

Sound Transit 3 Expert Review Panel

September 26, 2016

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Dear Sirs and Madam:

We are writing to provide the final report of the Sound Transit 3 (ST3) Expert Review Panel. As you know, Washington State law requires that an expert review panel provide independent technical review of a high-capacity system plan that will be funded in whole or in part by local option voter approved measures. Our Panel was appointed in Spring 2015. We met six times between May 2015 and June 2016 to review the policy and technical work prepared by Sound Transit as it drafted the proposed ST3 system plan. The system plan was approved by the Sound Transit Board at its meeting on June 23, and a ballot proposition authorizing the ST3 plan and funding will be on the November ballot.

State law provides clear guidance for the work of an expert review panel. RCW 81.104.110 describes the role and purpose as follows:

To assure appropriate system plan assumptions and to provide for review of system plan results, an expert review panel shall be appointed to provide independent technical review for any system plan which: (a) is to be funded in whole or in part by the imposition of any voter-approved local option funding sources enumerated in RCW 81.104.140; and (b) includes a rail fixed guideway system component or a bus rapid transit component that is planned by a regional transit authority. (RCW 81.104.110(2))

At our first meeting we conducted a tour of the region to familiarize all Panel members with the work underway to construct the Sound Move and ST2 projects, and to look at some of the potential corridors for ST3 projects. Our six meetings consisted of briefings and discussions with Sound Transit staff and their consultants regarding the methodologies being used to evaluate projects, estimate ridership, estimate capital and operating costs, and develop the ST3 financial model. We discussed each of the methodologies and in some cases provided suggestions for modifications. Puget Sound Regional Council (PSRC) and local transit agency staff presentations were also included in many of our sessions.

After review of the methodologies we then reviewed and discussed how those methodologies were used to create the individual project estimates, as well as the system plan estimates. Throughout our work we provided comments to Sound Transit where we suggested enhancements or modifications, and highlighted where we felt that their work was consistent with best industry practices.

We were very fortunate to have an outstanding group of panelists that provided a wide range of expertise. A list of the Panel members is attached to this letter. The Panel included members with local, regional and national perspectives. Their knowledge and experience reflected the following skills: planning, environmental review, transit operations, finance, engineering, legal and political structures, geography, ridership forecasting, and business and real estate development.

We wrote eight letters during the course of our work, providing summaries of our comments and questions to Sound Transit. We trust that the Panel's letters and comments have been useful and productive for Sound Transit in preparing the ST3 plan. In this final letter we are providing a summary of the planning requirements described in state law, a detailed description of our work regarding each requirement, and our conclusions about Sound Transit's compliance with those requirements.

SUMMARY OF FINDINGS

Through the course of our six meetings, and through much discussion with Sound Transit staff, we reached conclusions about the methodologies and assumptions used by Sound Transit to create the ST3 plan. Overall, we conclude that Sound Transit has met its obligations described in state law. The following provides a brief summary of our major findings, along with several recommendations. The remainder of the letter provides further detail about this summary.

- Sound Transit has met the requirement to define the roles of local, regional and state agencies at this stage of planning. Because project design is at such an early stage, and required environmental analysis has not been completed for most projects, more formal agreements between Sound Transit and other agencies will be developed as project planning continues.
- Creating seamless connections between the light rail system, commuter rail and local and regional bus services is essential to generating high ridership throughout the region's high-capacity transit system. The Panel encourages Sound Transit to ensure that the processes to design light rail stations and to coordinate services are done in close collaboration with the other regional transit providers.
- Sound Transit identified high-capacity transportation system options and studied an appropriate range of services and technologies.
- The methodologies used to develop ST3 capital and operations and maintenance costs are sound and consistent with industry best practices.
- The ridership forecasts for the ST3 system plan are consistent with industry practices. The ridership forecasts are strongly influenced by the PSRC regional population and employment forecasts.
- The ST3 finance plan is built on the model developed for ST2. The assumptions embedded in the plan are reasonable. Sensitivity analysis was completed on the plan to test key assumptions. Consistent with the adopted ballot measure proposal, the finance plan assumes the continuation of Sound Move and ST2 taxes, along with the generation of revenue from ST3 taxes.
- The evaluation methodology used by the Sound Transit staff and Board is appropriate at this stage of project development. The Panel encourages the Board to utilize cost-effectiveness evaluation measures when alternative analysis is completed on specific projects.
- The methodology used to create the benefit-cost analysis has been found by the PSRC to be appropriate and consistent with industry standards.
- Sound Transit has included in the ST3 plan all the elements required by state law for a high-capacity system plan. The elements include the level and type of transportation services, route alignment and station locations, performance characteristics, and social, economic and environmental impacts.
- Newly adopted state requirements regarding transit oriented development (TOD), affordable housing and funding for education are included in the ST3 plan.
- Sound Transit has outlined a comprehensive set of actions to achieve the necessary internal and external capacity to achieve an aggressive, overall program schedule. Securing the staff, consultant, and contractor capacity to carry out the combined ST2 and ST3 capital programs will be a challenge, and should be monitored closely by the Sound Transit Board.

I. ORGANIZATION AND MANAGEMENT

RCW 81.104.100(2)(a) provides that a transit agency proposing to provide a high-capacity transportation system must “define roles for various local agencies, review background information, provide for public involvement, and develop a detailed work plan for the system planning process.”

A. Define Roles

The development of the ST3 proposal required extensive engagement between Sound Transit and local agencies. The Panel had considerable conversation with Sound Transit and several partner agencies during the course of its meetings.

Puget Sound Regional Council – Local governments in the central Puget Sound area created and designated the PSRC as a regional transportation planning organization (RTPO). Sound Transit is located within the PSRC planning area. There are various federal, state and local requirements with which plans for high-capacity transit improvements, such as ST3, must conform, including consistency with the land use and transportation plans approved by the PSRC. The PSRC adopted Transportation 2040, an action plan for transportation in the central Puget Sound region for the next 30 years, and Vision 2040, the long-range regional growth strategy for the region. The 2015 Transit Integration Report is part of this transportation plan. That report expressly references the Sound Transit ST3 System Plan Development that includes completing the Link light rail spine.

As required by law, Sound Transit submitted its ST3 plan for PSRC to determine its conformance with Transportation 2040. On September 22, 2016, the PSRC Executive Board conducted a conformity review, and found that the ST3 System Plan conforms with the regional plans (VISION 2040 and Transportation 2040), and with the region’s transit-oriented development plan (Growing Transit Communities Strategy).

The PSRC is also responsible for creating the regional population and employment forecasts. These forecasts were used by Sound Transit to develop ridership forecasts for planned projects. The regional forecasts were updated during the ST3 planning process, and the new forecasts were incorporated into the ridership modeling. The Panel was actively engaged in discussions with PSRC staff regarding their new forecasts. We were particularly interested in the ratio of forecasted jobs to population. Although this region has a higher ratio of jobs to population than most major metropolitan areas, we concluded that the revised forecast is appropriate.

In addition, the Panel explored another role of the PSRC. State law (RCW 47.80.030) requires each RTPO to ensure that its regional transportation plan “is based on least cost planning methodology that identifies the most cost-effective services, facilities and programs.” The Panel requested and received a response from the PSRC on the methodology it uses to perform the required analysis. Their letter stated that, “PSRC meets the state law requirements on least

cost planning in two ways: through its long-range plan development, and on a project by project basis when projects move from candidate to approved status within the long-range plan.”

Local Transit Providers – Sound Transit has contractual relationships with other transit agencies in the region (King County Metro, Community Transit, and Pierce Transit) to provide many of its bus and rail services. These contracts define roles and establish rates of payment for the provision of express bus service and light rail operations.

The Panel focused considerable time and attention on understanding the relationship between Sound Transit and the other transit agencies across the region, and what their respective roles will be in planning and implementing ST3. In particular, the Panel was interested in how Sound Transit is working with the transit agencies to plan for the integration of bus service with the proposed ST3 system. One of the challenges for public transit is overcoming the convenience of private vehicles that tend to be easily accessible at most times, and provide only a one-seat ride. In our letter of November 25, 2015, the Panel stated:

*The Panel feels strongly that planning for ST3 projects, even at this early stage, must actively consider the ways in which services for bus, light rail and commuter rail will be integrated. Successful integration must focus on the rider experience. . . . The ability to attract significant ridership to the light rail system is contingent on the region’s ability to create a good bus/rail transfer experience at light rail stations.**

Twice the Panel met with the local transit providers and Sound Transit staff to discuss how system integration will occur. We learned that the respective staffs are working together to discuss how to create seamless connections between locally operated bus service and light rail improvements that would be included in ST3. However, planning for the station locations and designs is at such a preliminary stage that detailed station area planning cannot yet be done.

The Panel suggested that Sound Transit and other regional transit providers work together and commit to considerable interaction in planning for complementary bus and rail services as the rail corridors are designed and constructed. The Panel encouraged the Sound Transit Board to monitor the planning process to ensure that station designs will create a seamless experience for bus and rail riders. Our letter of April 26, 2016, stated:

The Panel suggests that more conversation is necessary between Sound Transit and regional transit agencies to determine the joint responsibilities for constructing the capital facilities to create a fully integrated bus/rail system for our region’s riders. Based on multiple conversations to date . . . we do not believe that any agency has taken “ownership” of determining the plans and funding for those needed capital investments.

The Panel noted that the final ST3 plan adopted by the Board states that “to facilitate convenient passenger transfers between modes, the cost estimates for the light rail projects . . . include approximately \$100 million (\$2014) in integration allowances to build off-street facilities at key stations for busses to lay over and maintain consistent schedules. As Sound

* Quotations from the Panel’s letters of comment are shown in italics.

Transit expands commuter rail, light rail, Bus Rapid Transit, and express bus corridors, there will be more opportunities to create convenient transfers for bus riders.” While this is a good start, the Panel cautioned that Sound Transit will need to do a better job integrating bus and rail services than has been achieved to date on some Sound Move and ST2 projects.

It is anticipated that the ST3 program will result in considerable interaction between Sound Transit and the other transit providers in the region as they plan for bus services after rail corridors have been constructed. The ST3 plan states that:

Sound Transit works closely with transit and transportation partners, including Community Transit, Pierce Transit, Everett Transit, City of Seattle, King County Metro and the Washington State Department of Transportation to extend the benefits of rail and Bus Rapid Transit services to more communities throughout the region by enabling our transit partners to redeploy bus hours in corridors as they become part of the regional high-capacity transit network through light rail transit and BRT projects. As rail corridors are built and extended, Sound Transit bus service funding for those corridors will be reallocated to operating costs for light rail services. (Sound Transit 3: The Regional Transit System Plan for Central Puget Sound, page 9.)

Other Agencies – Local jurisdictions will serve as the designated permitting agencies as the ST3 projects move from engineering and design through construction. In addition, if voters approve the ST3 plan, Sound Transit will conduct an alternatives analysis and environmental review in the different corridors to determine final alignment, and station locations and designs. Sound Transit will work closely with local jurisdictions in each corridor during that environmental review and design process. (Sound Transit 3: The Regional Transit System Plan for Central Puget Sound, Putting the System in Place, pages 18-20.)

Because of the importance of the relationship with local jurisdictions, the Panel encouraged Sound Transit to request letters from all jurisdictions where ST3 projects would be located to request concurrence with the project scopes. Sound Transit received letters acknowledging the scopes, and in some cases jurisdictions suggested alternative alignments or changes to the ST3 plans. The letters from jurisdictions did not provide concurrence on the project scopes and budgets. (See comment below in Section III on Estimating Capital Costs.)

The Panel also suggested that Sound Transit should attempt to engage environmental regulators and local jurisdictions very early in the planning process if the ST3 measure is approved. This was suggested as a means of discussing potential regulatory issues, possible efficiencies, and strategic partnerships for ST3 projects. Sound Transit CEO Rogoff has expressed his intent to pursue this approach with local, state and federal agencies.

Formal collaborative agreements that define the roles of these multiple agencies have not been established, since many of the projects are at the very early planning stage, with less than one percent of the engineering and design work completed. However, the Panel believes that the definition of roles for partner organizations is appropriate for the current stage of project planning.

B. Review of Background Information, Provide for Public Involvement, and Develop a Detailed Work Plan for the System Planning Process

Sound Transit has engaged in an extensive and detailed planning process to develop its ST3 plan. This process has involved a review of relevant background information and extensive public involvement.

Briefings on Sound Transit's public involvement activities were presented at several of the Panel's meetings. The public involvement process included developing and widely distributing extensive public information materials, holding numerous public meetings, use of the Sound Transit web site, providing for community outreach, and engaging in extensive intergovernmental relations. During the development of the ST3 plan Sound Transit created an online survey, which had nearly 35,000 responses. More than 1,200 people attended seven community meetings across the region. The outreach efforts included strategies to engage ethnically diverse communities, with advertising in community publications, translation of the online comment form into seven languages, translated Facebook posts, and briefings with community-based organizations that serve diverse populations. The comments from the online survey and the community meetings were summarized and presented to the Sound Transit Board. In addition, a telephone survey of 1,000 registered voters within the Sound Transit district was conducted in April, and those survey results were also reported to the Board.

Sound Transit developed and followed a detailed work plan leading to the Sound Transit Board adopting its ST3 plan. The work plans were clear and methodical, and were modified from time to time to account for decisions by the State Legislature or the Sound Transit Board.

The Panel notes one final point with respect to communication with the public. Later in this letter, the Panel points out that the ST3 funding proposal includes: (a) a continuation of the full rate of the general sales and use taxes that were authorized for Sound Move and ST2 to fund those projects, with any surplus funding a portion of the ST3 projects; and (b) the imposition of additional, new general sales and use taxes, a property tax, and a motor vehicle excise, which will be applied to ST3 projects. The Panel has suggested that Sound Transit communicate this in a clear manner to voters during the next several months, so that voter expectations are clear. Sound Transit followed the Expert Review Panel's suggestions by reporting annual median costs per household, median costs per adult, and providing a formula and mechanism for voters to determine their own impacts.

Conclusion: Sound Transit has met its organization and management requirements. The Panel encourages the Sound Transit Board to closely monitor the light rail station planning and design process to ensure that a seamless connection with regional bus service is provided.

II. DEVELOPMENT OF OPTIONS

RCW 81.104.100(2)(b) provides that high-capacity transportation system planning shall include a study of options to ensure that an appropriate range of technologies and services are evaluated. The law requires the study of a do-nothing option and a low capital cost option, along with higher capital options that consider use of different technologies. Sound Transit used a multi-step process to develop these options.

The steps Sound Transit took to conform with these development of options, and other steps taken to comply with statutory planning requirements, were detailed in a document entitled “DRAFT Options Assessment and Analysis Methods Technical Memorandum,” dated May 2016, that was presented to the Panel at our last meeting. These steps included completing five High-Capacity Transit corridor studies in 2013 and 2014; adopting revisions to the Regional Transit Long-Range Plan in 2014; preparing a supplemental environmental impact statement (SEIS) relating to this long-range plan in 2014; and in 2015 and 2016 further refining and adopting a High-Capacity Transit System Plan, which identified a range of potential projects to be included in its ST3 planning.

A range of development scenarios were studied in the Long-Range Plan and SEIS, including a do-nothing option (described as being consistent with the 2005 Long-Range Plan, plus the ST2 improvements) and a range of alternatives the Sound Transit Board could review. In addition, during the ST3 planning process, the Board was presented with a range of alternative development scenarios, including a do-nothing scenario, a low-cost option with minor steps leading toward completing the spine of light rail, two sets of medium-cost options, four high-cost options, and a highest-cost option. The proposed set of projects was taken to the public for input, and a final set of projects was developed for the final ST3 Regional Transit System Plan.

The options included projects in four corridors—the north corridor, central corridor, east corridor and south corridor—as well as region-wide/multi-corridor projects. At several stages during its planning process Sound Transit considered a range of technologies. As part of the Long-Range Plan process, a High-Capacity Transit (HCT) Technologies Issue paper was developed in October 2014. The paper identified 13 potential high-capacity transit technologies: express bus, bus rapid transit (BRT), streetcar, light rail transit (LRT), monorail, sky train, diesel multiple unit (DMU), commuter rail, heavy rail, high-speed rail/maglev, people movers/airport circulators, gondola/aerial tram and personal rapid transit. The analysis of each technology included three factors: (1) is the scale of application local or regional; (2) does the technology have high-capacity transit capability; and (3) is the technology viable for Sound Transit to operate, maintain and expand the existing, regional high-capacity transit system. Based on this analysis the report concluded that “the most viable HCT options to connect regional centers are LRT and BRT that operate principally on exclusive rights-of-way, including grade separation, along with commuter rail and DMU in selected corridors.”

The SEIS for the Long Range Plan studied three primary technologies: light rail, commuter rail, and regional express bus/BRT. The high-capacity transit corridor studies that evaluated options

in 10 travel corridors studied mode choices within each corridor. In addition, once the project identification process began, the Board was presented with options that included four mode choices: light rail, commuter rail, express bus, and BRT projects.

The Panel also had conversation about the potential impact of automated vehicles. Future ST3 ridership and cost-benefit ratios are likely to be affected by the adoption of automated vehicles. However, at this stage it is not possible to reliably estimate their impact in the next several decades. Capacity of expressways should increase as vehicles can safely platoon more closely together at high speeds. Conversely, there will be more vehicles traveling without occupants as they are programmed to reach a desired destination, e.g., for picking up passengers or packages.

Conclusion: Sound Transit has met its requirements for developing options.

III. ANALYSIS METHODS

RCW 81.104.100(2)(c) requires a transit agency to develop reports describing the analysis and assumptions used for estimating capital costs and operating and maintenance costs, developing methods for travel forecasting, preparing a financial plan, and developing an evaluation methodology.

The document described above, entitled “DRAFT Options Assessment and Analysis Methods Technical Memorandum,” dated May 2016, that was presented to the Panel at our last meeting, describes the analysis methods used by Sound Transit to develop its ST3 Regional Transit System Plan. During the course of our deliberations, we received briefings on the methodologies and provided comments regarding each of the methodologies described below.

A financial plan was developed and included in the DRAFT Options Assessment and Analysis Methods Technical Memorandum as Appendix A: Detailed Description of Facilities and Estimated Costs, June 2016; and Appendix B: Financial Policies, June 2016.

A. Estimating Capital Costs

Sound Transit’s capital cost estimating methodology for ST3 projects includes several elements: development of a project scope, identification of cost categories and quantities of materials needed, development of a unit cost library to apply current cost data to each construction item or activity, application of contingencies to each project, review of lessons learned from the agency’s experience constructing Sound Move and ST2 projects, and an internal risk assessment process evaluating project scopes, schedules and budgets.

Sound Transit created a set of cost categories that are consistent with Federal Transit Administration (FTA) standards: (1) guideway and track elements; (2) station, stops, terminals, and intermodal; (3) support facilities such as yards, shops and administrative buildings; (4) sitework and special conditions; (5) systems; (6) right-of-way, land and existing improvements; (7) vehicles; (8) professional services; (9) unallocated contingency; and (10) finance charges.

Each project developed for the ST3 plan had conceptual alignment drawings, potential station locations, and/or written descriptions for each cost component. In general, for most projects quantities of construction items and related quantities were developed from system planning drawings or technical reports. Unit cost prices for construction items or activities were developed and applied to unit quantities identified for each cost item, producing an overall unit price for each element. Contingencies typically greater than 20 percent were added to the estimate base, and a 7 percent reserve was added to the fully marked-up project cost.

The Panel reviewed both the capital cost estimating methodology, and the application of that methodology on major projects included in the ST3 plan. This review was completed using cost estimates for selected large ST3 projects, and was performed for the Panel by Mike Morrison of Value Management Consulting, Inc. Our initial focus was on the use of contingencies, and understanding the comparison of original ST2 project cost estimates versus actual experience.

With respect to the use of contingencies and reserves, our November 25, 2015, letter stated the following:

It is important to recognize that at this stage of project planning (and when projects go to the ballot) the necessary [project level] environmental work has not begun for most of the projects. The level of design is minimal—less than 1 percent in some cases. This makes cost estimating with any precision difficult. As a result, Sound Transit has developed a capital cost estimating methodology that includes a design allowance, allocated contingencies, unallocated contingencies, and project reserves. These allowances, contingencies and reserves are reduced as the project moves through the various stages of design through construction.

The Panel concluded that “*the level of allowances, contingencies and reserves at this very early stage of planning and design is appropriate. Further, the capital cost estimating methodology is sound and consistent with good industry practice.*”

In addition, the ST3 plan includes additional contingency in its financial plan to deal with potential cost increases or revenue shortfalls. The plan states, “the agency plans to maintain a 50 percent annual contingency (after payment of operating expense) above the amount necessary to pay debt service (1.5x net coverage policy).” (Sound Transit 3: The Regional Transit System Plan for Central Puget Sound, Paying for the System, Risk Assessment, page 31.) This is sound industry practice, and the policy provides an appropriate level of net coverage.

One uncertainty regarding capital costs is that local jurisdictions where ST3 projects are located have not yet agreed to project designs, alignments and budgets (as mentioned above). While this is likely not possible at this early stage of planning, before the project-level environmental analysis has even begun, it does introduce some budget and schedule risk. Sound Transit has addressed this in several ways. First, as mentioned above, the project contingencies are robust to account for this risk. In addition, Sound Transit published the initial project descriptions and budgets approximately six months before the Board’s final action. This provided considerable

time for Sound Transit staff to work with local jurisdictions on mutually agreeable project scopes.

Regarding the comparison of original ST2 capital cost estimates versus actual experience, the November 2015 letter made the following observation: *“Review of Sound Transit’s experience on seven ST2 projects indicates that the use of the allowances, contingencies, and reserves has enabled current project cost estimates to remain close to original and revised budget estimates.”* The ST2 program employed a methodology similar to the approach used for the ST3 planning in the application of allowances, contingencies and reserves. This allowed Sound Transit to weather a severe reduction in its tax revenues as a result of the great recession in 2008 and 2009. This rather conservative cost estimating methodology is also prudent for the ST3 program.

The Panel also examined how the methodology was applied to the development of capital cost estimates for eleven large candidate ST3 projects. In our letter of March 10, 2016, we made the following summary points:

- *“The unit costs used to assemble the project cost estimates are reasonable and appropriate*
- *Sound Transit has made good use of its knowledge and experience with the Sound Move and ST2 project design and construction*
- *The cost estimating methodology provides excellent documentation and good references to industry standards.*
- *Consider using life-cycle cost analysis for conceptual value assessment, even at this early stage of program and project development.*
- *For the Basis of Estimates, consider eliminating the inclusion of risk in the Right-of-Way (ROW) cost estimate, and develop ROW risk analysis when work is done to analyze other risks in the program.”*

Sound Transit will continue its conservative approach to replacing its capital facilities by placing money into capital replacement accounts to finance the maintenance and replacement of its capital facilities and equipment. (See Resolution No. R2016-17, page 3; and Sound Transit 3, Appendix B, Financial Policies, Asset Management, page B-4.) The Panel commends Sound Transit for this approach that will avoid difficulties experienced by other mass transit agencies unable to maintain the quality of its fleet and facilities.

The Panel also reviewed the risk assessment process used by Sound Transit to identify potential risks to ST3 project scopes, budgets and schedules. The process was used to identify the severity of potential risk exposure, and modify project scopes and budgets as warranted. We concluded:

The Panel commends Sound Transit for performing the risk assessment workshops and incorporating the results into the draft system plan. This is early in the planning process to conduct project risk assessment because the designs are at a conceptual level. However, this early work will help sharpen scopes and budgets.

B. Operations and Maintenance Costs

The Panel reviewed the Sound Transit methodology for estimating operations and maintenance (O&M) costs for ST3 projects. The methodology begins with updating the experience Sound Transit has had in operating and maintaining existing light rail, commuter rail, and express bus services as part of the Sound Move and ST2 programs. The agency maintains, and has updated for ST3 planning, an O&M cost model that is consistent with FTA New Starts guidance. The cost model includes a detailed list of inputs and outputs for each project that affect O&M costs, such as the anticipated level of service, the number of stations, whether the alignment is at grade, aerial, or underground, the number of vehicles, anticipated headways, etc. The cost model is updated annually. Staff reviews actual cost data, levels of service, and overhead allocations. The actual O&M cost results are compared to the forecasted costs, and large differences are explored through conversations with operations and maintenance staff. Costs are also compared with external data forecasts for factors such as fuel, labor rates, Consumer Price Index (CPI), etc. Part of the forecasting also includes identifying plans for new service and changes in staffing plans. When a new forecast is completed it is reviewed with the managers responsible for operating the different modes of service.

In our letter of August 11, 2015, the Panel stated, “*Generally [Panel] members’ initial reaction to the methodology was that it is consistent with industry best practices. However, we would like to review the accuracy of past Sound Transit O&M cost forecasting.*” At our November meeting we were briefed on the comparison of actual O&M costs to forecasted costs for the past five years, for each of Sound Transit’s modes of service (light rail, commuter rail, and express bus). We concluded that “*Sound Transit has shown a multi-year history of having actual O&M costs track closely with forecasted costs.*”

Sound Transit instituted an asset management policy of operating and maintaining its assets “in a state of good repair,” meeting or exceeding federal and other regulatory requirements. As discussed above, Sound Transit will maintain “capital replacement and maintenance reserves and annual budgetary amounts sufficient to fully fund the system in a state of good repair.” Funding for this purpose “will have precedence over other agency expenditures.” (Resolution No. R2016-17, section 4; and Sound Transit 3, Appendix B: Financial Policies, page Asset Management, page B-7.) This policy was established for its Sound Move and ST2 assets, but was not a binding obligation for Sound Transit. However, Sound Transit, as part of its ST3 program, has established this “state of good repair” policy as a legally binding policy. The policy is now included in the Resolution submitting the ST3 proposal before voters and in the Sound Transit 3 documents referenced by that Resolution. The Panel commends Sound Transit for this forward thinking policy.

C. Ridership Forecasting

Sound Transit used a methodology for forecasting transit ridership that was documented in Transit Ridership Forecasting Methodology Report, prepared in March 2015. The incremental ridership model was developed using analytical ridership forecasting procedures and refined

using two decades of experience with the model. The ST3 incremental model was updated to a 2014 base year, using analysis of ridership for each peak and off-peak transit route.

Three stages of incremental analysis were conducted using the model. The first stage of analysis incorporates only changes to the PSRC land use forecasts. The second stage considers external, non-transit factors such as highway congestion, parking costs, and household incomes. These first two stages of analysis result in ridership forecasts from one zone to another within the Sound Transit service boundaries. (The model divides the service area into more than 700 zones, with summarized reporting for 27 districts.) In the third stage of analysis, incremental changes in transit service levels, including wait times, travel times, and fares, are assessed.

The Panel reviewed the ridership forecasting methodology and raised several questions about assumptions used to create the ST3 forecasts. In the August 11, 2015, letter the Panel said:

We suggest that Sound Transit consider refining some of the assumptions it is using to forecast ridership. Specifically, Sound Transit's modeling assumption that long-term traffic congestion will be unchanged from today's levels seems unrealistic. . . . A second underlying assumption that should be reconsidered is the level of freeway tolling assumed in the model . . . this assumption would seem to be overly aggressive.

The Panel also raised questions about the assumptions regarding parking prices in the model. We suggested that Sound Transit conduct analysis to determine the sensitivity of the model's forecasts to changes in some of the key variables questioned by the Panel.

At our November 2015 meeting, Sound Transit staff presented results from sensitivity analysis regarding highway tolling and congestion, and parking prices. As we said in our letter of January 21, 2016, "*The Panel has learned that the regional [population and employment] forecasts drive the ridership estimates more than variables such as the future cost of parking, highway tolling, or even the changes in future alignment of the service.*" We also learned in November that the ridership model was being revised to incorporate updated demographic forecasts from the PSRC, and that the method for incorporating automobile operating costs into the model was changing from an assumption that there would be tolling on all limited access highways, to using a mileage fee for auto use. The Panel supported both changes to the model.

Because of the importance of the regional population and employment forecasts to the ridership forecasting model, the Panel spent considerable time assessing the PSRC forecasts. In particular, we explored the relationship between the employment and population forecasts. In our August 11, 2015, letter the Panel stated:

Approximately 54 percent of the population in the Sound Transit service area is working. For the nation as a whole, the average percentage of population working is 46.5 percent. . . . the Regional Transit Long-Range Plan states that between today and 2040 population in the Sound Transit service area is expected to grow by 900,000, while employment is expected to increase by 1 million. That would mean that by 2040, 67.5 percent of the population would be working.

We noted that this ratio seemed high to the Panel. At our February 2016 meeting we learned that the PSRC's work to update the 2040 regional forecasts resulted in a reduction of the estimated job growth by 202,000, or 89,000 jobs after subtracting construction/resource jobs. In our letter of March 10, 2016, we said, "*The Panel understands that Sound Transit is using an incremental model for estimating ridership. This is a reasonable approach and makes the model sensitive to shifts in population and employment throughout the region.*"

Another area of inquiry for the Panel was discussion about whether the ridership forecast model can accommodate changes in land use that are different from the adopted PSRC forecast. For example, if proposed transit development results in more or less growth than anticipated at or near station locations, how will that affect ridership forecasts? We learned that the model relies on the population and employment forecasts from the PSRC, but as stated in the Sound Transit March 2015 ridership methodology report, "the ST model is ill-suited for analyzing structural changes in regional land use beyond those already included in PSRC demographic forecasts."

D. Financial Plan

The Panel's analysis of the ST3 finance plan took place in three parts: first we reviewed the model used to create the plan; second we reviewed and discussed some of the key underlying assumptions used in the plan; and third we reviewed the draft plan and associated sensitivity analysis.

In January 2016, several Panel members reviewed the Sound Transit model used to develop the ST3 finance plan. The model was used to develop the ST2 finance plan, but was updated with several improvements. We were informed that the model was also undergoing independent peer review to ensure that there were no errors in data inputs or formulas. In our letter of March 10, 2016, we stated that, "*We found the model to be sound and consistent with good industry practice.*"

There are a number of key assumptions that are factored into the finance plan, including the interest rates on long-term borrowing and debt service payments; the amount of federal loans and grants that will be received; the minimum debt service coverage ratio the agency will accept; the rate of inflation for construction, O&M expenses and right-of-way acquisition; growth rates of income sources; the amount of set-aside for vehicle repair and replacement; interest earnings; and ridership and fare revenues. As the Panel reviewed the underlying assumptions we had several initial comments. We raised questions about the use of a contingency on the inflation forecast indices, since the capital cost estimates already include contingencies, allowances and reserves. We also questioned the initial assumptions about federal grant revenues, stating that the initial estimates seemed to be too low. At later meetings we learned that both of these underlying assumptions were changed: the contingencies were removed from the inflation forecasts, and the federal grant assumption was increased from 11 percent to 13 percent of the total capital spending (although it is 9 percent of the total program revenue – see below). At the June 2016 Panel meeting we also learned that the growth

assumptions for the sales and use tax and Motor Vehicle Excise Tax (MVET) were modestly reduced.

The ST3 finance plan is estimated to cost \$53.845 billion in the year of expenditure, consisting of \$36.685 billion (68 percent) for capital expenditures and \$17.162 billion (32 percent) for operations and maintenance expenditures, including debt service. The plan describes the sources of revenues and uses of funds as follows:

Sources of Funds

- (1) ST3 local tax revenues (\$27.7 B, or 51 percent of the total revenues)
- (2) Federal grants (\$4.7 B or 9 percent of the total revenues)
- (3) Surplus revenues from Sound Move and ST2 (\$8.6 B or 16 percent of the total revenues)
- (4) Bond proceeds (\$11 B or 20 percent of the total revenues)
- (5) Fares and other revenues (\$1.5 B or 3 percent of the total revenues)
- (6) Interest earnings (\$0.3 B or 0.1 percent of the total revenues).

Sound Transit retains the ability to accept funds and assets from local governments or private parties to make enhancements to its projects, as was the case in the ST2 program when the City of Bellevue agreed to contribute funds to help finance the undergrounding of light rail in downtown Bellevue.

Uses of Funds

- (1) Sounder Commuter Rail (\$2.2 B, or 4 percent of the total expenditures)
- (2) Link Light Rail (\$31.7 B, or 59 percent of the total expenditures)
- (3) Sound Transit Express Bus (\$0.6 B, or 1 percent of the total expenditures)
- (4) Bus Rapid Transit (\$1.8 B, or 3 percent of the total expenditures)
- (5) System Wide Activities (\$0.4 B, or 1 percent of the total expenditures)
- (6) O & M Expenditures (\$10.2 B, or 19 percent of the total expenditures)
- (7) Debt Service (\$7 B, or 13 percent of the total expenditures).

Three new taxes will be imposed if the ST3 ballot measure is approved: 0.5 percent sales and use taxes; 0.8 percent motor vehicle excise taxes; and a 25 cents per \$1,000 of assessed value regular property tax. In addition, the cumulative rates of Sound Move and ST2 taxes (sales and use tax and MVET) will be continued.

When the Panel was able to review the draft ST3 finance plan at its June 2016 meeting, we had several comments. We noted that the plan assumes a sales tax growth rate of 1.6 percent over inflation. While we believe this is a reasonable assumption for the plan based on historic trends, we also cautioned that sales tax revenue could be at some risk over the life of the ST3 program due to shifting consumer purchasing habits, away from brick-and-mortar stores to internet sales.

We also commented that the plan assumed a 1 percent annual growth rate in O & M costs, above inflation. Again, the Panel said this is a reasonable assumption, but cautioned that it

could be an area of risk given the historical growth of national healthcare costs that could affect labor costs.

In April the Panel suggested that Sound Transit conduct sensitivity analysis on the finance plan for several factors: a significant decline in revenues in the first two years of the plan, a change in inflation of +/- 100 basis points, and a change in interest rates of +/- 100 basis points. At our June meeting we received a presentation describing the two types of sensitivity analysis conducted by Sound Transit on the draft ST3 finance plan: a static stress test and a dynamic risk assessment. The static stress test examined the impacts of five different scenarios: (1) a capital cost increase of 10 percent; (2) lower than anticipated sales tax revenues; (3) a major recession occurring in 2017/18; (4) an interest rate increase of 25 percent (or 130 basis points); and (5) an inflation increase of 60 basis points.

The dynamic risk assessment, or Monte Carlo analysis, examines a broader set of factors to understand how they would affect the agency's debt service coverage ratio (e.g., what is the risk of the agency dropping below its requirement to have revenues available that would be 1.5 times greater than debt service payment requirements?).

In our letter of June 20 we described the two types of sensitivity analysis as "*sound industry practice*," and noted that "*the results provided to the Panel indicated the financial plan had a good probability of success.*" We commented that dramatically lower revenues in the early years of the ST3 program could create risk (in approximately 2038) of not being able to meet the required debt service coverage ratio.

The ST3 estimate for federal grants (9 percent of total revenues) is greater than the estimate for federal grants under the ST2 program (6.9 percent of total revenues). However, Sound Transit has been able to secure federal grants for the ST2 program at an 18 percent rate to date. Given Sound Transit's historic success in securing federal funds, and the size of the proposed program, this assumption appears reasonable.

The financial plan does not include any revenues from third parties. The Panel has commented in its letters that other funding sources should be pursued, such as when a local jurisdiction desires Sound Transit to enhance or alter its proposed facilities. However, it is appropriate to not include those other funding sources in the Financial Plan until agreements are in hand.

The Panel spent considerable time reviewing Sound Transit's calculation of the typical cost per household for residents within the Sound Transit service area. We stated in our June 20, 2016, letter that, "*Best practices suggests that clear, meaningful information should be provided to voters about the proposed ST3 taxes.*" In this regard the Panel suggested several modifications to the description of the typical cost per household. We said that all materials should be very clear that the ST3 measure includes a combination of new taxes and a continuation of taxes approved as part of the Sound Move and ST2 measures. This information is included in the ST3 finance plan, and has now been incorporated in documents and information Sound Transit has supplied to voters. We suggested that the cost per household numbers be updated to reflect

more recent data regarding property tax assessed values, MVET revenues, and household incomes (which impact the estimated sales tax that each household pays). Sound Transit updated each of those estimates, which resulted in a decrease in the estimated typical cost per household from \$203 per year to \$169 per year.

The Panel also suggested that Sound Transit provide tables and other figures so voters could calculate their own estimated annual tax burden from these additional taxes. Sound Transit staff responded to the Panel that they would create an online calculator for that purpose. The calculator was posted on the Sound Transit web site in late August.

State law (RCW 81.104.130) states that, “Agencies providing high-capacity transportation service shall determine optimal debt-to-equity ratios” Sound Transit’s calculated debt-to-equity ratio reaches a maximum of 30 percent in 2036, and declines after that.

Lastly, the Panel requested data regarding the combined ST2 and ST3 cash flows. This was one method for examining the level of activity that will be required to implement the ST3 program and complete the ST2 program. See below for comments about the agency’s project delivery capacity.

E. Evaluation Methodology

The evaluation methodology used by Sound Transit to determine draft and final priority projects included several elements: core priorities established by the Sound Transit Board, and a two-step evaluation methodology that included criteria for project-level evaluation of individual projects (Step 1) and criteria for evaluation of system-level or a package of projects (Step 2).

The Board’s core priorities included the following:

- Complete the light rail spine
- Increase ridership
- Connect the region’s designated centers with high-capacity transit
- Promote transit-friendly land uses and supportive TOD
- Advance “Logical Next Steps” projects beyond the spine, within financial capacity
- Promote socioeconomic equity
- Integrate with other transit operators/transportation systems
- Improve multi-modal access.

These priorities were used by the staff and Board to create an initial Draft Priority Projects list. This list was circulated for public comment, and in August of 2015 the Sound Transit Board identified 74 candidate projects for further analysis—64 individual projects in the north, central, east and south regions, and 10 region-wide projects. From this list the Board directed staff to prepare project scopes and templates for 65 projects to complete the Step 1 evaluation, including some projects with multiple options (e.g., the Lynnwood to Everett Light Rail project had five alternatives). The project scopes included descriptions of key project elements, utility

needs, right-of-way and property acquisition needs, potential permits needed, project dependencies, potential partners, and outstanding risks and issues.

Both the written scopes and the project templates incorporated the Board's core priorities, and also included the following criteria for the project level evaluation:

- Part of the regional light rail spine
- Ridership (Daily project riders)
- Capital cost
- Annual O&M cost
- Travel time
- Reliability
- System integration
- Ease of non-motorized access
- Percent of non-motorized access
- Connection to PSRC-designated regional centers
- Land use and development/TOD potential
- Socio-economic benefits.

The templates enabled the public and the Board to review how each project compared on the list of evaluation criteria.

From this list of individual projects the Board created a Draft System Plan, identifying projects to be included in a potential ballot measure. The Step 2 evaluation was completed on this collection of projects. The evaluation included the same criteria as listed above, plus consideration of customer experience, environmental effects and public support. The ridership forecasting at the system level included estimates of daily project riders for each corridor in 2040. In addition, the Step 2 evaluation included development of financing assumptions and financial scenarios for the Draft System Plan.

During the course of our review, the Panel provided multiple comments about the evaluation methodology. In August of 2015 the Panel wrote, *"We suggest that the Board consider including evaluation criteria that measure cost effectiveness, such as cost per rider and cost per new rider."* Our letter went on to suggest that Sound Transit *"look for opportunities to make the evaluation criteria more quantitative, with an understanding that there is also a need for a good balance between the qualitative and quantitative measures."* In our letter of January 21, 2016, we also said that we would like to see a *"travel time comparison between proposed light rail projects, and current and future auto travel times, and current and future transit travel times"*

Sound Transit responded to these suggestions in several ways. They did include more quantitative analysis for several of the criteria listed above. They also provided highway travel time comparisons between current conditions, and 2040 with an ST3 build-out and without an ST3 build-out, for general purpose and HOV lanes. With regard to the Panel's suggestion to

include cost effectiveness measures in the evaluation methodology, Sound Transit stated in October 2015 that they intended to present cost per rider data at the corridor level once the system plan had been developed. The Panel saw that analysis at our final meeting in June 2016. However, the cost-per-rider and cost-per-new-rider data were not available to the Board at the time it was making decisions on which projects to include in the final system plan submitted to voters. In our letter of June 20, 2016, we stated:

The Panel believes that cost effectiveness metrics are a useful part of the analysis that should be considered as project decisions are made. The Panel would encourage the Board to include cost effectiveness measures (these two or others) as part of the analysis of alternatives that will be conducted during the ST3 environmental review process for the projects. As we have stated previously, we are not suggesting that cost effectiveness measures become the sole basis for decision making, but they should be included in the Board's discussions.

F. Benefit-Cost Analysis

Sound Transit prepared a report in August 2015 describing the methodology they intended to use to conduct a benefit-cost analysis on the system plan to be submitted to the voters. At our meeting in June 2016 we reviewed a letter from the PSRC indicating that they found the methodology to be appropriate and consistent with industry standards.

Sound Transit issued a report on September 1, 2016, describing the results of the benefit-cost analysis for the system plan adopted by the Board in June. The projected benefit-cost ratio for the proposal is 1.12. This report was issued after the Panel completed its final meeting but it was reviewed by several Panel members.

Benefit-cost analysis is a widely used tool to assess the benefits and returns associated with large-scale capital projects. It frequently receives great attention and is intensely scrutinized and criticized. This stems from the fact that there is no universally accepted means of analysis. The core problem is that many benefits cannot be monetized to widespread acceptance. Potential monetary benefits such as positive health outcomes, lives saved and the value of time, can be subjects of disagreement.

Nevertheless it is useful to perform an analysis using accepted scholarly practices and report the findings, even if not all transportation realities can be accurately captured. The ST3 benefit-cost analysis reports that over half of the benefits accrue to the transit users and also a high proportion of benefits accrue to highway users. Four percent is due to improved highway travel-time reliability. Environmental and health benefits are not reported separately and apparently account for less than one percent. Further there may well be other transit benefits that are not included, such as: (1) the economic benefits that accrue from companies seeking to relocate in an urban area where high-quality public transit is available; (2) improvements in the quality of life; and (3) reduced stress.

Among the most critical elements in the analyses are the values of time (VOT). As the ST2 Expert Review Panel observed, “Much of the benefit in this ratio may be traced to the value of an hour of travel time and the corresponding changes in travel times experienced by users of the transportation system. The use of 50 percent and 60 percent of the region’s average hourly wage as the value of time for off-peak and peak travel respectively may overstate the benefits. While this does not deviate from the approach used by other analogous studies, it may well be high. There is evidence in the literature that the value of time (that is, the benefit actually accruing to a new rider) is lower.” Nevertheless, the value of peak travel time is marginally higher in the ST3 benefit-cost analysis. While this seems to be at the high end of a reasonable VOT estimate, the use of wage increases of 1.2 percent in the analysis may be low and counteract the high VOT. In the recent Bureau of Labor Statistics wage and employment release for King County, employment is up 3.6 percent and wages increased 5.1 percent (March 2015 to March 2016). This is but one point in time but it underscores the challenges inherent in the analysis.

Further, we echo the ST2 Panel comments: “we believe that it is prudent for Sound Transit not to use the results of the benefit cost analysis as ‘the’ measure of return on investment, but rather as a best estimate of a plausible outcome.” In this regard we find the analysis to be sound and one that follows the current state of industry best practices.

Conclusion: Sound Transit has met its requirements for development of methodologies, detailing assumptions and methods used for ST3 plan development. The Panel has encouraged the Sound Transit Board to utilize cost effectiveness measures when it analyzes alternatives as part of its project decision making process.

IV. REQUIRED ELEMENTS OF A SYSTEM PLAN

RCW 81.104.100 requires that any high-capacity transportation plan submitted to the voters must address various requirements. On June 22, 2016, the Sound Transit Board adopted its ST3 final plan and its appendices, entitled *Sound Transit 3: The Regional Transit System Plan for Central Puget Sound*, which provides information about each of these requirements.

A. Level and Types of High-Capacity Transportation Services to be Provided

The ST3 plan documents approved by the Sound Transit Board in June 2016, and available on the agency’s web site, provide descriptions of the type of high-capacity transit services that are included in the ballot measure, and how service would expand from the Sound Move and ST2 programs. These include light rail, bus rapid transit, express bus service, and commuter rail. Descriptions of the type of services can be found in *Sound Transit 3: The Regional Transit System Plan for Central Puget Sound*, pages 6 – 9, and in Appendix A of that plan.

The ST3 levels of service are described in the final plan Appendix C. For light rail “the planned peak-hour headways are between three and six minutes in each direction.” The Appendix also

states that “typical light rail frequencies on all lines in 2040 will be at least every 10 minutes, with service more often during peak commute times.”

For ST3 BRT, Appendix C states that the new service “will serve customers approximately every 10 minutes in the peak period and every 15 minutes off-peak.” For the I-405 BRT project it is anticipated that buses will operate in express toll lanes managed by the Washington State Department of Transportation (WSDOT). The ST3 system plan document states that it is anticipated that BRT service will “operate at 45 miles per hour or greater at least 90 percent of the time during peak hour commute.” Anticipated service speeds are not provided for BRT on SR-522, which will operate using Business Access Transit (BAT) lanes, or on SR-518, which will operate mostly on exclusive right-of-way.

For express bus service the plan states that “ST Express operates frequent, all-day bus service on major corridors between centers, with half-hour headways or better, from about 6 a.m. or earlier until about 10 p.m.”

For ST3 commuter rail services, Appendix C states that program funding will “extend Sounder commuter rail service during peak hours from Lakewood to new stations in Tillicum and DuPont,” expand platforms to accommodate trains up to 10 cars, and provide additional parking at stations. The plan also states that “Sound Transit will negotiate with Burlington Northern Santa Fe and affected organizations for additional trips to serve growing ridership along the Sounder south line, within available financial resources.” The plan does not provide anticipated levels of service if those negotiations are successful.

Appendix C also provides estimates of travel times and transfers between selected regional centers, comparing existing transit times with projected 2040 transit times with and without ST3 projects.

B. A Plan for High-Occupancy Vehicle Lanes to be Constructed

The ST3 plan does not include projects for the construction of HOV lanes. However, the BRT projects on I-405 and SR-522 will operate in HOV or BAT lanes, and several new inline freeway bus stations are planned as part of ST3, which will allow buses to load and unload passengers in the freeway right-of-way. These BRT stations are planned for NE 85th St. and NE 44th St. in Renton. The ST3 system plan document also states that “Sound Transit will coordinate with WSDOT regarding implementation of the I-405 Master Plan, including additional capital projects to improve bus speed and reliability for high-capacity transit service, should funding become available.”

There also is a bus-on-shoulder program included in the ST3 plan, with possible shoulder improvements to I-5, I-405, I-90, SR-522, and SR-167 that would allow BRT to use these shoulders. (See Sound Transit 3, the Regional Transit System Plan for Central Puget Sound, the Sound Transit Plan, Bus Rapid Transit (BRT), page 6.)

C. Identification of Route Alignments and Station Locations with Sufficient Specificity to Permit Calculation of Costs, Ridership, and System Impacts

The ST3 system plan (see Appendix A) includes a map indicating anticipated route alignments and station locations. The project scope narratives, described earlier, provide sufficient detail to create credible capital and operating cost estimates, ridership forecasts, and analysis of system impacts. However, as noted earlier, the route alignments and station locations are “representative” at this stage of planning. Most of the projects are at less than 1 percent design, and for most, no environmental review has been completed. Through the course of the environmental review process, including alternatives analysis, route alignments and station locations may change from the proposed ST3 plan. For both the Sound Move and ST2 programs, there were several changes in route or station location as a result of the planning/design processes and the environmental review. Sound Transit retains the authority to modify route alignments and station locations if costs, unforeseen difficulties, ridership or system impacts warrant such modifications.

The ST3 program, unlike the ST2 program, includes two provisional light rail stations: the Lakemont station in East King County, and the SR99/Airport Road station in Snohomish County. The ST3 system plan states that “provisional stations will be built if additional funding becomes available from grants, cost savings, additional subarea tax revenue or financial capacity, or contributions from other parties not currently assumed in the financial plan.”

D. Performance Characteristics of Technologies

Appendix C for the ST3 system plan describes the performance characteristics by mode. We have summarized those descriptions above in Section A above, regarding level and type of high-capacity services. The Panel believes the anticipated performance characteristics by mode are reasonable and consistent with good industry practice.

In addition, ST3 services are described as “operating principally on exclusive rights-of-way and providing a substantially higher level of passenger capacity, speed and service frequency than public transit operating on highways and city streets in mixed traffic.” Appendix C also states that the ST3 system plan connects “nearly all the major cities in King, Pierce and Snohomish Counties with light rail, Bus Rapid Transit (BRT), express bus, and commuter rail.”

E. Patronage Forecasts

The ST3 plan adopted by the Sound Transit Board provides ridership estimates (Appendix C) for the system as a whole, with daily and annual estimates for transit trips (“a completed journey made by a person from an origin to a destination”) and for transit boardings (“when a passenger steps into any transit vehicle”). These daily and annual estimates for the entire system are for 2014 ridership, 2040 ridership without ST3 build-out, and 2040 ridership with ST3 build-out. The plan also provides ridership estimates by mode: for light rail, commuter rail, BRT and express bus services. Similarly, for each mode there is an estimate of 2014 ridership,

2040 ridership without ST3 build-out, and 2040 ridership with ST3 build-out. The ST3 plan does not include ridership estimates for specific projects within the system plan. However, those estimates were provided at an earlier stage of planning and the Panel reviewed those project ridership estimates and stated that they were consistent with sound industry practices.

F. **Financing Plan**

State law requires the financing plan to describe the following: the phasing of investments; capital and operating costs and expected revenues; cost-effectiveness represented by a total cost per system rider and new rider estimates; estimated ridership and the cost of service for each individual high-capacity line; identification of the operating revenue to operating expense ratio; and specifically to differentiate the proposed use of funds between high-capacity transportation facilities and services, and high occupancy vehicle facilities. This letter has already provided the Panel's detailed comments on the ST3 Financial Plan and addressed some of the issues described above. The following provides additional comments on the topics not covered previously.

Phasing of investments – Sound Transit will provide the ST3 projects and facilities staggered over a 25-year period. The ST3 plan describes the completion dates for all of the projects included in the system plan. The initial phase of development is being referred to as “Early Deliverables.” Projects included in that stage are expected to be completed between 2019 and 2025. These projects include a number of express bus or BRT enhancements, including: bus-on-shoulder express bus services; improvements to King County Metro’s RapidRide C and D bus lines and development of a Madison Street BRT route in Seattle; improvements for bus operations on Pacific Avenue/SR7 in Pierce County and in East Pierce County; express bus service between Lakewood and Tacoma Dome Station; a park-and-ride facility in North Sammamish; and BRT projects on I-405, SR 518, and on SR 522 and NE 145th in King County. Parking expansion at the Edmonds and Mukilteo Sounders stations is also included as an early deliverable.

The ST3 light rail projects are phased to open in the following years:

- 2024 - Extensions from Redmond Technology Center/Overlake to downtown Redmond and from Kent/Des Moines to Federal Way
- 2030 - Extensions from Federal Way to Tacoma and from downtown Seattle to West Seattle
- 2031 - Infill stations at S. Boeing Access Road, S. Graham Street, and NE 130th St. in Seattle
- 2035 - An extension from downtown Seattle to Ballard
- 2036 - Extension from Lynnwood to Everett
- 2039 - Extension of Tacoma Link to Tacoma Community College
- 2041 - Extensions from Bellevue to South Kirkland and to Issaquah.

Sounder capital improvements are scheduled between 2024 and 2036, and the extension of Sounder service from Lakewood to DuPont is scheduled for 2036.

In addition to the descriptions of phasing in the ST3 plan, the Panel identified project delivery and staff capacity issues as an important topic for exploration with Sound Transit officials. We also examined the anticipated cash flow and levels of capital spending for Sound Move, ST2 and ST3 revenues. We looked at timelines for all remaining major ST2 light rail projects and the proposed ST3 projects. The timelines were broken into phases of activity (planning and preliminary engineering, final design, construction, and systems testing prior to opening) in order to examine the overlap between all of the projects.

In the early years of the ST3 program there will be as many as nine major ST2 and ST3 projects under construction simultaneously. This raised a number of questions for the Panel. In our April 26 letter we raised questions about the assumptions regarding the “*necessary staff and consultant expertise to support such an aggressive design and construction agenda . . .*” The letter went on to say that, “*the Panel is concerned about the supply of qualified construction contractors available to accomplish general construction, structures, track work, systems and station work in a timely manner.*” In our June 1 letter we provided the following suggestion:

Panel members believe there is an opportunity to work in partnership with higher education institutions and skilled labor unions to develop joint programs to increase the local labor pool. Sound Transit should be developing partnerships that would create opportunities for young people to train for construction jobs.

At our June 6 meeting Sound Transit CEO Rogoff presented the agency’s plans for addressing the challenges presented by such a large capital program. In our letter of June 20, 2016, we concluded that:

In several of our previous letters we have raised questions about how Sound Transit is planning to manage the unprecedented level of work that will be required to complete ST2 and ST3 projects. We have asked questions about internal capacity, contractor and consultant availability, and the supply of the local labor pool. The Panel received a briefing on the work Sound Transit is doing to ensure that it can deliver projects on the schedules proposed as part of the ST3 plan. The Panel believes the overall project schedule is aggressive, but that Sound Transit outlined a comprehensive set of actions to address both internal and external workforce issues.

Creating the internal and external capacity to deliver projects on time and on budget will be a challenge for the combined ST2 and ST3 programs. It should be monitored closely by the Sound Transit Board.

Cost effectiveness represented by a total cost per system rider and new rider estimates – Appendix C of the ST3 plan includes estimates for the cost per ST3 system rider and the cost per new system rider. Each estimate is provided as a range, with a cost assuming 2040 high ridership and a cost assuming 2040 low ridership. In addition, the estimates for all system riders and for new riders include a cost per rider for ST3 transit operations and for ST3 capital expenditures. The estimated cost per ST3 system rider for transit operations ranges from \$3.50 per rider (high ridership estimate) to \$4.34 per rider (low ridership). The estimated cost per ST3

system rider for the capital expenditures ranges from \$10.02 to \$12.42. For new system riders the estimated cost per rider for ST3 transit operations ranges from \$13.56 to \$17.13. The estimated cost per new rider for ST3 capital expenditures ranges from \$38.83 to \$49.05. Appendix C was completed after the Panel's final meeting. We did not review or comment on the methodology used to develop the cost effectiveness estimates.

Estimated ridership and the cost of service for each individual high-capacity line – Appendix C of the ST3 plan includes 2040 ridership projections for each of the individual light rail and BRT lines proposed in ST3, and the annual operating costs for each of the lines. As mentioned previously, the Panel reviewed the methodologies used by Sound Transit to estimate project ridership, and the annual operation and maintenance costs, and found both methodologies to be consistent with sound industry practice.

Identification of the operating revenue to operating expense ratio – Also in Appendix C are projections for operating revenue to operating expense ratio. These estimates are provided by mode. The estimates for each mode include the total operating cost in 2041, the fare recovery in 2041, and the resulting operating revenue/operating expense ratio. The projected 2041 operating revenue/operating expense ratio for each mode are as follows: commuter rail (25 percent), light rail (38 percent), regional express bus (19 percent) and BRT (28 percent). The future fare structure is assumed consistent with the current practice.

G. Relationship Between High-Capacity Transportation System Plan and Adopted Land Use Plans

In late August 2016 Sound Transit completed the “PSRC Conformity Report. System Plan Development (ST3) – Conformity with Puget Sound Regional Council (PSRC) Plans.” In that document Sound Transit includes the Transit Plan Reporting Tool (Appendix A) developed by PSRC, which describes how the ST3 plan conforms with the adopted regional urban growth management plan (VISION 2040) and the adopted regional long-range transportation plan (Transportation 2040). The conformity report also includes the Partner Implementation Status Report (Appendix B), which describes how the ST3 plan conforms with the PSRC Growing Transit Communities (GTC) Strategy. As mentioned earlier in this letter, on September 22, 2016, the PSRC Executive Board found that the ST3 System Plan is in conformance with the regional plans (VISION 2040 and Transportation 2040), and with the region's transit-oriented development plan (Growing Transit Communities Strategy).

In addition, Appendix D of the ST3 plan includes a description of how the plan is integrated with the regional land use plan. This is particularly important in evaluating the ST3 ridership estimates. As stated in our January 2016 letter, “*the ST3 project ridership forecasts are highly dependent on the volume and location of population and employment growth being estimated.*” The Vision 2040 plan calls for concentrating growth in regional growth centers. By 2040, with the ST3 investments, Sound Transit will provide regional transit services to 39 cities in the three-county area.

H. Assessment of Social, Economic and Environmental Impacts

Appendix D of the ST3 plan describes the plan's social, economic and environmental benefits and impacts. Appendix D was completed after the Panel's final meeting. We did not review and comment on the methodology used to estimate the benefits and costs described.

I. Mobility Characteristics

RCW 81.104.100 requires a high-capacity transportation system plan to address system mobility using a variety of factors, including a qualitative description of system/service philosophy and impacts; qualitative system reliability; travel time and number of transfers between selected residential, employment, and activity centers; and system and activity center mode splits.

In the ST3 plan, Sound Transit provides several qualitative descriptions of the philosophy behind the proposal. For example, the plan introduction states that "The Sound Transit 3 System Plan will improve and expand the regional mass transit system by connecting the major cities in King, Pierce and Snohomish counties with light rail, Bus Rapid Transit (BRT), express bus, and commuter rail." In addition, the introduction to Appendix C states, "Transportation improvements strongly shape the growth, development, quality of life and economic vitality of the region. ST3 proposes improvements that add major new capacity in the region's most congested corridors to help serve the transportation demands of people and businesses here today as well as the more than 800,000 new residents anticipated in the next 25 years."

At our June 2016 meeting we reviewed data regarding transit travel times between selected urban centers. The estimates compared existing transit travel times with 2040 assuming no ST3 build-out, and 2040 with an ST3 build-out. The travel times identify where one bus-to-bus, rail-to-bus, or bus-to-rail transfers are expected. Transfers are expected to take 5 minutes, and are not included in the estimated travel times. Travel time savings range from 7 to 22 minutes in the seven corridors highlighted. The travel times based on transit speeds seemed reasonable, but we encourage Sound Transit to include transfer times in future calculations of travel times once projects become further defined and transfer times can be better estimated.

Appendix C of the plan provides projected system boardings by mode split for 2014, and compares that with 2040 projected annual boardings once the ST3 projects are completed. The plan does not provide anticipated travel times or ridership by activity center, by mode.

In addition to the required elements of a system plan described at the beginning of this section, the Washington State Legislature, in 2015, included two additional requirements for a potential ST3 ballot measure described below under Sections J and K.

J. Transit-Oriented Development and Affordable Housing

The 2015 legislation granting Sound Transit additional voter-approved taxing authority to finance its ST3 plan added various new transit-oriented development requirements for Sound

Transit. Sound Transit has included these new responsibilities, including the funding of \$20 million for a regional revolving loan fund to support development of affordable housing, as part of the Resolution submitting the ST3 plan to voters and in the ST3 plan itself. (Resolution No. R2016-17, Section 1; and Sound Transit 3: The Regional Transit System Plan for Central Puget Sound, Transit-Oriented Development (TOD), pages 12-13.)

The TOD and affordable housing elements of the ST3 plan are also included in Appendix D. It states that the plan includes \$12 million for TOD-related work on specific ST3 capital projects “to support inclusive and collaborative planning for TOD during the transit project planning and development stages.” The text goes on to describe a number of ways in which those TOD funds can be used.

Appendix D also describes the future use of ST3 surplus property. The ST3 plan includes \$20 million “to support TOD program activities with respect to planning and pre-development activities on surplus property, air rights and joint development sites.” Also included in the Appendix is a statement describing the requirement in state law: “a minimum of 80 percent of the surplus property to be disposed or transferred, including air rights, that is suitable for development as housing, will be offered for either transfer at no cost, sale or long-term lease first to ‘qualified entities’ that agree to develop affordable housing on the property, consistent with local land use and zoning laws.”

In our June 1, 2016, letter we also provided comments on the future uses that should be incorporated to insure successful TOD projects. The letter stated:

The members understand the importance of using public assets to support the creation of a diverse housing stock. The Panel believes that creating successful TOD also requires the development of a mixture of residential, retail, and office development. The Panel would encourage Sound Transit to develop TOD policies that allow for mixed-use development, even when affordable housing is being developed.

K. Financing Education Outcomes

The 2015 legislation granting Sound Transit additional, voter-approved, taxing authority also included a major, non-transportation-related requirement for Sound Transit to finance education services within its boundaries if voters approve the ST3 plan and new taxes. Sound Transit includes this non-transportation requirement to finance \$518 million of educational outcomes within its boundaries as part of its ST3 plan. (Sound Transit 3: The Regional Transit System Plan for Central Puget Sound, Sales and Use Tax Offset Fee to Support Educational Outcomes in the Sound Transit District, page 15.) This expenditure of ST3 funds is included in Appendix A, in a table titled, “System-Wide Activities,” as \$518 million for the “Sales and Use Tax Offset Fee.”

<p>Conclusion: Sound Transit has met its requirements for the required elements of a high-capacity transportation system plan.</p>

V. CONCLUSION

We would like to thank the Governor, Washington State Legislature, the Secretary of Transportation and the Sound Transit CEO for our appointment to the ST3 Expert Review Panel. It has been an honor to serve in this capacity. We hope that our work has been helpful for you, the Sound Transit Board, and members of the public. A peer review process such as this provides an important forum for measuring local practices against national and international best practices, and for creating full transparency in the development of a complex proposal.

The Panel would like to thank the staffs from Sound Transit and WSDOT. Throughout the course of our work they were responsive to questions asked by the Panel members, and provided us with good materials and briefings that enabled us to delve into the methodologies and key assumptions being used to prepare the ST3 plan.

Please let us know if you have any additional questions regarding this letter or our work during the past 16 months.

Sincerely,

A handwritten signature in blue ink that reads "Jim Jacobson". The signature is written in a cursive style with a long horizontal stroke at the end.

Jim Jacobson

Chair

Cc: Expert Review Panel members

ST3 Expert Review Panel Membership

	Area of Expertise
Mark Hallenbeck Washington State Transportation Center, Univ. of Washington Director, Washington State Transportation Center	Planning
Susan Haupt Oregon Department of Transportation Chief Environmental Officer and Geo-Environmental Section Manager, Oregon Department of Transportation	Environment
Jim Jacobson Retired Deputy General Manager, King County Metro	Transit Operations
Kimberly Koenig Retired Fiscal Resources Manager, Santa Clara Valley Transportation Authority (VTA)	Finance
William C. Lorenz, PE Retired Director of Engineering, San Diego Metropolitan Transit Development Board	Engineering
Steve Lundin Retired Senior Counsel for Washington State House of Representatives, including staff of the Local Government Committee	Legal and Political Architecture
Dr. Siim Sööt Emeritus, University of Illinois at Chicago. Former Executive Director of the Urban Transportation Center, and President of the Illinois Universities Transportation Research Consortium	Geography
Richard Walker Oregon Metro Modeling and Forecasting Manager, Oregon Metro	Ridership Forecasting
Mark Weed Main Street Equity Partners Managing Member, Main Street Equity Partners	Business/Public