CAMBRIDGE SYSTEMATICS

Statewide Rail Capacity and Needs Study

second interim

report

prepared for

Washington State Transportation Commission

prepared by

Cambridge Systematics, Inc.

with

Berk & Associates, Inc.
Global Insight, Inc.
HDR, Inc.
Starboard Alliance Company
Transit Safety Management
Willard F. Keeney & Associates

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Executive Summary

WHAT IS THE PURPOSE OF THIS INTERIM REPORT?

This report provides draft policies governing State actions and investments in the rail system. It presents a process for assessing whether actions and investments are consistent with the State's policies and for evaluating the benefits and impacts of the actions and investments on rail user groups and Washington State communities.

The Washington Rail Capacity and Needs Study is being conducted in three phases. The findings of the first phase of work were summarized in Interim Report 1; they analyzed the "state of the system" and defined the key issues and opportunities for the State's passenger- and freight-rail system.

The findings of the second phase of work are summarized in this report, Interim Report 2. The findings are reported as work in progress meant to inform early policy deliberations regarding the future role of the State in passenger and freight rail.

In the final phase of the study, policy packages will be evaluated and a recommended project evaluation technique, asset management plan, and rail governance models will be presented.

Interim Report 2 introduces a methodology that could be used by state legislators to determine *if* the State should participate in a particular project, package, or policy, and, if so, *how* the State should participate. The framework contained in this report is a dynamic process that will continue to be refined, elaborated, and finalized during the next phase of the study.

Several general principles shaped the guiding policies and the analytical framework:

- Ensure that the State is participating only in projects that have positive effects on its economy, the environment, or the quality of life of its citizens.
- Ensure that any project, package, or policy selected for state involvement is consistent with both the guiding and sector policy statements.
- Ensure that all beneficiaries are being considered when evaluating the need for state action, and, if appropriate, each beneficiary is paying an appropriate share of the costs of action. A critical principle of the policies is that the State will rarely act alone and that project/action proponents and beneficiaries must have a real stake in a project/action if it is to be undertaken with support from the State.

- Ensure that when evaluating benefits/impacts to the State and other affected parties, that the appropriate benefit/impact categories are established for each group of affected parties/stakeholders.

The benefit/impact evaluation process has three components:

- An assessment of whether the proposed project or action is consistent with the State's guiding, sector, and program policies.
- An evaluation of benefits/impacts to the State, passengers and shippers as rail users, railroads, and communities. Benefits/impacts from the State's perspective are determined by a quantitative benefit/cost calculation (based on consideration of public benefits and costs) and a qualitative assessment that takes into account other key features of the project that may influence public decision-making. Benefits/impacts for the other three stakeholder groups are determined by qualitatively evaluating the variables deemed most important to each group.
- A comparison of the benefits across the four stakeholder groups (the State, passengers/shippers, railroads, and communities) to determine the appropriate level of state involvement and the level of support expected from other stakeholders.

Figure 1.1 offers a simplified sketch of the results of the benefits/impacts evaluation process. The qualitative nature of this comparison is an excellent decision-making tool because it provides state decision-makers with accurate and important information, but does not attempt to weight the benefit categories. It is a flexible tool that allows state decision-makers to assess actions on a case-by-case basis, and to weight those variables which they deem most important in any particular case.

Figure 1.1 Cross User-Group Benefit/Impact Methodology

Benefit Evaluation Cross-User Group Comparison						
Proposed Action	WA State	Passengers/ Shippers	Railroads	Communities	Likely Recommendation	Level of Action
A	High	High	High	High	State should participate, but only if other beneficiaries contribute appropriate share	Consider direct investment and supporting legal and institutional mechanisms
B	High	Low	Low	High	State should participate and be prepared to contribute more than other groups	Consider direct investment and supporting legal and institutional mechanisms
C	Medium	Medium	Medium	Medium	State should participate with caution- and only if costs to do so are low	Consider tax exempt financing loans or other methods that have limited costs to state but benefit private industry
D	Low	High	High	Low	State should probably not participate	State should probably not participate with financial, institutional, or legal mechanisms
E	Low	Low	Low	Low	State should probably not participate	State should probably not participate with financial, institutional, or legal mechanisms

FINDINGS OF INTERIM REPORT 2

Guiding, sector, and program policies express what the State hopes to achieve through action in the passenger and freight rail system. Any proposal for state action must be evaluated for consistency with these policies. Each level of decision-making is guided by a separate and specific set of policy statements. At the guiding level, the policy statements are overarching and broad. They embody the State's approach to participation in the private sector rail system. The sector policies acknowledge the current primary user groups in Washington State, including ports and international trade, industry, agriculture, and passenger rail. The sector policy statements set the goals for what the State hopes to achieve for each of these groups through an efficient and cost-effective rail system. The sector policies are based on the Interim Report 1 findings, which suggested that the State's economy and transportation system would benefit if current users maintain or expand their use of rail. Finally, program statements are specific, targeted statements that suggest the set of solutions that might be acceptable to the State in implementing projects or actions. A proposed project or action should be consistent with the guiding, sector, and program policies to qualify it to move forward in the benefit evaluation criteria.

The benefit evaluation processes used by other states and organizations offers some guidance for a benefit evaluation process for Washington State. Several other states and organizations, including Florida, Tennessee, and FMSIB, have established methodologies by which to evaluate rail projects for public sector involvement. Development of the Washington State benefit/impact evaluation process included a review of the decision-making criteria, the variables used in the evaluations, and the framework for assessing each action that have been adopted by these other states. This review contributed to a consistent definition of what constitutes public benefits, provided examples of generally accepted and relatively simple approaches to measuring benefits, and gave examples of approaches that included qualitative as well as quantitative assessment methodologies. A clear finding of the review was that the process for evaluating Washington State rail actions should be relatively simple to execute and should focus on a modest number of critical benefit categories so that the results of the evaluation can be communicated easily to decision-makers and the general public.

Every project, package, or policy under consideration must be reviewed through the lens of each of the four different key stakeholder groups. This is a key feature of the benefit/impact evaluation methodology proposed for Washington State that distinguishes it from those of other states that were reviewed for this study. Every action of the State in the rail sector will affect a wide variety of stakeholders. The degree to which an action benefits other stakeholders besides the State should be an important indicator of the degree of required participation by these other parties. The action will offer benefits and disbenefits to the State, to the rail carriers (Class I and short lines), to passengers/shippers (depending whether it is a passenger or freight rail action), and to communities in which the action will be taken or through which the rail service

will operate. Each of these four stakeholder groups will be affected in different ways by an action; therefore each must have its own set of variables by which to gauge the magnitude of the effect (either positive or negative). The variables recommended in this report were developed with the assistance of the Technical Review Panel experts assembled for this study.

The benefit/impact evaluation methodology provides for a comprehensive evaluation of public benefits to the State that includes both quantitative and qualitative benefit measures. The result is summarized and then compared to benefits/impacts for other stakeholders that are measured using a simpler, more qualitative approach. Benefits to the State from a particular action are calculated using several tools, including a public benefit/cost calculator and a set of associated qualitative questions. It is a fairly robust process that considers many variables and quantitative measures. The process for assessing benefits to the passengers/shippers, railroads, and communities is much simpler, focusing on "a few good measures." Evaluating a few measures focuses the methodology on those factors that are most important to other stakeholders when they consider their participation in a project/action. Taking a more qualitative approach to evaluating these measures recognizes the potential difficulties associated with obtaining proprietary data for more sophisticated quantitative measures.

The methodology presented in this report needs to be refined and tested with some case studies in order to decide if it is the correct approach to take. The tools produced in this report are drafts and will be revised based on feedback and the completion of several case studies. The case studies, along with continuing discussions with the rail study team, will determine if this process is to be the final product for the WA State Rail Capacity and Needs Study.

A general principle of the policies recommended in this report is that free market economics is preferred as the approach to achieving economically efficient outcomes. By economic efficiency, we mean an outcome in which the economy can achieve the highest level of net output and aggregate consumer welfare (i.e., the total benefits to all consumers is as high as it can be). There are many reasons why markets may not deliver this outcome. For example, there are cases where there is limited competition in the marketplace, consumers do not have adequate information about choices in the marketplace, government is already subsidizing one economic sector over another, or businesses do not have access to the capital they need to make profitable investments. In addition, the most economically efficient outcome is not always the most equitable, and there may be compelling political reason to give one economic sector more assistance relative to another in order to "level the playing field." In all of these cases, a public role in the marketplace can be justified.

In order to evaluate policies that involve government intervention in the private marketplace in a way that may appear to give preference to one sector over another, the general approach recommended by this report is to evaluate the net public benefits of government action – i.e., do public benefits as defined in the benefit/cost indicator exceed public costs. Further, we have proposed a set of

sectoral policies that promote the interests of key economic sectors in the state based on input received from the Commission. In making the final decisions about whether or not to adopt the policies recommended in this report, the Commission and the Legislature need to pay careful attention to the potential preferences implied. For example, subsidizing short line services for Eastern Washington agricultural interests may negatively affect trucking businesses. However, when the public cost of road maintenance and the potential loss of business to the state's agricultural sector are taken into account, this policy may still be desirable.

1.0 Summary of Washington State Rail System Major Issues

1.1 SYSTEM ISSUES

Many segments of the rail mainlines in the Washington rail system are at or near capacity. As reported in the Interim Report 1, mainline capacity was determined in a two-step process that first estimated theoretical capacity (that is the maximum density of trains that can operate over a given section of track at the highest speeds authorized), then adjusted the estimates to practical capacity (that is, the fraction of theoretical capacity at which the system can be operated reliably without significant delays). Interim Report 1 found that:

- Current train volumes exceeded practical capacity on the BNSF lines between Everett and Wenatchee (over Stevens Pass), and between Ferndale and the U.S.-Canada border.
- Current train volumes were nearing capacity on the BNSF lines between Seattle and Bellingham; Wenatchee and Spokane; Pasco and Lind; and along the Columbia River Gorge between Vancouver and Wishram.
- Current train volumes were nearing capacity on the UPRR lines along the Columbia River Gorge between Portland and Hinkle; between Hinkle and Spokane; and between Spokane and Sandpoint.

Interim Report 1 and subsequent operational analyses also determined that there are significant bottlenecks in the north-south "I-5" rail corridor between Seattle and Vancouver. These bottlenecks prevent the double-track mainline from operating at its practical capacity. The I-5 bottlenecks are created, in part, by the lack of capacity on the east-west rail corridors, which triggers problems in the north-south I-5 corridor. For example, when trains moving westbound through the Columbia Gorge are delayed, they may miss their window on the I-5 line or their crews may run out of service hours, causing the train to "die" on the I-5 mainline in the vicinity of Vancouver. Problems with track configurations and access into and out of the ports of Portland, Vancouver, Kalama, Longview, Tacoma, and Seattle also contribute to delays and congestion along the I-5 rail corridor.

A final critical bottleneck identified in the Interim Report 1 was the tunnel over Stampede Pass, which has insufficient clearance for double-stack trains.

Demand for rail service from industrial shippers, importers/exporters, agricultural shippers, and passenger-rail riders is growing across Washington State. Each contributes traffic to the Washington rail system and therefore to the capacity and congestion problems of the rail system. It is not the purpose of this study to suggest that any particular source of traffic is more responsible for the

problem than any other. Nonetheless, it is important to understand how each market segment contributes to and is affected by the rail capacity and congestion problems. For example, the recent surge in intermodal traffic, primarily from the Ports of Seattle and Tacoma, has played a major role in the current capacity problems in the Washington rail system. Shortages of locomotives required to power trains over Stevens Pass line have led the BNSF to divert intermodal rail traffic down the I-5 rail corridor into the Columbia River Gorge. The line over Stevens Pass is also approaching its practical capacity. The intermodal trains are considered a "premium" service by the Class I railroads and receive dispatching priority. Growth in traffic of this type in the north-south corridor between Seattle and Tacoma makes the operational bottlenecks in this corridor more problematic for all users.

As another example, the number of intercity passenger and commuter trains operating in the I-5 corridor is growing. Increased frequency of service, relatively higher speeds, and high levels of reliability are critical for these services to achieve their ultimate market potential. Operational bottlenecks that affect these trains have a major impact on their ability to meet service objectives. Even without the growth of intermodal trains in this corridor, growth of carload trains and bulk unit trains (mostly grain exports) has, in concert with the growth in passenger traffic, resulted in more congestion at existing bottlenecks in this corridor.

The railroads are investing to expand rail line capacity and add new equipment, nationally and in the Pacific Northwest. However, both the BNSF and the UPRR have indicated a preference for addressing capacity problems through operational strategies instead of capital expenditures. The railroads argue that they are at their best as a cost-effective transportation mode when they focus on wholesale "hook and haul" services. By handling large volumes over longer distances they can realize economies of scale that keep the cost of individual shipments low. They prefer this approach because it represents less financial risk than expanding mainline infrastructure. Once in place, rail mainline infrastructure must be maintained for decades and cannot be reduced or redeployed to other markets.

The railroads are pursuing a number operational strategies to increase freight "velocity," that is, to increase the volume of freight moved through the system using existing infrastructure. These strategies will have significant impacts on the Washington State rail system. The strategies include:

- Operation of longer trains and higher slot utilization on intermodal trains (e.g., maximizing the number of containers on intermodal flat cars);
- Marketing and operation of single-destination unit trains for carload traffic;
- Consolidation of traffic at central terminals by third parties;
- Elimination of mainline switching wherever possible (i.e., picking up and putting out of individual cars or sets of cars for a specific shippers and receivers while the train is "parked" on the mainline); and

- Transfer of responsibility for branch line switching from the Class I railroads to local short lines wherever possible.

These operating strategies will increase velocity and reduce car cycle times (generating more effective capacity) if certain infrastructure improvements are undertaken. However, they have major implications for Washington State:

- The benefits of longer trains cannot be realized without significant investment in supporting infrastructure. This includes lengthening sidings, building more and longer storage tracks for assembling trains in terminals and yards, and adjusting operations to account for the time it takes longer trains to clear grade crossings and entry and egress locations at terminals. In addition, the use of longer and heavier trains will mean more, and more frequent, track maintenance.
- Significant improvements must be made at yards and at access points from the Ports of Seattle and Tacoma. While many of the terminal capacity and access issues that these ports are experiencing are independent of railroad operations (that is, the bottlenecks will exist without the shift to longer trains), they will be exacerbated by the shift to longer trains, at least as currently contemplated. For example, assembling an 8,000-foot train as opposed to a 6,000-foot train will require longer lead tracks; longer storage tracks; more switching time on the lead tracks to assemble the train; more time to inspect and air-test the readied train; more time to set-out a bad-order car if one is discovered prior to departure; and more time for the train to depart once a signal to enter the mainline is received. Long slow-moving trains may also block at-grade road crossings located near the yard for an inordinate amount of time.
- The inability to use the Stampede Pass corridor for intermodal trains and the growth in container trade through the ports will put increasing pressure on the north-south I-5 rail corridor. This is and will continue to degrade the performance of passenger trains in the corridor as well as UP's ability to serve its intermodal traffic over track shared with the BNSF. Ultimately, this will affect the availability of competitive rail service from the ports and their potential attractiveness to certain ocean carriers.
- Carload shippers who generate small volumes of cargo and who ship small numbers of carloads to many different destinations will find it harder to get service, will find the service increasingly costly, and will see their service receiving the lowest priority of all the cargo that is being moved. This change in priorities has already been felt by Washington's industrial carload shippers and Eastern Washington's agricultural shippers.
- Many shippers of carload traffic, even those generating high volumes, will need to reorganize their rail facilities and operations to bring them more in line with the operating models of the Class I railroad. Many customers are finding that they must change storage track configurations, change the way they build trains, and change how trains are set for pickup and drop off. In

the future, shippers on industrial leads may need to identify opportunities for third-party switching in order to maintain their service.

- Short-line traffic that does not fit the "hook and haul" operating strategy of the Class I railroads will find it increasingly difficult to get cars, get timely service, and get low rates, especially for small shipments. It will take more time and cost more for short lines to service their customers. This may affect the long-term financial viability of some of the short lines. In the past, short lines have often compensated by deferring expensive infrastructure maintenance, particularly on low-density lines. This usually compounds the problem by forcing slower train speed and less reliable services – services that cannot compete effectively against trucking, especially for short-haul shipments. Additional financial pressure on short-line railroads may affect the market share and profitability of agricultural product storage businesses. In the worst cases, the financial pressures might force businesses to relocate or close with a loss of jobs and revenue for the local communities.
- Longer, more frequent trains will create growing conflicts in at-grade crossings throughout the state. Given current traffic patterns, this is expected to be a significant problem along the I-5 corridor. If BNSF crown cuts the Stampede Tunnel, enabling it to route more double-stack intermodal trains over this line, the high traffic flows will be felt in communities from Wenatchee to Yakima through to Kennewick, where there is increasing development.
- Third party operators are interested in providing short-haul services that connect Washington exporters with the ports or other domestic markets. These services would benefit the State by decreasing truck traffic; however, given the current capacity constraints in the system, the availability of train time slots for short-haul services is expected to be extremely limited.
- Railroads are using pricing to turn aside lower-profit carload freight in favor of intermodal and coal traffic, which can be handled more cost-effectively and profitably in bulk unit trains. In some markets and corridors, international intermodal traffic is squeezing out industrial-carload traffic, and even domestic-intermodal traffic. Shippers, who are used to being price setters, are now price takers. This is painful change for all shippers, especially captive shippers, who are being forced to rethink their supply chains and markets. This shift is having a noticeable effect in Washington State and the PNW. The Ports of Seattle and Tacoma are major gateways for intermodal traffic moving to and from the Pacific Rim. The strong growth in intermodal traffic is slowly eroding the railroads' capacity to serve local Washington State and Oregon industrial and agricultural carload traffic.
- The railroads are rerouting traffic. As oil prices have increased, the demand for coal from the Powder River Basin has surged. The Class I railroads have been under strong pressure from electric utilities and politicians to ensure reliable deliveries of coal. The high volume of coal trains moving east out of

the Powder River Basin (PRB) has made it virtually impossible to route time-sensitive intermodal trains moving from PNW ports to central and southeast gateways such as Kansas City and Memphis through the near continuous flow of slow-moving coal trains. Adjusting to this, BNSF has shifted most intermodal traffic destined to locations south of Chicago to the Ports of Los Angeles and Long Beach. All intermodal traffic landing at PNW ports must now move through Chicago. Because of continuing delays in implementing much needed physical plant and infrastructure improvements in the Chicago area rail network, many trains routed through Chicago are penalized up to one to two days.

- The UPRR faces a similar problem. The UPRR's only east-west corridor connecting the PNW with Midwest and Eastern destinations passes directly through the 120 to 140 trains per day (TPD) central-Nebraska coal corridor. To avoid conflict with the coal trains, UPRR now routes their time-sensitive intermodal traffic over their Sunset Corridor, bypassing the large volume of coal trains of the Central Corridor. These routing changes make it more difficult for the Ports of Seattle, Tacoma, Portland, and Vancouver to compete with the Ports of Los Angeles and Long Beach for intermodal traffic destined for central and south-central U.S. and East Coast markets.

The remainder of this section summarizes the major problems in the rail system from the perspective of main user segments. Addressing these problems is the basis for the policies that are proposed in this report.

Port and International Trade

We focus here on international container trade. Bulk cargo exports face their own issues moving through the Ports of Vancouver, Kalama, and Longview as well as through Seattle and Tacoma. Those issues are discussed in a later section focus on freight rail and the agricultural sector.

The Ports of Seattle and Tacoma have experienced tremendous growth in container cargo over the past decade, and the forecasts presented in this study suggest the potential for this growth to continue for the next 20 years. Much of this cargo is discretionary cargo bound for the interior U.S. and points east. This high-volume, long-haul traffic is served most cost-effectively by rail. The ports generate significant economic activity that benefits the State. These benefits were described in the first interim report.

In the near-term, the throughput capacity of the ports is hampered by a number of issues including rail-terminal capacity constraints and bottlenecks accessing the mainlines from the port terminals. The key problems are:

- Intermodal capacity constraints at the Port of Seattle caused by short stub-ended intermodal tracks; short arrival and departure tracks; short switching leads crossing busy streets at-grade; low-speed train movements; short staging tracks; limited ability to move cars between intermodal and staging yards; and dense urban development surrounding their facilities.

- Duwamish corridor access constraints to the Port of Seattle
- Terminal access problems at the Port of Tacoma through the Tideflats, most notably the current configuration of Bullfrog and Chilcote Junctions as well as the lack of direct northbound access to the BNSF's mainline at Reservation Junction.
- Capacity bottlenecks on the mainlines between Everett and Tacoma, especially the bottleneck associated with the double-track Seattle Tunnel, which is located just north of King Street Station in downtown Seattle.

In the longer term, the lack of intermodal capacity in the east-west mainline corridors is likely to be the most significant constraint to growth facing the port and international trade sector. The current routing options are limited by capacity over Stevens Pass. Running times between sidings between Skyhomish and Leavenworth over Stevens Pass will continue to limit capacity on this line even if the ventilation is improved in the tunnel. As intermodal traffic demand grows, the railroads will divert more traffic into the north-south I-5 corridor to get to the Columbia River Gorge. Sidings along the Gorge routes do have sufficient length at a sufficient number of locations to accommodate 8,000-foot trains. Opening up Stampede Pass to intermodal traffic and implementing directional running by pairing the Stevens Pass and Stampede Pass lines may be effective strategies to address the needs of the ports to move intermodal traffic.

Agriculture and Food Products

The three major components of this market sector are: Midwest grain exporters; Washington agricultural shippers using the Columbia River and Puget Sound ports to export products to international and domestic U.S. markets; and the food products industry, especially the growing wine industry of the Columbia Valley. Rail traffic in this market sector is dominated by unit trains serving Midwest grain exporters using the Columbia River and Puget Sound ports. The Class I railroads have also been encouraging Washington State grain and other bulk agricultural shippers to consolidate shipping points so that the railroads can operate more unit trains. Notable examples of this trend are the Ritzville loading facility and the new Rail Ex service. Both of these examples involve third parties, which assemble shipments from a number of business, then assemble them at a central location before handing them over to the Class I railroads for the long-haul move.

Specific problems on the primary agricultural products routes through the State that affect all shippers that use these lines include:

- Short sidings that cannot accommodate longer trains, and inadequate siding spacings or sidings that require trains to slow down when entering them on the BNSF Columbia River Gorge route. These capacity constraints create operational problems downstream by causing westbound trains to miss schedule windows when they move through the Portland/Vancouver Triangle and into the I-5 rail corridor. There is also limited capacity on the UPRR line

between Wallula and Sandpoint, Idaho caused by inadequate siding lengths and spacing along the line.

- Low-speed trains moving through Portland/Vancouver area block Portland-Seattle trains, including passenger rail trains, for long period. Likewise, trains stopping on the mainline outside Vancouver to change crews block the mainline tracks and significantly reduce effective throughput capacity of the I-5 corridor. The problems are compounded track configuration problems through Vancouver and Portland area that cause trains to block mainline movements and reduce effective capacity.
- Limited access to the grain elevators, lack of long industrial tracks adjacent to the mainline, and limited yard and unloading track capacity at Kalama and Longview require trains to stop on the main tracks for extended periods.
- At Centralia, BNSF currently interchanges trains (changes crews) with the Puget Sound and Pacific Railroad on the BNSF mainline. Movement to and from the mainline is restricted to 10 mph, blocking one of the two main tracks and many at-grade road crossings within Centralia for significant periods.
- Short lead tracks at the Port of Seattle's Cargill grain elevator require trains to block a main track when arriving or departing the grain elevator.

There are also problems that within-state agricultural shippers face that are unique to their situation. Historically, many Washington agricultural shippers, particularly grain shippers, have moved their products to elevators and storage facilities that were built adjacent rural branch lines, most of which are today operated by short lines. The storage facilities and the short lines have developed relationships that rely on the financial health of both entities. Many of these short lines have not generated enough revenue to maintenance their tracks. As track is downgraded, safe operating speeds decline, and the service that shippers receive no longer meets their needs. Those who can, shift to truck, transferring their product to another storage location where they receive better rail service. Over time, this has undermined the financial viability of the storage facilities on low-density short lines as well as the short lines themselves. The problem has been exacerbated by the changing business model of the Class I's, which favors unit train operations, and the growth in other more profitable intermodal traffic that uses the available mainline capacity. In the long run, shippers need viable transportation options to stay competitive and stay in business. This may include rail, but in some cases it may involve shifts to truck or barge. In considering cases where preservation of rail service is desirable, the State may wish to consider actions that help rationalize the short-line system, improving overall operations and velocity, keeping costs down, and minimizing the amount of additional truck traffic.

Industrial Carload Shippers

The industrial carload market segment was the mainstay of the rail business until the development of intermodal service and bulk unit-train services. It is still a

large market for the railroads nationally and in the PNW, especially for the UPRR. In Washington State, there are businesses throughout the state that are located along the mainlines and along industrial leads and spurs that rely on traditional carload rail service because of the nature of the commodities they ship and the markets they are trying to reach. Many of these are low-volume shippers, but high-volume shippers are experiencing some of the same service issues and problems as low-volume shippers. Even when shippers generate high volumes of traffic, destination management is an issue. Moving dozens of carloads out of Washington State to a single Midwest or East Coast destination for a high-volume shipper is cost-effective and profitable for a Class I railroad; but moving dozens of carloads out of Washington State to a many Midwest or East Coast destinations may be less cost-effective and profitable.

In general, the industrial carload market in Washington will experience healthy growth in the next decades. Interviews with shippers conducted during the first phase of the study indicate that most shippers expect their businesses and volume of freight shipments to grow, and freight forecasts prepared for this study show growth in this market. However, many of these shippers report that they are paying higher prices, are getting lower quality service, and are often having business turned away. These shippers substitute truck for rail when they can, but for shippers of bulky semifinished products or primary materials, trucking may not be feasible or cost-effective. In the longer term, there is a risk that Washington State will lose some of these businesses to relocation or closure.

If industrial carload shippers want to continue to use rail, they may need to reorganize their rail facilities or make arrangements to consolidate their shipments with those of other rail shippers. Many shippers, even those with high traffic volumes, have track configurations at their plants and warehouses that are not compatible with the Class I railroads preferred, high-volume, hook-and-haul operations. For example, their storage track configurations may not allow for efficient switching of cars to and from the mainline. The Class I railroads are pushing shippers, wherever possible, to reorganize and upgrade their tracks and track layout to improve switching efficiency.

Where track configurations cannot be changed or upgrades are not cost-effective, a second option may be for the shipper to arrange with a third-part switching railroad to move cars from the shipper's location to the nearest rail consolidation terminal.

A third option is to move industrial shippers into new or existing rail-served industrial parks where carload lots from a number of businesses can be combined into a wholesale-sized consist. Rebuilding track and relocating businesses is costly, and many Washington State industries will require outside financial assistance to make these changes.

A fourth option is to use transload centers. This works well for shippers who send and receive freight in less-than-carload quantities and can ferry their commodities between a railyard and their plant by truck. Lumber, plastic pellets,

feed, and some chemical products can be handled cost-effectively through transload centers. However, both consolidation and transload centers must be located and designed with sufficient storage and siding track so that pick-up and put-out operations do not block the mainline. Again, the costs of these facilities is high, they need a strong business plan to ensure that they can generate sufficient revenues, and none are feasible if the railroads cannot keep pace with economic growth and handle the freight across the PNW and the U.S.

A related problem facing the industrial carload market is yard capacity. As the railroads move to longer trains, cars spend more time in the yard because there are less frequent trains to haul them out. This creates yard congestion, increases shipping time, may dramatically increase car-hire costs, and can decrease pick-up and delivery reliability. Yards with short switching leads and inadequate arrival/departure track lengths – like individual industry sidings – will contribute to congestion on the mainline because the longer trains must occupy the mainline track for more time.

The final problem facing smaller carload shippers is simple competition for rail service. In a wholesale, hook-and-haul railroad world, smaller carload shippers will be competing against larger, lower-cost shippers for the railroad's limited supply of capacity, power, crews, and railcars. Likewise, smaller switching services, connecting shippers to consolidation terminals, will be competing with larger switching operations and the Class I railroads themselves for access to limited mainline capacity. This can lead to higher operating costs and a lower quality of service for both small shippers and small switching operators.

Passenger Rail

The passenger rail sector covers both intercity rail and commuter rail. While serving different markets with different service requirements, both intercity and commuter rail require:

- Frequency of service and service at appropriate times of day. The trains need to run when people want to travel and they need to run often when people want to travel.
- High-speed services. Both intercity and commuter rail need to be able to transport passengers at speeds that produce overall travel times that are at least competitive with auto travel. Intercity rail travel times should compete with the local air city-pair service.
- Reliability at an appropriate cost. The trains need to run on time and at a cost, including out-of-pocket cost and the cost of transfer and waiting time, that is commensurate with the frequency, times, speed, and reliability of the service.

Both Sound Transit and the Amtrak services that are provided in the State have developed service and operating plans with these goals in mind. In addition, both have experienced growth in ridership as they have added trains. In the case

of the Cascades service, market studies have shown that if the long-range service objectives can be achieved, ridership will be sufficient to recover all operating costs from the farebox.

Achieving these goals when the passenger trains share track with freight trains is difficult. Passenger and freight rail trains operate at different weights, at different speeds, on different schedules, and with different business constraints. In general, frequent passenger rail service, especially high-speed rail service, requires a large number of relatively wide time-space slots on the mainline (e.g., because of their higher operating speeds, passenger rail trains need more cleared space ahead of them to guarantee safe stopping distances, etc.). The freight railroads, who own the track, are focused on obtaining the maximum benefit from each train time-space slot available and the revenue they receive for providing train slots to the passenger railroads is usually modest. As a result, passenger services are often asked to pay a premium when they contribute to mainline capacity enhancements and the resolution of system bottlenecks.

The bottlenecks and operational problems in the north-south I-5 rail corridor have been well documented. These bottlenecks must be eliminated for the Amtrak Cascades to achieve its service objectives (e.g., Schedule C with eight roundtrips and speeds of 79 mph). It is generally agreed by the passenger and freight rail operators that these improvements must be made in the short- to medium-term and that the additional capacity will benefit all users of the I-5 rail corridor – passenger and freight. But as the Amtrak service moves towards a truly high-speed and reliable service, the improvements will increasingly be for the benefit of the passenger system only. And the demand for passenger service is likely to grow in the short-term, as a result of rising fuel costs and freeway congestion. In examining the potential benefits to the State of supporting passenger rail programs, it will be important to take into account the environmental benefits, the congestion benefits, and the investments already made in the rail system and the highways.

2.0 What Conditions Justify State Action?

One of the fundamental questions to be answered in the Washington Statewide Rail Capacity and Needs Study is "What conditions justify State action?" In more elaborate terms, when do public benefits warrant the participation of the public sector (the State) in a rail system that is owned primarily by the private sector (the railroads)? The following sets of policy statements help to answer this question. They are an expression of the intent of the State to provide public benefits through planning, legal/regulatory action, and investment related to the passenger and freight rail system in the State. In addition, as noted in the "findings" section of this report, a general principle of the policies recommended here is that free market economics is preferred as the approach to achieving economically efficient outcomes. The draft policies are designed to be consistent with overall policies of the State embodied in the Washington Transportation Plan (WTP) in that they are designed to emphasize actions that will serve citizens' safety and mobility, the State's economic productivity, community livability, and ecosystem viability. The general policies give priority to actions that emphasize preservation of the existing system when cost-effective, enhancement of system safety, support of economic growth in key rail-user sectors, enhancement mobility for all citizens and businesses of the State through multimodal solutions, and preservation of environmental quality.

2.1 GUIDING POLICIES

The guiding policy statements are overarching and broad statements of intent. They are written "goal" statements that embody the State's philosophy towards the statewide rail system and embody the State's approach to participation in private sector rail. They are meant to guide the selection of actions that are consistent with these stated goals. They do not address specific users or industry sectors, and are broad enough to apply to future rail user groups who are not currently being considered in the benefits evaluation methodology.

Proponents wishing to approach the State for support or participation in a given project or action should ensure that their proposed project address the policy statement goals. In evaluating proposals or initiating their own projects and actions, the State should also ensure that their projects satisfy guiding policy statements before continuing in the benefit/impact evaluation process. The guiding policy statements are summarized in Table 2.1.

Table 2.1 (Draft) Guiding Policy Statements

The State may play a role in passenger- and freight-rail transportation programs, projects, and other initiatives if these actions do one or more of the following:

- Stimulate economic development by raising the well-being of Washington State communities and regions, the State as a whole, and the Pacific Northwest;
- Assist in supporting and enhancing the economic relationship between Washington State and the rest of the nation and its trading partners;
- Improve overall transportation system performance and mobility for passengers and freight;
- Enhance rail transportation safety;
- Support, sustain, and stimulate industry sectors such as agriculture that are established in the State and benefit from rail as a reasonably priced and reliable transportation alternative;
- Protect and improve communities and environmental quality; and
- Improve transportation security.

In addition, the State's implementation of any project must be guided by the following statements:

- The State supports private sector investment in passenger- and freight-rail transportation, and will only participate financially in programs and projects in proportion to well-defined public benefits.
- Private beneficiaries, which include ports, Class I railroads, short-line railroads, shippers and passengers, and communities are expected to contribute directly or indirectly to the financing and management of rail projects that benefit them. In the case of shippers and passengers, participation may be through user fees or pass-through costs from service providers. In any rail assistance programs offered by the state, priority will be given to projects that have substantial financial participation from private and local stakeholders and that leverage state investment to the maximum extent possible.
- The State will work to maximize the contribution of all rail assets, including state-owned assets, within Washington State (e.g., rights-of-way, rail lines, intermodal connections, trackage, and equipment) to achieving the State's rail transportation goals and policies. The State will work to maximize the use of existing rail assets prior to making investments in new capacity.
- The State will give priority to actions that improve the operational efficiency of the rail system, including supporting infrastructure investments. The State will participate in rail programs that optimize overall transportation system performance. Multimodal and cross-modal impacts must be considered prior to State participation in a project or action. The State supports competition among freight-rail service providers. In taking action in the private rail system, the State will give consideration to the effect of that action on competition among freight-rail service providers.
- The State may participate in projects or programs that support local economic development, improved safety, and congestion mitigation. When evaluating these projects or programs, the State will also consider the system-level impacts of local projects and actions.
- If the State takes actions in support of third-party rail services such as transload operations and short-line services the third-party providers must present a viable business plan.

Source: Cambridge Systematics, Inc., 2006.

2.2 SECTOR POLICIES

Sector policy statements are also statements of intent, embodying the State's philosophy towards the statewide rail system and the State's approach to private sector rail participation. However, the sector goals are more specific and targeted than the guiding policies. They are directed toward the four primary rail-user sectors in Washington State: ports and international trade, industry, agriculture, and passenger rail. The sector policy statements ensure that the proposed projects and actions address current and projected customer needs. They are guiding principles for project proponents in selecting projects to advance through the benefit/impact evaluation process. Any action being proposed for state participation should be able to satisfy one or more of the sector statements prior to moving forward in the benefit/impact evaluation criteria. The sector policy statements are summarized in Table 2.2.

Table 2.2 (Draft) Sector Policy Statements

Sector	Policy Statement
Ports and International Trade	The State will take action to encourage the competitiveness of its port and international trade sector to encourage jobs and economic growth, and to maximize throughput consistent with forecast trade growth.
Industry	The State will take action to ensure that the State's transportation system meets the growth needs of industries that can effectively use rail services, for businesses of all sizes. The State will work to create situations where small-volume industrial shippers are able to take advantage of the state rail system, through clustering, strategic combinations, or other adaptations that fit the railroads' desired customer characteristics and that do not impede increased rail throughput.
Agriculture	The State recognizes the importance of and the competitive pressures on its agricultural sector. The State will support actions that ensure access to reasonably priced, efficient, and reliable transportation services. The State will work to create situations where small-volume agricultural shippers are able to take advantage of the state rail system, through clustering, strategic combinations, or other adaptations that fit the railroads' desired customer characteristics and that do not impede increased rail throughput.
Passenger Rail	The State will take action to ensure that the quality, reliability, and usefulness of the State's passenger rail system are preserved. The State will participate in projects that maximize the efficiency of the rail system by conferring benefits to both passenger- and freight-rail users. In evaluating participation in passenger-rail projects, the State will consider benefits such as congestion relief, environmental impact, energy security, system maintenance impacts, safety, and provision of transportation services for users with special needs. The State's passenger rail program will continue to be guided by a targeted set of performance objectives that are intended to maximize ridership and maximize net public benefits.

Source: Cambridge Systematics, Inc. 2006.

2.3 PROGRAM POLICIES

Program policy statements are the third and most specific set of policy statements. They build on the policy framework developed during the guiding and sector policy statement development step, but add an additional level of focus and direction to the project selection process.

There are numerous program statements for each of the four user groups. This study does not attempt to evaluate every possible program statement. However, it does offer a good cross-section of program statements that represent some of the most visible and urgent problems facing the State's rail system. Sample program statements are shown below in Table 2.3. These statements are draft statements created for illustrative purposes only. Their inclusion here is to give examples as to the level of detail to be included in each program policy statement.

Table 2.3 (Draft) Program Policy Statements

User Group	Programs	Program Policy Statement
Ports and international Trade	Terminal Capacity Program	In cooperation with the Washington Public Port Association and the Ports of Everett, Seattle, Tacoma, Olympia, Grays Harbor, Longview, Kalama, and Vancouver, the State will identify priority terminal capacity and port access improvements that are eligible for State contributions from the Freight Mobility Investment Account (or a special new account). The State will provide cost-sharing contributions to projects on this list based on criteria for project selection outlined in this report. In selecting projects for funding as part of port rail terminal and access improvements, the State will consider the effect of investments on competitive access among rail carriers. The State will give priority to projects that preserve competitive access.
	Community Impact Mitigation Program	The State will establish an account to fund community mitigation projects such as rail grade crossing improvements necessitated by the growth in port-related rail traffic. In selecting projects as part of port rail terminal and access improvements, the State will consider the impacts of different alternatives on communities through which traffic will pass and will consider the relative costs of mitigating these impacts when choosing among alternatives.
	New Terminal Development Program	The State may provide assistance in identifying sites for new intermodal terminals and conducting site preparation activities (e.g., supporting infrastructure and utilities) when such projects are needed to meet future rail terminal capacity requirements and the construction of such terminals will maintain competitive rail services for the state's ports.

User Group	Programs	Program Policy Statement
	Mainline Capacity Program	The State may provide assistance to private railroads to make mainline capacity improvements that support forecast growth at the state's ports if the improvements also ensure adequate capacity to other within-state rail shippers and if there is a memorandum of understanding with the private railroad or railroads to continue to provide service to within-state shippers. Assistance may be in the form of low-cost financing to be paid in part with user fees paid by the participating railroad.
Industry	Third-Party Switching Program	The State will work with the Class I railroads to develop plans for alternative switching arrangements that would maximize operational efficiencies in the State's carload network and benefiting the State's industrial shippers. Assistance may include identifying opportunities for third-party switching agreements and acting as an intermediary in negotiation of zone-switching agreements.
	Industrial Site Rail Improvement Program	The State will establish a program of financial incentives to allow industrial shippers to make site improvements consistent with Class I operating requirements. Specific site investment criteria will be established in cooperation with the Class I railroads. Financial incentives may include tax improvement districts, investment tax credits, or participation in a low-cost loan pool.
	Transload/ Consolidation Centers Program	The State will establish a program in concert with port districts or other special districts created through this policy to create premier transload/consolidation sites. Design and service criteria for these sites will be developed in cooperation with the Class I railroads. The State may provide investment tax credits, establish tax improvement districts, or may provide 'Curb' economic development funds for supporting infrastructure and site improvements. To be eligible for incentives under this program, the special district must present a business plan that analyzes the potential tenant market, identifies job creation or retention potential, evaluates the potential impact of this new source of traffic on switching operations and mainline capacity constraints, and demonstrates commitments for service from the Class I railroads.
Agriculture	Rural Freight Transportation District Program	The State will establish rural freight transportation districts. *(Under discussion; to be completed)*
Passenger Rail	*(Under discussion; to be completed)*	*(Under discussion; to be completed)*

Source: Cambridge Systematics, Inc. 2006.

2.4 USING POLICIES TO DEVELOP STRATEGIC ACTION PACKAGES

The guiding policies, sector policies, and program policies can be used to guide decisions about individual projects or actions that the legislature or other state agencies may be asked to make. However, one goal of the Washington Statewide Rail Capacity and Systems Needs Study is to provide direction for more comprehensive strategy development in order to address the major system needs that were identified in Section 1.0 of this report and in Interim Report 1. The policies presented in this section are meant to guide development of strategic action packages that include multiple projects and programs. In the final report for the study, the consultant team will develop some example packages to demonstrate how the policies and the evaluation framework that will be introduced in the next section can be used in the development of a broader strategic action plan as well as how they can be used to evaluate individual project actions.

What Is a Strategic Action Package?

A strategic action package is a combination of actions that addresses broad policy goals comprehensively. Strategic action packages will generally include actions drawn from several program elements (as described in the program policies discussion previously). Strategic action packages may include infrastructure investment, changes in rail operations, regulatory actions, provision of legal authorities to governing entities, or other types of state actions. Strategic action packages will generally include actions that will be taken by a number of entities, both public and private, including state agencies.

The best way to describe a strategic action package may be to illustrate it with a few examples. The following examples are meant to be illustrative but they draw on real project/action proposals that address issues that have been discussed in Section 2.0 and in Interim Report 1.

Package Example 1 – Improve Throughput Capacity of International Container Ports by Improving Access and Terminal Operations

The specific projects/actions associated with this strategic action package are presented in Table 2.4. As indicated in the table, this package is meant to address the sector policy that calls for the State to encourage the competitiveness of its trade and port system. The package is also designed with the intent of directly supporting the following guiding policies:

- Stimulate economic development by raising the well-being of either Washington State communities and regions, the State as a whole, or the Pacific Northwest – by allowing international trade growth and supporting local industries that rely on this growth.

- Assist in supporting/enhancing the economic relationship between Washington State and the rest of the nation – by allowing international trade growth that supports the national economy.
- Improve overall transportation system performance and mobility for passengers and freight – by making improvements in corridors that include international intermodal cargo, domestic intermodal cargo, carload industrial and agricultural cargo, and passenger traffic, the projects represent a system-/corridor-level set of improvements.
- Protect and improve communities and environmental quality – by including grade separations to help mitigate impacts on urban and suburban communities of growth in trade-related rail traffic.

Table 2.4 Ports and International Trade

Policy Objective: State will take actions to encourage competitiveness of its port and trade system to encourage jobs and economic growth.

Goal: Achieve efficient movement of projected TEU growth.

Sample Action List: Optimize the throughput capabilities of the POT and the POS, including improving access at the major entrance and egress points, as well as increasing operational speeds.

Type of Action	Action	Is It Likely That the State Should Participate in This Action?
Mainline Infrastructure	• ST Phases I and II improvements between Everett and Seattle	Yes
	• ST Phase 3 mainline improvements on Argo to Black River line. Relocate existing mainlines to the east side of the corridor, with all yard and local operations on the west side	Yes
	• Martin's Bluff to Kelso mainline and off mainline infrastructure improvements. Include construction of a third line between the 2 points.	Yes
	• Construct grade separations in appropriate locations along the I-5 N-S corridor (unspecified: many)	Yes
	• Vancouver Rail Yard project, including the construction of a bypass route of Vancouver Yard and the mainlines	Yes
Operational Improvements	• Reduce car cycle time by increasing car velocity: improve railroad operation, schedule switching times, and work to implement second and third shift longshoreman labor agreements	No

Type of Action	Action	Is It Likely That the State Should Participate in This Action?
	• Improve train cycle time: increase coordination between arriving trains/stripping/reloading of trains	No
	• Co-production between BNSF and UP between Seattle and Tacoma	Yes
Port Access Improvements	• North SIG yard expansion and upgrades (including increasing the number of tracks under rail mounted cranes).	No
	• East Duwamish corridor construction to facilitate access/egress between the mainlines and the Port of Seattle on-dock facilities.	No
	• Construct a direct connection to Tacoma Rail Mountain Division from Tideflats.	No
	• POT reconfiguration of intermodal loading/support tracks within the Tideflats area.	No

Source: HDR, Inc.; and Cambridge Systematics, Inc. 2006.

Other guiding policies will need to be considered during implementation planning, as the specific roles that the State and other stakeholders will play in the project become better defined.

The action package builds on a number of program policies by incorporating:

- Priority port rail terminal capacity and access improvements. These can be funded under the proposed policies but will require cost-sharing.
- Consideration of competitive impacts on the rail carriers. This is a corridor in which both Class I carriers operate and in which UP has had difficulty expanding its operations due to capacity constraints. Through operational improvements, competition is more likely to be improved in this corridor.
- The package includes community impact mitigation with its grade crossing component.

This example illustrates the fact that the packages are able to show a mixture of types of actions. The package clearly includes a number of infrastructure investment projects. But it also recognizes the operational improvements that can either enhance the benefits of the infrastructure investments or which can be enhanced by supporting infrastructure investments.

A final key feature of the package is that it includes actions by a wide range of key stakeholders. A number of the operational improvements and some of the infrastructure investments might not involve any direct action by the State. However, this points out an important feature of thinking in terms of strategic

packages. By linking State investments, financing plans and incentives (including potential tax exempt financing), and operating strategies, the State may increase its leverage in partnership with other stakeholders and the solutions that emerge may be more comprehensive. This is especially true if the State can link its investments to operating agreements with the railroads.

Package Example 2 – Restructuring Carload Network Between Tacoma and Vancouver Along the I-5 Corridor

This package is illustrated in Table 2.5. The package is meant to address the sector policy that the State will take actions to ensure access to viable transportation options for local industries and encourage continued rail service for low-volume shippers in a manner that is consistent with emerging railroad business models. Guiding policies supported by the package include:

- Stimulate economic development by raising the well-being of either Washington State communities and regions, the State as a whole, or the Pacific Northwest – The package focuses on retaining and expanding businesses that rely on rail carload services by providing opportunities to improve and maintain rail services.
- Support/sustain/stimulate existing clusters (such as agricultural) that already exist in the State and that do or could benefit from rail as a reasonably priced and reliable transportation alternative – Forecasts from this study indicate that many businesses that currently use carload services are in growth industries and this package will help sustain their growth.
- The State supports competition among freight rail service providers. In taking action in the private rail system, the State will give consideration to the effect on competition that its actions may have – The package includes approaches that would facilitate competition by bringing third party services into the system to take over switching operations that the Class I railroads may no longer wish to provide.

As in the case of the first example, there are a number of guiding policies that may be relevant to this package depending on the specific implementation approaches that are pursued for funding or regulation.

This package includes actions that are derived directly from each of the program policies and show clearly how the program policies can guide some very specific strategies.

Table 2.5 Restructuring Carload Network Between Vancouver and Seattle

Policy Objective: State will take actions to encourage and preserve industries of all sizes and their access to railroad service.

Goal: Increase efficiency of industry rail shipment packaging in order to increase rail throughput velocity.

Sample project list: Increase N-S capacity by restructuring the carload network between Tacoma and Vancouver, WA along the I-5 corridor. Restructure in order to fit into the railroads developing business model which emphasizes hook and haul service.

Operational	Zone switching agreements by carriers (between Vancouver and Tacoma).	No
	3rd party switching agreements.	No
	Allow mainline trackage rights to Class 3 carriers (to allow them to direct deliver to consolidation points).	No
	Scheduled service at consolidation points.	No
	Establish car hire zones/car availability pools.	No
	Increase branch line volumes to attract/retain business (typical measured in cars/mile).	No
	Use Curb Economic Development funds to entice industries or assist with relocation of industries/consolidation.	Yes
	Create an "Industrial Sanctuary" (industrial preservation zoning) in regions where targeted industrial growth is desired.	Yes
	Establish Tax improvement districts.	Yes
	Use relocation incentives to attract small industries to appropriate/predesignated regions where consolidation is desired.	Yes
	Encourage transloading for low volume shippers (at any transload facility).	Yes
Infrastructure Improvements	Chehalis Jct. to Blakeslee Jct., via Centralia. Rail track upgrades, new switching and signaling infrastructure.	Yes
	Construct the South Sound Logistics Center (Maytown).	Yes
	Upgrade Tacoma Rail Mountain Division Class 3 Track.	No
	ST/WSDOT Rebuild Lakewood Line.	Yes
	Relocate industries off of the mainline: Centralia (STM plant),Winlock (Industrial spur), Napavine (Lumber yard), Ridgefield (Port access).	Yes
	Vancouver Yard Project.	Yes
	Tacoma Rail/POT connection.	No

Source: HDR, Inc.; and Cambridge Systematics, Inc. 2006.

This package also introduces a broader range of actions that the first package. The first set of actions, which are all designated operational actions include alternative operating practices, alternative approaches to configuring industrial rail facilities, involve a number of third parties, and involve a wider range of financial incentive types offered by the State. The State is likely to have a larger role in brokering operating agreements and bringing Class I railroads, shippers, and third party service providers together than it is likely to have in funding specific rail improvements. In working with third party service providers, the State will need to use the policies that direct these providers to prepare viable business plans prior to requesting state support of any kind.

3.0 Benefit/Impact Evaluation Process

The next step in determining when and how the State should act in the rail system is an evaluation of the benefit/impact of actions. An evaluation should only be undertaken if the proposed project or action is determined to be consistent with the State's guiding and sector policies.

The benefit/impact evaluation process has several components:

- A comprehensive evaluation of public benefits in the State that includes a quantitative benefit/cost evaluation as well additional qualitative criteria (this helps determine if State action is warranted at all);
- An assessment of benefits/impacts to each of the other three stakeholder group (passengers/shippers, railroads, and communities); and
- A comparison of the benefits/impacts across the four stakeholder groups (the State, passengers/shippers, railroads, and communities) to determine the appropriate level of State involvement and the level of support expected from other stakeholders.

3.1 SELECTION OF BENEFIT/IMPACT METRICS

In order to evaluate the benefits/impacts for each stakeholder group, it is first necessary to select appropriate benefit/impact metrics. As previously noted, these metrics were chosen to reflect those aspects of system performance that are most critical to each affected stakeholder group. In order to simplify the implementation of the benefit/impact evaluation process and to make it easier to present results to decision-makers and the public, we have chosen to focus on "a few good measures"; that is, we have tried to identify a very limited number of the most critical metrics for each group.

Several sources were consulted in selecting benefit/impact metrics for each group and the calculation methods for those that could be effectively quantified. These sources include:

- Best practices review of rail benefit/cost methodologies used by other states and organizations (See in Appendix A of this report.);
- Consultation with area experts, including shippers, community association representatives, ports, railroads, and others who are members of the Washington State Rail Study Technical Resource Panel; and
- Metrics derived from the guiding policy, sector policy, and program policy statements.

The recommended benefit/impact measures are listed in the evaluation matrix illustrated in Figure 3.1. This matrix forms the basis of the benefit/impact evaluation and comparison process. The matrix includes columns for each of the four stakeholder groups. The benefit/impact metrics are presented as questions that are asked about how the project benefits/impacts each group. There is also a row entitled "Relative Rating." The relative-rating variable summarizes the extent of benefit/impact by group and allows for comparison across the groups. This helps determine the level of involvement that should be expected from each group. If an action offers high benefits to a particular stakeholder group, it should be expected to contribute significantly to the action.

Special consideration must be given to projects that mitigate rail impacts on communities. For example, a grade-separation project may have safety and mobility benefits for communities that experience high levels of rail traffic. The grade-separation project may not generate significant benefit for the railroad or the customers using the rail line. If the community does not benefit economically from the rail service, the project is only mitigating impacts. The evaluation matrix, in this case, would appear to suggest that the community should contribute significantly to the project and the railroads should not. The evaluation matrix will need to flag situations such as this. Ultimately, the appropriate method for funding the improvement should be guided by the program policies described in the prior section of this report.

Figure 3.1 Benefit/Impact Evaluation Matrix: Four User Groups

	Four Rail User Groups			
	WA State	**Passengers/ Shippers**	**Railroads**	**Communities**
	Does the action receive a positive rating on the B/C indicator?	Does the action reduce business costs?	Does the action increase throughput?	Does the action contribute to increased safety?
	Does the action fulfill other criteria, including: Project readiness Railroad priority Project funding Community goals Environmental goals Transportation Security Technology	Does the action facilitate better service? Does the action facilitate increased reliability?	Does the action increase revenue by an increase in traffic or throughput? Does the action lower operational costs associated with labor and delay?	Does the action contribute to increased mobility? Does the action support community economic development goals? Does the action have minimal environmental impact?
Relative Rating	High, Medium or Low	High, Medium or Low	High, Medium or Low	High, Medium or Low

3.2 WASHINGTON STATE BENEFITS METHODOLOGY

The next step of the benefit/impact evaluation process is to select methodologies for estimating the benefits to the four main user groups.

The methodology to estimate benefits to Washington State itself is the most rigorous and quantitative of the four stakeholder groups. It includes the use of a Rail Investment Benefit/Cost Indicator as a major component of the benefit/impact evaluation process. This calculation is then supplemented by qualitative assessment of other benefit categories, including questions that reflect the support of the community and project readiness. The result of the BC indicator and supplemental questions is a score that influences a relative rating of high, medium, or low for the "relative rating" variable.

Estimation of Public Benefit/Cost Ratio Using the Rail Benefit/Cost Indicator

The BC indicator uses a multivariable spreadsheet model developed for Washington State to indicate what the relative public benefit/cost ratio is for a given action. The interface of the spreadsheet model allows the user to input certain values to represent benefits in several major categories, including:

- Transportation and economic benefits;
- Economic impacts; and
- External impacts (safety and environmental).

In each case, the project proponent should attempt to input values that are specific to the region, the state, and to the project. This will increase the validity and the accuracy of the Benefit/Cost Indicator output. Table 3.1 details the variables included in the Benefit/Cost indicator, an explanation of the theory behind them, and a rough equation to calculate their value.

The Rail Benefit/Cost indicator is programmed to calculate the relative public benefit given the input costs and variables. In cases when no values are input (for example an unknown value for the average trucking rate per mile) the calculator defaults to standards that have been established through a review of current research and best practices for rail investment benefit methodologies. The default values may be adjusted.

Table 3.1 Variables Included in the Public Rail Investment Benefit/Cost Indicator

Variable Description	Explanation	Calculation
Transportation and Economic Benefits		
Avoided maintenance costs	By diverting trucks off the roadways and onto the railroads, the public can benefit from reductions in highway maintenance costs	Maintenance costs saved = Distance x traffic diverted to rail x maintenance costs
Reduction in shipper costs (for shipments originating in state)	Benefits derived from lower logistic costs to the shippers, which ultimately can lead to lower consumer prices	Shipping costs saved = (Truck rate – rail rate) x (Avg. tons per truck) x Distance x Diversions
Reduction in automobile delays at grade crossings	Benefits resulting from improving grade crossing and decreasing automobile delays	Value of delay reduction = (AADT/min. in a day) x Delay value/veh min)) x (grade crossings impacted) x (highway delay/2)^2
Economic Impacts		
New or retained jobs	Jobs that a particular project/action may keep from moving out of the State (e.g., by construction of a rail spur serving a factory or warehouse, etc.), or new jobs that are created within the State. This measure accounts for both retained and new jobs.	Value of new wages earned = (# New Jobs)) x (Avg. Annual Wage)) x (Indirect Jobs Multiplier)
Tax increases from industrial development	A rail action/project may foster industrial development that results ultimately in increased industrial property taxes to the State.	Property Taxes from New Ind. Development = (Sq ft of new industrial development)) x (tax rate/sq ft)
External Impacts		
Safety Improvements	By diverting truck freight to rail, savings on highway safety improvements can occur.	Savings from safety improvements = (Distance)) x (% distance in WA State)) x (Diversions)) x Safety Value/VMT)
Environmental Benefits	Railroads are on average three or more times more efficient than trucks. The State can benefit from savings due to environmental improvements.	Savings from environ. Improve. = (Distance)) x (% Distance in WA State)) x (Diversions)) x (2/3)) x Environ. value/VMT)

Source: Cambridge Systematics, Inc.

Table 3.2 lists the items that are common across all the transportation and economic calculations. These default values should be periodically updated by the user to ensure their validity for Washington State calculations.

Table 3.2 Benefit Cost Indicator Default Values

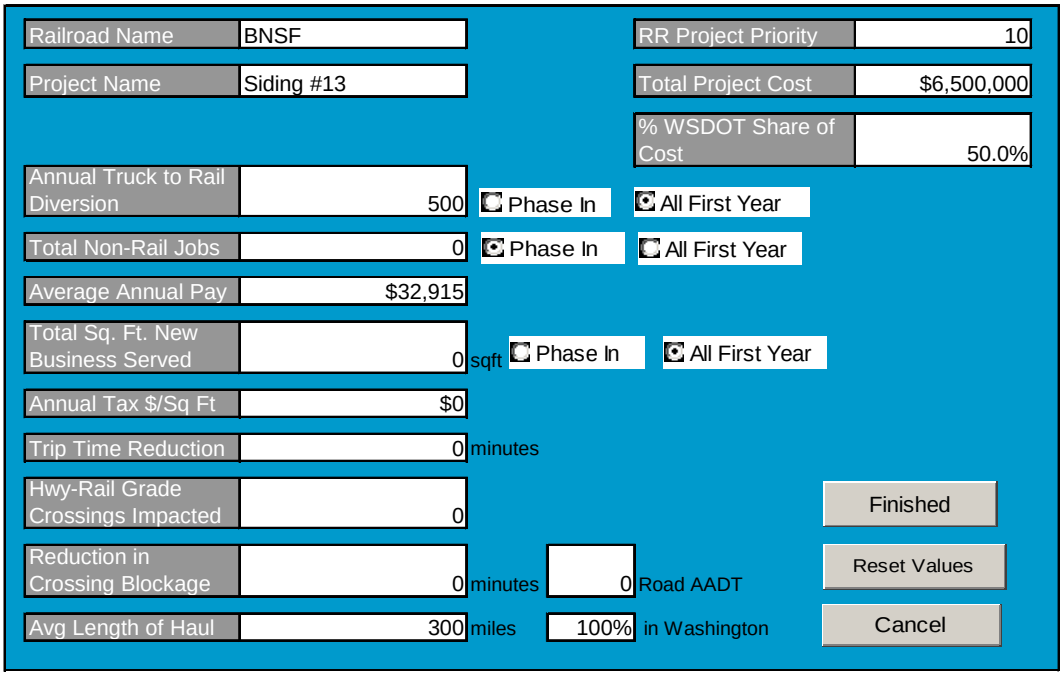
Variable	Value	Justification
Annual inflation rate	3.5%	Estimated from best practices review.
Average Annual Pay for Private Industry in WA	$40,224	U.S. Department of Labor WA State statistics.
Average Rate for Rail Shipments	$0.045/ton-mile	Average rate for intermodal rail shipments.
Average Rate for Truck Shipments	$0.08/ton-mile	Estimated from best practices review.
Average Tons per truck	20 tons/truck	Maximum load for most containers.
Delay Value per Vehicle Minute	$0.341/veh.min	See Appendix, Estimated from best practices review.
Environmental Value per VMT Change	$0.01979/VMT	It is a baseline value for the cost of pollution, established using HERS (Federal Highway Administration's Highway Economic Requirement System).
Multiplier for Indirect Jobs	2	Estimated from best practices review.
Planning Horizon	10 years	FRA "Benefit Cost Methodology for Local Rail Freight Assistance Program," July 1990.
Safety Value per VMT Change	$0.014012/VMT	It is a baseline value for the cost of vehicle crashes, calculated with HERS.
Tax Rate based on Sq Feet of industrial space	$0.00/sq ft	A default of zero is used. The user can enter the appropriate rate for a location.
Time Value of Money	7.5%	Estimated from best practices review.

Source: Cambridge Systematics, Inc.

The project detail screen where many of these variables and default variables are input is shown in Figure 3.2. This is a draft version of the BC indicator and may be adjusted in subsequent technical memoranda and the final report for this study. Nevertheless, this figure gives an indication of the ease of using the BC indicator.

Figure 3.2 Washington State Public Benefit/Cost Indicator

Washington Transportation Commission
Rail Investment Benefit/Cost Indicator
Project Detail



Output of the Rail Benefit/Cost Indicator

The Rail Benefit/Cost indicator draws on the input and default variables to calculate an estimated public B/C ratio. It also provides measures for each of the component benefit categories listed in Table 3.1. The output is given in terms of the different input variables. For example, it will stipulate:

- Economic benefits received from the transportation and economic variables (e.g., reduced roadway maintenance costs, reduction in automobile delay at railroad crossings, etc.);
- Economic benefits received from the economic variables (e.g., new or retained jobs, tax increases, etc.); and
- Economic benefits received from the external impacts (e.g., safety and environmental).

This allows decision-makers to easily discern the variables that had the greatest impact on the overall rating of an action.

Supplemental Questions to Estimate Washington State Benefits

The final step of the Washington State Benefits Evaluation considers several questions established during the sector and program policy review in Section 3.0 of this report. Questions are qualitative in nature, but are critically important issues that must be considered prior to embarking on state involvement. Questions are given a point value that is used only for purposes of comparing projects, packages, or policies against each other. In this step, the score from the Rail Benefit/Cost indicator is also considered and summed with the value of the questions to produce a relative score. One possible scoring method is shown below in Figure 3.3. The relative rating is inserted into the benefit evaluation matrix shown in Figure 3.1.

While scoring and cumulating the ratings provide a single evaluation score, this step is not necessary. If the number of evaluation measures is kept to "a few good measures," many policy-makers prefer to review the full matrix so they can weight each measure according to their best political and technical judgment.

Figure 3.3 Washington State Benefit/Impact Methodology

Benefit Evaluation For Washington State				
Category	**Question/Criteria**	**Value**	**Yes**	**Points**
Benefit/Cost	Does the Rail Investment Benefit/Cost Indicator suggest a good public benefit?			
	Recommended by B/C indicator	**20**		
	B/C= > 1	**10**		
	B/C <1	**0**		
Current	Does the action address a current railroad problem?	**1**		
Priority	Is this project one of the top priority projects of the railroad?	**1**		
Readiness	Does the project appear to be "ready?" i.e. is there already an EIS, Preliminary Engineering, etc.?	**1**		
Funding	Do all matching funds appear to be in place?			
	Yes, there are already partners available	**2**		
	There is some talk of partnership, nothing is finalized	**1**		
Community	Does the project have the support of the community?	**1**		
	Does the project contribute to geographic equity?	**1**		
	Does the project address a particular societal concern such as noise?	**1**		
Environment	Does the project have environmental benefits?			
	Yes, it will have considerable truck to rail conversion	**2**		
	Unclear, but the project will not unnecessarily harm the environment	**1**		
Security	Does the project address a particular security concern?	**1**		
Technology	Does the project introduce a new and beneficial technology?	**1**		
Total Points		**32**		
			22-32	**High**
			12-21	**Medium**
			<12	**Low**
Relative Rating				

3.3 PASSENGER/SHIPPERS BENEFITS METHODOLOGY

The evaluation of passenger/shipper benefits differs slightly depending on if the proposed action is related to passenger rail service or freight rail service. A metric for "reduced business costs" is one of the most important metrics by which to measure benefits to shippers, but is not useful to determine benefits to passengers. Instead, passenger projects will use the metric of "reduced travel costs to passengers," in terms of real costs (fare) and time savings.

Similar to the WA State benefits evaluation, questions are given a point value that is used only for purposes of comparing projects, packages, or policies against each other. The point values are then summed to produce a relative rating of high, medium, or low. This method is shown below in Figure 3.5. The relative rating is inserted into the benefit evaluation matrix shown in Figure 3.2.

Figure 3.4 Passenger/Shipper Benefits/Impacts Evaluation Methodology

Benefit Evaluation For Passengers/Shippers				
Category	**Question/Criteria**	**Value**	**Yes**	**Points**
Reduced Business Costs to Shippers	Shipping costs saved= (Truck rate – rail rate)* (Avg. tons per truck) * Distance* Diversions			
	Savings in shipping costs	**10**		
	No discernable savings in shipping costs	**0**		
Reduced Travel Costs to Passengers	Will the action result in measurable time savings to passengers?			
	Yes	**8**		
	No	**0**		
	Will the action reduce the cost of travel to passengers?	**2**		
Service	Does the action appear to improve the service options available to passengers/shippers?	**1**		
	Does the action appear to improve the service quality offered to passengers/shippers?	**1**		
	Does the action improve the passengers/shippers access to rail service?	**1**		
Reliability	Does the action offer improved reliability to passengers/shippers?	**2**		
	Does the action offer improved reliability of access to rail for passengers/shippers?	**2**		
Total		**17**		
			12-17	**High**
			6-11	**Medium**
			<5	**Low**
Relative Rating				

3.4 RAILROAD BENEFITS/IMPACTS EVALUATION METHODOLOGY

Rail carriers look closely at Return on Investment (ROI) when deciding what investments to prioritize in their capital improvement budgets. The information needed to determine ROI is both proprietary and complex to calculate. The railroads hold the information closely, and seldom divulge it to public or state agencies. Calculation of ROI requires access to complex models of train movements, shipper locations, and commodity flows. The process is cumbersome and time-consuming for the railroads. It is unrealistic to expect the public sector to replicate the process for the purposes of this benefit/impact methodology.

However, other information can be used as a proxy for ROI. Essentially, ROI for any rail action will be computed by taking the ratio of increase in revenue against the ratio of increase in operating costs. The increase in revenue can be approximated by the increase in traffic; that is, will the investment allow the rail carrier to service more customers and carry additional traffic. Operating costs can be estimated similarly by evaluating the impact on the investment on the increase in velocity, the reduction in train hours of delay, and the reduction of dwell times in yards. These variables capture the labor implications and costs incurred by delay, and are therefore valid proxies for operating costs. Lacking a

direct calculation of ROI, information on these variables can be used to approximate revenue and operating cost and gauge the benefits received by the rail carriers.

The evaluation of railroad benefits then becomes a set of simple, qualitative questions. Similar to the Washington State benefits evaluation, questions are given a point value that is used only for purposes of comparing projects, packages, or policies against each other. In the case of the railroads, this rating is meant only as an indicator of how the Railroads *might* respond to a given situation. In reality, the railroad will make the final decision of benefits received by a project, as well as the ultimate decision of whether to participate or not. However, this methodology at least allows the project proponent to gain a sense of the benefits received by the railroads in order to compare it with those received by other user groups. Figure 4.6 shows the questions that are part of the railroad benefit/impact assessment methodology. The relative rating received would then be transferred to the benefit evaluation matrix shown in Figure 4.2.

Figure 3.5 Railroad Benefit/Impact Methodology

Benefit Evaluation For Railroads					
Category	**Question/Criteria**		**Value**	**Yes**	**Points**
Increased Velocity	Will the action improve the velocity of rail on the system?				
		Yes, significantly	**10**		
		Somewhat	**5**		
		No	**0**		
Train Hours of Delay	Will the action reduce the amount of train hours of delay?				
		Yes	**5**		
		No	**0**		
Yard dwell time	Will the action reduce train yard dwell time?				
		Yes	**5**		
		No	**0**		
Increased Rail Traffic	Will the action increase the amount of traffic carried on rail?				
		Yes, significantly	**10**		
		Somewhat	**5**		
		No	**0**		
Total			**30**		
				21-30	**High**
				10-20	**Medium**
				<10	**Low**
Relative Rating					

3.5 COMMUNITY BENEFITS METHODOLOGY

Communities are an important stakeholder in the benefit/impact evaluation process because they are often inordinately affected by railroad activity, and yet are often unable to fully support measures to alleviate the affects. Often times, communities are bisected by rail tracks, a condition that leads to serious safety and mobility issues. Commonly cited issues include concerns about rail and automobile collisions at crossings, concerns about emergency vehicle access when trains are blocking major crossings, and roadway congestion due to increased train operations.

Benefits to the community, similar to the other user groups, are posed in a set of qualitative and point-based questions. These point values are used only for

purposes of comparing actions against each other, and are summed to produce a relative rating of high, medium, or low. This method is shown below in Figure 3.6. The relative rating score of high, medium or low would then be substituted back into the benefit evaluation matrix shown in Figure 3.1.

Figure 3.6 Community Benefit/Impact Methodology

Benefit Evaluation For Communities				
Category	**Question/Criteria**	**Value**	**Yes**	**Points**
Congestion	Does the action relieve community congestion from railroad and automobile interactions?			
	Yes, provides tremendous congestion relief	**10**		
	Provides some congestion relief	**5**		
	Has no discernable congestion impacts	**0**		
Increased Safety	Does the action increase safety by reducing train/automobile incidents?	**2**		
	Does the action increase safety by creating new mobility effects for emergency vehicles?	**2**		
Economic Development	Does the action appear to support community economic development goals?			
	Yes, the action directly supports economic development goals	**5**		
	The action has some secondary economic development benefits	**2**		
Environmental Impact	Does the project have excessive environmental impact?			
	Yes	**0**		
	No	**1**		
Total		**20**		
			15-20	**High**
			9-14	**Medium**
			<9	**Low**
Relative Rating				

3.6 CROSS USER GROUP BENEFITS/IMPACTS EVALUATION METHODOLOGY

Purpose of Cross-User Group Benefits Comparison

The purpose of comparing the relative benefits received by all four rail user groups is to summarize the benefits/impacts received by each group; and to use this information to draw conclusions about which groups are benefiting the most from any proposed action. Doing so gives a good estimation of which user groups should be more responsible for supporting and implementing a proposed action. It also can be used by the State to determine preliminary recommendations and an appropriate response to any proposed action.

The cross user group benefit methodology is a qualitative comparison that simply takes each individual user group's relative rating of benefits (high, medium, or low) and compares them against each other. A separate comparison should be done for each proposed action. As shown in Table 3.3 below, there are many possible combinations of user group "relative ratings." Each combination will lead to a different conclusion. This cross-group comparison then allows the assessor of the proposed project to react in several ways, including:

- **Acknowledge which rail user groups are receiving the most benefit from a proposed action, and therefore determine which groups should support the action.** The summary nature of the cross-user group comparison allows the

group assessing the proposed action to quickly discern which groups are benefiting the most from an action, and which groups should therefore be expected to support a proposed action. It is a tool that can be used by any user group trying to determine if they should support a particular action. For example, the result of a proposed action may show that tremendous benefits are bestowed to the shippers and the State, with negligible benefits to the community. If the project assessor in this case is the community, the community may chose to not support the project, and to instead reserve its support for a project which yields high benefits to the community.

- **Determine what percentage of the proposed action each beneficiary is receiving, and use this percentage as a baseline to begin negotiating expected contributions from each rail user group.** One of the guiding policies of the State is to participate in projects only when the other beneficiaries, if possible, are paying their fair share. This side-by-side comparison of benefits begins to determine how much benefit is received by each group, and, therefore, how much participation and support should be expected from each group. This principle may be utilized in a case where the State benefits are estimated to be high, while the benefits to the shippers and the rail carriers are low. In this situation, the State is receiving much more benefit than the other three user groups, and should therefore be expected to have to support a much greater share of the project than a situation where equal benefits are received by the State and the rail carriers alike.
- **Provide data which can help to justify a proposed action because it gives high benefit to a user group that is high on the State's priority list, even though the benefits are not high across all user groups.** The large capital costs of many rail actions means that, at times, the group that benefits the most from an action is unable to participate to a great extent in its implementation. If this group is recognized by the State as a high priority stakeholder, the State may choose to support the action in lieu of the group receiving the benefit. The sample case for this principle is the case of a short spur line that confers very high benefit to a cluster of small businesses, yet does not register as being a high benefit on the statewide level. If the State has a policy to support and nurture small businesses, then it can use the results of the benefit methodology to justify why it may consider participating in or supporting the action.

Recommendation and Determination of Level of Action

The results of the cross-user group comparison are then paired with recommended participation strategy and a suggested level of action. For example, as shown in Table 3.3, if the relative rating received from all user groups is "high," then it is recommended that the state participate in the action, but only does so if the other groups who are benefiting (in this case passengers/shippers, railroads, and communities) are also contributing an appropriate share. The level of action that the State could consider includes considering direct investment and the

necessary supporting legal and institutional mechanisms. The recommendations and level of action statements are still in their draft format in this Interim Report 2. Nevertheless, they are worth mentioning here to illustrate the eventual goals of the benefit/impact methodology.

Table 3.3 Cross-User Group Benefit/Impact Methodology

Benefit Evaluation Cross-User Group Comparison						
Proposed Action	**WA State**	**Passengers/ Shippers**	**Railroads**	**Communities**	**Likely Recommendation**	**Level of Action**
A	High	High	High	High	State should participate, but only if other beneficiaries contribute appropriate share	Consider direct investment and supporting legal and institutional mechanisms
B	High	Low	Low	High	State should participate and be prepared to contribute more than other groups	Consider direct investment and supporting legal and institutional mechanisms
C	Medium	Medium	Medium	Medium	State should participate with caution- and only if costs to do so are low	Consider tax exempt financing loans or other methods that have limited costs to state but benefit private industry
D	Low	High	High	Low	State should probably not participate	State should probably not participate with financial, institutional, or legal mechanisms
E	Low	Low	Low	Low	State should probably not participate	State should probably not participate with financial, institutional, or legal mechanisms

Source: Cambridge Systematics, Inc. 2006.

Appendices

A. Review of Benefit Evaluation Methodologies

This appendix examines different benefit-cost methodologies for evaluating rail infrastructure projects used by the Federal government, state Departments of Transportation (DOTs), and other agencies. Special attention is paid on whether or not the methodology specifies the project situation against which the different project alternatives should be compared, the time horizon of the evaluation, the measurement of benefits, and the existence of additional criteria to undertake the evaluation. The estimation of costs is superficially contemplated because among the different methodologies there is no discrepancy on how to estimate the costs. However, in the case of benefits, there is broader discrepancy not only in the variables included to measure the benefits but also in the way they are estimated.

The following methodologies were reviewed:

- Federal Railroad Administration, Benefit-Cost Methodology for the Local Rail Freight Assistance Program, 1990.
- Florida Department of Transportation, Florida Freight Rail Benefit/Cost Methodology, 2005.
- Tennessee Department of Transportation, Strategic Project Evaluation Protocols and Procedures, Tennessee Rail System Plan, 2001.
- Freight Mobility Strategic Investment Board, Freight Mobility Strategic Investment Program Criteria, 2006.

A.1 FEDERAL RAILROAD ADMINISTRATION

This methodology is to be used for calculating the benefit-cost ratios for all projects for which assistance is requested to acquire, rehabilitate or construct rail facilities.

Null alternative: The null alternative represents the best estimate as to what will happen if the project is not undertaken.

Time Horizon: 10 years.

Evaluation of Costs: Cost of acquiring or rehabilitate the line, including the present value of any future work to keep the line operating.

Evaluation of Benefits: The FRA differentiates between two types of benefits: efficiency benefits and secondary benefits.

Efficiency benefits result from the impact that the project has on the reduction of transportation costs to the shipper and the increase on profits derived from the

incremental traffic, which is the additional traffic that occurs due to service improvement. Secondary benefits are an indirect consequence of the project such as the avoidance of relocation costs of shippers or other businesses, creation of new jobs or retention of current jobs, reduction of both highway maintenance costs and pollution emissions due to traffic diverted from trucks to rail. The salvage value of the facilities is also included.

Table A.1 FRA Measurement of Benefits

Benefits Description	Benefit Calculation
Efficiency Benefits	
*Reduced transportation costs to shippers on base traffic	*Difference between rates charged by alternate mode and rail on base traffic (traffic that occurs independently of the project).
*Profits earned by the shipper in producing, shipping and selling incremental traffic	*Profits provided by the shipper derived from incremental traffic.
Secondary Benefits	
*Prevention of relocation costs of shippers/businesses.	*Data provided by the shippers/businesses. These include costs of moving equipment and inventory, employees, and breaking the lease.
*Avoidance of jobs loss	*Value of the wages earned for the length time that workers would have been unemployed if the project was not undertaken.
*Reduction in highway maintenance costs	*No measure provided
*Reduction in pollution emissions	*No measure provided
*Salvage value	*No measure provided

Source: Federal Rail Administration, Benefit-Cost Methodology for Local Rail Freight Assistance Program, 1990.

Additional Criteria: No additional criteria are contemplated.

A.2 FLORIDA DEPARTMENT OF TRANSPORTATION

Florida's methodology was built on the FRA methodology. The major difference between them is that Florida DOT includes a broader estimation of the benefits affecting the general public and a capital budget model that maximizes the return on a series of investments.

Null alternative: The null alternative represents the best estimate as to what will happen if the project is not undertaken.

Time Horizon: 10 years.

Evaluation of Costs: Correspond to the cost of acquiring/rehabilitate the line, including the present value of any future work to keep the line operating.

Evaluation of Benefits: The methodology differentiates between three types of benefits: Transportation and economic benefits, benefits derived from spur economic development; transportation benefits, benefits that result from reduction in highway maintenance costs and shipper costs; and external benefits. External benefits include land use, safety, security, and environmental benefits.

Table A.2 Florida DOT Measurement of Benefits

Benefit Description	Benefit Measure
Transportation and Economic Benefits	
Avoided maintenance costs	Maintenance costs saved= Distance * traffic diverted to rail*maintenance costs
Reduction in shipper costs	Shipping costs saved= (Truck rate – rail rate)* (Average tons per truck) * Distance* Diversions
Reduction in automobile delays at grade crossings	Value of delay reduction= (AADT/min. in a day)*Delay value/veh min)*(grade crossings impacted)* (highway delay/2)^2
Economic Impacts	
Jobs created or retained in state	Value of new wages earned= (# New Jobs)*(Avg. Annual Wage)* (Indirect Jobs Multiplier)
Tax increases from industrial development	Property Taxes from New Ind. Development= (Sq ft of new industrial development)*(Tax rate/Sq Ft)
External Impacts	
Safety Improvements	Savings from safety improvements= (Distance)*(% distance in WA state)*(Diversions)*Safety Value/VMT)
	Savings from environ. Improve. = (Distance)*

Environmental Benefits	(% Distance in WA State)*(Diversions)*(2/3)*Environ. value/VMT)

Source: Florida DOT, Freight Rail B/C Methodology, 2005.

Additional Criteria: No additional criteria are contemplated.

Benefits Maximization

Florida's methodology includes a mathematical formula that allows decision-makers to select the combination that maximizes total profits (considering budget constraints) from a group of projects.

A.3 TENNESSEE DEPARTMENT OF TRANSPORTATION

Tennessee's methodology for benefit-cost evaluation of rail projects, similar to Florida, is built on the FRA's methodology. However, the Tennessee DOT method provides a greater level of detail on the input variables to calculate the benefits and includes additional criteria for ranking the projects.

Null alternative: The null alternative represents the best estimate as to what will happen if the project is not undertaken.

Time Horizon: 10 years.

Evaluation of Costs: Correspond to the cost of acquiring/rehabilitate the line, including the present value of any future work to keep the line operating.

Evaluation of Benefits:

The calculation of benefits involves capturing data on five levels of analysis:

1. Economic Impact;
2. Job Creation;
3. Tax Impact;
4. Operational, Socioeconomic/Environmental Effects; and
5. Rate of Return on State Capital Investments.

Table A.3 Tennessee DOT Measurement of Benefits

Benefits Description	Benefit Calculation
Economic Impact	
*State economic output	*Estimation of regional output using Regional Industrial Multiplier System (RIMS II) based on total capital and operating investments.

Job Creation *Employment	*Number of total jobs created in the region calculated using RIMS II based on information provided by private entities.
Tax Impact *Property Tax	*Cumulative amount of property taxes= land developed (sq ft) * property tax.
Return on Capital Investment of the State	
Fuel savings	*Gallons saved= Number of trucks displaced*(avg. miles displaced) * (tons per truck) / (tons per gallon) * (fuel price).
Impact on shipping costs	Differential in rates between trucks and rail service. Data to be collected from interviews with shippers.
Railroad Operation Cost Differential	Cost differential for the railroad carrier between the current situation and the project situation.
Travel Time Effects	Changes in travel times of the proposed route compared to existing route.
Reduction in highway maintenance costs	Highway/pavement maintenance costs = (number of trucks displaced) * (average miles traveled)* (maintenance cost per mile).
Reduction in accidents, injuries and fatalities	Safety benefits= (number of trucks displaced) * (average miles traveled)*(average crash cost)
Reduction in congestion costs	Congestion costs= (number of trucks displaced) * (average miles) * (congestion cost/mile)
Other annual fees, state receipts or costs savings	Includes all revenues to the state that may not be captured in other benefits such as sale taxes.
Public/Private Project Capital	The ratio is calculated based on the information provided by the public and private funding sources
Public/Private plus induced capital	The ratio is calculated based on the information provided by the public and private funding sources, and the induced capital calculated using RIMS II.

Source: Tennessee DOT, Strategic Project Evaluation Protocol and Procedures, Tennessee Rail System Plan, 2001.

Additional Criteria

The Tennessee DOT uses a scoring methodology to rank projects, based on five levels of analysis: economic impact, job creation, tax impact, operational, socioeconomic/environmental effects, and return on state capital investments (which take into account both monetary and non-monetary factors). Each of the five levels of analysis and their component criteria are given a numeric score based on qualitative and/or quantitative standards. This numeric score allows for direct quotation of project benefits in dollars and other relevant factors (e.g., gallons of fuel saved and number of trucks displaced from the highway).

Project Benefit Scoring Methodology

A consistent scoring method (a 1 to 5 score, with 1 being the lowest score and 5 being the highest) is used throughout for qualitative criteria. Criteria that can be quantified are scored based on its value within an established series of values that then are ranked using the same 1 to 5 method. The scores are summed, and then weighted by the five levels of analysis including their respective sub-components. Weighting of the values is set based on policy priorities established by the state.

The total weighted value equals a base 100 points, or 100%, with projects scoring a percentage of a possible 100 percent. A rating or scoring of each criteria measure will be assigned based on quantitative or qualitative information with as many of the measures as possible being quantified. Each measure will be rated based upon the following scoring system:

1 = Unacceptable performance or negative effect
2 = Poor but acceptable performance or effect
3 = Neutral or no effect
4 = Moderately positive effect
5 = Significantly positive effect

The ranking system for evaluating the qualitative and quantitative criteria is provided in the following section.

Cost Effectiveness

Order of magnitude of capital costs per mile of railroad estimated in Year 2000 dollars. Capital costs will include trackwork, bridges, signaling, right-of-way, utility relocation, litigation, risk management, and environmental mitigation.

1: indicates a cost between $8 million and $10 million per mile.
2: indicates a cost between $6 million and $7.9 million per mile.
3: indicates a cost between $4 million and $5.9 million per mile.
4: indicates a cost between $2 million and $3.9 million per mile.
5: indicates a cost between $0 million and $1.9 million per mile.

Public Safety

Quantitative assessment of the railroad project relating to enhancement of public safety for motor vehicles, bicycles, and pedestrians by the elimination of highway at-grade crossings.

1: indicates an increase of 3 to 5 highway at-grade crossings.
2: indicates an increase of 1 to 2 highway at-grade crossings.
3: indicates no change in the number of highway at-grade crossings.
4: indicates a decrease of 1 to 2 highway at-grade crossings.
5: indicates a decrease of 3 to 5 highway at-grade crossings.

Freight and Passenger Service Expandability

Qualitative assessment of how easily a project could accommodate future expansion by the railroad for either freight or passenger rail service. Potential issues could include limited right-of-way, environmental impacts, terrain, costs, etc.

1: The project has very limited expansion ability for either freight or passenger service and could not be expanded due to limited right-of-way, significant community impacts, environmental impacts, or costs.
2: The project has limited expansion ability for either freight or passenger service and could not be expanded due to limited ROW, costs or other impacts.
3: The project could accommodate the expansion of the railroad for either freight or passenger rail service but would have some impacts to the community.
4: The project could accommodate the expansion of the railroad for either freight or passenger rail service to the community.
5: The project could easily accommodate the expansion of the railroad for either freight or passenger rail service.

Ability to Serve Businesses

Qualitative assessment of how well each alternative could provide rail service to existing local businesses and future businesses in other areas planned or zoned

for industrial development. Included in this criteria is consideration for the need to convert some delivery services to trucks in the case of no rail service along the delivery routes.

1: The project will not provide rail service to existing businesses or future businesses in areas planned/zoned for industrial development.
2: The project may not provide service to existing businesses, but may provide for future development along a very limited section of the alignment.
3: The project may not provide service to existing businesses, but may provide service for future development along a section of the alignment.
4: The project provides rail service to existing businesses and has the potential to serve future development along multiple sections of the alignment.
5: The project provides rail service to existing businesses and has a strong ability to serve future businesses in areas planned/zoned for industrial development.

Community Compatibility

Qualitative assessment of the impacts on a broad range of neighborhood concerns such as visual and noise impacts, affects on quality of life, changes in land use, emergency services, displacement of residents and businesses, and access to community facilities, such as medical facilities, schools, and parks. Proximity impacts to historical structures, archeological sites, regulated material sites or brownfields is also included in this criterion.

1: indicates the project would have few or no benefits and have adverse impacts on the communities through which it passes.
2: indicates the project would be less compatible with the communities through which it passes, having limited benefits and few or no adverse impacts
3: indicates the project could be compatible with the communities through which it passes with benefits generally balanced with impacts.
4: indicates the project could be compatible with the communities through which it passes with limited benefits and few or no adverse impacts.
5: indicates the project could be compatible with the communities through which it passes with more benefits than adverse impacts.

Consistency with Regional Plans and Existing/Planned Development

Qualitative indication on how consistent each alternative is with approved plans for residential development, commercial developments, transportation projects, community centers, schools, land use, zoning, master planned developments, and other plans along the alignment.

1: The project is inconsistent with existing and planned development and could preclude some development plans.

2: The project is inconsistent with existing and planned development.

3: The project is generally consistent with existing and planned development.

4: The project is consistent with existing and planned development and could encourage some additional development or redevelopment.

5: The project is consistent with existing and planned development and could encourage significant additional development or redevelopment.

Natural Environment Effects

Environmental issues will be investigated to assess the potential of a project to affect the natural environmental such as properties (parkland, wildlife refuges, and waterfowl refuges), wetlands, floodplains, threatened and endangered species, and/or prime and unique farmlands.

1: More than 10% of the land required for the project would require the conversion of the natural environment (such as wetlands, floodplains, prime/unique farmlands) for development and/or the project requires a direct impact to properties or critical habitat for threatened and endangered species.

2: Between 1-10% of the land required for the project would require the conversion of the natural environment (such as wetlands, floodplains, prime/unique farmlands) for development and has no direct impact to properties or critical habitat for threatened and endangered species.

3: Less than 1% of the land required for the project would require the conversion of the natural environment (such as wetlands, floodplains, prime/unique farmlands) for development and has no direct impact to properties or critical habitat for threatened and endangered species.

4: Project would preserve the natural environment (such as wetlands, floodplains, prime/unique farmlands) and has no direct impact to properties or critical habitat for threatened and endangered species.

5: Project would preserve and enhance the natural environment (such as the creation of addition wetlands) through mitigation measures and has no direct impact to properties or critical habitat for threatened and endangered species.

Public and Agency Support

This criterion indicates support or acceptance of a project by the public and other Federal, state, and local agencies, including regulatory and support agencies, such as economic development entities.

1: indicates the alternative has strong public and agency opposition.
2: indicates the alternative has some public and agency opposition.
3: indicates neutral public and agency support or equal support and opposition.
4: indicates the alternative has some public and agency support.
5: indicates the alternative has strong public and agency support.

A.4 FREIGHT MOBILITY STRATEGIC INVESTMENT BOARD

The Freight Mobility Strategic Investment Board (FMSIB) does not provide a methodology to undertake benefit/cost analysis, however, it does have a set of criteria to rank projects based on the project's ability to improve freight mobility in the area and in the region, enhance safety, attract private sources to fund the project, and mitigate projects impact on the environment, among others.

The FMSIB supports projects from public entities that meet the eligibility criteria summarized as follows:

- The project must be on a strategic corridor
- The project must meet one of the following conditions:
    - It is primary aimed at reducing identified barriers to freight movement with only incidental benefits to general or personal mobility;
    - It is primarily aimed at increasing capacity of the movement of freight with only incidental benefits to general or personal mobility
    - It is primarily aimed at mitigating the impacts on communities of increasing freight movement, including roadway/railway conflicts; and
- The project must have a total public benefit/total public cost ratio of equal or greater than one.

Table A.4 describes the criteria included and their weight in the project score. However, unlike Tennessee's additional criteria, the FMSIB does not provide a detailed score of the level to which the criterion is accomplished.

Table A.4 FMSIB Criteria

Criteria	Weight
Freight Mobility for the Project Area	**35 Maximum**
Reduce truck, train, or car delays	0-25
Increase capacity for peak hour truck	0-10

Freight Mobility of the Region, State, Nation	**35 Maximum**
Importance to the regional freight system & regional economy	0-10
Importance to state freight system & state economy	0-10
Direct access to ports or international border	0-10
Provide a corridor/system solution	0-5
General Mobility	**25 Maximum**
Reduce vehicular traffic delay	0-10
Reduce queuing & backups	0-7
Reduce delay from use of alternative railroad crossing	0-5
Address urban principal arterials	
Urban principal arterials	3
Otherwise	0
Safety	**20 Maximum**
Reduce railroad crossing accidents	0-5
Reduce non-railroad crossing accidents	0-5
Provide emergency vehicle access	
Essential access route	5
Otherwise	0
Close additional related railroad crossings	
2 or more additional crossing closures	5
1 additional crossing closure	3
No crossing closures	0
Freight and Economic Value	**15 Maximum**
Benefit mainline rail operations	
High	5
Moderate	3
Minimal	1
Negligible	0
Access to key employment areas	0-5
Support faster train movements	0-5
Environment	**10 Maximum**
Reduce vehicle emissions	0-5
1.0 X delay in attainment area	
1.5 X delay in non attainment area	
Reduce train whistle noise crossing vicinity	0-5
Partnership	**25 Maximum**
Matching funds (35% match is required)	20 maximum
Public participation	1 point for every 4% of match after initial 20%
Private participation	2 point for every 2% of match after initial 20%

Critical timing of partner investments	0-5
Consistency with Regional & State Plans	**5 Maximum**
Regional transportation plan	3
State level of transportation plan	2
Not in regional or state transportation plan	0
Cost	**10 Maximum**
Cost effectiveness	0-7
Degree to which least-cost alternatives are considered	0-3
Special Issues	**8 Maximum**
Address special or unique circumstances not otherwise addressed	0-8

Source: FMSIB, Freight Mobility Strategic Investment Program Criteria.

B. Washington State Benefits Measures

Based on the revision of the methodologies documented in Appendix A, this appendix describes the public benefit measures chosen to evaluate rail infrastructure projects in Washington State and specifies the input variables needed to calculate such benefits using the Washington State Public B/C Calculator.

Table B.1 provides a detailed description of the benefit measures considered and their calculations to assess the impact that the proposed project has at the state level in terms of:

- Transportation and economic benefits, benefits derived from spur economic development;
- Merely transportation benefits, benefits that result from reduction in highway maintenance costs and shipper costs; and
- External benefits, these include land use, safety, security, and environmental benefits.

Table B.1 Washington State Benefit Measures

Description	Calculation
Transportation and Economic Benefits	
Avoided maintenance costs	Maintenance costs saved= Distance * traffic diverted to rail*maintenance costs
Reduction in shipper costs	Shipping costs saved= (Truck rate – rail rate)* (Avg. tons per truck) * Distance* Diversions
Reduction in automobile delays at grade crossings	Value of delay reduction= (AADT/min. in a day)*Delay value/veh min)*(grade crossings impacted)* (highway delay/2)^2
Economic Impacts	
	Value of new wages earned= (# New

New or retained jobs	Jobs)*(Avg. Annual Wage)* (Indirect Jobs Multiplier)
Tax increases from industrial development	Property Taxes from New Ind. Development= (Sq ft of new industrial development)*(Tax rate/Sq Ft)
External Impacts	
Safety Improvements	Savings from safety improvements= (Distance)*(% distance in WA state)*(Diversions)*Safety Value/VMT)
Environmental Benefits	Savings from environ. Improve. = (Distance)* (% Distance in WA State)*(Diversions)*(2/3)*Environ. value/VMT)

Source: Cambridge Systematics, Inc. 2006

In order to calculate the benefits the applicant should provide many of the inputs directly associated with the project, while other inputs common to all projects such as inflation, value of time, etc, will be provided as default values.

Table B.2 describes the information that needs to be supplied by the applicant, this information is project specific which means that the value of the variables will change based on the project impacts.

Table B.2 Variables to be Input By the Applicant

Variable	Description	Units
Distance	Average haul distance for trips originating and terminating on the rail line	Miles per trip
% Distance in WA	Percentage of the average haul distance occurring in WA	Percentage
Diversions	Estimate of the annual number of truck trips shifting to rail as a result of this project	Truckloads per year
Grade Crossings Impacted	Number at grade crossings impacted by the project	Number of crossings

AADT	Average annual daily traffic counts for roadways involved in rail highway grade crossing impacted by the project.	Vehicle counts (To be Provided by WADOT)
Highway delay	Average time reduction per crossing per day for the amount of time trains block roadways	Minutes per day
Jobs	Full-time, non railroad new jobs in WA as a result of this project	Total new jobs
Priority	Ranking of project priority for railroad	Positive integer
Square Footage	Square footage of new businesses in WA as a result of this project	Total square feet
Total Project Cost	Total cost of the project	Dollars

Source: Cambridge Systematics, Inc. 2006

Table B.3 presents the items that are common across all the transportation and economic calculations. These default values should be periodically updated by the user.

Table B.3 Default Values

Variable	Value	Basis
Annual inflation rate	3.5%	Average annual inflation rate over planning horizon. This figure was estimated according to data gathered in the best practices review
Average Annual Pay for Private Industry in WA	$40,224	U.S. Department of Labor, Quarterly Census. This default value is based on a selection that included WA statewide, all industries, private sector, and all companies size. Available at http://data.bls.gov/PDQ/outside.jsp?survey=en
Average Rate for Rail Shipments	$0.045/ton-mile	Average rate for intermodal rail shipments, which tend to be the most highly competitive truck rail traffic.

Average Rate for Truck Shipments	$0.08/ton-mile	Standard rate used in many studies, for example, the Mid-Atlantic Rail Operations Study.
Average Tons per truck	20 tons/truck	Maximum load for most containers. Higher weight should be used if diverted trucks are carrying heavy materials.
Delay Value per Vehicle Minute	$0.341/veh.min	Benefits from reduction in roadway waiting time at rail-highway grade crossings. The largest component is person minutes of waiting, calculated dividing the average annual pay for private industry by the average minutes in a work year (2080*60 min/hr) which is $0.32/veh-min for WA. A smaller component is the fuel burned while idling. On average, a car consumes 25 cm^3 of fuel per minute. This results in $0.019/veh-min at current fuel prices.
Environmental Value per VMT Change	$0.01979/VMT	The value was obtained from HERS. It is a baseline value for the cost of pollution, established as part of the Mid-Atlantic Rail Operations Study.
WA Share cost		To be decided based on the analysis.
Highway Maintenance Cost	$X/VMT	WSDOT will provide this figure
Multiplier for Indirect Jobs	2	Every direct job (factory, warehouse, etc) can create indirect jobs (restaurant, stores, etc.) The multiplier determines how many indirect jobs are created per direct job. A default value of 2 is based on a best practices review. A better estimate can be obtained using RIMSII. For more information see: http://www.bea.gov/bea/regional/data.htm
Planning Horizon	10 years	FRA "Benefit Cost Methodology for Local Rail Freight Assistance Program," July 1990.
Safety Value per VMT Change	$0.014012/VMT	The value was obtained from HERS. It is a baseline value for the cost of vehicle crashes, established as part of the Mid-Atlantic Rail Operations Study (MAROps).
Tax Rate based on Sq	$0.00/sq ft	Tax rates vary by location. A default of zero is used. The user can enter the appropriate rate

Feet of industrial space		for a location, when applicable.
Time Value of Money	7.5%	This represents an average return that could be realized if the money were invested differently. The difference between the time value of money and the inflation rate is the annual discount rate used to convert future benefits into current benefits. This default value is based on a recommendation from a Cambridge Systematics economist.

Source: Cambridge Systematics, Inc. 2006