is true

because car and vanpools are already far more effective in getting people out of single occupancy vehicles than is mass transit, as the following chart makes clear.



To put this in perspective consider the following. Central Link is only expected to reduce PM peak period VMT by 3.7% in 2020. (Ref 2: p. 3-4) This is a reduction of 63,000 VMT during the peak period. The average work trip is a little over 10 miles long so Central Link would be taking 6300 cars out of the morning commute, and the same 6300 out of the evening commute. One could say Link removes 6300 cars from peak period traffic.

However, in 1998 there were already 459,690 work trips being made by car/van pool, presumably half in the morning and half in the afternoon (Ref 17: p.xvii) This means there were about 230,000 persons commuting to/from work by car/van pool. If we assume every car/van pool carried two persons this would mean that there were 115,000 carpools in operation, each of which removes one car from the evening commute, and one from the morning commute. In short, car/van pooling is now taking 115,000 cars out of peak period traffic. This is 18 times more than Central Link is expected to remove.

Expressed differently every two people deciding to car pool takes at least one vehicle out of peak period traffic. (Actually it would be more than one vehicle since some car pools and most bus pools have over two persons. But two is a conservative estimate.) Link takes 6300 vehicles out, so it would take a maximum of 12,600 additional people deciding to carpool to have the same impact as Central Link. 12,600 is 5.5 % of the 230,000 people now car/van pooling.

In short, increasing the number of people who car or van pool to work by just 5.5% would remove as many cars from the commute as building 21-miles of light rail at a cost of $3.6 billion (YOE$).

A recent article in the Bellevue Reporter indicates just how cost-effective car and van pool programs can be, and at the same time indicates the paltry sums being devoted to encourage them.

> "The Commuter Challenge offered by the Regional Smart Commute Program, pays those who typically drive to work alone to instead ride the bus, join a car pool, bicycle or walk to the office or work from home.
>
> ...The program pays $3 for every day a participant leaves his single occupancy vehicle (SOV) at home.
>
> ...Flexible and profitable. The program pays participants up to $192. It is funded by a $100,000 WSDOT grant." (Amy Roe, Bellevue Reporter, Nov. 24, 2004)

To put this in perspective, $3 per day times 200 workdays per year comes to $600 per year for each car this program removes from peak period traffic. In contrast Central Link will cost $43,000 per year for each car it removes from the road. (See Part 6 of this report for details) The $100,000 this program gets is just 1% of what Sound Transit spends on public relations alone each year.

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Part 5: The Capacity Issue

5.1 Introduction

5.1.1 Overview: ST and the RTP used capacity as a major criterion in their selection of rail as opposed to bus technology for the region's HCT network. However RTP's analysis was incomplete and biased. Their reasoning was not valid at the time and is even less valid today. This is partly because we are now dealing with light, not heavy or rapid rail. Based on what' s known today, bus alternatives would not only have adequate capacity but may in fact be superior in meeting the region's long term capacity needs.

In one very serious case of bias RTP officials knew capacity was a key consideration and potential weakness of the TSM (bus) alternative, nevertheless they: 1) chose to assume a worst case assumption about bus capacity in the DSTT rather than make a serious effort to determine an accurate value, and 2) failed to fix any remaining capacity shortfall using any of a number of previously identified remedies. In short, RTP deliberately created a hobbled bus alternative to compare against rail.

The consequences of putting forward this designed-to-fail bus alternative were pervasive and long-lived. It led to a lower ridership forecast for the bus alternative, less attractive economics, and a long series of negative assessments claiming buses lacked adequate capacity to meet the region's needs. It was therefore decisive in essentially ruling out buses as the core technology for the region's HCT network back in 1993. There has been no serious reconsideration of the issue since. Thus the current light rail strategy continues to rest on the flawed and misleading way capacity was treated in the 1993 FEIS.

The essence is as follows. The maximum load ST claims a rail system would need to handle by 2020 is 15,000 persons per hour through downtown Seattle. About 20% of this would be used by persons traveling to nearby Capitol Hill. Because a freeway BRT system would bypass Capitol Hill it would need a capacity of only 12,000 persons per hour through downtown to accommodate the same overall transit demand. It would take about 110 buses per hour to provide this capacity. There have been six separate studies of bus capacity in the downtown Seattle Transit Tunnel (DSTT). Although the results ranged from 125 to 192 buses per hour, Sound Transit's predecessor the RTP assumped that the tunnel could handle only 100 buses per hour. Even if that were correct and the tunnel could not handle the entire load, there are several other ways to increase bus capacity through downtown. When all this is taken into consideration it appears ST's assertions that an all-bus alternative would not have enough capacity are unfounded. To the contrary, buses would have considerably more capacity to meet the regions long term needs than would Link light rail.

Light rail has other capacity-related deficiencies: There is a fixed upper limit on Links capacity whereas bus capacity is relatively open ended. Placing light rail on the I-90 bridge would reduce the people moving capacity of the bridge relative to having the center lanes shared by buses, carpools and vanpools. There is an equity issue in that Link's design shortchanges the region's south-end in terms of transit capacity. There is

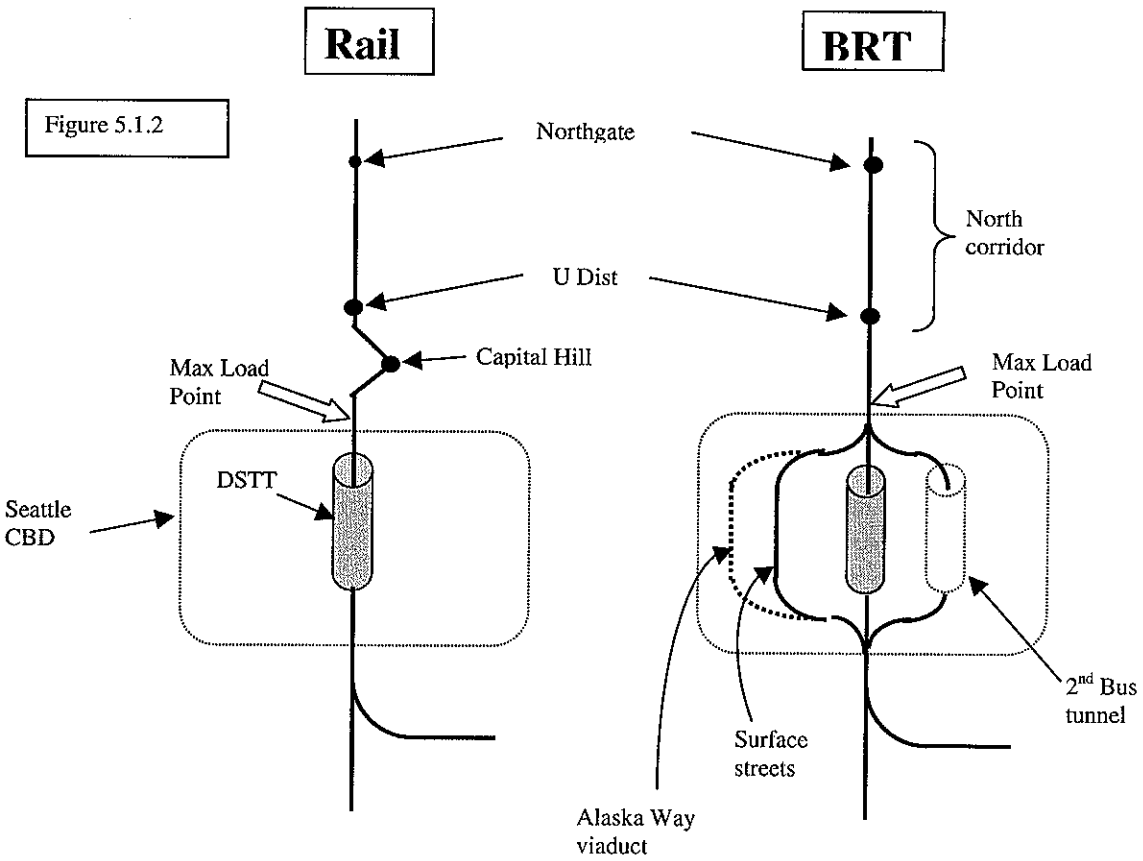
some risk that Link's south line may not have enough capacity. The ability of the DSTT to move people in and out of downtown Seattle would be reduced if rail is not extended across Lake Washington.

Because the 1993 FEIS mishandled the capacity issue in a biased manner, dealt with heavy not light rail, and failed to address the full range of capacity issues, a new alternatives analysis is needed. It needs to compare not only the currently planned 24-mile Central Link against bus alternatives, but also the 100+ mile version of Link envisioned by ST.

5.1.2 Visualization of capacity issue

Figure 5.1.2 helps visualize key aspects of the capacity issue. The light rail line would come south from Northgate with a station in the University District and one on Capital Hill before entering the Seattle central business district (CBD) and going into the Downtown Seattle Transit Tunnel (DSTT). There are other stations between the U District and Northgate but they aren't shown since they aren't relevant to this discussion. The Capitol Hill station is shown as a jog because it's east of I-5.

Figure 5.1.2



Ridership forecasts show that the maximum passenger load point on the entire rail system would be just north of the DSTT. Maximum load is measured as passengers per hour (pph) in the peak direction. Rail would need enough capacity to carry this maximum load.

The main bus or BRT line serving the north corridor would share an HOV lane on I-5, and would not serve Capitol Hill. There are four different ways to get buses through downtown. Today some go through the DSTT while others use north-south streets such as 3td Avenue. The maximum capacity of the DSTT remains uncertain at this time as will be explained later, but estimates range from 100 to 192 buses per hour. The capacity of surface streets is also somewhat uncertain, although RTP has identified ways to increase the number above today's levels. A third potential way to increase bus capacity through downtown would be to divert some buses off I-5 at Mercer, cross the south Lake Union area on a new busway and tie into SR99. Once on SR 99 the buses could proceed south on whatever facility replaces the existing Alaska Way viaduct, especially if that replacement includes HOV lanes. A fourth possibility was identified by the RTP back in 1993, namely to build a second bus tunnel. In short, if the DSTT in combination with the existing number of buses on surface streets does not have enough capacity, there are three ways to add additional bus capacity through downtown.

A bus alternative would also need enough capacity at the max load point to carry its projected ridership. The maximum load point on freeway BRT would be just north of Mercer if some of the southbound bus stream were diverted at that point to some future south Lake Union busway, otherwise it would be just north of the DSTT. The remainder of Section 5 assumes the latter since none of the projected ridership scenarios is high enough to demand a south Lake Union busway. It's just an option.

The bulk of section 5 deals with the issue of whether rail has an advantage over bus in terms of capacity at the peak load point, or vice versa. This only becomes an issue with a fully mature or fully built-out rail or bus system. Shorter systems, such as the 24-mile Central Link or a BRT system with equivalent ridership, would not have enough passenger volume to make capacity an issue. A fully built out light rail system would have 100+ route miles, as did the Rail/TSM alternative in the 1993 FEIS and as ST envisions Link growing to. A fully built out bus system as I define it here is a BRT system having the same geographic coverage and ridership as the fully built out light rail system. In other words it would include 100+ route miles of freeway BRT.

Thus Section 5 will focus on these key questions:

1) Would a fully built out light rail system have enough capacity to handle forecast demand at the peak load point in 2020?

2) Would a fully built out light rail system have enough capacity to handle the region's long term needs for growth in demand well beyond 2020? In other words, is light rail "strategic"?

3) Would a fully built out bus or BRT system have enough capacity to handle the forecast demand at the peak load point in 2020?

4) Would a fully built out bus or BRT system have enough capacity to handle growth in demand well beyond 2020? In other words, is BRT "strategic"?

NOTE: The author uses the following terms to describe bus alternatives: "all-bus", bus rapid transit or "BRT", and "TSM". They all mean pretty much the same thing: namely a mix of express buses operating on freeway HOV lanes and on arterials where they are given bus only lanes, signal priority and so forth. The bus alternative would also include Park and Ride lots. In other words the bus alternative is an integrated system built around buses. As was the case with the 1993 FEIS's TSM alternative, the bus alternative would be an extension to or overlay on the current local bus system. The BRT or express bus-on-HOV portion of a bus alternative could be thought of as light rail with rubber tires using an existing right of way rather than carving a new one. Whether BRT or light rail, the networks would follow the region's main freeway corridors. The largest light rail network might have somewhat over100 route miles. A BRT network might extend over the region's 200+ route miles of HOV lanes.

5.1.3 Capacity has been used as a discriminator against the all-bus alternatives.

The probability that an alleged capacity limitation was used as a major reason for dismissing the bus alternatives is illustrated by the large number of times it was mentioned in various RTP and ST documents. The following quotes are from the 1993 FEIS:

> "A rapid rail line operating in exclusive right of way has the theoretical capacity to carry over 22,000 persons per hour in each direction...These numbers represent the rail capacity of the downtown Seattle transit tunnel.... In comparison the bus passenger capacity of the downtown tunnel is about 13, 400 persons per hour..." (Ref 1, p. xviii)
>
> "TSM Alternative bus traffic levels would meet or exceed the capacity of the downtown Seattle transit tunnel and the street network in downtown Seattle at rush hour, resulting in a constraint to meeting the demand created by the TSM Alternative." (Ref 1, p. xxxiv) The same is said about the TSM/Transitway Alternative on page xxxv.
>
> "Bus volumes to meet ridership needs would exceed street capacity in downtown Seattle..." (Ref 1, p. xliii)
>
> "Neither the TSM nor the Transitway/TSM Alternative could accommodate the transit demand associated with implementing the Visions 2020 land use concept and consequently would not fully support its land use goals." (Ref 1, p. 4-5)
> "The Rail/TSM alternative would provide enough capacity to meet the high end of projected transit demand." (Ref 1, p. xxxv)

The October 1992 "System Plan Technical Report" said:

"In the long term, neither of these (TSM or Transitway/TSM) alternatives offers the mobility or capacity necessary to support growth management policies, control sprawl or provide the mobility necessary for sustained economic viability." (Ref 45: p.89)

The Nov 1993 "Central Corridor Project Justification Report" said:

"The TSM and Transitway/TSM alternatives were found to provide only a temporary solution to the transportation needs of the region. In the long term neither of these build alternatives offered the mobility or capacity necessary to support the adopted growth management policies, control sprawl or prove the mobility necessary for sustained economic vitality." (Ref 19: p.23)

"Finally, only the Rail/TSM Alternative had sufficient capacity to accommodate transit demand in key areas such as the Seattle CBD..." (Ref 19: p. 25)

The Nov. 1999 FEIS for Central Link reiterated the theme as follows:

"The benefits that led to the selection of the rail alternative were its capacity to meet the high end of projected transit demand." (Ref 2: p. P-1)

"Criteria such as capacity, operating speeds, ...were considered" (Ref 2: p. S-19)

"1.1.2 How were the alternatives identified and narrowed for the EIS? ...Evaluation criteria included capacity, ..." (Ref 2: p 7-3)

The PSRC's Summary of Prior All-Bus and Integrated Rail/Bus Alternatives Analyses report dated 2001 quoted the Expert Review Panel as saying

:

"...only rail provides the capacity, speed, and reliability to meet growing demand." (Ref 28: p.3)

The Summary goes on to say:

"Probably one of the most significant factors that tipped the scales toward the rail/bus alternative was the long term effectiveness and relative efficiencies that rail services would provide over the 20 year planning period. In addition to faster speeds and greater reliability in direct service to the high demand transit markets, the rail bus alternative was found to provide a substantially higher level of long term future capacity than either of the all bus alternatives."

Finally, the recent "Summary of Prior All-Bus and Integrated Rail/Bus Alternatives Analyses" dated April 5, 2001 and appended to the June 14, 2001 "Central Link Board Workbook" says:

"As mentioned previously, the bus capacity constraint in downtown Seattle was one of the major reasons for selection light rail in the central I-5 corridor" (Ref 36, Appendix Q, p.7)

In sum, it is clear that an alleged capacity shortfall in the bus alternatives was a key factor in the selection of rail. The sections below examine whether this alleged shortfall was in fact real.

5.2 How the capacity issue was mishandled in the 1993 FEIS

5.2.1 Overview of what RTP did and didn't do in the 1993 FEIS

The RTP ran ridership forecasting models to estimate year 2020 ridership for the rail alternative. The models predicted that rail ridership during the peak hour at the peak load point just north of the DSTT would be 15,000 persons per hour in the peak direction. (Ref 1: p. 2-58) RTP then assumed the rapid rail system could operate at 90-second headways giving it an ultimate capacity of 22,000 persons per hour. (Ref 1: p.2-58) From this RTP concluded that rail had enough capacity to meet 2020 demand, plus plenty of excess capacity for growth.

RTP also ran the models to predict ridership in the DSTT for the TSM and Transitway/TSM alternatives. The result was that the TSM alternative attracted 518,000 daily riders. (92% of what the rail alternative attracted) In parallel RTP reviewed six previous studies of tunnel capacity. Those studies had each come to different conclusions, ranging from 125 to 194 buses per hour. However, RTP decided to assume a maximum capacity of 100 buses per hour. One hundred buses per hour would not handle the 518,000 riders so RTP reduced the predicted TSM ridership to what they said 100 buses could handle, namely 473,000 daily riders. (Ref 42: p.5-2) This was an 8.7% reduction.

Table 3.2
Existing and 2020 (PSRC Adopted) Constrained Versus Unconstrained Total Daily Transit Trips

Alternative	Unconstrained	Constrained
1990	284,100	284,100
No-Build	419,500	388,500
TSM	518,100	473,900
Transitway	524,300	480,000
Rail	564,800	560,500

Scanned image of Table in Ref 42

This "constrained" ridership was the one reported in the 1993 FEIS and became the basis for calculating all the ridership related benefits and cost-effectiveness measure for the bus alternative. Obviously the bus alternative would have fared much better in its fly-off against rail if the RTP had found some way for the bus alternative to achieve its unconstrained ridership, either by double-checking its assumption about bus capacity in the DSTT, or if this failed, finding some workaround.

However, the RTP did not attempt to narrow the range of uncertainty about the true capacity of the tunnel, but instead assumed worst case. Neither did the RTP attempt to fix the alleged DSTT capacity bottleneck with any of the remedies they had identified elsewhere, even though the $6 billion difference between the bus (TSM) alternative and

the rail alternative provided plenty of money for such remedies. Thus the RTP deliberately entered a capacity deficient bus alternative into competition with the rail alternative. Naturally, the bus alternative didn't do as well as it might have. Thus in higher level summaries prepared for policy makers the RTP repeatedly asserted that the bus alternatives were deficient in terms of capacity, and this was given as one of the major reasons the bus alternatives were dropped in favor of rail.

In a nutshell, an alleged capacity bottleneck in a 1.5-mile segment of a 100+ mile BRT network became the tail that wagged the dog.

Specific ways in which RTP mishandled the capacity issue are further described below.

5.2.2 The 1993 FEIS and subsequent studies did not define or quantify the capacity benchmark the alternatives were being judged against.

The following benchmarks are mentioned in the quotes in Section 5.1: "transit demand associated with implementing the Visions 2020 land use concept", " high end of projected transit demand", " capacity necessary to support the adopted growth management policies, control sprawl or prove the mobility necessary for sustained economic vitality", " capacity... to meet growing demand". Unless these benchmarks are quantified how is it possible to rule that one system meets them and another does not?

5.2.3 The 1993 FEIS assumed a lower bus capacity for the DSTT than all prior studies had estimated as being possible.

Prior to the 1993 FEIS, six paper studies had attempted to estimate the bus capacity of the DSTT. (Ref 34) The results ranged from a low of 125 buses (one way) to a high of 192, and are plotted in Figure 5.2.3. (Other values in the Figure will be described later.) Study #6, an "internal Metro technical memorandum" cited on page 12 of Reference 34, says the following:

> " 'tunnel capacity for outbound revenue service leaving downtown is approximately 100 buses per hour per direction...' as one of its major conclusions. The phrase "leaving downtown" is important as approximately 45 buses per hour per direction also operate in the tunnel for deadheading (10 per hour), inbound terminating (35 per hour) or unscheduled trips. Thus the capacity of the tunnel was taken to be 145 buses per hour per direction. The DSTT's capacity was based on the DSTT's stated peak hourly capacity of 145 buses per hour per direction and the opinion of Metro's operating staff." (Ref 34: p.12)