

PRIORITIZATION OF CAPACITY IMPROVEMENTS

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16. ABSTRACT <p>This technical report summarizes the Prioritization of Capacity Improvements Study (PCIS), the purpose of which was to develop a new methodology for prioritizing mobility improvement projects to reflect State Transportation Policy Plan objectives. This report includes a discussion of the preexisting Category C prioritization formula, an overview of state-of-the-art prioritization methods for regional and statewide project programming elsewhere, a detailed discussion of the proposed ranking methodology for mobility improvements, and finally, a description of the implementation process for the 1995-97 biennial programming cycle at the Washington State Department of Transportation (WSDOT).</p> <p>This study focused on the safe, cost-effective movement of people and goods; the encouragement of high occupancy vehicles and alternative modes; land use-transportation compatibility; environmental conservation; social and economic impacts; institutional coordination; and local support, all of which are explicit goals in the State Transportation Policy Plan.</p> <p>The new prioritization framework has several advantages. It is flexible enough to accommodate future changes in state policy. Additionally, it represents a significant step toward the ability to evaluate and rank multimodal mobility projects in direct response to transportation policy and service objectives. WSDOT is clearly in the forefront of such planning efforts nationwide.</p> <p>There are many opportunities for further study, and it is recommended that the Washington State Department of Transportation continue to push the known boundaries of economic analysis as innovative, multimodal solutions are considered increasingly frequently in the mobility improvement program. Such efforts will allow decision makers to make the best use of limited state resources.</p>			
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Prioritization of Capacity Improvements

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by

Tracy L. Reed
Graduate Research Assistant
Department of Civil Engineering
University of Washington

D. A. Niemeier
Assistant Professor
Department of Civil Engineering
University of California, Davis

G. Scott Rutherford
Associate Professor
Department of Civil Engineering
University of Washington

Washington State Transportation Center (TRAC)
University of Washington
University District Building
1107 NE 45th Street, Suite 535
Box 354802
Seattle, Washington 98105-4631

Washington State Department of Transportation
Technical Monitor
Patrick E. Morin
Priority Management Engineer

Prepared for
Washington State Transportation Commission
Department of Transportation
and in cooperation with
U.S. Department of Transportation
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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Introduction	1
Research Objective and Scope	1
Problem Statement	1
Project Framework	8
Survey of Current Practice	11
WSDOT Category C Prioritization Formula	11
Steps 1-3.....	11
General Comments.....	13
State-of-the-Art Assessment	14
San Francisco Bay Area Metropolitan Transportation Commission	15
Los Angeles County Transportation Commission	21
Washington Transportation Improvement Board	21
Priority Rating System	28
State Transportation Policy	28
Prioritization Methodology	32
Screening Criteria	33
Evaluation Criteria	34
Cost-Efficiency	34
Community Support	41
Environmental Impact.....	42
Mode Integration.....	47
Land Use	48
Calculation of Priority Index.....	49
Theoretical Comparisons of Ranking Algorithms	49
Priority Index Calculation	50
Implementation	52
Sensitivity Analysis & Categorical Weight Assignment	52
Sensitivity Analysis Results	52
Delphi Decision-making Technique	54
Implementation Assistance to WSDOT	55
Criteria and Database Assessment	55
Technical Advisory Committee	60
1995-1997 Project Ranking Results.....	61
General Comments.....	66
Conclusions and Recommendations	67
Acknowledgment	71
References	73

TABLE OF CONTENTS (Continued)

Section

Appendix A. Details of Priority Index Calculation

Appendix B. Mathematical Summary of Topsis

Appendix C. Detailed Listing of Topsis-6

Appendix D. Previous and Proposed Project Sheets

Appendix E. Proposed Criteria Worksheets & Scoring Guidelines

Appendix F. Statewide Resource Summary

Appendix G. General Guideline for User Benefit Calculation

Appendix H. Summary of Delphi Analysis for Weight Setting

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1.	Washington State Transportation Policy Implementation	3
2.	Washington State Multimodal Transportation Plan Structure	4
3.	State Highways Priority Programming Structure.....	5
4.	Transition from CATA-H to 1995 WSDOT Highway Program Structure	7
5.	Priority Process	33
6.	Mathematical Ranking Process	51
7.	Statewide Prioritization Urban Mobility Program, 1995-97.....	56
8.	Statewide Prioritization Rural Mobility Program, 1995-97.....	57
9.	Overall Urban Mobility Program Cost Effectiveness, 1995-97.....	63
10.	Overall Rural Mobility Program Cost Effectiveness, 1995-97.....	64

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1.	Prioritization Study Phases	9
2.	MTC's Criteria and Scoring Measures (San Francisco Bay Area) ...	17
3.	Los Angeles County Screening Criteria.....	22
4.	Los Angeles County Evaluation Criteria	23
5.	Urban Program Scoring Criteria	24
6.	Small City Program Scoring Criteria	24
7.	Comparison of Criteria Used in Regional Programming Case Studies	25
8.	Final Weight Assigned to Evaluation Criteria Categories	53

LIST OF EXHIBITS

<u>Exhibit</u>		<u>Page</u>
1.	State Transportation Policy Plan Goals	29
2.	State Transportation Policy Plan Objective Associated with Urban and Rural Mobility Sub-Programs	31

INTRODUCTION

RESEARCH OBJECTIVE & SCOPE

Summarized herein are the findings of the Prioritization of Capacity Improvements Study (PCIS). Since this study was initiated in 1990, policy guidelines and program structure at the Washington State Department of Transportation (WSDOT) have changed significantly. While the scope of the study was originally limited to a review of the prioritization methodology for Category C capacity improvements, the scope has been expanded. It now includes development of a prioritization methodology for both the urban and rural Mobility improvement programs. This new methodology is to reflect State Transportation Policy Plan objectives for the 1995-1997 programming cycle. The expanded study scope now encompasses the following elements:

- Development of a prioritization methodology for evaluating mobility project proposals to emphasize movement of *people and goods* rather than movement of vehicles. The methodology includes criteria to assess cost-efficiency; multimodal highway projects; non-monetized environmental, social, and land use impact costs.
- A full-scale test of the ranking methodology and sensitivity analysis between criteria.
- Coordination of criteria weight assignment.
- Implementation assistance to WSDOT.

PROBLEM STATEMENT

RCW 47.05, the Washington State Transportation Priority Programming for Highway Development Law, establishes a programming policy for the state highway system based on the "rational selection of projects according to factual need..." The scope of this law was expanded in 1993 to require "...an evaluation of life cycle costs and benefits systematically scheduled to carry out defined objectives within available revenue." RCW 47.05 further mandates that priority selection be applied to projects that are part of a comprehensive, six-year investment program, based on needs identified in

the state-owned highway component of the statewide multimodal transportation plan. The program must be adopted and periodically revised by the Washington State Transportation Commission (WSTC). The WSTC must specify state transportation policy objectives for each programmatic service objective (fig. 1). WSDOT has clearly distinguished between state-owned and state-interest facilities (fig. 2). State-owned facilities consist of state airports, the Washington State Ferries, and state highways. State-interest facilities consist of aviation (broadly defined), marine ports, bicycle/pedestrian access, freight and passenger rail, and public transportation. It is notable that PCIS is constrained to priority programming of mobility improvements in the State Highway Construction Program (shaded area in fig. 3). Specifically, this report recommends a revised prioritization method for evaluating Urban and Rural Mobility improvements that is responsive to II-Mobility program service objectives.

Prior to RCW 47.05 revision, highway improvements were categorized as A, B, C, or H. Category A provided funding for non-interstate preservation, safety, and minor operational improvements. Budget category B provided funding for interstate capacity, initial system completion, and preservation. Budget category C provided funding for non-interstate highway capacity improvements. Non-interstate bridge work was addressed separately in category H. Since the inception of this study, three things have been restructured. First, a State Transportation Policy Plan Steering Committee was set up in 1988 to identify goals and service objectives. Second, WSDOT's planning department drafted a 20-year Multimodal Transportation Systems Plan. Third, the Legislative Transportation Committee commissioned the program structure, monitoring, performance, and prioritization study (PAPS) in 1990-1992. As a result of this restructuring, the WSDOT highway construction program now more clearly differentiates system preservation from system improvement. The current program also minimizes facility type distinctions within the program.

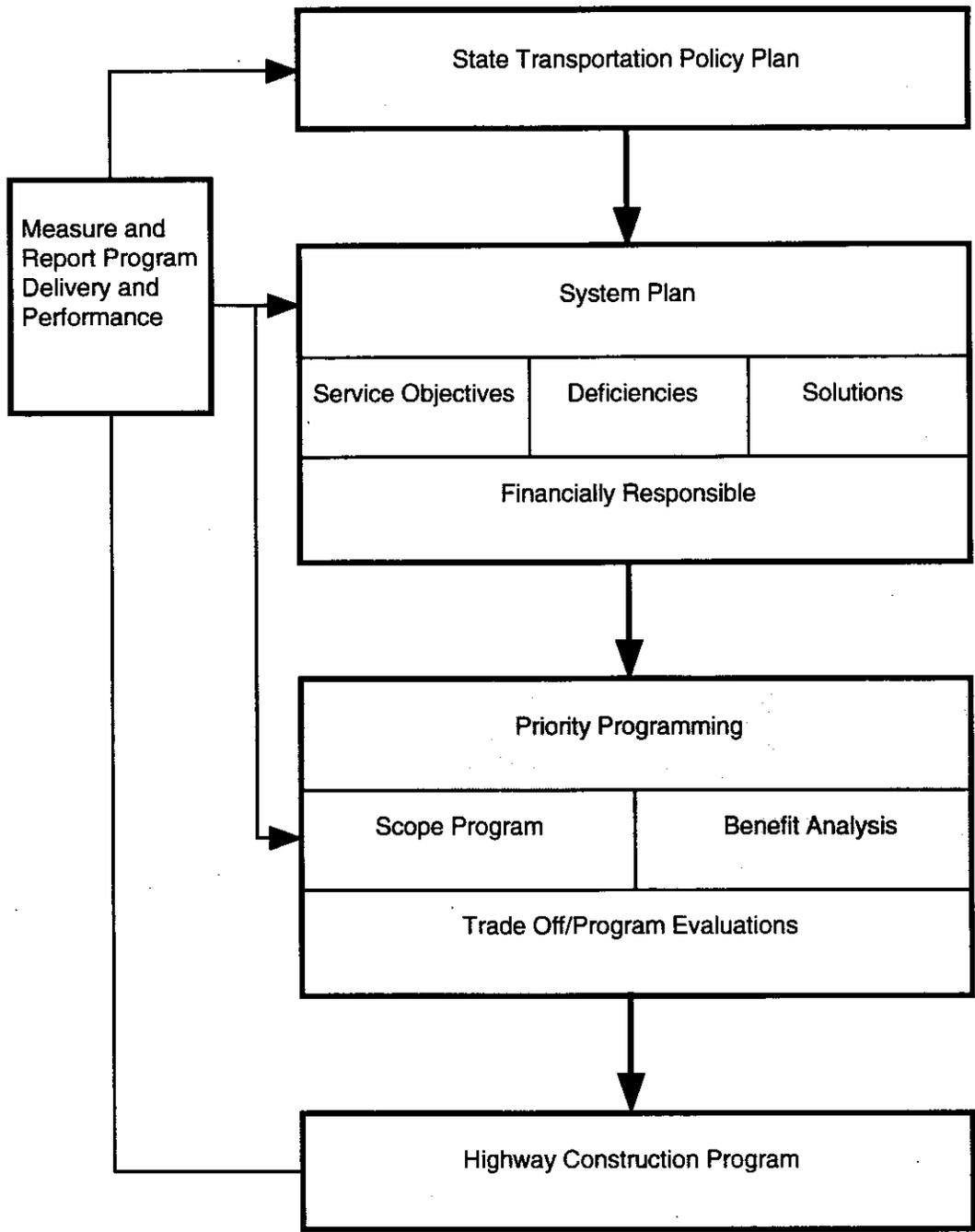


Figure 1. Washington State Transportation Policy Implementation

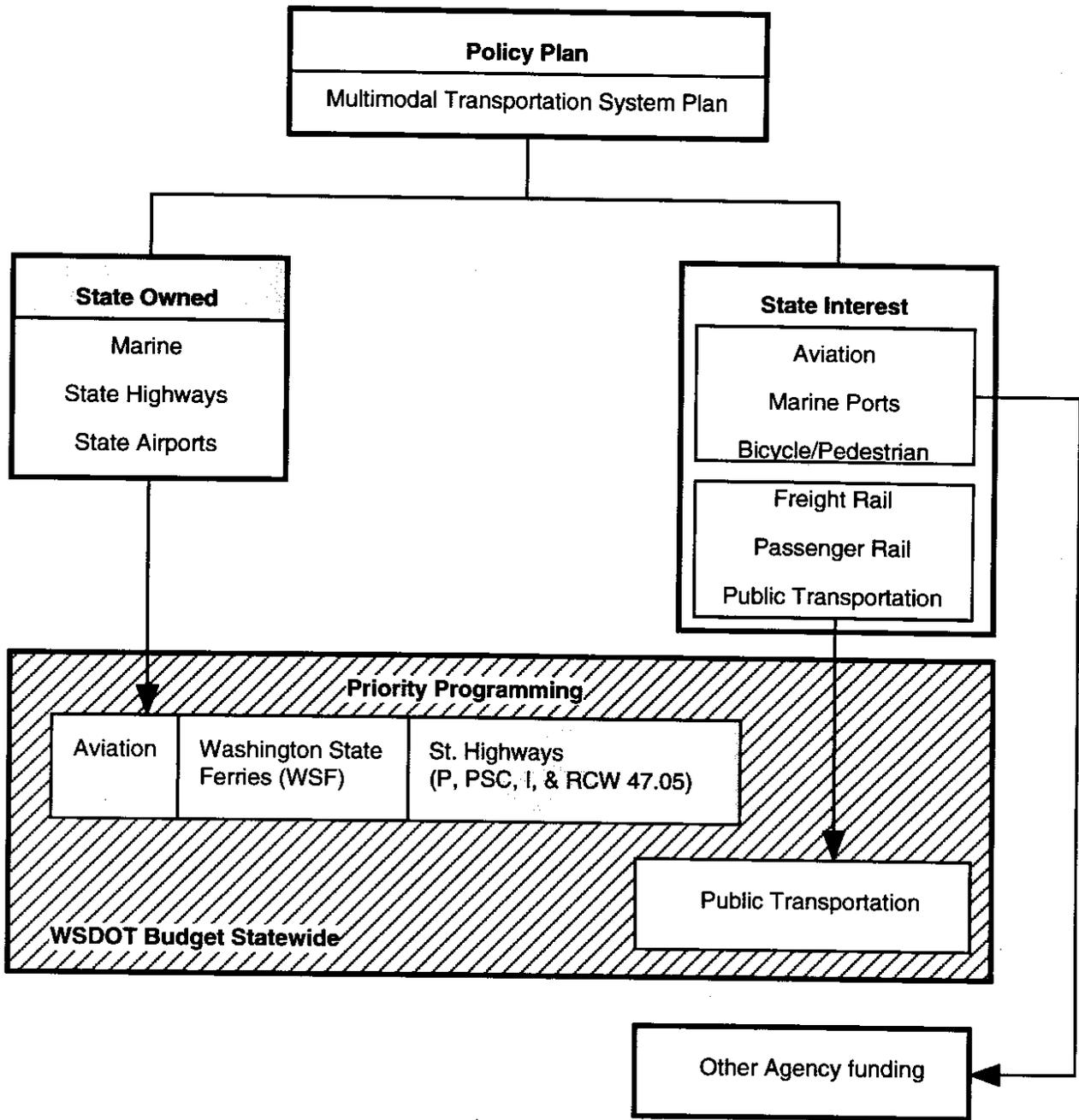


Figure 2. Washington State Multimodal Transportation Plan Structure

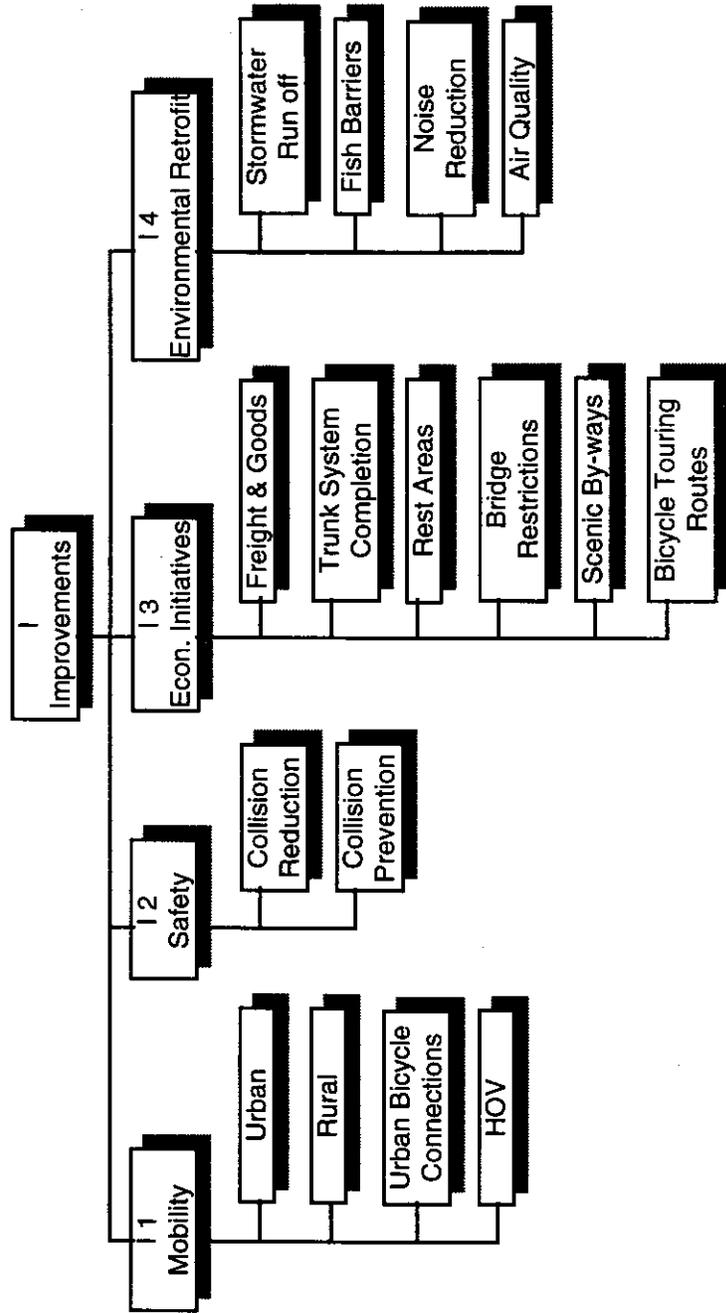
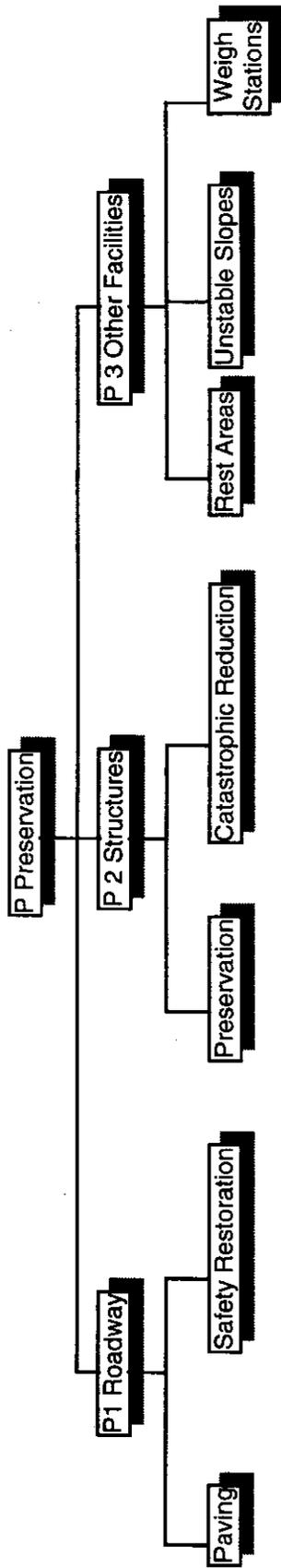


Figure 3. State Highways Priority Programming Structure

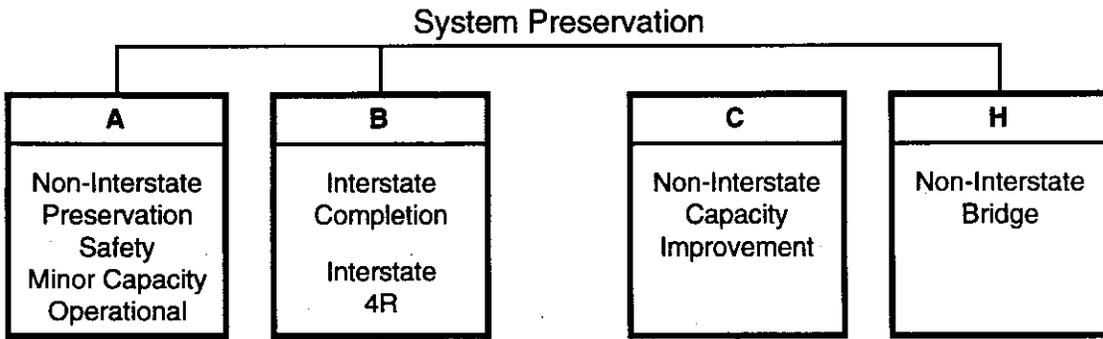
Two independent budget categories, P and I, were created to align with the service objectives of the System Plan and to define all of the highway construction sub-programs. The elements of this programming transition are described in figure 4.

Category B ranking was based primarily on completion of the interstate system. In Washington state, the process included evaluation of quantitative factors, such as level of service, traffic volumes, accident rates, and volume-to-capacity ratios. The WSDOT also considered qualitative criteria, such as district priority, the balance of funding opportunities vs. project costs, and degree of transit relatedness. Category B was not a focal point for the PCIS because its purposes were relatively limited. It was used only to program federal interstate completion funds. As the interstate system nears completion, the magnitude and diversity of this category are receding.

Category C encompasses more diverse project types, ranging from high occupancy vehicle improvements to interchange improvements. The Category C rating system consisted of a screening process against statutory criteria, followed by computation of a rating factor. The rating factor was a function of specific engineering criteria (level of service change, accident reduction, and traffic volumes) and the project's annualized costs and benefits. Another distinction between categories B and C is that Category C was more controversial because prioritization was done biennially, on a larger number of projects. Category B projects were prioritized on only one occasion.

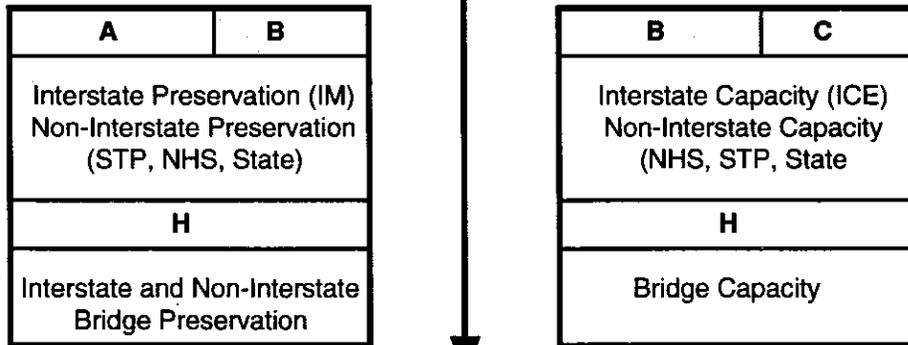
As competition for funding increases, and as highway deficiencies continue to require complex, diverse solutions, a new rating system is needed. This rating system must also be capable of encompassing a greater range of social, environmental, and economic impacts, as well as system performance parameters. This rating system must be responsive to State Transportation Policy Plan objectives and to the 1990 Washington State Growth Management Act (GMA). Federal funding priorities expressed in the Intermodal Surface Transportation Efficiency Act (ISTEA) necessitate prioritization

Previously Existing Program Structure



Capacity Improvement

Interim Stage



Revised Highway Construction Program

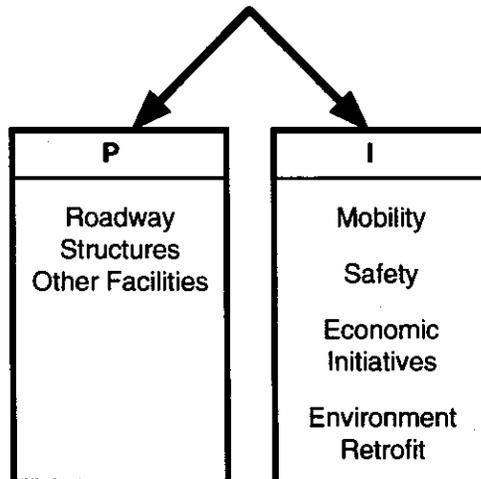


Figure 4. Transition from CATA-H to 1995 WSDOT Highway Program Structure

methods applicable to multimodal projects (e.g., HOV facilities, transit, and non-motorized access).

To meet these new challenges and to improve upon the pre-existing Category C prioritization methods, WSDOT initiated a three-phase project (table 1). Phase I focused on development of a new ranking formula and on selection of criteria to reflect the state policy goal of cost-effective movement of people and goods. Phase II expanded on Phase I by selecting criteria to reflect land use, social, and environmental policy goals. Finally, Phase III, which completed the study effort, consisted of selecting and testing criteria for evaluating multimodal highway mobility projects. Greater ease in understanding for the lay person regarding the project selection process was also a WSDOT goal for the new methodology. The following section describes the progression and products of each phase in more detail.

PROJECT FRAMEWORK

Phase I study efforts focused on the selection of evaluation criteria based on cost-effectiveness in moving people and goods, and the development of a ranking algorithm. Phase I results included an evaluation of the existing WSDOT prioritization methodology, a state-of-the-art assessment, a detailed review of three typical methods, three cost-effectiveness criteria, systems attribute index criteria, and a preferred ranking algorithm (TOPSIS). This phase of the project satisfied RCW 47.05, which requires an evaluation that includes life-cycle cost and benefit analysis.

The number of evaluation criteria was expanded in Phase II to reflect the breadth of policy objectives established by the WSTC. Five criteria categories were added to reflect the importance of community support, social concerns, land use, wetlands, water quality, and noise impacts, as well as expected permitting difficulty. Existing database capabilities were assessed to ensure that each criterion could be evaluated consistently statewide.

Table 1. Prioritization Study Phases

Phase I	<ol style="list-style-type: none">1. Develop ranking formula2. Select ranking criteria for cost-effective movement of people and goods
Phase II	<ol style="list-style-type: none">1. Select ranking criteria to reflect land use, social, and environmental state transportation policy goals as expressed in the state transportation policy plan2. Review literature and conduct state-of-the-art assessment for multi-modal evaluation criteria
Phase III	<ol style="list-style-type: none">1. Select multi-modal evaluation criteria2. Conduct final test of complete criteria set and formula3. Implement prioritization methodology

During Phase III, which completed the study, the cost-effectiveness and Systems Attribute Index criteria developed in Phase I were revised; a final full-scale test of the ranking methodology was carried out; sensitivity analysis among criteria was carried out; final criteria weights were set; and the WSDOT was assisted with full implementation of the new methodology for the 1995-97 biennium. Phase III resulted in a more detailed definition of a benefit-cost ratio as the sole cost-efficiency criteria, and in refinement of the Systems Attribute Index into an explicitly multi-modal criteria category that encourages designs that incorporate public transportation, TSM, pedestrian, and bicycle improvements. Second, data were collected for the 1993-95 biennium project proposals for a final full-scale test of the ranking criteria and methodology. Finally, the sensitivity analysis was used to assist in the adoption of criteria weights among WSDOT representatives. UW TRAC investigators assisted WSDOT with full implementation of the methodology for the 1995-97 biennium program.

The following types of projects are considered typical mobility improvements in this prioritization study:

- passing lanes
- interchanges
- geometric intersection improvements
- general purpose widening
- additional high-occupancy vehicle lanes and facilities
- park-and-ride lots
- transportation system management (e.g., surveillance control and driver information technologies)
- arterial, frontage road, and ramp improvements
- bridge improvements associated with proposed projects

In the following section, a survey of current prioritization practice is presented (including detailed evaluation of methods used in agencies in three west coast urban areas). The WSDOT's Category C prioritization is also presented. This discussion identifies important components and concepts that should be incorporated into the new ranking methodology. A discussion of the proposed ranking system, including the proposed evaluation criteria and the mathematical algorithm, follow. The report concludes with comments on the results of the full-scale test, sensitivity analysis, and observations on the successful implementation of the PCIS in the 1995-97 biennial programming cycle. WSDOT continues to refine and develop the method and criteria, and views the PCIS as an evolving tool.

SURVEY OF CURRENT PRACTICE

The discussion of current practices entails (1) an in-depth evaluation of the pre-existing WSDOT formula, and (2) a review of the state-of-the-art.

This section describes and evaluates the WSDOT's category C prioritization formula for non-interstate capacity improvements. This material is followed by summaries of prioritization methods currently in use by several transportation agencies. The prioritization methods highlighted herein are unusual in that they begin to incorporate a broad range of issues, including environmental impacts, intermodal connections, and land use.

WSDOT CATEGORY C PRIORITIZATION FORMULA

The rating system for Category C projects consisted of screening project proposals against statutory criteria, followed by calculation of a rating factor. The screening criteria required (1) that project proposals address existing highway deficiencies, such as roadway congestion, and (2) that there be community support for the proposal addressing the deficiency. Projects meeting both statutory criteria were then evaluated and ranked.

The quantitative formula for Category C projects actually constituted one overarching relative rating calculation, which consisted of several levels of interim calculations. These calculations, as well as the input data required, are discussed in the following sections. Six sets of calculations were performed, with the results of the first five calculations defining the parameters for the remaining relative rating calculation.

Step 1

Three parameters must be derived for each project: (1) the accident reduction factor; (2) the level of service factor; and (3) the volume factor.

1. **The Accident Reduction Factor (ARF)** is calculated on the basis of the estimated reduction in accidents for the proposed project. The project(s) expected to cause the greatest reductions in accidents is awarded the

maximum 40 points; the project(s) expected to cause the least reduction are awarded one point. Remaining projects are awarded points between one and 40, standardized according to the highest- and lowest-scoring projects. The input data for this calculation are estimated with reference to the *Information Guide for Highway Safety Improvements* (1979).

2. The Level of Service Factor (LOS) is formulated in much the same manner as ARF. Projects are awarded points on the basis of the number of service levels they will improve. A change from LOS F to LOS E is awarded 20 points; a change from LOS E to LOS D, 15 points; LOS D to LOS C, 10 points; LOS C to LOS B, 5 points; and LOS B to LOS A, 0 points. The points for each successive improvement are cumulative; for example, a project that is expected to improve traffic from LOS F to LOS B is awarded 50 points. As with the ARF calculation, the project(s) with the largest number of points receives 40 points; the lowest gets 1 point. Remaining projects are pro-rated between the two extremes. Change in LOS is estimated on the basis of existing volumes and forecasted volumes (with and without the proposed improvement).
3. Volume Factor (VRF) The project that would serve the highest volume is awarded 20 points. The project serving the area with the lowest volume is awarded one point; the rest are pro-rated along a continuum defined by the two extremes. Note that this criterion is weighted less heavily than either ARF or LOS, for which the point maximum is 40, but that all three factors are scored on a normalized scale.

The next step in category C prioritization is the calculation of the engineering factor and the annualized costs.

Step 2

1. The Engineering Factor (EF) is calculated by adding together the points from Step 1. The only weight applied to these factors is the scale from which the factors are derived.

$$EF = ARF + LOS + VRF$$

Because the individual components of EF are in integer form (i.e., from 1 to 40), the EF itself does not range widely among projects. A large proportion of projects have an EF score between 15 and 35. Consequently, cost turns out to be a key determinant of final project ranking.

2. Cost Factor- The cost factor is calculated as follows:

$$CA = (C+MC)K_{30} - Oc - ARC$$

K_{30} is the capital recovery factor used to convert present project costs to an annualized value. C is project design and construction costs, and MC is maintenance costs. ARC is the estimated accident reduction savings and Oc is the operating cost savings. In essence, annualized benefits are subtracted from annualized costs, resulting in an overall cost factor.

Note that travel time savings are not calculated as a project benefit in the Category C formula. For this reason, very few projects would emerge as economically efficient, i.e., having greater benefits than costs without revision of Category C's life-cycle cost analysis. There are both advantages and disadvantages associated with calculating travel time savings into the formula. Leaving aside travel time savings means avoiding the thorny issue of assigning an appropriate monetary value to time. Alternatively, leaving travel time savings out of the formula makes it difficult to ascertain a project's true economic efficiency. By monetizing travel time savings, an economic analysis comes much closer to assessing all the benefits of any project, making it possible to demonstrate the return on the taxpayer's investment.

Step 3

The final step project prioritization combines the results from Step 2 as follows:

$$\text{Relative Rating} = \frac{EF}{\sqrt{\frac{CA}{10,000}}}$$

The engineering factor is divided by the square root of the cost factor (10,000 is simply a scaling factor). Taking the square root of the cost factor decreases the disparity between projects for which costs are very high and projects for which costs are very low. In theory, more expensive projects are not penalized simply because of their high cost. However, because the calculated engineering factor does not vary greatly among projects (roughly 70 percent of the projects have an engineering factor between 15 and 35), cost does play a significant role in the final ranking. Nevertheless, not taking the cost factor's square root would exaggerate its effect to an even greater degree.

General Comments

The current formula is well-suited to evaluating highway-related projects that are similar in nature and whose primary purpose is to move vehicles. However, transportation policy and funding strategies are changing; as such, a new approach to

project prioritization is both needed and mandated by RCW 47.05. It is hoped that the foregoing review of the current formula has helped identify elements to consider in developing a new approach. For example, review of the current formula revealed that changes in the evaluation criteria would require substantive changes in the existing mathematical algorithm. Ideally, a mathematical formula should be flexible enough to accommodate any number or type of criteria. Such flexibility would enable WSDOT to respond to changes in state transportation policy without changing the basic prioritization framework. The prevailing emphasis on multi-modal planning and project evaluation also suggests that criteria should be applicable across a wide range of project types and costs.

The new approach should include criteria that capture the cost-effective movement of people and goods, community support and impact, environmental impact, multi-modal design attributes, and land-use transportation linkage factors. Although this study primarily addressed project evaluation for improvements within the Mobility program, the new methodology is flexible enough to allow future expansion to accommodate additional criteria, or for application to other improvement program areas.

STATE-OF-THE-ART ASSESSMENT

Three state-of-the-art methodologies for ranking transportation projects are discussed in this section: two from California and one from Washington state. While each is in some way unique, all address broad multi-modal and intermodal transportation objectives. These state-of-the-art methodologies are offered as case studies of regional priority programming efforts; as such, they provide a starting point for incorporating a broader range of system criteria into the new methodology.

For a complete discussion of a similar literature review and the status prioritization methods throughout North America, see “Synthesis 201: Multimodal Evaluation in Passenger Transportation” (Rutherford, 1994). This document reports the

results of a survey conducted in 1991-92 for the National Cooperative Highway Research Program.

San Francisco Bay Area Metropolitan Transportation Commission

The San Francisco Bay area Metropolitan Transportation Commission (MTC) uses a ranking process to prioritize projects ranging from highway paving to child-care facilities at transit stations. The method consists of four tasks:

- Three independent sets of evaluation criteria are developed (or reviewed) to screen projects, to assign a score based on a project's merits, and to ensure overall program effectiveness.
- All proposed projects, regardless of mode, must pass the same initial screening.
- All proposed projects are scored based on technical merit and external impacts.
- A draft priority list is developed and evaluated against a third set of programming criteria/principles.

MTC continues to refine this process with every regional transportation improvement program (TIP) cycle, which allows the MTC to be flexible in responding to evolving transportation policy. Once evaluation criteria have been established, a committee screens and scores transit, highway, and multimodal projects. While the scoring criteria presently employed are qualitatively similar, multimodal performance measures are not quantified, and benefits are not monetized. Thus, the value of road, freight, mass transit, and bicycle/pedestrian projects are evaluated as separate subcategories, but they are scored similarly. The MTC's scoring procedure is interesting because it relies on impact measures that cut across modes wherever possible. The MTC method also applies weight differentially across modes by safety, congestion, and demand multipliers.

Screening Criteria

MTC planners first screen proposed projects for conformance criteria to ensure consistency among agencies and other interested parties (e.g., the regional transportation plan, land use plans, ISTEA, air quality plans, etc.). The committee also scrutinizes other

threshold requirements, including project definition and justification, completeness of documentation, reasonableness of provided cost estimates, Americans with Disabilities Act compliance, and support by an adequate financial plan. Although certified environmental documentation is not required at this stage, projects must not show significant adverse, unmitigated air quality impacts. Projects that pass the initial screening are then scored and prioritized.

Scoring Procedure

Scoring is structured to handle multi-modal project evaluation. Projects that pass the initial screening, are scored against four sets of criteria that quantify the following Metropolitan Transportation System (MTS) issues:

1. maintaining/sustaining the MTS
2. improved efficiency and effectiveness
3. system expansion
4. external impacts

Each scoring category contains various sub-category measures of effectiveness, with a maximum of 100-points possible. Multi-modal projects can be evaluated more than once in each category, but the sum of a group of criteria must not exceed the sum allocated to the scoring category of criteria . The components of each of the four categories are summarized below (table 2).

Maintaining/sustaining the MTS. Contributions to maintenance are assessed on the basis of management system evaluation and priority or normal replacement and rehabilitation cycles. Seismic retrofitting is proportionately assessed. Existing conditions constitute the scoring baseline.

Improved efficiency and effectiveness are scored based on the extent to which the proposed project would improve safety and security, and reduce congestion. Multipliers are applied according to the magnitude of the existing problem. The

Table 2. Metropolitan Transportation Commission's Criteria and Scoring Measures (San Francisco Bay Area)
(Younger & Murray, 1994)

Category	Roadway Elements	Mass Transit Elements	Pedestrian & Bicycle Elements
Maintain/Sustain the MTS (Max. Score = 30)			
Management System based rehabilitation/replacements (0-30pts.)	magnitude of rehabilitation/replacement	urgency of replacement or degree of prolonged useful life of asset	---
Rehabilitation/replacement NOT based on Management Systems (1-20pts.)	magnitude of rehabilitation/replacement	determined largely by replacement cycles in transit finance plan	magnitude of rehabilitation/replacement
Seismic Retrofit (0-30pts.)	proportion of project for seismic retrofit and estimated degree of risk	<i>not distinguished by type</i>	<i>not distinguished by type</i>
Breakdown prevention (0-10)	degree that project will prevent unacceptable breakdowns in the MTS	<i>not distinguished by type</i>	<i>not distinguished by type</i>
Improved Efficiency & Effectiveness of MTS (Max. Score = 30)			
Safety and Security* (0-20pts.)	extent project addresses generic problems -scored by improvement type	extent project addresses generic problems -scored by improvement type	extent project addresses generic problems -scored by improvement type
Congestion Relief* (0-20pts.)	degree of impact based on MTS, CMP deficiencies and improvement type	degree of impact based on MTS, CMP deficiencies, and emphasizes reliability over comfort.	degree of impact based on MTS, CMP, and emphasizes utilitarian facilities over recreational
Cost effectiveness (0-10pts.)	total project score divided total project cost -normalized to ordinal scale	<i>not distinguished by type</i>	<i>not distinguished by type</i>
Freight Movement (0-30pts.)	based on heavy truck traffic % and scale of intermodal improvement on MTS	<i>not distinguished by type</i>	<i>not distinguished by type</i>

* Multiplier based on magnitude of existing conditions modifies the ordinal score assigned.

Table 2. Metropolitan Transportation Commission's Criteria and Scoring Measures (San Francisco Bay Area)
(Younger & Murray, 1994)

Category	Roadway Elements	Mass Transit Elements	Pedestrian & Bicycle Elements
System Expansion (Max. Score = 15)			
Degree of Demand** (0-15 pts.)	degree of benefit to MTS; HOV improvements favored over arterial capacity	degree of benefit to MTS	projects that primarily serve commuters are favored over recreational improvements and connections to MTS
Corridor Preservation (0-15 pts.)	significance of, and threat to transportation corridor	<i>not distinguished by type</i>	<i>not distinguished by type</i>
External Impacts (Max. Score = 25)			
Air Quality Control (0-25 pts.)	effectiveness of Clean Air Plan Transportation Control Measures	<i>not distinguished by type</i>	<i>not distinguished by type</i>
Land Use Planning (0-10pts.)	degree to which project promotes increased density at transit station, more efficient l/u patterns, and reduces auto dependence	<i>not distinguished by type</i>	<i>not distinguished by type</i>
Energy Conservation/ Modal Shift (0-10pts.)	degree project promotes modal shift, or by type of signal improvement	<i>not distinguished by type</i>	<i>not distinguished by type</i>
ADA Enhancements (0-20pts.)	degree to which project is for ADA requirements	<i>not distinguished by type</i>	<i>not distinguished by type</i>
ISTEA Enhancements (0-15 pts.)	degree to which project is a qualified enhancement	<i>not distinguished by type</i>	<i>not distinguished by type</i>
Negative Impacts*** (negative points)	<i>not presently quantified</i>	<i>not presently quantified</i>	<i>not presently quantified</i>
100	TOTAL POINTS		

** Intermodal freight facilities are scored based on significance of new access provided; and, Multiplier based on magnitude of existing conditions modifies the ordinal score assigned.

*** There is no consensus on how to measure such impacts and whether negative impacts were only significant of non-SOV projects. This is intended to be a future consideration.

maximum score for this category is 30 points. Improved freight movement and intermodal transfer facilities may account for zero to 20 or 30 points alone, while a proxy for lifecycle cost analysis may contribute no more than ten points. The MTS cost-effectiveness measure is a proxy because it is calculated by dividing the total project score in all four categories by total project cost, as opposed to calculating a detailed benefit value.

System expansion. System expansion project scores, are qualitatively assigned, but scaled with a multiplier, based on whether the project meets (1) current demand and (2) projected demand. The 15-point maximum in this subcategory may also be accrued if the project includes right-of-way acquisition for corridor preservation. Projects in this category are scored based on the primary mode served, rather than cumulatively across all modes served, as is the case in the other three categories.

External impacts. This category evaluates the degree to which a project is expected to (1) affect air quality in the Bay Area, (2) support land use plans and goals, (3) conserve energy, (4) promote alternative mode shifts, and (5) promote transportation enhancement activities as defined by ISTEA and the Americans with Disabilities Act. If a project has no significant impact on air quality, then it is awarded no more than one point. However, if a project scores well or moderately well in each of the other subcategories it may still accrue the desirable, maximum score of 25 points.

Air quality impacts are scored based on the effectiveness of the transportation control measures (TCMs) included. Assignment ranges from *non/marginal* to *most-effective*. Points are assigned qualitatively. For example, if a project is entirely a TCM, such as signal timing or a market-based TDM measure, it receives 20 points. Conversely, if arterial flow or transit service improvements are minor, then the project receives only five points. When multiple state and/or federal TCMs are included, the maximum contribution of the air quality subcategory is 20 points.

Interestingly, although projects that replace diesel buses with electric or clean-fueled buses are considered moderately effective TCMs for air quality purposes, they are not evaluated in terms of energy conservation. In fact, the only projects assessed in the energy impacts subcategory are those that encourage alternative mode shifts and improve arterial flow. Scores are assigned qualitatively in energy conservation, and the two other external impact subcategories: (1) land use and (2) enhancement activities. Negative impact on mobility across modes is slated for inclusion, but a means of measuring this impact are still being developed.

Programming Criteria/Principles

After projects have been scored, the MTC committee uses a final set of criteria to ensure that the overall program improves mobility, provides for air quality, leverages resources, and promotes equity. Ensuring overall compliance with the federal Clean Air Act is an important consideration at this stage.

The following criteria are used to arrive at the final program:

- Project merit. Based primarily on the project's score according to the procedure just described.
- Project readiness. The ability to program a project as soon as obligation authority is conferred.
- Cost-effectiveness: Based on points received in scoring process and total cost.
- Geographic equity: Based on county population over the duration of ISTEA.
- Funding. (1) 50 percent of ISTEA Surface Transportation Program funds programmed by counties and 50 percent by MTC; (2) all ISTEA Congestion Mitigation and Air Quality funds programmed by MTC with emphasis on addressing most serious air quality problems (Rutherford 1994)

Discussion

The MTC's prioritization process applies to capacity, facilities, and management-related improvements. The process stresses regional coordination, project justification, air quality improvements, ADA enhancements, and funding adequacy. The process is

simple, and participants can adjust points and evaluation criteria as to keep pace with policy shifts. However, the process has two drawbacks. First, the criteria and scoring measures entail significant subjectivity, particularly so in the case of cost-effectiveness and efficiency. Second, the methodology does not explicitly compare the movement of people and goods across modes. In fact, a full range of quantifiable criteria are not employed. The MTC process favors transit projects because the measures of effectiveness for roadway elements channel additional points to projects that encourage transit.

Los Angeles County Transportation Commission

The California Department of Transportation (Caltrans) uses another methodology in the Los Angeles region. Typical projects are lane additions, new roadways, new and modified interchanges, geometric improvements, traffic flow improvements, park-and-ride construction, and many combinations thereof. Each project is screened according to the criteria listed in Table 3. After screening, the remaining projects are ranked on the basis of several quantitative and qualitative criteria. The criteria used in the ranking procedure are outlined in Table 4.

The prioritization method stresses cost effectiveness, but it also includes community and environmental considerations. Like the MTC's procedure, the Los Angeles County prioritization method is designed to compare very different types of projects. The Los Angeles method's drawbacks are its dependence on subjective point assignment and its disproportionate emphasis on highways relative to other modes.

Washington Transportation Improvement Board

The Washington State Transportation Improvement Board (TIB) uses one of two evaluation methods, depending on whether the project is in an urban area or part of a small city program. Criteria from each of the programs are highlighted in tables 5 and 6.

Table 3. Los Angeles County Screening Criteria

Current Congestion	• Facility must be considered congested
Regional Approval	• Project must be consistent with the current regional plan
Ability to Maintain and Operate	• Sponsoring agency must be able to operate the facility
Air Quality	• The project is consistent with the most recent air quality plan in non-attainment areas
Project Study Report	• A study is required for each project prior to submission. This study must encompass location, limits, scope, costs, and schedule. In addition, project reports must include a description of efforts to ensure that the project is coordinated with other rail/transit services.

Screening criteria are absent from the TIB prioritization process. Local financial support is weighted heavily. The TIB prioritization process rewards multi-agency cooperation and mode integration by assigning points based on the number of agencies or modes involved. However, the range of criteria employed is narrow, and point assignment is basically qualitative. In fact, land use impacts, environmental impacts, equity, accessibility, goods movement, cost, cost-effectiveness, and energy consumption are not even factored in. Still, this process is a good first step toward a more multi-modal selection process.

Conclusion

This report discussed the California and Washington methods for regional prioritization. In addition, another report, issued by NCHRP and authored by this study's principal investigator, covers other regional programming methods used in Denver, Calgary, and California (Rutherford 1994). While the results of Rutherford's study are too lengthy to reproduce herein, a combined summary of the state-of-the-art multimodal programming is provided here in table 7.

Table 4. Los Angeles County Evaluation Criteria

QUALITATIVE CRITERIA	Modal Integration	The degree to which a project integrates alternative transportation modes. For example, bicycle travel.
	System Linkage	The degree to which a project is part of an integrated program to solve congestion within a larger setting.
	Trip Generators	The degree to which a project serves major trip generators (e.g., airports, industrial, and recreational centers).
	Community, Environment, Energy	The degree to which a project fits into community plans, the relative benefit of the project as a trade-off against significant environmental impacts, and the projects energy efficiency of operating the project.
	Freight Movement	The degree to which truck traffic is expedited or the degree to which congestion is reduced by modifying truck traffic.
QUANTITATIVE CRITERIA	Degree of Existing Congestion Problems	Based on duration of LOS E or worse, the peak hour volume on the existing route, the V/C ratio, and for transit, the peak load factor by direction.
	Cost Effectiveness of the Improvement	Based on the cost to provide additional capacity (improvement cost divided by the change in vehicle trips per hour) and the cost to provide additional person trips per hour (cost of the improvement divided by change in vehicle flow rate).
	Time Savings Index	The annual value of time saved divided by dollars spent.
	Local Financial Contribution	The local or private investment relative to total project cost.
	Marginal Cost for Peak Hour Improvement	Total project cost per additional peak-hour person-trip served, based on a ten-year horizon.
	Estimated Level of Service	Estimated after project implementation, based on a ten year planning horizon.

Table 5. Urban Program Scoring Criteria

• Multi-Agency	Points based on the number of agencies involved
• Multi-Modal	Points based on additional modes served
• Congestion/Safety	Points awarded in several categories based on the anticipated effect on current operations, i.e., <ul style="list-style-type: none">• existing LOS• existing V/C• accident savings
• Economic Development	Points based on the types of jobs created or retained, on the project's contribution to economic development, and on community support.
• Local Match	Points based on the ratio of TIB support to community financial support.

Table 6. Small City Program Scoring Criteria

• Structural and Geometric Factors	Points based on pavement condition or roadway width
• Congestion/Safety	Points awarded in several categories based on the anticipated effect on current operations: <ul style="list-style-type: none">• existing LOS• existing V/C• accident savings
• Other Factors	Allows up to 20 points for other factors

Table 7. Comparison of Criteria Used in Regional Programming Case Studies*

General Criteria Category	Typical Criteria	CA Congestion Relief Program -MTC-	Bay Area MTC	Denver	Calgary	L.A. County	Washington TIB	Summation of Criteria Used Across Studies ⁺
Transportation System Performance	-No. of trips by mode -Vehicle miles traveled -Congestion -Peak hour congestion -Transit boardings -Highway level of service	5	2	2	2	6	2	19
Mobility	-Mobility options -Improved movement of people	-	1	-	1	1	1	4
Accessibility	-% within 30 minutes, etc.. -Transit and highway speeds	-	-	-	-	-	-	-
System Development, Coordination, and Integration	-Terminal transitions -Transportation system development -Regional importance -Projects in existing plans	3	3	5	1	3	1	16
Land Use	-Compatibility with land use plans -Growth inducement	1	-	-	1	2	-	3
Freight	-Reduced goods movement costs	1	1	-	-	1	-	3

* Table contents for the California Congestion Relief Program, Bay Area, Denver, and Calgary case studies were previously published in NCHRP Synthesis 201 (Rutherford, 1994), and the table formats of that report have been modified for this study.

+ This column is the total of all the criteria used in the 6 case studies for each criteria category, and indicates which categories generally receive the most emphasis.

Table 7. Comparison of Criteria Used in Regional Programming Case Studies* (Cont'd.)

General Criteria Category	Typical Criteria	CA Congestion Relief Program -MTC-	Bay Area MTC	Denver	Calgary	L.A. County	Washington TIB	Summation of Criteria Used Across Studies ⁺
Socio-economic	- Homes/businesses displaced -Maximize economic benefit -Historic impacts -Construction employment	1	-	-	1	-	3	5
Environmental	-Air quality -Sensitive Areas -Natural Environment	1	1	-	-	2	-	4
Energy	-Energy consumption	1	-	-	1	1	-	3
Safety	-Annual accidents by mode -Safety ratings	-	1	1	-	-	1	3
Equity	-Equity of benefit and burden	-	1	-	-	-	-	1
Costs	-Capital costs -Operating costs	-	1	-	-	-	-	1
Cost Effectiveness	-Annualized costs per trip or mile -FTA (UMTA) index	5	1	-	-	4	-	10
Financial Arrangements	-Funds required -Funding feasibility to build/operate -Public/private sources	1	1	-	-	1	1	4

* Table contents for the California Congestion Relief Program, Bay Area, Denver, and Calgary case studies were previously published in NCHRP Synthesis 201 (Rutherford, 1994), and the table formats of that report have been modified for this study.

⁺ This column is the total of all the criteria used in the 6 case studies for each criteria category, and indicates which categories generally receive the most emphasis.

Table 7. Comparison of Criteria Used in Regional Programming Case Studies* (Cont'd.)

General Criteria Category	Typical Criteria	CA Congestion Relief Program -MTC-	Bay Area MTC	Denver	Calgary	L.A. County	Washington TIB	Summation of Criteria Used Across Studies ⁺
Institutional Factors	-Ease of staging and expansion -Nonimplementing agency support	-	-	-	-	2	1	3
Other	-Fatal flaw -Right of way opportunities -Enforcement -Recreation	-	1	3	-	-	1	5

There are few good examples of multimodal planning and programming evaluation in state and regional programming because of the largely inflexible modal funding process, which pre-dates ISTEA. Transportation planning procedures seem to change slowly. Other reasons for the general lack of multimodal planning tools include the following:

- Truly multimodal evaluation is hindered by the lack of a commonly accepted multimodal measure of mobility.
- Mobility is measured infrequently; and accessibility is rarely, if ever, assessed.
- A full range of generally accepted, reasonable criteria are infrequently used.
- Criteria evaluating equity, cost, and institutional factors are left out more often than they are included in regional programming efforts.

* Table contents for the California Congestion Relief Program, Bay Area, Denver, and Calgary case studies were previously published in NCHRP Synthesis 201 (Rutherford, 1994), and the table formats of that report have been modified for this study.

+ This column is the total of all the criteria used in the 6 case studies for each criteria category, and indicates which categories generally receive the most emphasis.

PRIORITY RATING SYSTEM

This section overviews state transportation policies and identifies how these policies form the basis for the selection of evaluation criteria and a ranking methodology. A proposed rating system, including evaluation criteria and calculation of a priority index are also discussed.

STATE TRANSPORTATION POLICY

Since 1988, the Washington State Legislature has revised state transportation policy significantly. In fact, a new chapter was added to the Public Highways and Transportation Title, RCW 47.06. This chapter specifies the following functions as part of WSDOT's role in transportation planning:

- ongoing coordination and development of statewide transportation policies that guide all Washington transportation providers
- ongoing development of a statewide multimodal transportation plan that includes both state-owned and state-interest facilities and services
- coordination of state high-capacity transportation planning and regional transportation planning programs
- conducting special transportation planning studies that impact state transportation facilities or relate to those of statewide significance

Mobility project prioritization is to be related to state transportation goals directly. Policy documents associated with the first legislative task have directly informed this study in developing a new ranking methodology and in selecting evaluation criteria. The second task of developing the statewide multimodal transportation plan ultimately served as the project screening process for this study.

The State Transportation Policy Plan is an ongoing, joint effort on the parts of the WSTC and the state legislature. The policy plan sets forth a vision and statewide transportation goals consistent with state growth management mandates. Because this is an evolving document, the underlying planning and programming processes must be flexible enough to respond to legislative direction.

STATE TRANSPORTATION POLICY PLAN GOALS

PROTECTING OUR INVESTMENTS

- 1) Preserve and maintain transportation systems needed today and in the future.

PERSONAL MOBILITY

- 2) Provide personal mobility choices for urban, rural and intercity travel that are safe, reliable, affordable, and convenient.
- 3) Provide access to employment, commerce, education, health care, recreation, heritage resources, and social opportunities.
- 4) Provide facilities and services to make transfers between modes efficient and effective.
- 5) Reduce the impacts of congestion on personal mobility.
- 6) Reinforce a sense of Washington as a statewide community.

TRANSPORTATION SUPPORT FOR ECONOMIC OPPORTUNITY

- 7) Provide access that is safe, reliable, affordable, and convenient to industrial, commercial and intermodal sites for people, goods, and services.
- 8) Support domestic and international trade.
- 9) Support Washington's business and industry.
- 10) Reduce the impacts of congestion on freight mobility.

ENVIRONMENTAL PROTECTION AND ENERGY CONSERVATION

- 11) Design new and improve existing transportation systems to avoid the disruption and degradation of the natural environment and heritage resources; work toward systems that are aesthetically pleasing and energy efficient.
- 12) Conserve scarce resources.
- 13) Reduce pollutants from transportation systems.

WORKING TOGETHER

Develop an institutional framework for transportation that:

- 14) Encourages opportunities for public-private partnerships.
- 15) Promotes greater sharing and coordination of technical expertise and services between state and local governments.
- 16) Promotes mutual understanding and public participation in transportation decision making.
- 17) Facilitates interjurisdictional and regional coordination.
- 18) Integrates land use planning and transportation planning.
- 19) Supports innovative research and development.

TRANSPORTATION FINANCE

- 20) Ensure funding to responsibly achieve the state's transportation goals.

Exhibit 1. State Transportation Policy Plan Goals (WSTC, 1994)

Evaluation criteria presently recommended for the new methodology respond directly to overall goals and specific policies associated with delivery of the WSDOT's Urban and Rural Mobility program. Broadly defined, the program goal is to ensure mobility alternatives that afford safe, reliable, convenient access to employment, educational, recreational, cultural, and social opportunities in both urban and rural environments.

Specifically, state policy emphasizes regional coordination in the planning and delivery of transportation programs, in the safe and cost-effective movement of people and goods over vehicles in planning capacity improvements, and in promoting cost-effective alternatives to SOVs (including transportation demand management and transportation system management). As discussed, WSDOT's highway improvement program for state-owned facilities is sub-divided into four categories:

- Mobility
- Safety
- Economic initiatives
- Environmental retrofit

Many policy objectives in one sub-program may have implications for the program decisions in another. The complete list of general policy plan goals is provided in exhibit 1. This list is representative of the comprehensive documentation used in developing the evaluation criteria. In addition, Mobility sub-program policy objectives are detailed in exhibit 2.

To meet these policy objectives, the new prioritization ranking methodology and evaluation criteria must be flexible and must clearly prioritize projects that

- emphasize the movement of people and goods
- promote alternatives to SOVs
- facilitate smooth intermodal connections
- provide safe, reliable, efficient, convenient access

GOAL: PERSONAL MOBILITY

Urban Mobility Policies

- Require regional coordination in the planning and delivery of transportation programs in urban areas.
- Emphasize the movement of people and goods, rather than vehicles, in planning for capacity improvements to a regional transportation system.
- Provide for cost-efficient alternatives to one-person vehicles, including transit and ridesharing, to ensure a high level of mobility.
- Require land use planning and development to be coordinated with state, regional, and local transportation planning and investments.
- Recognize demand management (parking fees, toll roads, flex-time, peak travel restrictions) as a major strategy to reduce congestion.
- Require transportation improvements to be made reasonably concurrent with economic development, so economic growth does not contribute to the deterioration of existing transportation services.
- Provide flexibility for different urban regions to adopt their own specific solutions to urban mobility problems.
- Determine and provide the desirable levels of accessibility for the elderly and persons with disabilities.

Rural Mobility Policy

- Provide effective and efficient rural transportation systems.
- Coordinate the delivery and funding to federal, state, and local rural public transportation programs, integration social service, health care, and transportation objectives.
- Establish and operate intermodal connection terminals at the community level.
- Provide desirable levels of accessibility for the elderly and persons with disabilities.
- Emphasize the movement of people and goods.

Exhibit 2. State Transportation Policy Plan Objectives Associated with Urban and Rural Mobility Sub-programs (WSTC, 1994)

- reinforce development patterns that reflect regional and local growth management objectives
- avoid or reduce disruption and degradation of the natural environment and heritage resources
- are energy efficient
- are consistent with state, regional, and local comprehensive plans
- are cost-effective

PRIORITIZATION METHODOLOGY

Any prioritization methodology contains several important components, the most basic of which are a formal ranking methodology (i.e., mathematical algorithm) and a set of evaluation criteria. In addition to being flexible enough to accommodate changing goals, the ranking methodology must operate independently of the evaluation criteria. Evaluation criteria should reflect state policy goals and objectives, should be measurable, and should have data requirements that are not unreasonable.

The first step in the prioritization process (figure 5) is the submission of project requests from WSDOT districts each of which is accompanied by a project description sheet (Appendix D). Project requests must address a need identified in the Statewide Systems Plan. As such, the financially constrained Systems Plan for Highway Improvements functions as the statutory screening criterion. Project requests that are not in the Systems Plan are not considered for prioritization in the current biennium. Evaluation criteria parameters are calculated for eligible proposals in five major categories: cost efficiency, community support, environmental impact, mode integration, and land use. Project requests are ultimately ranked by means of a mathematically derived priority index.

Each ensuing step (2) project screening, (3) application of project evaluation criteria, and (4) application of the ranking algorithm is discussed in the following sections.

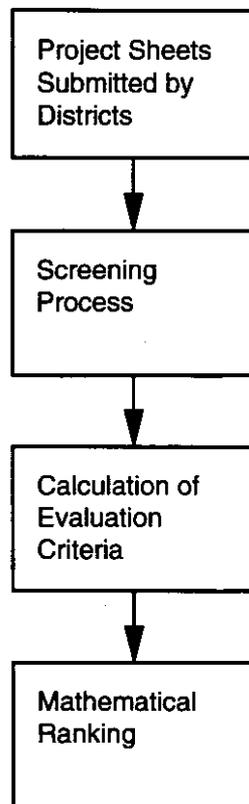


Figure 5. Priority Process

Screening Criteria

There are two elements in the state-owned facilities component of the statewide multimodal transportation plan: a state highway system plan and a state ferry system plan. The state highway system plan identifies needs and recommends specific, financially feasible improvements to preserve the highway system's structural integrity, to ensure acceptable operating conditions, and to provide enhanced access to scenic, recreational, and cultural resources. The state highway system plan contains the following elements (RCW 47.06, 1994):

System Preservation – establishes structural preservation objectives, identifies current and future deficiencies, and recommends program funding levels and specific actions

Capacity and Operational – establishes operational objectives, identifies current and future deficiencies, and recommends program funding levels and specific improvements

Scenic and Recreational Highways – identifies and recommends designated routes, provides enhanced destination access, and recommends management strategies

Paths and Trails – identifies non-motorized needs

The Capacity and Operational element functions as the statutory screening criterion in the Urban and Rural Mobility categories. All proposals that provide recommended improvements from the financially constrained plan pass the initial screening. Because the state highway systems plan must meet air quality conformity requirements, any proposal that worsens air quality in non-attainment areas fails the initial screening. It is further expected that project submittals generated from the within the WSDOT for each biennium will focus on addressing existing deficiencies. However, if outside agencies, such as metropolitan planning organizations, wish to address anticipated, as opposed to existing, deficiencies, the WSDOT will consider those proposals nonetheless.

Evaluation Criteria

Evaluation criteria may be continuous (e.g., benefit-cost analysis), or categorical (e.g., yes/no questions or placement by type). Evaluation criteria and the statewide policy objectives served are overviewed in the following sections. Appendix E contains detailed worksheets and scoring guidelines. Evaluation criteria are grouped into five major categories: cost efficiency, community support, environmental impact, mode integration, and land use.

Cost-Efficiency

The State Transportation Policy Plan (hereafter referred to as the Policy Plan) clearly suggests that project selection be based on relative cost- efficiency in moving people and goods. Although there are many ways to measure cost efficiency, many would not be useful for the prioritization process or they would entail an excessive data collection burden and significant error accumulation. For this study, the following types

of measures were considered, but not selected, for use: sufficiency ratings, level of service standards, and traditional cost per unit of interest criteria. These measurements were not recommended because they capture capital costs but do not account for the monetary value of benefits. Thus, traditional prioritization methods systematically underestimate transportation investments' contribution to economic growth and productivity (Lewis, 1991). Another drawback of traditional prioritization criteria is that they cannot be uniformly applied to improvements that span multiple modes. Therefore, the PCIS pursued a single, continuous measure of project worth aimed at assessing progress toward state economic objectives. These objectives encompass provision of personal and commercial mobility that is safe, reliable, accessible, and efficient.

The research team selected the measurements of net present value, benefit-cost ratio, and net present value-cost ratio as potential criteria for several reasons. First, these measures can be related to the Policy Plan directly and easily. Second, these criteria can be quantified on the basis of data already available. Third, input data for the calculations can be refined incrementally as the management systems required under ISTEA are implemented. Furthermore, the criteria selected for consideration can be applied to all types of mobility projects.

Alternative investment-choice measures such as rate-of-return (the discount rate at which net present value (NPV) is zero) and annual cost to sufficiency rating comparisons were not selected because of their major flaws. First, the rate-of-return is subject to mathematical anomalies (White et. al, 1989). Second, it is an unnecessary measure because the minimum rate-of-return is assured by considering NPV to rank alternatives since it is noted that investments are only considered economically worthwhile when the NPV is positive. Third, these measures are not direct benefit assessments. Moreover, NCHRP Report #342 has concluded that "all the evidence, both theoretical and actual experience, indicates that sufficiency ratings, volume-to-capacity criteria and cost-

effectiveness tests do a poor job of helping decision makers find the most economically worthwhile transportation policies and projects." (Lewis, 1991)

In summary, net present value, the benefit-cost ratios, and net present value-cost ratios are the three most informative measures when prioritizing independent projects under financial constraints. Each of these criteria are defined below.

Defining the Criteria

1). Net Present Value (NPV)

NPV can be computed once the benefits and costs have been identified. In general, projects are considered economically efficient when the NPV is positive. Net present value is given by the following equation:

$$\text{Net Present Value} = \text{Present Value of Benefits} - \text{Present Value of Costs}$$

Projects with higher NPV are assigned a greater value than those with lower NPV. In theory, projects with a high NPV return more to society than do similar projects with a low NPV. So, in calculating the final rankings, NPV would need to be maximized. The NPV criterion is limited by the implicit assumption that the program's capital resources are *unlimited* (Lewis, 1991). This limitation is due to the fact that the greatest combined NPV (per dollar invested) cannot be ascertained by linear NPV ranking alone.

2). Benefit-Cost Ratio (B/C)

Planners calculate B/C by simply dividing the present value of project benefits by the present value of project costs.

$$\text{Benefit Cost Ratio} = \frac{\text{Present Value of Benefits}}{\text{Present Value of Project Costs}}$$

In general, projects are considered economically efficient when the B/C is equal to or greater than one. Like NPV, B/C can be computed for any project once benefits and costs have been identified. The B/C would also need to be maximized in the final ranking algorithm. However, unlike NPV, B/C is not a calculation of *net worth* and can be optimized by means of a descending linear ranking alone. As such, B/C is often limited by a narrow range of computed benefit-cost ratios, which makes it difficult to differentiate among projects.

3.) Net Present Value-Cost Ratio (NPV/C)

The NPV/C represents the net benefit expected per dollar of capital investment, given by the following equation,

$$\text{NPV - Cost Ratio} = \frac{(\text{Present Value of Benefits} - \text{Present Value of Costs})}{\text{Present Value of Costs}}$$

NPV/C analysis has been characterized as a search for the biggest “bang for the buck” (Lewis, 1991). This criterion implies a prioritization method that would ration capital under financially constrained programming scenarios by a linearly descending NPV/C rank order. Like NPV and B/C, the NPV/C ratio would need to be maximized in the final ranking.

Selecting the Criteria

Selecting the appropriate criteria depends on budgetary constraints and on whether projects to be compared are independent or mutually exclusive (Wright, 1979). Because transportation funding is scarce, project prioritization is necessary to make the best choices amid difficult tradeoffs. WSDOT has required that proposals must be independent submittals. In other words, no project is an alternative “version” of another; each addresses a wholly separate need. This independence affects the criteria selection process by requiring evaluation measures that differentiate among projects enough to support program tradeoffs. Ideally, a group of related projects would be selected in coordinated fashion for maximum program value within given budget constraints.

NPV is the best single indicator of economic merit for guiding investment choices where the goals are to reduce congestion and delay, diminish vehicle operating costs, enhance safety and environmental conditions, and to increase business and industrial productivity (Lewis, 1991). To enable program building based on cost-efficiency using net present value, it is necessary to optimize NPV within the budget limits. However, WSDOT’s objectives extend beyond superficial costs and encompass hidden costs and benefits insofar as they incorporate alternative mode promotion, intermodal design, growth management, non-monetizable environmental impacts, and community support. Therefore, the ranking algorithm developed in this study aims to include quantitative

measures of project impacts that cannot be assigned a consistent monetary value. While cost-efficiency is a major WSDOT objective, the final prioritization is not based on economic criteria alone. A cost-efficiency optimization routine would select a group of projects within the budget limit in order to summarily provide the greatest NPV but it would not rank the projects. Thus, NPV was eliminated from further consideration because it isn't feasible to accommodate an optimization routine within the preferred ranking algorithm.

Alternatively, NPV/C and B/C ratios may both serve as measures of worth that can also allow linear ranking of projects which, unlike standard optimization routines applied to project NPV, eliminate any possibility of discrimination against proposals with unusually high project costs. As previously described, NPV is the most comprehensive measure of productivity and economic merit. Of course, the NPV/C ratio retains these advantages. However, B/C ratio has an advantage over the NPV/C ratio in that the B/C ratio is more easily understood. The B/C ratio is a suitable approximation of the present worth per dollar invested. For these reasons, the researchers selected B/C as the most appropriate measure of cost efficiency for the PCIS. B/C provides adequate differentiation between generally cost-efficient projects ($B/C > 1.0$), despite the fact that B/C is a gross measure of benefit per dollar invested, while NPV/C ratios more accurately represent actual project worth (per dollar invested).

Computing the Criteria

Most important in *calculating* costs and benefits is first *defining* the project's costs and benefits. A discount rate and an analysis period must also be selected. Accuracy depends on consistency in computations. To address the need for accuracy, WSDOT appointed a Technical Advisory Committee (TAC) to determine appropriate unit values and to ensure consistency in benefit computations (the role of the TAC is detailed on pages 60-61 of this report).

WSDOT staff must compute standardized cost estimates for each proposal. It is not always clear in the existing WSDOT method whether all submitted cost estimates reflect consistent analytical methods. Addressing this concern by ensuring consistency is the purpose of the recommended project sheets, which clearly identify the costs that should be factored into the proposal. Costs are grouped into four major categories:

1. Construction (including right-of-way)
2. Environmental retrofit
3. Preliminary engineering
4. Annual operating and maintenance costs

Within the construction cost category, the researchers assume that environmental analysis, mitigation costs, and right-of-way expenditures are included. The WSDOT has singled out environmental *retrofit* costs to indicate proposals that must address pre-existing environmental impacts. There is a separate environmental retrofit program intended to fund this type of work; therefore, these costs should not be a part of the cost efficiency calculation. When possible, funds to pay for environmental retrofitting should be transferred to the Mobility program, so that project rank is not negatively affected.

In the previously existing Category C formula, annual operating and maintenance costs were calculated as 15 percent of project costs. In the future, these cost estimates should be provided by the district that submitting district, and they should be based on historical trends in the region.

Benefits must also be treated consistently across projects, in terms of both categorization and application. Benefit calculations should take into account the categories used in traditional benefit-cost analysis:

- accident savings
- user cost savings
- travel time savings

Travel time savings and accident savings together typically account for more than 80 percent of transportation benefits. This combination ultimately raises productivity and

economic output by reducing work time losses. Though accident savings and user cost savings were already included in the existing Category C prioritization process, the new, recommended process described herein builds on these calculations by including travel time savings and by estimating user cost savings on an hourly basis. Estimates of travel time savings and user cost savings were combined into a single procedure based on volume-to-capacity ratios over 20 years. This modification to the traditional method has the advantage of reducing the repetitious burden of calculating user cost savings per project. The traditional method does not differentiate one project proposal from another significantly, except by length.

Including travel time savings as a monetary benefit is complicated because it requires assigning a monetary value to time. It is further complicated by the need to distinguish between personal and commercial time expenditures. Vehicle occupancy for each project must be considered to account for time accurately, and to faithfully reflect the movement of people and goods. In the short-term, WSDOT has defined statewide estimates of average value of travel time differentiated by trip purpose (e.g., general vs. commercial travel) and average vehicle occupancy, by trip purpose, region, and facility type (e.g., non-commercial travel in HOV vs. general purpose lanes) where more accurate local counts are not available. In the long term, as traffic management systems become operational, the occupancy parameter could be computed on the basis of observed values.

Benefit-cost analysis also requires future volume estimates. Although future volumes have been calculated for many WSDOT projects in the past, they have not been used for prioritization.

Because of the debate over their value and appropriateness, other significant, non-quantifiable costs associated with transportation projects are not typically monetized. The following four recommended categories of criteria are included in the mobility prioritization framework to ensure that these important impact areas and benefits are taken into account: community support, environmental impact, mode integration, and

land use. As new methods become available, these presently non-monetized costs and benefits should be incorporated into the cost-efficiency calculation.

Community Support

Community support has always been central to the WSDOT's screening process for proposals. Accordingly, it was addressed specifically on previous WSDOT category C submittal forms. The statewide twenty year Systems Plan is subject to substantial public comment and participation throughout the planning process. As described in the previous section, the Systems Plan will be used a statutory screen for prioritization. However, strong community support for proposals cannot always be taken for granted in programming. Moreover, state transportation policy goals generally emphasize cooperation, economic development, and shared financial responsibility. This category of criteria is aimed at gauging community support and potential local impacts.

The community support criteria reflect the following state policy objectives: 1) public-private partnerships; 2) access to employment, commerce, education, health care, recreation, heritage resources, and social opportunities; and 3) transportation decision making characterized by mutual understanding and public participation. The community support category of criteria evaluates the magnitude of financial contributions and endorsements from other agencies. In so doing, extra emphasis is placed on interjurisdictional coordination otherwise assessed in the land use category. While assessing local government support in both categories could be considered "double counting", the WSDOT Program Management staff and the Washington State Transportation Commission deemed it critical to include each proposed measure.

Community support criteria consist primarily of categorical questions regarding public and private participation, endorsement (or opposition), disruption of cohesive neighborhoods, and physical displacement. These yes/no categorizations are supplemented and scaled by means of qualitative assessments. The criteria specifically promote:

- projects with minimal or no opposition
- official endorsements
- financial involvement of private sector, special programs, and local governments
- preservation of existing access within neighborhood and business areas
- communication with the public

Points are accrued by project proposals that displace homes, farms, or businesses, while points are withheld from proposals depending upon the percentage of contributed financing. Points are assigned categorically regarding formal endorsements and division of identifiable neighborhood, school, or business service areas. The total community support score is the sum of points accrued in this category and will be minimized in the final ranking algorithm. Thus, projects with the most community support and the least physical impact receive lower total scores than projects that are insensitive to local sentiment and conditions. Appendix D provides detailed worksheets and scoring guidelines.

Environmental Impact

Transportation policy objectives in Washington state aim to avoid or minimize damage to the natural environment and heritage resources, and to favor energy-conservative transportation strategies. Other state and federal guidelines such as ISTEA, state and federal clean air acts and amendments, the National and State Environmental Policy, and the 1990 Washington State Growth Management Act further support State Transportation Policy Plan goals. This legislation requires systemic consideration of environmental factors before committing to transportation improvement projects. However, historically, environmental impacts were not assessed until after prioritization and approval (Washington, 1992). Washington state law, RCW 47.01.280, now requires that WSDOT involve the relevant permitting agencies in the project scoping phase, a requirement intended to avoid cost overruns and delays due to unforeseen environmental

problems. Sketching potential environmental impacts at the outset of project development and getting preliminary permit approval should result in an impact assessment accurate enough to use for prioritization. Thus, environmental criteria are critical to programming proposals based on relative merit in a manner consistent with state policy.

The environmental criteria address wetland encroachment, water quality and resource related permitting, and noise impacts. The selection of only these topic areas does not reflect any oversight of other environmental concerns. Rather, the researchers focused on these three areas because they are generally the most controversial, the most closely regulated legislated, and most potentially expensive impacts of transportation projects that can be readily quantified.

Air quality and energy conservation criteria are obviously absent from this category of criteria, but not for lack of consideration. During Phase II of the prioritization study, researchers tried to develop air quality evaluation criteria applicable to mobility projects statewide. However, data requirements for air quality assessment are enormous, and exceed either (a) current database capabilities, or (b) programming budgets statewide. Manual estimation of air quality impacts were not comprehensive and were unreliable because air quality is sensitive to individual pollutant concentrations. Modeling must be based on projected vehicle type, speeds, volumes, and atmospheric conditions. Consequently, the programming process depends on the 1991 Washington State Clean Air Act "Conformity Rule," which requires that WSDOT and the Washington State Department of Ecology ensure that transportation plans, programs, and projects conform to the State Implementation Plan. Because the conformity rule applies to the Systems Plan, the screening process will exclude any proposal expected to have negative air quality impacts from prioritization.

The cost efficiency and mode integration categories of criteria will serve as indirect measures of relative energy efficiency. Proposals that promote alternatives to

SOV travel, improve the operating efficiency of the transportation system, and decrease congestion will be favored in these categories. Energy efficiency will also be favored in the land use category. If concurrent land use and GMA goals are implemented, short auto trips may be reduced and replaced by nonmotorized access to local services in dense urban areas.

The environmental criteria in the new methodology serve the following WSDOT policy objectives: 1) to support federal and state “no net loss” policies by protecting, restoring, and enhancing natural wetlands adversely impacted by transportation related construction, maintenance, and operations; 2) to minimize and control levels of harmful pollutants generated by transportation activities from entering surface and ground water resources; 3) to protect, restore, and enhance, where feasible, fish and wildlife habitat and populations within transportation corridors; 4) to avoid, minimize, or mitigate impacts of transportation projects on heritage resources; and 5) to minimize noise impacts from transportation systems and facilities. The scoring process and proposed evaluation criteria for the environmental sub-categories (wetlands, water quality and permitting, and noise) are described below.

Wetlands

This category is designed to assess proposed projects’ likely encroachment on classified wetlands and associated buffers in accordance with federal, state, and local regulations. The wetlands evaluation criteria begin with a categorical question that requires further quantification of wetland acreage only if wetlands are identified within 300 feet of either side of the proposed project. The 300-foot distance is based on a statewide buffer zone requirement for Class I wetlands. Detailed definitions and scoring guidelines are provided in appendix D. The wetlands criteria favor the following:

- advance project planning
- avoidance of classified wetlands
- “no net loss” of state wetland area

Points accrue based on (1) the actual wetlands acreage likely to be affected by project construction, and (2) a multiplier that reflects Washington State Department of Ecology and GMA-mandated replacement ratios (EPM, 1993). The total score reflects calculations in each of four wetland categories and the associated buffers category. The final ranking algorithm minimizes the wetlands score so that projects with minimal or no net impacts (low scores) rank favorably.

Water Quality and Permitting

The criteria in this sub-category have two purposes: (1) to assess potential watershed impact, and (2) to measure the risk and staff time associated with the permitting requirements for proposed projects. The evaluation criteria consist primarily of categorical questions regarding the project's proximity to sensitive areas, resource lands, waterways and sources. The total impervious surface area of the project proposal within 2000 feet of any body of water is measured and scored. Point assignment is variable and depends on the relative risk per item or duration of associated permit review. Appendix D provides detailed definitions and scoring guidelines. The criteria favor

- advance project planning and environmental review
- interjurisdictional coordination
- avoidance of sensitive areas and water sources
- minimization of total impervious surface area

Points are accrued by all proposals slated to be built within sensitive areas, managed resource lands or heritage resources, and federally designated floodways or sole source aquifer areas. The measures are very conservative, for example, the impervious surface area score is based on *maximum* pollutant filtration estimates. However, the score may be split in half if all permitting agencies have been contacted, and if no foreseeable conflicts or disagreements are anticipated. If a required permit has already been obtained for the project's expected duration, then no points are assigned for that particular measure and the issuance date is recorded. Consequently, projects that avoid watershed impacts

and that have preliminary environmental agency approval receive lower scores than do roadway expansions in sensitive areas with uncertain permitting prognoses. Water quality and permitting scores are minimized in the final ranking algorithm.

Noise

This sub-category is aimed at assessing potential noise impact and the associated costs and risks for project implementation. Accordingly, the criteria favor

- transportation system management without lane expansion
- avoidance of significant traffic noise impacts
- mitigating retrofit of existing impacts

The proposed evaluation criteria begin with a categorical question that requires documentation of the feasibility, reasonableness, and cost of mitigation measures where there are existing noise impacts on-site. The number of receptors within a 200-400 foot perimeter of the proposed roadway are then detailed in the criteria. This variation in distance is based on whether the proposed roadway is new or existing. The difference is justified on the basis of ambient noise levels due to existing traffic and acoustics. The criteria quantify a noise level risk factor that grades potential noise impacts associated with a proposed project. The risk factor is based on the number and proximity of receptors per type of improvement (new or existing roadways). Geographic variability and specific decibel estimates are not factored into the noise criteria because the time and cost associated with such measurements would make this infeasible. Appendix D provides detailed definitions and scoring guidelines for the recommended criteria.

Points are assigned based on the calculated risk along the proposed project distance. The total score is the sum of scores for each receptor category, and is minimized in the final ranking algorithm. Urban or rural projects that propose significant road widening or lane additions near multiple receptors receive higher scores than projects that avoid roadway expansion and maintain existing setbacks from homes,

businesses, and schools. Consequently, most projects likely to result in increased traffic volumes and speed rank poorly in this sub-category.

Mode Integration

Washington state's transportation policy aims at development of a multi-modal transportation network that (1) facilitates smooth intermodal connections for people, goods, and (2) services and promotes alternatives to single occupancy vehicle (SOV) travel. It therefore follows that projects promoting SOV alternatives, such as park-and-ride lots, intermodal terminals and HOV lanes, should be prioritized over projects that add only SOV capacity. Moreover, ISTEA requires more multimodal planning on the part of state departments of transportation. The research team thus developed mode integration criteria (originally referred to as a systems attribute index) to encourage multimodal characteristics in every project.

These evaluation criteria consist of categorical (yes/no) questions designed to check for the existence of multimodal attributes. The criteria specifically favor

- more efficient use of existing capacity,
- connectivity between existing systems,
- integration of modes, and
- better packaged projects.

Points are withheld from proposals that encourage multimodal integration, support intermodal freight transfers, include non-motorized facilities, support or extend HOV system development, link or extend the network of SOV alternatives, and preserve existing roadway capacity by means of TSM or TDM. The total mode integration score equals the sum of points accrued on the worksheet for this category (see appendix D) and is minimized in the final ranking algorithm. Consequently, projects that optimize existing capacity and improve alternative mode integration are scored lower than projects aimed at SOV travel.

Land Use

State policy objectives for mobility reflect land use and growth management mandates. State policy clearly emphasizes that projects should reflect specified, long-term growth patterns, provide convenient, multimodal accessibility, and better integrate land use and transportation planning. To meet these objectives, evaluation criteria must assess the following factors:

- (1) accessibility
- (2) the degree to which proposals support local and regional growth management goals;
- (3) consistency with state, regional, and local comprehensive plans; and
- (4) sensitivity of roadside and adjacent land use design to SOV users.

Accordingly, a set of land use criteria was developed.

These land use criteria combine categorical (yes/no) questions regarding site location and transit routes with a required synthesis of associated regulations/standards dictated by local governments adjacent to the project limits. These land use criteria specifically encourage

- coordination between WSDOT engineers and local planners,
- convenient accessibility for transit,
- connectivity between urban activity centers, and
- consistent transportation planning.

Points are awarded for proposals designed for existing or planned transit thoroughfares, and/or to connect areas of mixed-use or high intensity commercial use. Points are also awarded for district completion of a land use checklist for every jurisdiction through which the proposal would pass. The screening criteria are quantified in this category such that points are assigned for projects consistent with local comprehensive plans. Proposals that address improvements not identified on state or regional transportation plans are, by definition, fatally flawed; as such, the screening criteria exclude them from prioritization as previously described.

The land use score equals the sum of points accrued on the worksheet for this category (see appendix D). The total score is maximized in the final ranking algorithm. Consequently, projects that better integrate land use and transportation improvements will receive higher scores than projects designed without regard to such goals.

Calculation of Priority Index

There are many mathematical methods for ranking projects. However, ranking groups of projects that are independent and exclusive of the previous set from biennium to biennium, and that may be composed of very different improvement types, presents a unique problem. In any given biennium the "best" and "worst" projects depend on the composition of the composition of that particular group, as well as on current policy objectives. Two methods for ranking projects are discussed below.

Theoretical Comparisons of Ranking Algorithms

The first ranking method considered is based on defining a standard by which any project can be measured for any given programming cycle. Such a standard does not vary from year to year; therefore, proposals submitted in any biennium are evaluated by the same standard. This approach is attractive because of its simplicity. However, determining a "standard" for projects that might be very different in composition would be difficult, if not impossible. In addition, policy changes would logically necessitate changes in the evaluation standards.

The second method considered and ultimately selected, for this prioritization study, is the assembly of a hypothetical "ideal" project made up of the best characteristics of all the proposals for each cycle. A "least desirable" project is similarly established. The "least desirable" project, for example, would be characterized by:

- the lowest cost-benefit ratio,
- the highest community support score,
- the highest wetlands score,

- the highest water quality and permitting risk score,
- the highest noise impacts risk score,
- the highest mode integration score, and
- the lowest land use score.

The ranking algorithm then ranks proposals according to their "distance" from the hypothetical ideal and negative-ideal projects for that biennium.

This method is appealing for several reasons. First, it is flexible. The ranking algorithm is independent of the criteria, in other words, any criteria can be used to rank projects. Criteria can be modified or expanded easily to reflect changes in transportation policy each biennium. Second, this methodology allows planners to more closely scrutinize projects with relatively similar total scores. This method eliminates the current formula's "integer" effect by relying on computed distance from the ideal project as the means of calculating priority. However, the project ranking is sensitive to changes in the input set. (See Appendix B for discussion of the mathematical basis for the prioritization calculation.)

Once the priority index has been computed, projects may be sorted in descending order. That is, proposals with a higher priority index value are ranked (sorted) higher than those with a lower priority index. Index calculation is described more fully below.

Priority Index Calculation

Priority index calculation is summarized in Figure 6. The first step is to derive the evaluation scores (e.g., B/C, community support score, etc.) for each proposal. The next step is to enter these values into a standard Excel spreadsheet. TOPSIS-6, the ranking algorithm, is then executed from the main menu. TOPSIS-6 is a macro that operates within Excel. TOPSIS-6 calculates the priority index and saves the project title and associated index in a file specified by the user. When the user opens this file, projects appear sorted in descending rank order. The program then prompts the user to input a budget limitation for the programming cycle. TOPSIS-6 responds by calculating,

the list of projects that may be funded according to that budgetary scenario in exact rank order.

The TOPSIS-6 macro is written to accommodate any number or type of criteria, which allows for easy expansion or modification. Both Macintosh and PC versions are available. Appendix A contains a more detailed discussion, along with an illustration of TOPSIS-6 macro execution. Appendix C contains a step-by-step explanation of the TOPSIS-6 code.

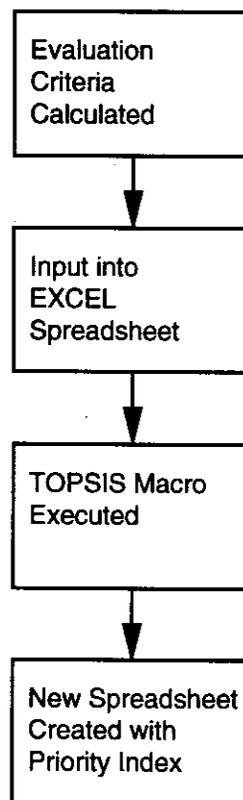


Figure 6. Mathematical Ranking Process

IMPLEMENTATION

The second half of Phase III focused on assisting the WSDOT in implementing the new prioritization methodology for the 1995-97 biennium. This section describes the process of weighting the proposed evaluation criteria and overviews the trial application of the methodology to past category C projects. Results from the 1995-97 programming cycle are also described. Conclusions and recommendations based on Phase III observations follow.

SENSITIVITY ANALYSIS AND CATEGORICAL WEIGHT ASSIGNMENT

Evaluation criteria were weighted by means of a Delphi analysis conducted by the WSDOT Program Management Division. Participants were geographically balanced and selected from planning, project development, and local programs. Representatives included two WSDOT district administrators, three assistant secretaries, three WSTC Commissioners, and the Transportation Improvement Board executive director. The results of three rounds of discussion and weight assignment (informed by sensitivity analysis for each category), were later adopted by the WSTC, which was responsible for establishing the final weights. Table 8 summarizes the final weights for the 1995-97 biennium.

Sensitivity Analysis Results

Six weighting scenarios were analyzed prior to the delphi analysis session. The purpose of the sensitivity analysis was to demonstrate the significant range of category weights. The six weighting scenarios are summarized below:

- (1) Cost-efficiency criteria receive 70 percent of the weight; the remaining 30 percent is equally divided among the other four categories.
- (2) Community support criteria receive 70 percent of the weight and the remaining 30 percent is equally divided among the other four categories.

Table 8. Final Weight Assigned to Evaluation Criteria Categories (WSTC, 1993)

CRITERION WEIGHTS	
MOBILITY PRIORITIZATION FORMULA	
<u>CRITERION / POLICY GOAL</u>	<u>WEIGHT</u>
COST EFFICIENCY	0.65
SAFETY	
FREIGHT/GOODS	
ENERGY CONSERVATION	
HIGH OCCUPANCY VEHICLES	
COMMUNITY SUPPORT	0.14
ENVIRONMENT	0.08
WETLANDS	
WATER QUALITY/PERMITTING	
NOISE	
MODE INTEGRATION	0.07
LAND USE	0.06
TOTAL:	1.00

- (3) 70 percent of the weight is divided equally among the three environmental criteria, and the remaining 30 percent is divided equally among the remaining four categories.
- (4) Mode integration criteria receive 70 percent of the weight; the remaining 30 percent is equally divided among the other four categories.
- (5) Land use criteria receive 70 percent of the weight; the remaining 30 percent is equally divided among the other four categories.
- (6) Each category is assigned a weight representing the average compiled from a questionnaire distributed among WSDOT district program managers and staff as follows:

Cost efficiency=46%, Community support=18%, Environment=15%, Mode integration=11%, & Land use=10%.

The analysis was carried out on test data from category C submittals from the 1993-95 biennium. The researchers were able to track projects by type, district, and previously calculated rank (based on the category C cost-effectiveness and rating factor formula).

Results of the weighting scenarios applied to both urban and rural project lists showed that if ~50-70 percent of weight (with the balance of the weight divided equally) were applied to a single category, such as cost efficiency, the remaining four criteria categories would have minimal effect on the resulting rank order. However, further investigation showed that if the remaining criteria combined for a negative weight greater than 30 percent, then the effect on the ranking would be noticeable, but not dramatic. For example, it was fairly common under this type of scenario for projects to appear in locally reverse order (i.e., a project ranked #7 switching places with #8 while a project previously ranked #9 may appear as #6). In only one case did a score from a single category with less than 10 percent of the weight affect the final project ranking significantly (this outcome was due to a relatively extreme level of wetlands impact).

Following the Delphi analysis session, two additional weight scenarios from the second and final rounds of the session were analyzed in the fall of 1993. These additions produced no unusual deviations from the previous sensitivity analysis. Each transportation commissioner was provided the complete analysis package prior to public discussion and the motion to adopt the weights.

Delphi Decision-making Technique

Because the evaluation criteria assessed potentially conflicting objectives, it was important to structure the decision-making process such that the participants could deal with the weight assignment as a single unit. The Delphi technique is recognized as an effective means of building consensus within a single group of divergent interests. The technique provides for comparison of group judgment and individual contributions, for an opportunity for individuals to discuss and revise their views, and for a degree of anonymity. The Delphi process as utilized by WSDOT is outlined below.

The researchers first led a combination presentation-discussion on established WSTC goals and objectives for the Urban and Rural Mobility program. The proposed evaluation criteria were also discussed. Participants were instructed to assign category weights individually. Individual weight assignments were then summarized and redistributed to the participants. The mean, median, and standard deviation of the group responses were provided. Participants discussed desired policy direction and implementation as documented in appendix H. This feedback process was repeated twice—until a satisfactory standard deviation and degree of individual comfort were achieved. The Delphi technique itself was effective in moving the participants toward a fairly strong consensus. The final round of criteria weights from the Delphi session were later adopted by the full WSTC.

IMPLEMENTATION ASSISTANCE TO WSDOT

UW TRAC researchers assisted WSDOT in implementing the new prioritization methodology for the 1995-97 biennium. Their role entailed active participation in the technical advisory committee and a review of the final results. The researchers also assisted district staff in gathering the new data required for the methodology. The TRAC team conducted and attended several training sessions and criteria review sessions. Finally, the researchers reviewed the results of the first application of the methodology, (figures 7 and 8). Implementation of the methodology at WSDOT took one year. Implementation was preceded by a trial application on past category C projects. This trial, described below, was a full-scale test to verify that the criteria were reasonable and to assess the sufficiency of statewide databases. A presentation of the technical advisory committee's critical role and 1995-97 results follows.

Criteria and Database Assessment

As with any new set of evaluation criteria, it was important to determine that the prioritization criteria were feasible for application and assessment. Prior to all other

1995-97 Biennium Statewide Ranking Results: I1-Urban Mobility Program

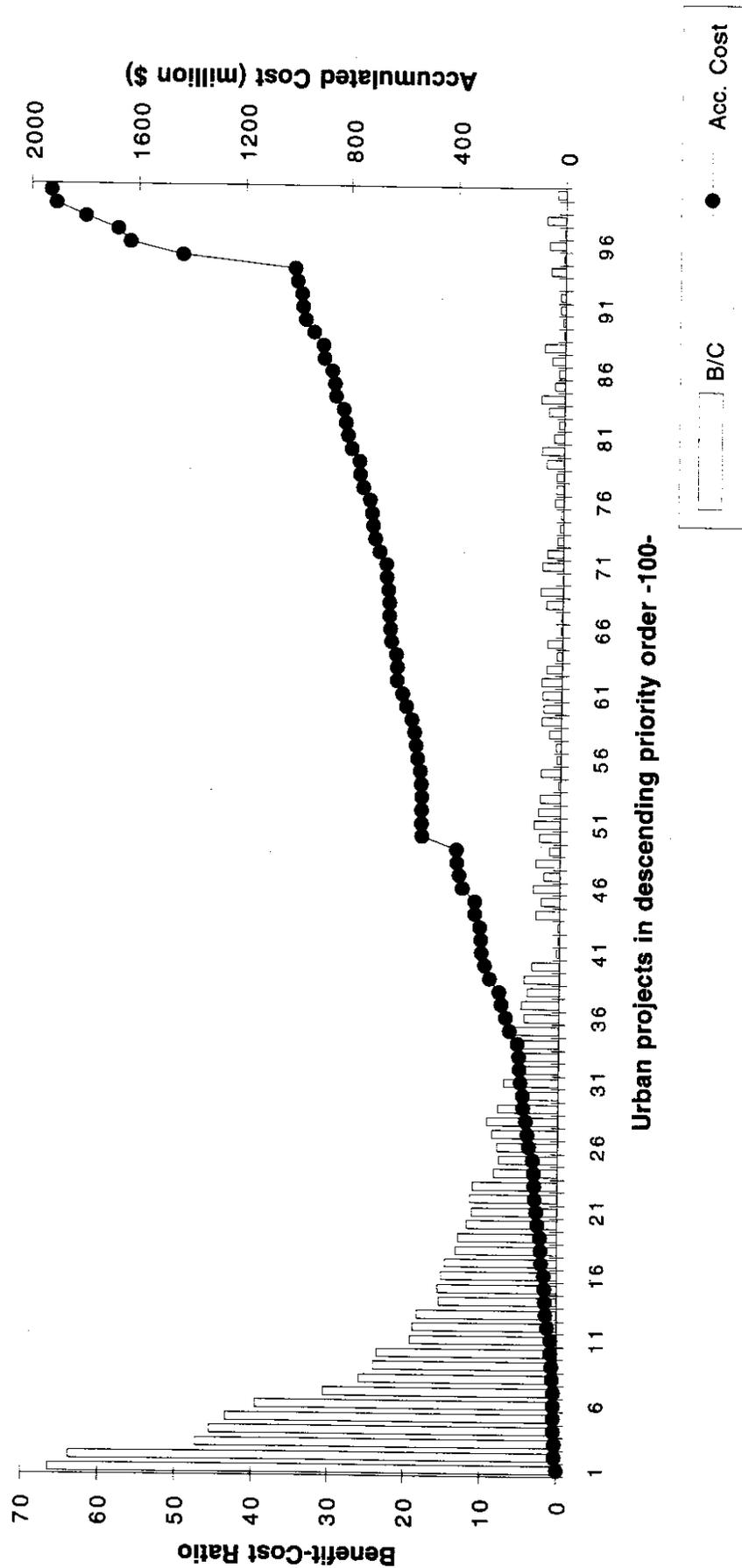


Figure 7. Statewide Prioritization Urban Mobility Program, 1995-97

1995-97 Biennium Statewide Ranking Results: I1 -Rural Mobility Program

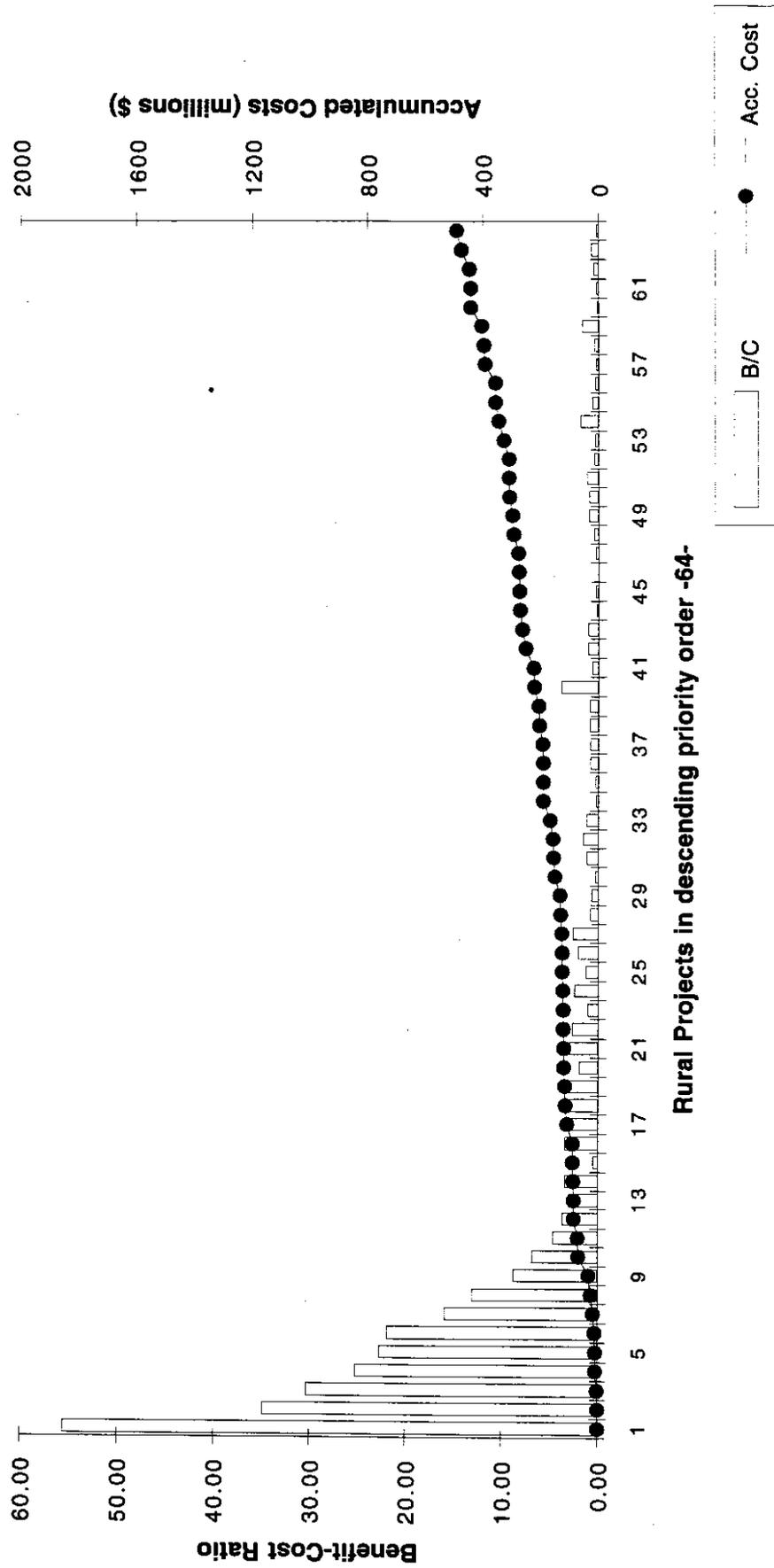


Figure 8. Statewide Prioritization Rural Mobility Program, 1995-97

aspects of implementation, a full-scale test of the recommended methodology was conducted on a complete set of category C 1993-95 biennium proposals provided by WSDOT. All additional data necessary for the new methodology was gathered for each project statewide. Ensuring that data collection for the criteria categories would not be unduly expensive or time-consuming was a primary concern. The trial application of the new prioritization criteria and methodology was a successful test of the ranking algorithm and criteria on traditional mobility projects, and this primary goal was ultimately achieved.

In the process, however, the researchers changed to the original criteria in the categories of water quality, air quality, wetlands, and land use substantially in order to reduce double counting and to improve the scoring framework. For example, the investigators eliminated the air quality criterion originally proposed in Phase II because it oversimplified mobile source analysis and was only sensitive to carbon monoxide pollution. Moreover, conformity rules of the 1991 Washington State Clean Air Act prevent construction of any project that would denigrate air quality in non-attainment areas. As such, the researchers determined that the statutory screening criteria already accounted for clean air policy objectives, and that the draft evaluation criteria would not contribute to the methodology in any meaningful way. Consequently, avoiding projects with negative air quality impacts became the focus and since the financially constrained systems plan document is required to comply with the Department of Ecology State Implementation Plan, WSDOT could be sure that no such projects would even be ranked.

Data collected in the full-scale test similarly strengthened the direct links between the remaining evaluation criteria and other state regulations. The investigators compiled an inventory of statewide resources intended for use by district staff and drafted scoring guidelines. Appendix F contains the resource inventory and Appendix E contains the scoring guidelines. The inventory provides contacts (names and addresses) at resource agencies that might assist WSDOT's data collection efforts and the scoring guidelines

define the legal parameters and terminology used in each criteria category. The full-scale test improved the prioritization methodology, and WSDOT benefited from the full-scale database assessment and revisions. Further, the test proved that the TOPSIS-6 ranking algorithm was in working order.

Beyond the full-scale test, TRAC investigators held several criteria review sessions with WSDOT programming and environmental engineers to further refine the criteria. For example, the debate over noise impact measurements became heated, but was resolved following circulation of several alternative approaches and a criteria review session with mediation. Noise impact evaluation ultimately evolved from a requirement of decibel change estimates per project to an assessment of increased noise level *risk* per project. Similarly, the focus of criteria refinements generally suggested by WSDOT staff was reduction in the time required to evaluate each proposal by means of simplifying assumptions. Minor numerical scoring revisions were also recommended, some of which were incorporated.

With regard to cost efficiency, the full-scale test in 1993 revealed that it would be feasible to assess travel time savings, and that such assessment would be supported by existing traffic counts, growth forecasts, and databases. However, the definition of proposed *mobility* improvements was significantly broadened from the old category C program between 1993 and 1995. The Mobility program now includes (to name a few) category B interstate, corridor-wide Intelligent Transportation Systems, and HOV-related improvements, as discussed previously. It was impossible for TRAC investigators to predict the full breadth of applications that would ultimately be required for implementation at the time of the test. To address this issue, WSDOT engineers convened a technical advisory committee (TAC) to assist in implementing the methodology for 1995-97.

Technical Advisory Committee

The technical advisory committee included representatives from three WSDOT districts, planning, programming and traffic engineers from WSDOT headquarters and the Transportation Data Office, the UW TRAC principal investigator, and a facilitator. The TAC was created to serve as a forum for technical debate, to establish consistent guidelines across project types, to improve communications, and to set all constant parameters for benefit-cost analysis (e.g., value of travel time). Many of the TAC deliberations during the implementation period were dedicated to benefit estimation methods for mobility improvements that were different from the old category B and C proposals. Examples of such projects included signalized intersection modifications, HOV lanes, park-n-ride lots, transportation system management, and driver information system improvements. The TAC produced a series of benefit calculation worksheets and directions (as well as explanations of the background discussion), for use in the districts.

Each worksheet pertains to a particular project type and represents travel time and operational savings in a manner appropriate for each improvement type. Benefit calculations for arterial highways and saturated conditions (LOS F) on freeways were among the most controversial topics. Appendix G includes a sample calculation.

The TAC's primary goal was to assist the districts in applying technical guidelines consistently, but it was also called upon to recommend improvements in the cost efficiency criteria to program management staff. Examples of technical decisions with implications for policy setting included project staging and analysis periods, discount rate selection, regional modeling variations, volume or growth projection coordination, vehicle occupancy assumptions, and benefit evaluation based on weekday peak hour volumes. The need to define benefits to the state (as opposed to local jurisdiction) was also an intriguing example of how policy must lead technical analysis. However, the need for particular guiding policies was often impossible to predict prior to beginning the technical analysis. For instance, the cost efficiency analysis resulted in

benefit-cost ratios of less than 1.0 in some cases, indicating the need for WSDOT to confront the sufficiency of project screening policies and foreshadowing several TAC debates over the full capture of actual annual benefits. On this point, modifications were made to incorporate the residual value of facilities (with service life beyond the standard 20-year horizon) in the benefit cost analysis using cost reduction factors. Daily benefits in highly congested areas were also estimated using an input capacity factor wherein peak-hour spreading was expected between 6 a.m. and 6 p.m. In the past, such issues had not been a concern because travel time savings were not quantified, and because non-interstate and interstate deficiencies were analyzed separately.

The TAC proved to be a key component of the prioritization implementation. The committee was very thorough, and a review of the new process by an independent consultant revealed few unique recommendations. The TAC also played a critical role in improving district support for, and confidence in, the new methodology. The TAC continues to refine the benefit estimation techniques and to develop guidelines for monetizing the impacts of emerging highway deficiency solutions and other external impacts (e.g., TDM/TSM and fish barrier removal).

1995-97 Project Ranking Results

The effectiveness of the study methodology is most convincingly illustrated by the actual 1995-97 prioritization results. Figures 7 and 8 depict the relationship between the priority order output from the ranking algorithm and each project's benefit-cost ratio. The figures simultaneously show how the biennial Mobility program costs accumulate in the urban and rural sub-programs respectively. The accumulated program costs depicted are calculated using the total present value costs of the project over 20 years for each proposal. The TOPSIS-6 algorithm and all five categories of criteria were used to calculate the rank order assuming statewide competition. The criteria categories were:

- Cost-efficiency
- Community Support

- Environment
- Mode Integration
- Land Use

The cost-efficiency criterion (B/C) is illustrated to show the strong relationship between the final rank order and the most heavily weighted category of criteria. Figures 9 and 10 illustrate the relationship between monetary benefits (i.e., B/C) and total accumulated costs and the descending priority order using all five categories of criteria. [Note the difference in scale.]

The most compelling observation is that both the Urban and the Rural Mobility programs show an overall *program* cost effectiveness. However, each program's cost effectiveness reaches a plateau (or point) where continued investment in priority order does not increase the measurable monetary benefit more than the associated increase in costs (i.e., where the slope of the accumulated benefit curve is less than or equal to the slope of the accumulated cost curve, $b_B < b_C$ or $b_B = b_C$). The Urban Mobility program does not reach the point of decreasing effectiveness (Z, fig. 9) until 94 projects are funded. The Rural Mobility program, on the other hand, reaches a plateau beginning with the project ranked 20th (X-Y, fig. 10) and reaches the point of decreasing effectiveness (Z, fig. 10) after 48 projects are funded. These curves might be utilized to program projects based only on measured cost effectiveness. For example, if the goal were to maximize the total accumulated benefit per dollar invested while still programming in priority order, it would not be advisable for WSDOT to invest beyond the point of equal slope or decreasing effectiveness in any biennium. Thus, WSDOT could respond to the greater need for mobility improvements in urban areas without sacrificing the comparative integrity of a statewide rural investment program.

However, the 1995-97 results cannot be evaluated based on statewide cost-effectiveness alone. State transportation policy recognizes the value of presently non-

Urban Mobility Program (II) Cost-Effectiveness

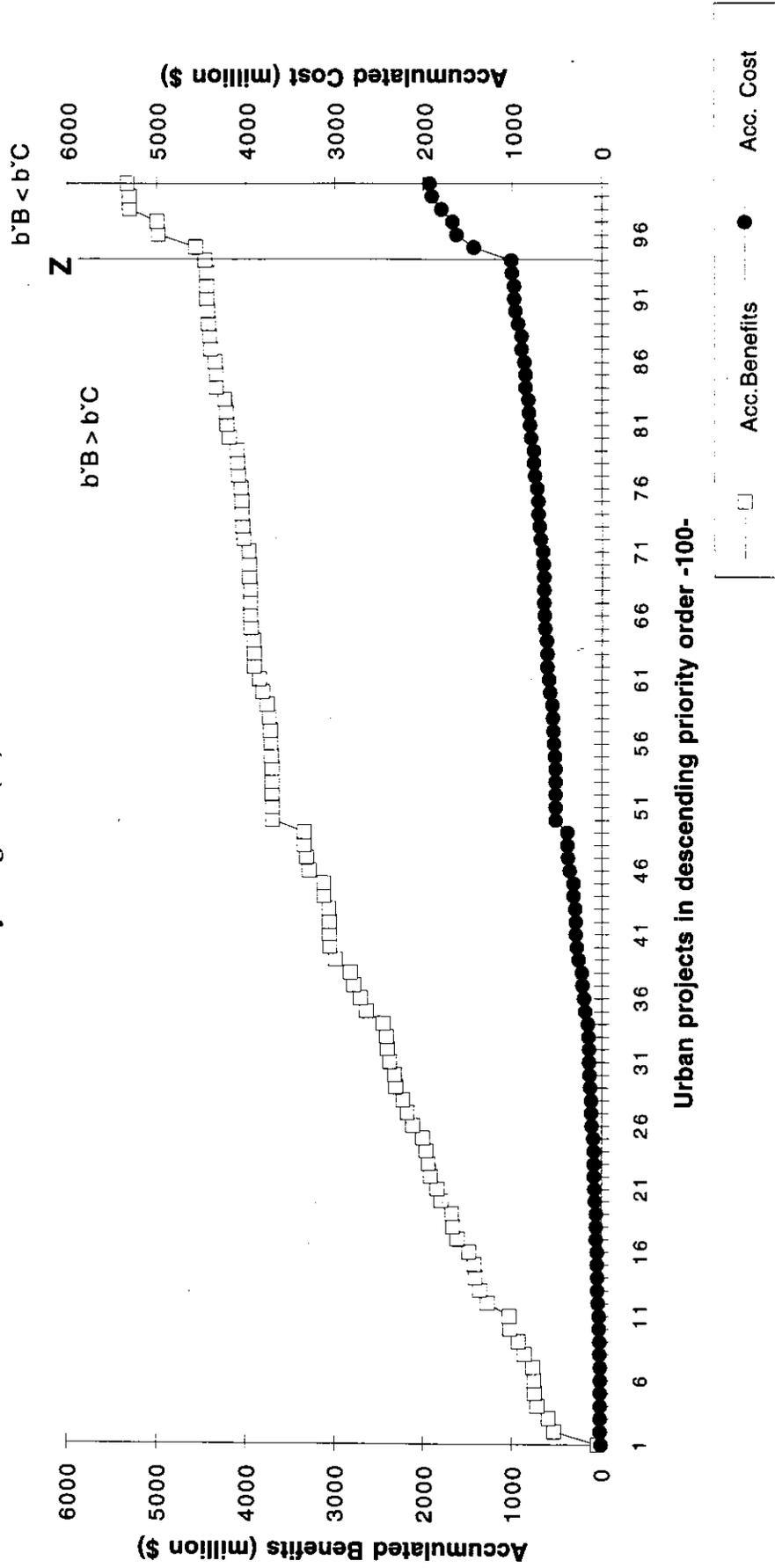


Figure 9. Overall Urban Mobility Program Cost Effectiveness, 1995-97
 [Note difference in scale]

Rural Mobility Program (II) Cost-Effectiveness

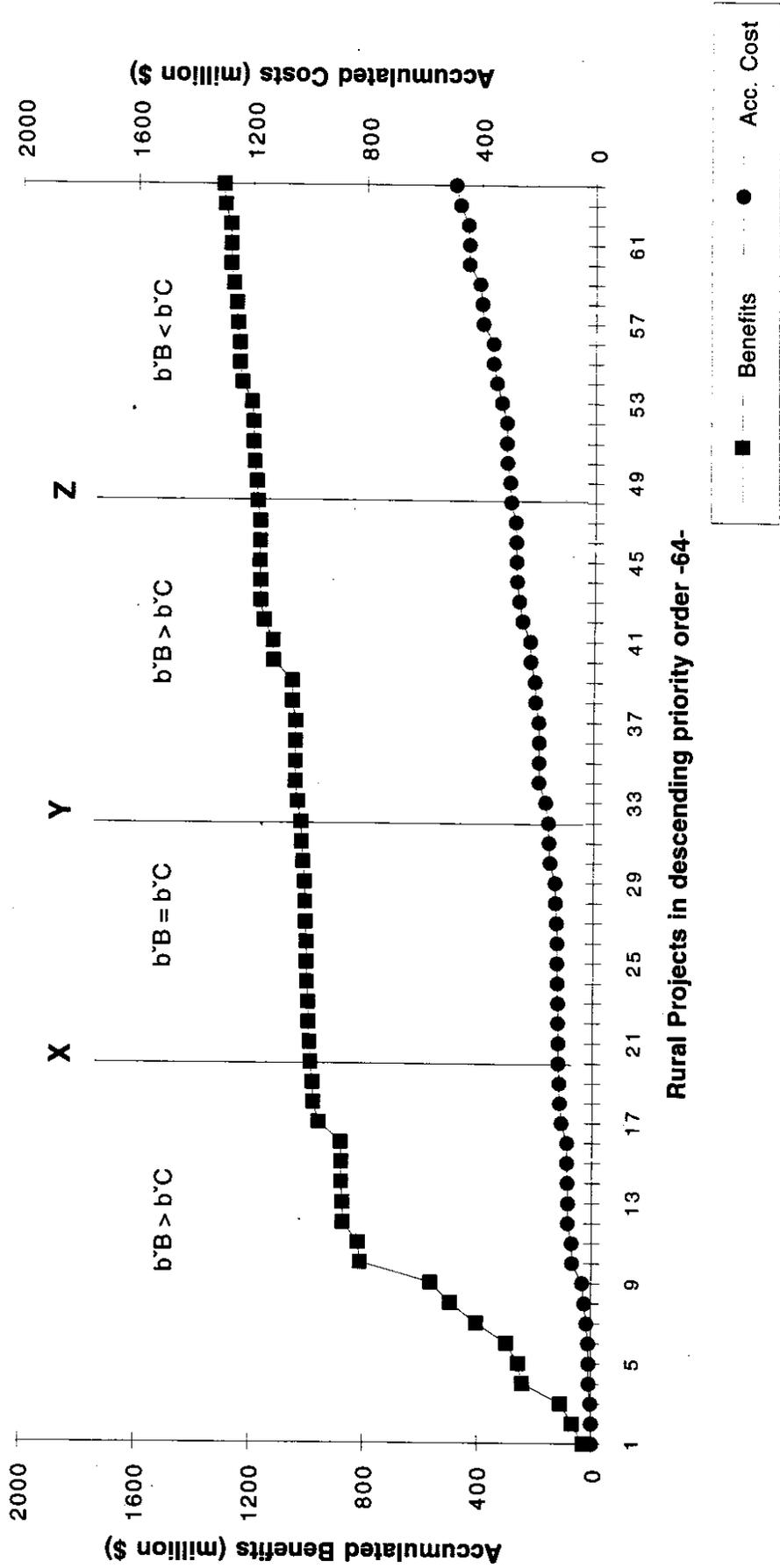


Figure 10. Overall Rural Mobility Program Cost-Effectiveness, 1995-97

monetizable impacts and there are several policy and technical issues that require a broad perspective, and non-monetary criteria, as previously discussed. Two issues remain.

First and foremost is the fact that local financial contributions were subtracted from nearly half of all the urban project costs used for the cost-efficiency analysis. The total rural projects affected by this WSDOT policy to encourage local-state partnerships in this way is unknown to the research staff. This policy has greatly impacted the prioritization of mobility improvements because the relationship between the most heavily weighted criteria (cost efficiency) and the priority order is very direct. In nearly half of the urban proposals, the prioritization reflects a higher benefit-cost ratio than would otherwise be calculated if the local contribution were not subtracted. Nonetheless, internal consistency on this and other points was carefully maintained by WSDOT program management among both sub-programs of the I1-Mobility program, and the results are comparable within this biennium and policy context.

Geographic equity is another policy issue with a significant effect on the prioritization results. Projects in heavily congested regions generate greater benefits than projects in uncongested regions. This is because the most heavily weighted criterion dominates the priority array of projects, and because travel time savings are the most significant proportion of the monetized benefits in the cost efficiency analysis. However, WSDOT executives established a policy of programming on a regional (or district) basis rather than opting for statewide competition for Mobility program funds in the 1995-97 biennium. Consequently, the funds are optimized regionally, not statewide. One reason the ranked results are not equivalent (statewide vs. district) is that funding allocations to districts are based on different criteria than those used for prioritization. In other words, many proposals with low priority statewide will be programmed for preliminary engineering and construction in relatively uncongested districts before higher priority projects are programmed in the most heavily congested districts. This policy, disrupts the optimal statewide investment scenario calculated by the new prioritization methodology.

Geographic equity may be served but the economic implications of this measured disruption may be significant, and as such, warrant further study.

GENERAL COMMENTS

Finally, the first biennium worth of proposals included significantly more diverse projects than ever before. The TAC identified several technical policy agenda items that should be carefully evaluated. WSDOT has suggested various circumstances that warrant project programming out of the rank order produced by this prioritization methodology. It should be noted that where the priority index of two competing proposals is nearly identical and there is no significant cost difference, either proposal may be selected based on irreducibles, regional priority, and professional judgment. Furthermore, WSDOT advised program managers to continue the logical pairing of construction work between separate improvement programs as necessary. As a result, it is possible that project work may commence out of the strict priority order. Executive oversight is required where the proposed jump in priority is extreme.

The new prioritization methodology does not replace professional management of the biennial mobility improvement programs. Rather, it is a tool that reflects WSDOT policy guidelines. The new methodology assumes that coordinated planning and major investment study precede the programming effort. The methodology is designed to inform program management of the inter-relationships of five specific quantified criteria categories. Program Management will benefit from increased knowledge of investment trade-offs.

CONCLUSIONS AND RECOMMENDATIONS

This report summarizes all phases of the Prioritization of Capacity Improvements Study (PCIS). Included herein are a discussion of the previously existing Category C prioritization formula, an overview of existing state-of-the-art prioritization methods for regional and statewide project programming, a detailed discussion of the proposed ranking methodology for mobility improvements, and finally, a description of the implementation process for the 1995-97 biennial programming cycle at the Washington State Department of Transportation. The new methodology, and more specifically the evaluation criteria, have been developed to respond directly to transportation policy goals for the state of Washington.

Phase I resulted in a preferred ranking algorithm, state-of-the-art assessment, and development of cost-efficiency evaluation criteria. Phase II expanded the number of evaluation criteria to reflect the breadth of state transportation policy objectives and established screening criteria. New categories of prioritization criteria include the following: cost-efficiency (benefit-cost ratios), community support, environment (wetlands, water quality and permitting, noise), mode integration, and land use. Phase III concluded the study with a full-scale test of the new methodology, criteria revisions, sensitivity analysis, weight assignment, and implementation assistance to the WSDOT.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and state transportation policy mandate the encouragement of multimodal projects. The new prioritization methodology for mobility improvements constitutes a flexible, inclusive framework for assessing projects related to all highway modes. The recommended criteria involve monetizing safety and user benefits, as well as the costs of all project proposals. Indeed, one of the prioritization study's long-range goals is to encourage the monetization of quantifiable impacts, particularly in the environmental category. This would allow accounting for environmental costs in the cost-efficiency evaluation.

Based on their experience in the first year of implementation, researchers concluded that setting up a technical advisory committee is essential. WSDOT used a technical advisory committee to maintain consistency in the application of cost-efficiency theory and to push the boundaries of economic analysis.

The needs for further study are many. Remaining technical issues associated with monetizing user benefit and external impacts include the following:

- full capture of annual and 24-hour benefits
- sensitivity of results to simplifying assumptions and cost parameters
- regional model compatibility
- consecutive intersection analysis on arterials
- refined benefit analysis for Intelligent Transportation Systems and HOV facilities
- an approach to scale environmental impacts by project length
- an approach for analyzing Transportation Demand Management, access management, and on-time freight delivery
- monetizing more social and environmental costs, such as water quality, wetlands banking, energy efficiency, and land use
- expanding the breadth or better quantifying mode integration and developing multimodal evaluation criteria.

Policy issues in need of further study include the following:

- geographic and taxpayer equity, or statewide vs. regional budget prioritization, and the associated need for additional equity criteria
- planning study coordination with the new methodology
- systems plan deficiency evaluation formula vs. priority programming formula
- calculation of all system benefits vs. proportionate analysis of state or local benefit and the policy to discount the project cost where other agencies/locals have contributed financially
- determination of "commitment" to a prioritized project
- Level of Service (LOS) standard variation among regions
- division of mobility projects into rural and urban sub-programs.

It is also recommended that WSDOT expand the scope of priority programming in other highway sub-programs, and in the public transportation, ferries, and aviation programs to include a similar prioritization methodology based on lifecycle cost analysis. This type of analysis would greatly enhance the budget trade-off process. WSDOT should also provide additional documentation and training for program management, planning, and environmental staff and pursue a dynamic programming process for the mobility program that links the criteria worksheets to the TOPSIS-6 algorithm.

Although many issues will require additional study, the proposed methodology represents a significant step toward the ability to evaluate and rank projects in a manner that directly reflects transportation policy and service objectives. WSDOT is clearly in the forefront of such efforts nationwide. Through continued effort, optimal utilization of limited state transportation funds will be made possible.

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APPENDIX A
DETAILS OF PRIORITY INDEX CALCULATION

PROGRAM INSTRUCTIONS

(Refer to Figure A-1 and Table A-1)

Step 1

Open TOPSIS-6¹ macro file from the directory.

Step 2

Open the data file containing projects and evaluation criteria values.

This data file must be formatted as shown in Table A-1. Column 1 is used for the project identification (project identification can be any alpha-numeric combination). Columns 2 through 2+y are reserved for the evaluation criteria, where $y=x-1$ and x =Project Cost Column.

Row 2 of the data sheet must include a weight for each evaluation criteria. The sum of the weights must equal 1.00.

Row 3 is used to denote whether the criteria should be maximized or minimized. A "1" is used when high values are favored over low values, e.g., B/C and Land Use scores. A "0" is used when low values are favored over high values, e.g., environmental impact criteria.

Step 3

Highlight (select) the entire data set area exactly with the mouse.

Step 4

Go to "Macro" on the main menu and select TOPSIS-6. The program will display interim calculations to the right of the selected worksheet area. Be sure that you have saved the input worksheet prior to running the program.

At the prompt, enter the name of a new file to which the output should be written.

At the second prompt in the new worksheet, enter the program budget as indicated. Use the same units as were input for project costs previously. TOPSIS-6 will figure the project list that can be funded given the budget scenario in exact rank order and display the remaining funds in the third column, row five.

When the program is complete, a window will display a notice as an indicator. Enter "OK".

Step 5

After the macro has completed execution, close the input data file and the TOPSIS-6 macro file; do NOT save any changes. Next, save the output file including changes and proceed to view the project priority indices in rank order. In order to format the output file, it must be saved under a different name before customizing the document.

¹ A detailed listing of the TOPSIS-6 program is included in Appendix C.

APPENDIX B
MATHEMATICAL SUMMARY OF TOPSIS

MATHEMATICAL SUMMARY OF TOPSIS

One of the most frequently used methods for prioritizing elements (i.e., projects) with disparate units is called technique for order preference by similarity to ideal solution (TOPSIS), which was developed by Hwang and Yoon based on the concept of Euclidean distance.¹ The algorithm uses one project that has the weighted minimum Euclidean distance as the ideal solution and assumes that each criterion has a monotonically increasing (or decreasing) utility. The "ideal project" is composed of all of the best criteria values, and the "negative-ideal project" has all of the worst criteria values. The method compares the Euclidean distance of each criterion to both the ideal and the negative-ideal solutions simultaneously by taking the relative closeness to this ideal solution, thus, the priority of each project is obtained.

Figure B-1 shows an example of the Euclidean distances to the ideal and negative-ideal solutions in two dimensional space. A^* is the ideal project, A^- is the negative-ideal project. In the figure, project A_1 has shorter distances both to the ideal project A^* and to the negative-ideal project A^- , than the other project A_2 . To justify the selection of projects, TOPSIS compares the relative closeness to the ideal solution by considering the two distances at the same time.

¹ Hwang, Ching-Lai and Yoon, Kwangsun, *Lecture Notes in Economics and Mathematical Systems*, Springer-Verlag Berlin Heidelberg New York, 1981.

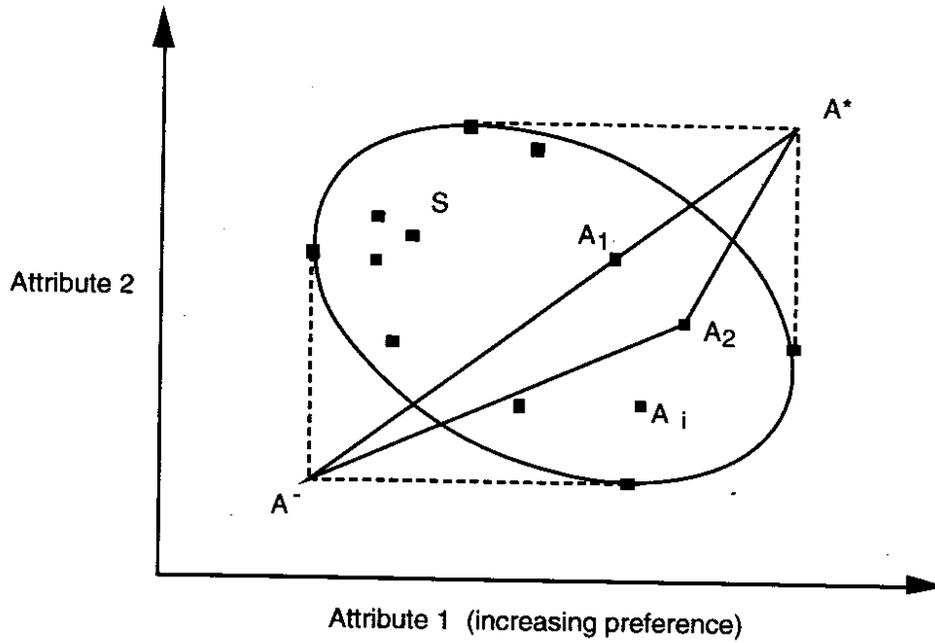


Figure B-1. Euclidean Distance to the Ideal and Negative-ideal Solutions in Two Dimensional Space

DETAILED ALGORITHM

The TOPSIS method evaluates m projects through n criteria, which make up the following decision matrix:

$$D = \begin{matrix} & & B_1 & B_2 & & B_j & & B_n \\ \begin{matrix} X_1 \\ X_2 \\ \vdots \\ X_i \\ \vdots \\ X_m \end{matrix} & \left[\begin{matrix} D_{11} & D_{12} & \dots & D_{1j} & \dots & D_{1n} \\ D_{21} & D_{22} & \dots & D_{2j} & \dots & D_{2n} \\ \vdots & \vdots & & \vdots & & \vdots \\ D_{i1} & D_{i2} & \dots & D_{ij} & \dots & D_{in} \\ \vdots & \vdots & & \vdots & & \vdots \\ D_{m1} & D_{m2} & \dots & D_{mj} & \dots & D_{mn} \end{matrix} \right] \end{matrix}$$

where X_i = the i th project considered,
 B_j = the j th criteria considered in the decision, and
 D_{ij} = the numerical outcome of the i th project with respect to j th criteria.

TOPSIS uses a set of weights obtained from decision makers to describe the importance of each criterion. It assumes the larger the attribute outcomes, the greater the benefit criteria and the less preferable the cost criteria. It consists of the following steps:

Step 1 Construct the normalized decision matrix (R). This process transforms the various criteria dimensions into non-dimensional criteria, which allows comparison across the different criteria. An element r_{ij} of the normalized decision matrix R can be calculated as:

$$r_{ij} = D_{ij} / \sum_{i=1}^m D_{ij}^2 \quad (\text{B.1})$$

Step 2 Construct the weighted normalized decision matrix (V). A set of weights $W = (W_1, W_2, \dots, W_j, \dots, W_m)$ are accommodated into the decision matrix. The weights should sum to one, that is $\sum_{j=1}^n W_j = 1$.

The updated weighted matrix can be calculated by multiplying each column by its associated weight:

$$v_{ij} = r_{ij} * W_j \quad (\text{B.2})$$

Step 3 Determine ideal and negative-ideal solutions: Let the ideal solution A^* and the negative A^- be defined as:

$$\begin{aligned} A^* &= \{ (\max_{i \in J} v_{ij}), (\min_{j \in J'} v_{ij}) \mid i = 1, 2, \dots, m) \} \\ &= \{ v_1^*, v_2^*, \dots, v_i^*, \dots, v_n^* \} \end{aligned} \quad (\text{B.3})$$

$$\begin{aligned} A^- &= \{ (\min_{i \in jJ} v_{ij}), (\max_{j \in J'} v_{ij}) \mid i = 1, 2, \dots, m) \} \\ &= \{ v_1^-, v_2^-, \dots, v_i^-, \dots, v_n^- \} \end{aligned} \quad (\text{B.4})$$

where $J = \{ j = 1, 2, \dots, n \mid j \text{ associated with benefit criteria} \}$

$J' = \{ j = 1, 2, \dots, n \mid j \text{ associated with benefit criteria} \}$.

Step 4 Calculate the separation measure. The separation between each project can be measured by the n-dimensional Euclidean distance. The distance of each project from the ideal one is then given by

$$S_i^* = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^*)^2}, \quad i = 1, 2, \dots, m \quad (\text{B.5})$$

Similarly, the distance from the negative-ideal one is given by

$$S_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}, \quad i = 1, 2, \dots, m \quad (\text{B.6})$$

Step 5 Calculate the relative closeness to the ideal solution. The relative closeness of A_i with respect to A^* is the priority of each project, which is defined as:

$$p_i^* = S_i^- / (S_i^* + S_i^-), \quad 0 < p_i^* < 1, \quad i = 1, 2, \dots, m \quad (\text{B.7})$$

Step 6 Rank the priority order. A set of projects can now be priority ranked according to the descending order of p_i^* .

APPENDIX C
DETAILED LISTING OF TOPSIS-6

- A1. Topsis (t)
Start of the macro
- A2. =SET.NAME("range",SELECTION())
Give the highlighted data area a name as "range"
- A3. =ROWS(range)
Return the number of rows in "range"
- A4. =COLUMNS(range)
Return the number of columns in "range"
- A5. =SET.NAME("temp",OFFSET(range,0,A4+1))
Return a reference of the same size and shape as "range", with its upper-left corner shifted horizontally by the number of column of "range" (A4) plus 1. And give this shifted reference a name as "temp"
- A6. =SET.NAME("workspace",INDEX(temp,4,2):INDEX(temp,A3,A4-1))
Give the area from row4-col2 in "temp" to rowA3-colA4 in "temp" a name as "workspace"
- A7. =SET.NAME("origin",INDEX(range,4,2):INDEX(range,A3,A4-1))
Give the area from row4-col3 in "range" to row A3-colA4-1 in "range" a name as "origin"
- A8. =SET.NAME("weight",INDEX(range,2,2):INDEX(range,2,A4-1))
Give the area from row2-col2 in "range" to row2-colA4-1 in "range" a name as "weight"
- A9. =SET.NAME("logic",INDEX(range,3,2):INDEX(RANGE,3,A4-1))
Give the area from row3-col2 in "range" to row3-colA4-1 in "range" a name as logic
- A10. =SET.NAME("sum1",INDEX(workspace,1,1):INDEX(workspace,1,A4-2))
Give the area from row1-col1 in "workspace" to row1=colA4-2 in "workspace" a name as "sum1"
- A11. =SET.NAME("sum",OFFSET(sum1,A3-2,0))
Return a reference of the same size and shape as "sum1", with its upper-left corner shifted vertically by the number of A3 minus 2. And give this shifted reference a name as "sum"

- A12. =SET.NAME("positive",OFFSET(sum,1,0))
 Return a reference of the same size and shape as "sum", with its upper-left corner shifted vertically by one row. And give this shifted reference a name as "positive"
- A13. =SET.NAME("negative",OFFSET(positive ,1,0))
 Return a reference of the same size and shape as "positive", with its upper-left corner shifted by one row. And give this shifted reference a name as "negative"
- A14. =SET.VALUE(A22,1)
 Start outer loop. Initialize the counter at cell A22 to 1
- A15. =SET.VALUE(A17,0)
 Intialize the value of A17 to 0
- A16. =SET.VALUE(A18,1)
 Start inner loop. Intialize the counter at cell A18 to 1
- A17. =A17+INDEX(origin,A18,A22)^2
 Calculate the sum of squares of each cell in the first column of "origin", and repeat for all the columns
- A18. =A18+1
 Increment the inner loop counter A18
- A19. =IF(A18<(A3-2),GOTO(A17))
 The inner loop ends when all the rows in each column of "origin" are reached
- A20. =SELECT(INDEX(sum,1,A22))
 Select the cell of row1-colA22 in "sum"
- A21. =FORMULA(A17)
 Write the result of A17 to the above selected cell
- A22. =A22 + 1
 Increment the outer loop counter A22
- A23. =IF(A22<A4-1,GOTO(A15))
 The outer loop terminates when all the columns in "origin" are reached

- A24. =SET.NAME("ido",INDEX(range,4,1):INDEX(range,A3,1))
Give the area from row4-col1 to row A3-col1 in "range" a name as "ido"
- A25. =SET.NAME("costo",INDEX(range,4,A4):INDEX(range,A3,A4))
Give the area from row4-colA4 to row A3-colA4 in "range" a name as "costo"
- A26. =SET.NAME("dummy",INDEX(workspace,1,1):INDEX(workspace,A3-3,1))
Give the area from row1-col1 to rowA3-3-col1 in "workspace" a name as "dummy"
- A27. =SET.NAME("sep",OFFSET(dummy,0,A4))
Return a reference of the same size and shape as "dummy", with its upper-left corner shifted horizontally by the number of A4. And give this shifted reference a name as "sep"
- A28. =SET.NAME("sepn",OFFSET(dummy,0,A4+1))
Return a reference of the same size and shape as "dummy", with its upper-left corner shifted horizontally by the number of A4 plus 1. And give this shifted reference a name as sepn"
- A29. =SET.NAME("ci",OFFSET(dummy,0,A4+2))
Return a reference of the same size and shape as "dummy", with its upper-left corner shifted horizontally by the number of A4 plus 2. And give this shifted reference a name as "ci"
- A30. =SET.NAME("id",OFFSET(ci,0,1))
Return a reference of the same size and shape as "ci", with its upper-left corner shifted horizontally by one row. And give this shifted reference a name as "id"
- A31. =SET.NAME("cost",OFFSET(ci,0,2))
Return a reference of the same size and shape as "ci", with its upper-left corner shifted horizontally by two rows. And give this shifted reference a name as "cost"
- A32. =SET.VALUE(A51,1)
Start outer loop. Initialize the counter at cell A51 to 1
- A33. =SET.VALUE(A37,1)
Start inner loop. Initialize the counter at cell A37 to 1

- A34. =SELECT(INDEX(workspace,A37,A51))
Select the cell of row A37-colA51 in "workspace"
- A35. =INDEX(origin,A37,A51)/SQRT(INDEX(sum,1,A51))*INDEX(weight,1,A51)
Construct the weighted normalized matrix. (see Steps 1&2 of TOPSIS)
- A36. =FORMULA(A35)
Write the result of A35 to the above selected cell
- A37. =A37 + 1
Increment the inner loop counter A37
- A38. =IF(A37<A3-2,GOTO(A34))
Repeat the above calculations until all the rows in "workspace" are reached.
End of Steps 1&2 of TOPSIS
- A39. =MAX(INDEX(workspace,1,A51):INDEX(workspace,A3-3,A51))
Return the largest number in the list from row 1-colA51 to row A3-3-colA51 in "workspace"
- A40. =MIN(INDEX(workspace,1,A51):INDEX(workspace,A3-3,A51))
Return the smallest number in the list from row 1-colA51 to row A3-3-colA51 in "workspace"
- A41. =IF(INDEX(logic,1,A51)=0,GOTO(A47))
If the value of cell row 1-colA51 in "logic" is 0, goto A47. This corresponds to the case of minimization in TOPSIS Step 3. When its value is 1, goto next step A42. This corresponds to the case of maximization in TOPSIS Step 3
- A42. =SELECT(INDEX(positive,1,A51))
Select the cell of row 1-colA51 in "positive"
- A43. =FORMULA(A39)
Write the value of A39 to the above selected cell
- A44. =SELECT(INDEX(negative,1,A51))
Select the cell of row 1-colA51 in "negative"

- A45. =FORMULA(A40)
Write the value of A40 to the above selected cell
- A46. =GOTO(A51)
End of maximization case
- A47. =SELECT(INDEX(positive,1,A51))
Select the cell of row 1-colA51 in "positive"
- A48. =FORMULA(A40)
Write the value of A40 to the above selected cell
- A49. =SELECT(INDEX(negative,1,A51))
Select the cell of row1-colA51 in "negative"
- A50. =FORMULA(A39)
Write the value of A39 to the above selected cell. End of minimization case
- A51. =A51+1
Increment the outer loop counter of A51
- A52. =IF(A51<A4-1,GOTO(A33))
End of Step 3 of TOPSIS
- A53. =SET.VALUE(A84,1)
Start of outer loop, initialize the counter A84 to 1
- A54. =SET.VALUE(A63,0)
Initialize A63 to 0
- A55. =SET.VALUE(A65,0)
Initialize A65 to 0
- A56. =SET.VALUE(A68,0)
Initialize A68 to 0
- A57. =SET.VALUE (A70,0)
Initialize A70 to 0

- A58. =SET.VALUE(A71,0)
 Start of inner loop, initialize the counter A59 to 0
- A59. =SET.VALUE(A74,0)
 Intitialize A74 to 0
- A60. =SET.VALUE(A75,0)
 Initialize A75 to 0
- A61. IF((AND(INDEX(positive,1,A71)>0,INDEX(workspace,A84,A71)>0)),goto
 A65)
 Determines whether the workspace value and ideal criteria value share the
 same sign
- A62. IF((AND(INDEX(workspace,A84,A71)<0,INDEX(positive,1,A71)<0)), goto
 A65)
 Same as A61
- A63. =A63 + (INDEX(workspace,A84,A71)+(0-INDEX(positive,1,A71)))^2
 Calculates the separation measure, Step 4 of TOPSIS, when criteria values of
 the workspace & ideal share the same sign
- A64. =goto A66
 Skips the alternate case calculation (see A65).
- A65. =A65 + INDEX(workspace,A84,A71)-INDEX(positive,1,A71))^2
 Calculates the separation measure, Step 4 of TOPSIS, when criteria value of
 the workspace is negative and the ideal criteria value is positive.
- A66. =IF((AND(INDEX(workspace,A84,A71)>0,INDEX(negative,1,A71)>0)),
 goto A70)
 Determines whether the workspace value and negative-ideal criteria value
 share the same sign.
- A67. =IF((AND(INDEX(workspace,A84,A71)<0,INDEX(negative,1,A71)<0)),
 goto A70)
 Determines whether the workspace value and negative-ideal criteria value
 share the same sign.

- A68. =A68 + ((INDEX(workspace,A84,A71) - INDEX(0-INDEX(negative,1,A71)))^2
Calculates the separation measure, Step 4 of TOPSIS, when criteria values of the workspace and negative-ideal share the same sign
- A69. =goto A71
Skips the alternate case calculation(A70).
- A70. =A70+(INDEX(workspace,A84,A71)-INDEX(negative,1,A71))^2
Calculate the separation measure, Step 4 of TOPSIS, when value in workspace is positive and the negative-ideal criteria value is negative.
- A71. =A71 + 1
Increment counter of inner loop A71
- A72. =IF(A72<A4-1,GOTO(A61))
Inner loop terminates when all the columns in row A84 of "workspace" are reached
- A73. =SELECT(INDEX(sep,A84,1))
Select row A84-col1 of "sep"
- A74. =A63 + A65
Sum all possible separation measures to the ideal
- A75. =A68 + A70
Sum all possible separation measures to the negative-ideal
- A76. =SQRT(A74)
Take the square root of the result in A74. This is the separation to ideal-solution for each project
- A77. =FORMULA(A76)
Write the above result in the selected cell (See A61)
- A78. =SELECT(INDEX(sepn,A84,1))
Select row A84-col1 of "sepn"

- A79. =SQRT(A75)
Take the square root of the result in A75. This is the separation to negative-ideal solution for each project.
- A80. =FORMULA(A79)
Write the above result in the selected cell (See A64)
- A81. =SELECT(INDEX(ci,A84,1))
Select row A84-col1 of "ci"
- A82. =INDEX(sepn,A84,1)/(INDEX(sepn,A84,1)+INDEX(sep,A84,1))
Calculate relative closeness, i.e., priority index. This is Step 5 of TOPSIS
- A83. =FORMULA(A82)
Write the above result to the selected cell (see A81)
- A84. =A84+ 1
Increment the outer loop counter A84
- A85. =IF(A84<(A3-2),GOTO(A54))
The outer loop terminates when all the rows in "workspace" are reached
- A86. =SELECT(ido)
Select "ido", which contains the ID numbers of all the projects
- A87. =COPY()
Copy the selected region, i.e., "ido"
- A88. =SELECT(id)
Select "id"
- A89. =PASTE()
Paste the selected data, i.e., the ID numbers, to "id"
- A90. =SELECT(costo)
Select "costo", which contains the cost of all the projects
- A91. =COPY()
Copy the selected region

- A92. =SELECT(cost)
Select "cost"
- A93. =PASTE()
Paste the copied content, i.e., the costs, to "cost"
- A94. =SELECT(INDEX(workspace,1,1):INDEX(negative,1,A4-2))
Select the area from the first cell in "workspace" to the last cell in "negative"
- A95. =EDIT.DELETE()
Delete the selected area. Notice: steps A94 and A95 clear all the intermediate results on the worksheet
- A96. =SELECT(INDEX(sep,1,1):INDEX(sepn,A3-3,1))
Select the area from row1-col1 in "sep" to rowA3-3-col1 in "sepn", which contains the final results of Topsis. We are going to write these results in a new file (see the following a few steps)
- A97. =EDIT.DELETE()
Delete the selected area
- A98. =INPUT("Enter a new file name (non-existing):",2)
Display a dialog box into which the user can enter information in text, i.e., the filename in which the user wants to store the final results
- A99. =FOPEN(A98,3)
Create the file named by the user in A98, with read/write access
- A100. =FCLOSE(A99)
Close the file specified in A99
- A101. =SELECT(INDEX(ci,1,1):INDEX(cost,A3-3,1))
Select the area from row1-col1 in "ci" to rowA3-3-col1 in "cost"
- A102. =SORT(1,,2)
Sort priority indices by rows in descending order. This is Step 6 of TOPSIS
- A103. =CUT()
Cut the selected area, i.e., the sorted results

- A104. =OPEN(A98)
Open the file created in step A98 as a window
- A105. =SELECT("r[1]c")
Select the first row and column "r[1]c"
- A106. =PASTE()
Paste the cut content (i.e., the sorted results) in the new file
- A107. =SET.NAME("b_range",SELECTION())
Give the selected area a name as "b_range"
- A108. =ROWS(b_range)
Return the number of rows in "b_range"
- A109. =COLUMNS(b_range)
Return the number of columns in "b_range"
- A110. =SELECT("r[-1]c")
Select (an inserted) row above the sorted results in the new file, "r[-1]c"
- A111. =FORMULA("Priority Index")
Write the heading "Priority Index" in the first above selected cell
- A112. =SELECT("rc[1]")
Select the first cell in the next column over (to the right), "rc[1]"
- A113. =FORMULA("Rank Order")
Write the heading "Rank Order" in the above selected cell
- A114. =SELECT("rc[1]")
Select the first cell in the next column over (to the right), "rc[1]"
- A115. =FORMULA("Project cost")
Write the heading "Project cost" in the above selected cell
- A116. =SELECT("rc[1]")
Select the first cell in the next column over, "rc[1]"

- A117. =FORMULA("Total Budget")
Write the heading "Total Budget" in the above selected cell
- A118. =SELECT("r[2]c")
Select the cell two rows beneath the previous cell (in the fourth column), "r[2]c"
- A119. =FORMULA("Remainings")
Write the heading "Remainings" in the above selected cell
- A120. =SELECT("r[-2]c[1]")
Select two rows above and the next cell over (top row, fifth column), "r[-2]c[1]"
- A121. =FORMULA("Funded Proj's")
Write the heading "Funded Proj's" in the above selected cell
- A122. =SELECT("r[1]c[-1]")
Select the cell one row beneath and one column to the left of the previous (second row, fourth column), "r[1]c[-1]"
- A123. =INPUT("Enter the total budget (unit should be consistent with the raw data!)",1)
Display a dialog box for user to enter information as text; i.e., the total available budget
- A124. =FORMULA(A123)
Write the value A123 to the above selected cell (under "Total Budget") in new file
- A125. =IF(A123>=INDEX(b_range,1,3),GOTO(A128))
Determine whether the top priority project is funded under the input budget scenario. Begins the outer loop if there is enough funding.
- A126. =ALERT("No projects can be funded under this ranking order! Please check your total budget.")
Display a dialog box notifying user that the total budget entered will not cover the project cost of the top ranked item
- A127. =RETURN()
Stop the macro

- A128. =SET.VALUE(A131,0)
Start inner loop. Initializes the counter at cell A131 to zero.
- A129. =SET.VALUE(A130,0)
Start outer loop. Initializes the counter at cell A130 to zero
- A130. =A130+1
Increment the outer loop counter A130
- A131. =A131+INDEX(b_range,A130,3)
Calculate the accumulated project cost in descending priority order
- A132. =IF(A131>A123,GOTO(A139))
Determine if accumulated project cost exceeds the total budget input
- A133. =IF(A130=A108,ALERT("all projects can be funded!"),GOTO(A138))
Determine if the project is from the last row in "b_range"
- A134. =SELECT("r[2]c")
Select cell two rows beneath previous cell in new file under "Remainings" (fourth row, fourth column), "r[2]c"
- A135. =A123-SUM(INDEX(b_range,1,3):INDEX(b_range,A108,3))
Calculate the remaining budget if any
- A136. =FORMULA(A135)
Write the value of A135 to the above selected cell
- A137. =RETURN()
Increment the inner loop
- A138. =GOTO(A130)
End of outer loop
- A139. =A123-(A131-INDEX(b_range,A130,3))
Calculate remaining budget; i.e., subtracts partially funded project from accumulated project costs of A131

- A140. =SELECT("r[2]c")
Select cell two rows beneath previous cell in new file under heading "Remainings" (fourth row, fourth column), "r[2]c"
- A141. =FORMULA(A139)
Write the value A139 to above selected cell
- A142. =SELECT(INDEX(b_range,1,2):INDEX(b_range,A130-1,2))
Select the cells of row1-col2 in "b_range" through row A130-1 (outer loop counter)-col2
- A143. =COPY()
Copy selected cells
- A144. =SELECT("rc[3]")
Select cell three columns over previous selection, "rc[3]"; i.e., under heading "Funded Proj's"
- A145. =PASTE()
Paste copied cells from above in selected cells; i.e., paste names of projects funded by total budget input under the heading "Funded Proj's"
- A146. =ALERT("This is the end!",3)
Display dialog box notifying user that the algorithm is finished
- A147. =RETURN()
Stop the macro.

APPENDIX D
PROJECT DESCRIPTION SHEET

PCIS MOBILITY PROJECT DESCRIPTION SHEET

PROPOSED IMPROVEMENTS

DISTRICT: _____
LOCAL JURISDICTION(S): _____

SR: _____
PROJECT TITLE: _____
SR MILEPOST: _____ to SR MILEPOST _____
LENGTH: _____ (miles)

The purpose of the following descriptions is to identify the existing geometric characteristics of the project area, to detail the proposed improvements, and to describe the proposed future facility.

In each case, *descriptions must address the following conditions:* number, width, and type of lanes; shoulder, sidewalk, and bike lane width/existence; median width and type; interchange/intersection specifications; midpoint of expansion; safety measures (e.g. signalization, lighting, etc.); functional class; design speed; alignment changes; and right-of-way needs.

A *map must be attached* that highlights the project area and describes the section-township-range coordinates, distance from the nearest intersection, and names of roadways in the vicinity. Where the project proposal entails a new roadway/alignment or major intersection improvements, attach a secondary map &/or cross section at a larger scale.

Description of Existing Facility:

Description of Proposed Improvements and Future Facility:

Ranking relative to other proposed district project submittals? _____ of _____.

WSDOT CATEGORY C PROJECT DESCRIPTION SHEET

PROPOSED CATEGORY C IMPROVEMENTS

DISTRICT: _____

SR: _____ Project Title: _____
SR Milepost: _____ to SR Milepost _____ Length _____ (miles)
Functional Class: _____ Level of Development _____

Description of existing facility:

Description of proposed improvement (include staging):
{map usually attached}

Can the problem be solved by a Category A improvement or any other program than Category C? Yes _____ No _____

Ranking relative to other proposed district Category C improvements: _____ of _____.

Local or TIB participation anticipated: Yes ___ No ___
If yes, to what extent?

Cost Data:

Total Estimated Cost _____ (19__ dollars)

<u>Activity</u>	<u>Start Date</u>	<u>Expenditures (\$in Thousands, Inflated)</u>					<u>Total</u>
		<u>FY 9_</u>	<u>FY9_</u>	<u>FY9_</u>	<u>FY9_</u>	<u>FY9_</u>	
PE							
R/W							
Construction							
<u>Total:</u>							

WSDOT CATEGORY C PROJECT CHECKLIST

**CHECKLIST OF NON-ENGINEERING STATUTORY REQUIREMENTS
CATEGORY C PROJECTS**

DISTRICT _____ Date _____
SR _____ Name _____ SR Milepost _____ to _____

1. Is this project included in the existing local or regional plan? Yes___ No___
If the project is not included in the applicable comprehensive plan, has action been taken by appropriate planning agencies to approve the project?
Yes___ No___ Not Applicable_____
2. Have the local legislative bodies requested or approved this project:
County (ies) _____ City(ies) _____
3. Have local organizations (e.g., Chamber of Commerce, League of Women Voters, Good Roads Association) endorsed this project? Yes___ No___
Comment: _____
4. Have local agencies or private groups indicated opposition? If so, who? _____
5. Will additional right-of-way be required? Yes___ No___
6. Will this project require coordination with other Transportation modes?
Yes___ No___ If so, what are they? _____
7. Will the project divide identifiable neighborhoods or the service areas of any school or business area? Yes___ No___
8. Will there be any significant adverse economic impacts on the community (such as increased business activity creating a barrier between businesses & customers)?
Yes___ No___
9. Will the project have any impact on minority interests? Yes___ No___
If so, what are they? _____
10. Will there be any significant impact on the natural environment?
Yes___ No___ If so, what impact? _____
11. Will any environmentally related construction permits or other approvals be required (e.g., shorelines, wetlands, 4F, prime farmland)? Yes___ No___
12. Will it be necessary to prepare an EIS? Yes___ No___ Maybe___

Form Completed by _____ *{checklist is NOT scored}*

APPENDIX E

CRITERIA WORKSHEETS AND SCORING GUIDELINES

MOBILITY PRIORITIZATION

CRITERIA

- **COST EFFICIENCY- Benefit-Cost Analysis for Safe Movement of People and Goods**

- **COMMUNITY SUPPORT**

- **ENVIRONMENT**
 - **Wetland Assessment**
 - **Water Quality and Permitting**
 - **Noise Assessment**

- **MODAL INTEGRATION**

- **LAND USE**

COST EFFICIENCY WORKSHEET -

BENEFIT-COST ANALYSIS FOR SAFE MOVEMENT OF PEOPLE AND GOODS

The purpose of this worksheet is to summarize project costs and benefits. Detailed calculations should be included for each project and attached on a separate page. Benefits and costs should be expressed as present values using the following parameters:

Discount Rate (i) = 0.04

Study Period (n) = 20 years

(may vary on some projects, yet MUST be consistent with the time period used to calculate Project Benefits in any case. See accompanying outlines as detailed below.)

Project Cost Estimate:

199 \$'s

Construction

(Sum ALL relevant line items including: environmental mitigation, and right-of-way; and excepting the following:)

_____ (C)

Environmental Retrofit

(costs incurred due to a pre-existing condition, e.g. noise barriers, water quality treatment, and fish barrier removal. Some may be exempt.)

_____ (E_R)

Preliminary Engineering

_____ (S_P)

Annual Operating and Maintenance

(based on historical rates in similar area with proposed geometrics, except the following: Snow and Ice Removal, Structures & Ferries, Rest Area Management, and Public Damage Repair)

_____ (OpM_A)

Calculate the Present Value of Project Costs (PV_C):

$$PV_C = (C) + (E_R) + (S_P) + \left\{ OpM_A \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right] \right\}$$

Total Est. Costs (PV_C) = _____

Project Benefit Estimate:

Present Value of User Benefits

(includes both Travel Time Savings & User Operating Savings. Calculate as outlined in accompanying "User Benefits Worksheets")

Present Value of Safety Benefits

(Calculate as outlined in accompanying "Safety Benefits Worksheets")

Total Est. Benefits (PV_B) = _____

Calculate the BENEFIT-COST RATIO of Proposed Project:

$$B/C = (PV_B) / (PV_C) = \underline{\hspace{2cm}}$$

COMMUNITY SUPPORT WORKSHEET

The purpose of this worksheet is to assess the community support and potential impact from the proposed project. For each question, check the appropriate answer and log score in the blank to the right.

Question	Score
<p>1. Is local, regional, or TIB financial participation anticipated? If yes, identify and indicate scale by percentage of total project costs: < 10% _____ 10-25% _____ > 25% _____</p>	<p>___ Yes No=3 _____ If Yes, < 10% =2 10-25% =1 > 25% =0</p>
<p>2. a. Have any local governments endorsed this project? (Identify): _____ _____ _____</p>	<p>Yes=0 No=3 _____</p>
<p>b. Have any local organizations endorsed this project? (Identify): _____ _____ _____</p>	<p>Yes=0 No=1 _____</p>
<p>3. a. Have any local governments indicated opposition? (Indicate scale): _____ _____ _____</p>	<p>___ Yes No=0 _____ If Yes, minimal =1 moderate =2 significant =3</p>
<p>b. Have any private groups or individuals indicated opposition? (Indicate scale): _____ _____ _____</p>	<p>___ Yes No=0 _____ If Yes, minimal =1 moderate =2 significant =3</p>
<p>4. Will the project divide identifiable neighborhoods, school or business service areas?</p>	<p>Yes=1 No=0 _____</p>
<p>5. Will this project displace homes, cultivated farmlands, or businesses? If yes, indicate scale of displacement: No. Homes/Farms/Businesses: Estimated Acreage: < 6 _____ _____ 6-20 _____ _____ > 20 _____ _____</p>	<p>___ Yes No=0 _____ If Yes, < 6 = 1 6-20 = 2 > 20 = 3</p>
<p>a. Has an evaluation of the potential opposition of the displaced been conducted?</p>	<p>___ Yes ___ No</p>

TOTAL SCORE: _____

WETLAND WORKSHEET:

The purpose of this worksheet is to assess the potential impact from the proposed project. For each question, check the appropriate answer or enter the appropriate acreage, and log score in the blank to the right.

Question

Score

1. Are there any wetlands within 300' from the edge of the present roadway?

___ Yes No=0

If yes, identify the Class and required buffer for each wetland. Note the total acreage that may be affected as a result of the proposed project below:

Category 1

___ No. of acres

(x6)=

Category 2 or Category 3

Forested

___ No. of acres

(x3)=

Scrub-Shrub

___ No. of acres

(x2)=

Emergent

___ No. of acres

(x1.5)=

Category 4

___ No. of acres

(x1.25)=

All Buffers

___ No. of acres

(x1)=

TOTAL SCORE :

(if yes, minimum=0.5, if no, score=0)

WATER QUALITY AND PERMITTING WORKSHEET:

The purpose of this worksheet is to assess the potential watershed impact and permitting requirements associated with the proposed project. For each question, check the appropriate answer or enter the appropriate acreage, and log score in the blank to the right. *If a required permit has already been obtained for the expected duration of the need, enter 0 pts and the date issued in the corresponding blank to the right.*

Question		Score
1. Will the project be located within 2000 feet of any body of water? If yes, then address the following:	___ Yes No=0	_____
What will the total impervious surface area be upon completion of the proposed project (within 2000' of any water body)?	< 6 acres =1 6-20 acres =2 > 20 acres =3	_____
Will the project require hydraulic permits (HPA's)?	Yes=4 No=0	_____
Is there a known fish passage problem?	Yes=1 No=0	_____
Will the project require COE Section 10, 404, or Coast Guard Section 9 permit?	Yes=5 No=0	_____
Will the project require Shoreline Development permits?	Yes=4 No=0	_____
Is the project located within a Shoreline of Statewide Significance?	Yes=1 No=0	_____
Will any water quality permits be required (ie., NPEDS, Short-Term Modification of Water Quality Standards)?	Yes=4 No=0	_____
Is the project a new roadway?	Yes=1 No=0	_____
2. Have any adjacent areas been identified as sensitive/critical by one or more governing jurisdictions? (Identify:) _____	Yes=5 No=0	_____
3. Is the project located within a regulatory floodway?	Yes=4 No=0	_____
4. Will the project increase impervious surface area within an EPA designated sole source aquifer area? (Identify:) _____	Yes=2 No=0	_____
5. Will this project require the purchase of additional right-of-way, or use of existing right-of-way?	___ Yes No=0	_____
If yes, is the project located within:		
Forest Lands as defined by Dept. of Natural Resources?	Yes=4 No=0	_____
U.S. Forest Service National Forest jurisdiction?	Yes=1 No=0	_____
Other jurisdiction/resource lands of regional significance? (Identify:) _____	Yes=2 No=0	_____
	SUBTOTAL:	_____
If permitting agencies have been contacted, are there any foreseeable conflicts or disagreements?	___ Yes ___ No ___ unknown/ not applicable	if no, divide subtotal by 2.
	TOTAL SCORE: :	_____

NOISE WORKSHEET:

The purpose of this worksheet is to assess the potential noise impact and associated costs due to the proposed project. For each question, check the appropriate answer or enter the appropriate number of residences, and log score in the blank to the right.

Question	Score
----------	-------

1. Have existing noise impacts been identified along the proposed project distance?

___ Yes ___ No

If yes, include the cost of feasible and reasonable mitigation measures in the project cost estimate, or cite determination otherwise: _____

2. Is this project a new or existing alignment?

___ new
___ existing

If new, evaluate the number of receptors within 400' of the edge of the proposed roadway. Go to question #4.

If existing, go to question #3.

3. Does the proposed project include widening of an existing roadway?

___ Yes ___ No

If yes, evaluate the number of receptors within 200' of the edge of the proposed roadway. Go to question #4.

If no, go to question #5, enter 0 in the blank to the right.

4. Refer to the chart below, and compute the project score as follows: Divide the number of lanes that will be added/constructed by 2. Multiply the result by the number of receptors in each distance category and by the appropriate risk factor (for New or Existing alignment per question #2) for each receptor category as indicated below.

No. of lanes added or constructed / 2	Receptor Category	Number of Receptors	Noise level risk factor (r.f.):		SUBTOTAL = (No. lanes/2) * (No. receptors) * (r.f.)
			NEW	EXISTING	
	< 100'		4	2	
	101-200'		2	1	
	201-400'		1		

5. Sum the results (Subtotals) for each category and enter the total project score in the blank to the right.

TOTAL SCORE: _____

LAND USE WORKSHEET:

The purpose of this worksheet is to assess the current land use and local planning/transportation policies, plans, and implementation measures of the governing jurisdictions concerned with the proposed project area. For each question, check the appropriate answer or enter the appropriate response, and log score in the blank to the right.

Question	Score
<p>1. Is the project included in the Comprehensive and/or Transportation Plan of any of the following? (If so, identify by name):</p> <p>Regional Transp. Planning Org. : _____</p> <p>Other regional planning agency : _____</p> <p>County &/or City government : _____</p> <p>Other local interests/agencies : _____</p>	
<p>2. Do all the local governments having an interest in the project include it in their plans as identified above? Yes=5 No=0 _____</p> <p>If no, has any action been taken by each of the appropriate planning agencies to approve the project? Yes=5 No=0 _____</p> <p>Indicate the action by what agency(cies): _____</p> <p>_____</p> <p>_____</p>	
<p>3. Has the "<i>Land Use Policy and Implementation</i>" file for local governments been updated in each jurisdiction that this project passes through? Yes= 5 No=0 _____</p>	
<p>4. Is the project on a roadway that directly links two or more designated growth centers? Yes= 3 No=0 _____</p>	
<p>5. Is the project located on an established or planned transit line/route? Yes= 1 No=0 _____</p>	
TOTAL SCORE:	_____

SCORING GUIDELINES

November 15, 1993

COMMUNITY SUPPORT:

Scoring:

- #3. Score the scale of opposition referenced by common extremes: minimal=1 to 2 individuals or a group without substantial support; significant=mobilized opposition substantial enough to seriously threaten the success of the project.
- #5. Score only the scale of displacement by number of homes/farms/businesses displaced. AVERAGE estimation is additional information in the scoping process.
- #5a. No score is assigned. The question serves as a procedural checklist for completing the project cost estimate.
- Total Score = sum each score entered in the column to right.

Definitions:

- "Divide identifiable neighborhoods, schools, business service areas"- Subject to local plans/existing conditions this may become an affirmative response in the case of substantial widening projects, access restrictions, or barrier separated facilities. Refer to historical local response and community plans where available.

WETLANDS:

This worksheet is intended to prompt a paper inventory of wetland resources for each project area. The values are based on the body of federal, state, and local regulations related to wetland preservation. Most notably, concurrent with WSDOT [EPM3-2-1A] and other state agency procedures, the "Washington State Four-tier Rating System, September 1, 1990" is used as the worksheet framework and the replacement ratios for compensatory mitigation outlined in *The Model Wetlands Protection Ordinance*, Washington State Department of Ecology are applied. The required band of analysis (300') is also based on the body of literature and adopted ordinances which establish wetland buffers ranging from 25-300' statewide. These buffers are also subject to a 1:1 replacement ratio in RCW 36.70A mandated local regulations statewide, as reflected on the worksheet.

Refer to the *District Resource List* for local inventory information and see the enclosed outline of the "Washington State Four-tier Rating System, September 1, 1990".

Scoring:

- Evaluate the acreage of the footprint of proposed construction encroachment into an inventoried wetland area &/or the associated buffers only.
- When the equivalent Four-tier Category of a wetland is unknown, use the "Category 2 Forested" replacement ratio.
- Total Score = sum each score entered in the column to right.
- If there are ANY wetlands that may be affected as defined above, the minimum Total Score=0.5 acres regardless of the area of encroachment. If there are NO wetlands or buffer areas affected as defined above, the Total Score=0.0 acres.

Definitions:

- "wetlands"- lands that are either permanently or seasonally "inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction." (Presidential Executive Order 11990). [WSDOT EPM3-2-1A.]

WATER QUALITY AND PERMITTING:

Scoring:

- Refer to the WSDOT Environmental Procedures Manual 6.0-6.9, March 1990 to evaluate permit requirements for the proposed project.
- Total Score = subtotal of each score entered in the column to right subject to the final operation as noted on the worksheet.

Definitions:

- "body of water"- All inter/intrastate waters within the ordinary high water line such as lakes, rivers, streams (including intermittent streams), mudflats, sand-flats, wetlands, sloughs, prairie pot-holes, wet meadows, playa lakes, or natural ponds, including all waters which are subject to the ebb and flow of the tide (ending where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by hydrologic, wind, or other effects).
- "total impervious surface area"- The total surface area of the roadway upon completion of the proposed project (i.e., width including the improvements * length of the roadway segment within 2000' of any water body).
- "Hydraulic Project"- Construction or other work that will use, divert, obstruct, or change the natural flow or bed of any river or stream, or that will utilize any of the salt or fresh waters of the state, or materials from the stream beds (WAC 220-110-020(16)).
- "fish passage problem"- Any migration barrier condition that exists when adult &/or juvenile fish are either delayed or denied passage beyond a point in a stream system or marine shallow water habitats during the normal course of their migration for spawning or rearing purposes. If fish are delayed from reaching suitable spawning areas, mass spawning or spawning in unsuitable substrate can occur, resulting in a decrease in survival. [WDF/WDW/DOT MOU (GC9058), & WDF/DOT State Interagency Agreement for Fish Passage Inventory & Barrier Removal (GC9392).].
- "Shoreline of Statewide Significance"- water areas of the state, including reservoirs, and their associated wetlands, including lands within 200 feet of the high-water mark including associated marshes, bogs, swamps, floodways, riverdeltas, and flood plains for which there is a special interest in preserving the natural characteristics and in encouraging and increasing public access to enjoy the physical and aesthetic qualities of the natural shoreline with the overall best interest of the state and people generally being considered. The restriction for development is greater because the master plan must meet the requirements of RCW 90.58.020 (see RCW 90.58.030 for list).
- "new roadway"- project construction along a new alignment.

- "Sensitive/Critical"- designation subject to definition by the local governing authorities under SEPA, GMA, or zoning code implementation.
- "governing jurisdiction"- The public agency, political unit, or apparatus with administrative powers to command, determine, judge, or otherwise enforce the laws, public policy and affairs within the proposed project area.
- "regulatory floodway"- the area regulated by federal, State or local requirements to provide for the discharge of the base flood (the flood which has a one percent chance of being equalled or exceeded in any given year, a.k.a 100-year floodplain) so the cumulative increase in water surface elevation is no more than a designated amount (not to exceed one foot). The "Zone A" designation on the *Flood Insurance Rate Maps* by the Federal Emergency Management Agency, indicates the 100-year floodplain, or minimum level to be used by a community in its floodplain management regulations. (44 CFR Ch.I 9.4)
- "sole source aquifer area"- area designated by the EPA as the sole or principal source of drinking water for a given aquifer service area; that is, an aquifer which is needed to supply 50% or more of the drinking water for that area and for which there are no reasonably available alternative sources should the aquifer become contaminated. (Section 1424(e) of Safe Drinking Water Act, 1974)
- "Forest Land"- all land that is capable of supporting a merchantable stand of timber (a stand of trees that will yield logs &/or fiber suitable in size and quality for the production of lumber, plywood, pulp, or other forest products and of sufficient value at least to cover all the cost of harvest and transportation to available markets) and is not being actively used for a use which is incompatible with timber growing. (RCW 76.09.020, WAC 222)
- "Other jurisdictions/resource lands of regional significance"- areas including but not limited to: tribal governments, reservation lands, regulatory commissions (e.g., Columbia River Gorge Commission), significant/endangered wildlife corridors, prime/unique farmlands, archaeological/historical sites, National Park lands, other recreation land, and wild and scenic rivers that have been identified in the planning process as outlined in the Environmental Procedures Manual 3.0-3.12, March 1990.

NOISE:

The intent of this worksheet is that it be carried out in-house using aerial photographs of the right-of-way and the table provided on the worksheet.

Scoring:

- Determine whether there are existing noise impacts over 67dBA level that would require mitigation where feasible and reasonable (see definition below). Cost of mitigation measures **MUST** be included in the cost estimate **EXCEPT** where mitigation has been previously determined 'unfeasible' or 'unreasonable' by WSDOT procedures. This determination must be referenced on the worksheet in the space provided and is the only justifiable reason for not including these potential costs in the estimate.
- If the proposed project is on a *new alignment* evaluate the number of receptors within 400' of the edge of the existing roadway.
- If the proposed project will **widen** the roadway along the *existing alignment*, evaluate the number of receptors within 200' of the edge of the existing roadway.
- Working with aerial photographs of the area, group the number of receptors with respect to distance from the edge of proposed roadway as categorized on the worksheet chart. If new, <100', 101-200', 201-400'; if existing, <100', 101-200' ONLY).
- Using the Noise Level Risk Factors in question #4, compute the subtotals as follows: Divide the number of lanes that will be added/constructed by 2. *This result will be the same for each Receptor Category.* Multiply the result by the number of receptors in each distance category and by the appropriate risk factor. Apply only one risk factor to each Receptor Category from either the new or existing alignment column in the worksheet chart.
- Add the Subtotals in the right-hand column of the worksheet chart and log the Total Score in the blank provided.

Definitions:

- "existing noise impacts"- Noise priority sites as established by WSDOT Directive D 22-22, November 2, 1987. Guidelines are detailed for conducting a noise inventory for existing state highways. The priority listing was developed based on an inventory of noise sensitive developments which existed, or for which a building permit had been approved, prior to May 14, 1976 and is current as of August 19, 1986 in Appendix A. As new sites must be investigated, because of citizen complaints or public officials' concerns, the procedures in this Directive will be used to prioritize the new sites. More comprehensive or up-dated inventories may have been conducted by individual districts, check with environmental noise specialists. (WSDOT EPM 3.1, March 1990)
- "feasible mitigation"- Noise mitigation that has no overwhelmingly significant physical constraints to construction and will provide significant noise abatement for *some* of the impacted receptors. Refer to WSDOT Headquarters Environmental division for specific parameters.
- "reasonable mitigation"- Noise mitigation that will cost \leq \$10,500/residence, not withstanding scenic views, desirability, and other consideration. Refer to WSDOT Headquarters Environmental division.

MODE INTEGRATION:

Scoring:

- Total Score = Sum of each score entered in the the column to the right.

Definitions:

- "improve or facilitate linkage for movement of goods through port or terminal facilities"- The proposed project must facilitate the movement of goods along a roadway with high truck traffic (for roadway classifications by truck percentage, Refer to "Task B: Freight and Goods Transportation System; Cost Responsibility Study-Phase I", Final Report for the St of WA Legislative Transportation Commission, January 1993.) and be within a ten mile radius from the terminal facility.
- "increased mobility"- used here to indicate conditions of greater movement of people and/or goods along the main roadway than presently supported by the facility.
- "bikeway"- Includes all four bikeway classes described by WSDOT Design Manual Standards.

LAND USE:

Scoring:

- Total Score = Sum of each score entered in the the column to the right.

Definitions:

- "local governments having an interest"- Those counties/cities where the proposed project passes through their respective jurisdictional boundaries.
- "*Land Use Policy and Implementation file*"- reference to a DOT District specific library of up-to-date documents, long-range transportation policies, and implementation measures for each city or county government encompassed by the District planning area. Each file must contain the following elements to enter a score of 5 points: *Land Use Checklist*, Comprehensive Plan, Transportation Plan, Zoning Code, Road/Design Standards, Critical Areas/Sensitive Areas Code/Ordinance, and other supporting inter-local, regional, &city/county-wide policy documents.
- "*Land Use Checklist*"- Form used to facilitate distillation of the governing jurisdiction's codes and policies. Intended for use as a procedural checklist, only categorical completion of this form (yes/no) is scored. See blank form attached.
- "designated growth center"- An area designated by regional or local planning agencies to receive a major share of the regional employment growth in the future.

APPENDIX F
STATEWIDE RESOURCE SUMMARY

RESOURCE LIST:

WSDOT District 1

JURISDICTION

Critical/Sensitive Areas Citations

King County

General Contact: Clint Lank, Administrator-Environmental Division
King County Building and Land Development
3600 136th Place SE, Bellevue, WA 98006-1400
(206) 296-6602, SCAN: 667

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, #9614 "*Sensitive Areas Ordinance*" adoption effective November 27, 1990. Designates areas to include: wetlands, streams, flood hazard areas, steep slopes, erosion, landslide, seismic, volcanic, and coal mine hazard areas. "*Sensitive Areas Map Folio*", inventory established.

Shorelines: King County Shoreline Management Master Program November 1975. King County Planning Department.

Wetlands Inventory: yes, "*King County Wetlands Inventory*", -field-verified inventory. Also refer to King County Surface Water Management applicable Basin Reconnaissance Program Reports. Contact: Mary Jorgensen, Basin Planning Unit, 400 Yesler Way, Rm.400, Seattle, 98104-2637 (206) 296-8002. The City of Auburn has their own Wetlands Inventory Reports covering the Mill Creek (1/89) and Green & White (6/90) River Basins.

Publications to Order: "King County Nonmotorized Transportation Plan", Dept. of Public Works, adopted May 1993.

City of Bothell

General Contact: Gordon Y. Ericksen, Director
Department of Community Development
18305 101st Avenue NE, Bothell, WA 98011
(206) 486-8152, fax 487-1204

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, -interim BMC Chapter 20.10, adopted February 28, 1992. Designates classification systems and development regulations for critical areas including: wetlands, geologically hazardous & frequently flooded areas, fish and wildlife & other habitat areas, and streams. Refer to the Federal Emergency Management Agency, *Flood Insurance Rate Maps*, for detailed floodplain boundaries.

Wetlands Inventory: no, National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps and areas included in the *King County Wetlands Inventory* are used a preliminary indicators.

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Federal Way	<p data-bbox="541 364 1348 491">General Contact: Greg Fewins, Planner City of Federal Way Planning Department 33530 First Way South, Federal Way, WA 98003 (206) 661-4000, fax 661-4129</p> <p data-bbox="541 526 1047 558">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="541 588 1422 715">Critical Areas Ordinance: yes, - FWCC Article 14, adopted February 28, 1990. Identifies and adopts "<i>Environmentally Sensitive Areas Inventory</i>" to include: streams, wetlands, wellheads, regulatory lakes, and geological hazardous areas.</p> <p data-bbox="541 750 1455 911">SEPA Ordinance: yes, FWCC Chapter 18, adopted September 1992. Implements RCW 43.21C and 197-11 WAC, <i>Environmental Checklist</i>, and supplements aquifer sensitive, critical habitat, and frequently flooded areas. Refer to the Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>, for detailed floodplain boundaries.</p> <p data-bbox="541 946 1455 1078">Wetlands Inventory: no, incorporate <i>King County Wetlands Inventory</i> data into the map inventory identified above, and refer to the National Wetlands Inventory, U.S. Fish & Wildlife Service, Washington Dept. of Ecology maps as supplementary indicators.</p>
City of Issaquah	<p data-bbox="551 1144 1377 1272">General Contact: Stephen R. Clark, Senior Planner Development Review Department 1775 12th Avenue NW, P.O. Box 1307 Issaquah, WA 98027 (206) 391-1002, fax 391-1049</p> <p data-bbox="551 1306 1058 1338">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="551 1369 1471 1496">Critical Areas Ordinance: yes, -interim #1886, adopted April 1, 1991. Identifies and adopts "<i>Issaquah Natural Resource Lands and Critical Areas Map Folio</i>" inventory. Also refer to the Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>, for detailed floodplain boundaries.</p> <p data-bbox="551 1530 1463 1597">Wetlands Inventory: no, incorporated <i>King County Wetlands Inventory</i> data into the map folio identified above.</p> <p data-bbox="551 1632 1471 1726">Other: The city may be petitioning EPA for Sole Source Aquifer status. For current information, contact: Sheldon T. Lynne, Project Engineer, Public Works Department (206) 391-1004.</p>

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

City of SeaTac

General Contact: Jack A. Dodge, Land Use Supervisor
Department of Planning & Community Development
19215 28th Avenue South
SeaTac, WA 98188 (206) 878-9272, fax 878-9416

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, -interim #92-1041, adopted October 27, 1992. Identifies and adopts "*Sensitive Areas in the City of SeaTac*" inventory including areas of erosion, landslide, and seismic hazards; and "*Wetland and Stream Classifications in the City of SeaTac*" inventory. Also refer to the Federal Emergency Management Agency, *Flood Insurance Rate Maps*, for detailed floodplain boundaries.

Wetlands Inventory: yes, refer to the "*Wetland and Stream Classifications in the City of SeaTac*" inventory and areas also included in the *King County Wetlands Inventory* as preliminary indicators.

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

Snohomish County

General Contact: Greg Williams, Manager
Department of Planning and Community Development
County Administration Building, 3000 Rockefeller
Everett, WA 98201-4060
(206) 388-3313, fax 388-3670

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: no, ordinance currently challenged.

Contact: Tom Niemann, Senior Planner II, Planning Department

SEPA ordinance: yes, Title 23 SCC. Implements RCW 43.21C and 197-11 WAC, *Environmental Checklist*.

Shorelines: Snohomish County Shoreline Management Master Program, updated January 1991. Snohomish County Office of Community Planning.

Flood plain ordinance: yes, Title 27 SCC updated February 27, 1984. Refer to Federal Emergency Management Agency, *National Flood Insurance Rate Maps*, Community #535534 for detailed floodplain boundaries.

Wetlands Inventory: yes, "*Stream & Wetland Survey Atlas*" inventory, August 1986 -includes Cowardin classifications and complete field-verification. **Contact:** Daniel Holeski, Cartographer (206) 388-3313 for maps, & Frank Scherf, Biologist for survey classifications(206) 388-3624.

Other: "*Snohomish County Agricultural Preservation Plan*", ordinance #82-134 adopted March 1983. Identifies and designates map inventory of agricultural areas of *primary importance*.

"*Snohomish County Interim Forest Land Conservation Plan*", ordinance #92-283, adopts map inventory as exhibit B. Identifies and designates interim Forest Reserve, interim Commercial Forest, and U.S.F.S. areas.

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Edmonds	<p data-bbox="546 389 1224 549">General Contact: Robert Chave, Planning Manager City of Edmonds Planning Division Civic Center, 250 Fifth Avenue North Edmonds, WA 98020 (206) 775-2525, SCAN: 495-0218</p> <p data-bbox="546 580 1050 614">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="546 646 1447 740">Critical Areas Ordinance: yes-interim1 #2879, June 26, 1992, ECC Title 20.15B. Identifies and adopts "Critical Areas" -paper inventory with project specific field-verification.</p> <p data-bbox="546 772 1447 904">Wetlands Inventory: yes, -paper inventory with project specific field-verification, otherwise based on NWI maps & DNR (streams) hydrography. Also refer to the Snohomish County "Stream and Wetland Survey Atlas" for field-verified wetlands on periphery.</p>
City of Everett	<p data-bbox="546 970 1377 1102">General Contact: Steve Ingalsbe, Assistant Planner City of Everett Planning Department 3002 Wetmore Avenue Everett, WA 98201 (206) 259-8731, Scan: 723-1011</p> <p data-bbox="546 1134 1050 1168">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="546 1200 1460 1332">Critical Areas Ordinance: yes, -interim "Sensitive Areas Ordinance" #1838-91, adopted December 18, 1991. Generalized inventory is available. Refer to the Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>, for detailed flood plain boundaries.</p> <p data-bbox="546 1364 1422 1457">Wetlands Inventory: yes, -paper inventory. Also refer to the Snohomish County "Stream and Wetland Survey Atlas" for field-verified wetlands ort periphery.</p>

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Lynnwood	<p>General Contact: J. Robert Henderson, Director Lynnwood Planning Department 19100 44th Avenue West, P.O. Box 5008 Lynnwood, WA 98046-5008 (206) 670-6645</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes-interim #1877, adopted Feb 24, 1992. -includes generalized inventory. Refer to the Federal Emergency Management Agency "Flood Insurance Rate Maps" for detailed floodplain inventory. <u>Contact:</u> Jeff Elekes, Public Works Department (206)670-6644.</p> <p>Wetlands Inventory: yes, also refer to the Snohomish County "Stream and Wetland Survey Atlas" for field-verified wetlands on periphery.</p>
City of Mill Creek	<p>General Contact: Beth Humphreys, Planner City of Mill Creek Planning Department 15728 Mill Creek Blvd. Mill Creek, WA 98012 (206) 745-1891, 337-1116</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes, adopted January 1992. Designations to include: erosion/slippage hazardous areas, 100-yr flood plain area, salmon bearing & other streams, aquatic habitat areas, & wetlands. Refer to "Environmental Critical Areas" map inventory. Also refer to Federal Emergency Management Agency "Flood Insurance Rate Maps" for detailed flood plain boundaries.</p> <p>Wetlands Inventory: yes, paper inventory based on Snohomish County, "Stream & Wetland Survey Atlas" designations.</p>

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Mountlake Terrace	<p>General Contact: Emily J. Lavin, Associate Planner Community Development Department 23200 58th Avenue West Mountlake Terrace, WA 98043 (206) 776-1161</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes, -interim #1584, November 10, 1984. Identifies and adopts "Environmentally Sensitive Areas" generalized inventory. Also refer to <i>National Flood Insurance Rate Maps</i>, Federal Emergency Management Agency for detailed flood plain boundaries.</p> <p>Wetlands Inventory: no, -project specific field delineations for the majority of sites are available.</p>
Whatcom County	<p>General Contact: Terry Galven, Planner Whatcom County Planning Department 284 W. Kellogg Road, Suite B Bellingham, WA 98226 (206) 676-6756</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes, -temporary #93-032 adopted June 23, 1992 currently challenged-- repealed by referendum November 1993 (refer to <u>SEPA Implementation</u>). Mapped designations include: geologically hazardous areas, rivers and streams, & wetlands partially field-verified.</p> <p>Flood plain Ordinance: yes, #87-25, updated 1987. Refer to the <i>National Flood Insurance Rate Maps</i>, Federal Emergency Management Agency for detailed flood plain boundaries.</p> <p>Shorelines: Whatcom County Shoreline Management Master Program, August 27, 1976. Ammended January 28, 1993. <u>Contact:</u> Matt Amott x6907.</p> <p>Wetlands Inventory: yes, -paper inventory based on National Wetlands Inventory, U.S. Fish & Wildlife Service maps on GIS system. <u>Contact:</u> Chris Piers, Biologist for maps.</p>

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Bellingham	<p>General Contact: Patricia Decker, Planning Director Department Community Development 210 Lottie Street Bellingham, WA 98225 (206) 676-6982</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: no.</p> <p>SEPA Implementation: BMC Chapter 16.04. See also, Subdivision ordinance #8192 (updated by ammendments).</p> <p>Flood plains: yes, BMC Chapter 17.76. Refer to the Federal Emergency Management Agency "Flood Insurance Rate Maps" for detailed flood plain designations.</p> <p>Shorelines: City of Bellingham Shoreline Management Master Program, updated 1989, ordinance #9887, pursuant to RCW 90.58. City of Bellingham Planning and Economic Development Department.</p> <p>Wetlands Inventory: yes, governed by separate ordinance #10267, adopted December 9, 1991. Refer to "City of Bellingham Wetlands Inventory", maps for field-verified classifications. Also covers streams.</p> <p>Other: City of Bellingham Comprehensive Plan, #88-68 (ammended) 1980.</p>
City of Lynden	<p>General Contact: Amy Mangum, Planner City of Lynden Planning Department 323 Front Street, Lynden WA 98264 (206) 354-3446</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes-interim #885 LMC "Environmental Policy" Title 16.16, adopted October 1991. Mapped designations include: steam & creeks, slopes, and wetlands. Also refer to the Federal Emergency Management Agency "Flood Insurance Rate Maps" for detailed flood plain designations.</p> <p>Wetlands Inventory: yes, refer to Critical areas map -paper inventory. Also refer to the Whatcom County GIS wetlands mapping -paper inventory.</p>

RESOURCE LIST:

WSDOT District 1

JURISDICTION

Land Use/Transportation Planning Contacts

**Puget Sound
Regional Council**

RTPO Contact: Mary McCumber, Executive Director
216 First Avenue South
Seattle, WA 98104 (206) 464-7090, fax 587-4825

Publications to Order: VISION 2020, Growth and Transportation Strategy
for the Central Puget Sound Region", October 1990.

Multicounty Planning Policies for King, Kitsap,
Pierce & Snohomish Counties, March 11, 1993.

King County

Zoning Implementation: Code Development Department
Building and Land Development
3600 136th Place SE, Bellevue, WA 98006-1400
(206) 296-7283

Long-Range Planning policies: Nancy Ousley, Chief
Comprehensive Planning Section
707 Smith Tower, Seattle, WA 98104
(206) 296-8609

Don Ding, Planner
Department of Public Works
Transportation Planning Section
King County Courthouse
Seattle, WA 98104 (206) 296-6553

City of Bothell

Zoning/Planning policies: Barbara J. Grace, Associate Planner
Department of Community Development
18305 101st Avenue NE, Bothell, WA 98011
(206) 486-8152, fax 487-1204

City of Federal Way

Long-Range Planning policies: Larry Springer, Planning Manager
City of Federal Way Planning Department
33530 First Way South
Federal Way, WA 98003
(206) 661-4102, fax 661-4129

Zoning Implementation: Greg Moore, Land Use Manager
(206) 661-4106

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Land Use/Transportation Planning Contracts
City of Issaquah	<p>Long-Range Planning policies: Stephen R. Clark, Senior Planner Development Review Department 1775 12th Avenue NW, P.O. Box 1307 Issaquah, WA 98027 (206) 391-1002, fax 391-1049</p> <p>Zoning Implementation: Jerry Lind, Senior Planner (206) 391-1002, fax 391-1049</p>
City of Sea-Tac	<p>Zoning/Planning Policies: Jack A. Dodge, Land Use Supervisor Dept. of Planning & Community Development 19215 28th Avenue South SeaTac, WA 98188 (206) 878-9272, fax 878-9416</p>
Snohomish County	<p>Transportation/Long-Range plan: John Davis, Transportation Planner Snohomish County Planning Dept. County Administration Building 3000 Rockefeller, Mail Stop: 604 Everett, WA 98201-4060 (206) 388-3313, fax 388-3670</p> <p>Zoning/Current policies: Barret Schmanska, Senior Planner Snohomish County Planning Department</p> <p>Publications to Order: "A Guide to Land Use & Public Transportation for Snohomish County, WA", Snohomish County Transportation Authority, December 1989.</p> <p>Snohomish County Comprehensive Plan -relevant area portions.</p> <p>"Countywide Planning Policies for Snohomish County", Snohomish Co. Council, #93-004 adopted February 4, 1993.</p> <p>"Residential Development Handbook for Snohomish County Communities", Snohomish County Tomorrow -Growth Management; May 26, 1992.</p> <p>"Interlocal Agreement between Snohomish County & the Cities of Everett ... & Woodway for Implementation of the Growth Management Act.", 7/21/92. See also, "Urban Centers in Snohomish County", Planning Advisory Committee Recommendation, 3/25/93.</p>

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Land Use/Transportation Planning Contracts
City of Edmonds	<p>Transportation Plan: Gordy Hide, Engineer City of Edmonds Public Works Department</p> <p>Current & Long-Range Planning policies: Robert Chave, Manager City of Edmonds Planning Division Civic Center, 250 Fifth Avenue N. Edmonds, WA 98020 (206) 751-3202, SCAN: 693-1011</p> <p>Zoning Implementation: John Bissell, Planner City of Edmonds Planning Division</p> <p>Publications to Order: "City of Edmonds Bikeway & Walkway Plan", 6/92.</p>
City of Everett	<p>Zoning/Planning policies: Paul Roberts, Director Dept. of Planning & Community Development City Hall, 3002 Wetmore St. Everett, WA 98201 (206) 259-8731, SCAN: 723</p> <p>Publications to Order: "A Guide to Land Use & Public Transportation for Snohomish County, WA- Chapter 4", Snohomish County Transportation Authority, December 1989.</p>
City of Lynnwood	<p>Zoning/Planning policies: David W. Woods, Associate Planner Lynnwood Planning Department 19100 44th Avenue West, P.O. Box 5008 Lynnwood, WA 98046-5008 (206) 670-6656</p>
City of Mill Creek	<p>Zoning/Planning policies: Beth Humphreys, Planner City of Mill Creek Planning Department 15728 Mill Creek Blvd. Mill Creek, WA 98012 (206) 745-1891, 337-1116</p>

RESOURCE LIST:

WSDOT District 1 (Continued)

JURISDICTION	Land Use/Transportation Planning Contracts
City of Mountlake Terrace	Zoning/Planning policies: Emily J. Laven, Associate Planner City of Mountlake Terrace Planning Dept. 23204 58th West Mountlake Terrace, WA 98043 (206) 776-1161, fax 778 6421 Transportation Plan: Joel E. Birchman, Director/City Engineer Public Works Department
Whatcom County Council of Gov't's	RTPO Contact: Rob Griffith, Transportation Project Manager 1203 Cornwall, Suite 104 Bellingham, WA 98225 (206) 676-6974 Publications to order: <i>"Whatcom County Urban Transportation Plan"</i> , Whatcom County, WA January 1992.
Whatcom County	Transportation/Long-Range planning policies: Dan Taylor, Director & Gordon Rogers, Planner Whatcom County Planning Department 284 W. Kellogg Road, Suite B Bellingham, WA 98226 (206) 676-6756 Zoning Implementation: Refer to appropriate Sub-Area plan.
City of Lynden	Transportation/Long-Range plan: Dwight Davis, Public Works Director 323 Front Street, Lynden WA 98264 (206) 354-4270 Zoning/Planning policies: Amy Mangum, Planner City of Lynden Planning Department
City of Bellingham	Zoning/Planning policies: Patricia Decker, Planning Director Dept. of Planning & Economic Development 210 Lottie Street, Bellingham WA 98225 (206) 676-6982, SCAN: 644

RESOURCE LIST:

WSDOT District 2

JURISDICTION

Critical/Sensitive Areas Citations

Chelan County

General Contact: Tim Smith, Planner
Chelan County Planning Department
Wenatchee, WA 98801
(509) 664-5225.

GMA: yes, mandate effective August 25, 1993.

Critical Areas Ordinance: no, interim ordinance currently in progress.

SEPA ordinance: yes, *Environmental Ordinance #8480-1*, October 1, 1984.
Implements WAC 197-11-960 *Environmental Checklist*.

Shorelines: Chelan County Shoreline Master Program, April 1975, updated 1979. Chelan County Planning Department. Contact: Tim Smith.

Floodplain ordinance: yes, governed by zoning district overlays, Chapter 11.39A, adopted June 1972. Refer to: *National Flood Insurance Rate Maps*, Federal Emergency Management Agency, for detailed floodplain boundaries.

Wetlands Inventory: no, refer to National Wetlands Inventory, U.S. Fish & Wildlife Service, Washington Dept. of Ecology, paper inventory with some areas classified, & hydric soils mapping from the Soil Conservation Service.

Other: "*Draft Map: Proposal of Agriculture lands/Forest lands of long-term commercial significance.*" Chelan County Planning Department.

City of Leavenworth

General Contact: Mike Cecka, City Administrator
City of Leavenworth
City Hall, 815 Front Street,
P.O. Box 287, Leavenworth, WA 98826
(509) 548-5275

GMA: yes, mandate effective August 25, 1993.

Critical Areas Ordinance: no, interim ordinance currently in progress.

SEPA ordinance: yes, #753, 1984. no site designations have been mapped to date.

Floodplain ordinance: yes, #600, 1976. Refer to: *National Flood Insurance Rate Maps*, Federal Emergency Management Agency, for detailed floodplain boundaries.

Wetlands Inventory: no, see above-Chelan County.

RESOURCE LIST:

WSDOT District 2 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
Okanogen County	<p data-bbox="563 396 1447 530">General Contact: Laurie L. Grimes, Assistant Director Okanogen County, Office of Planning & Development P.O. Box 1009, Okanogen, WA 98840 (509) 422-7120, fax (509) 422-7106.</p> <p data-bbox="563 556 690 590">GMA: no.</p> <p data-bbox="563 620 1285 655">Critical Areas Ordinance: no, ordinance expected by 12/93.</p> <p data-bbox="563 685 1422 750">SEPA ordinance: yes, #85-3, adopted April 23, 1985. Implements WAC 197-11-960 <i>Environmental Checklist</i>.</p> <p data-bbox="563 780 1414 845">Shorelines: Okanogen County Shoreline Master Program, July 7, 1987. Okanogen County Planning Department. <u>Contact:</u> Laurie L. Grimes.</p> <p data-bbox="563 875 1455 974">Floodplain ordinance: yes, #87-2, adopted May 8, 1987. Refer to: <i>National Flood Insurance Rate Maps</i>, Federal Emergency Management Agency, for detailed boundaries.</p> <p data-bbox="563 1004 1463 1103">Wetlands Inventory: no, rely on National Wetlands Inventory, U.S. Fish & Wildlife Service, Washington Dept. of Ecology, paper inventory with some areas classified, & hydric soils mapping from the Soil Conservation Service.</p>

RESOURCE LIST:

WSDOT District 2 (Continued)

<u>JURISDICTION</u>	<u>Land Use/Transportation Planning Contracts</u>
North Central Regional Transp. Planning Org.	<u>RTPO Contact:</u> Dave Honsinger District 2, WSDOT (509) 663-9641
Chelan County	Transportation plan: Lloyd L. Berry, County Engineer Director, Chelan County Public Works Wenatchee, WA 98801 (509) 664-5225. Zoning/Planning policies: Rick Simon, Senior Planner Chelan County Planning Department Wenatchee, WA 98801 (509) 664-5225.
City of Leavenworth	General Contact: Mike Cecka, City Administrator City of Leavenworth City Hall, 815 Front Street, P.O. Box 287, Leavenworth, WA 98826 (509) 548-5275
Okanogen County	Transportation plan: Steven A. Hyzer, Division Manager Roadway Engineering Division Okanogen County Public Works 237 4th Avenue North, P.O. Box 232 Okanogen, WA 98840 (509) 422-7200, fax:(509) 422-7301. Zoning/Current policies: Louis Webster, Assistant Planner Okanogen County Planning Department Long-Range planning policies: Laurie L. Grimes, Assistant Director Okanogen County Planning Department P.O. Box 1009, Okanogen, WA 98840 (509) 422-7120, fax (509) 422-7106.

RESOURCE LIST:

WSDOT District 3

JURISDICTION

Critical/Sensitive Areas Citations

Clallam County

General Contact: Bill White, Director
Clallam Department of Community Development
223 E. 4th Street, Port Angeles, WA 98362
(206) 452-7831.

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, interim-C.C.C27.12 adopted by #471/493 effective July 1/December 10, 1992. Adopts an overlay inventory of: geological hazardous areas, fish & wildlife habitat conservation areas, frequently flooded areas, critical aquifer recharge areas, & wetlands.

Shorelines: Clallam County Shoreline Management Master Program Designation of Environments, June 30, 1976. Clallam County Planning.

Wetlands Inventory: yes, implemented by Critical Areas Ordinance, December 10, 1992-paper inventory overlay.

City of Forks

General Contact: Dave Zeller, Public Utilities Supervisor
City of Forks, 5th & Division
P.O. Box 1998, Forks, WA 98331
(206) 374-5412, SCAN 737

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, -interim #342 adopted February 24, 1992. Identifies and adopts performance criteria to be applied case-by-case. No designations have been made yet, refer to the Federal Emergency Management Agency, *Flood Insurance Rate Maps*, for floodplain boundaries.

Wetlands Inventory: no, National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps are used as preliminary indicators. Governed by separate wetlands ordinance #341, adopted February 24, 1992.

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

City of Port Angeles

General Contact: Bradley Collins, Planning Director
City Planning Department
321 East 5th, P.O. Box 1150
Port Angeles, WA 98362 (206) 457-0411

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, -interim #2656, adopted November 25, 1991. Identifies and adopts "*Critical Areas Composite Map*" an inventory of: streams & stream corridors, frequently flooded areas, geological hazardous areas, fish & wildlife habitat conservation areas, locally unique features, & wetlands.

Wetlands Inventory: yes, refer to "*Critical Areas Composite Map*" cited above- paper inventory based on NWI wetlands maps and SCS hydric soils inventory. Also governed by separate wetlands ordinance #2655, adopted November 25, 1991.

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
Jefferson County	<p data-bbox="558 394 1397 556">General Contact: Craig Ward, Director Jefferson County Planning & Building Department County Courthouse, 1820 Jefferson Street P.O. Box 1220, Port Townsend, WA 98368 (206) 385-9140.</p> <p data-bbox="558 588 865 620">GMA: yes, opted in 1992.</p> <p data-bbox="558 653 1397 728">Critical Areas Ordinance: no, ordinance currently under review. <u>Contact:</u> Eric Taves & James Fahland, Jefferson County Planning Dept.</p> <p data-bbox="558 750 1455 847">SEPA ordinance: yes, Environmental Ordinance, 1984. Implements WAC 197-11-960 <i>Environmental Checklist</i>, and adopts "<i>Environmentally Sensitive Areas</i>" map set.</p> <p data-bbox="558 879 1381 955">Shorelines: Jefferson-Port Townsend Shoreline Management Master Program, March 7, 1989. Jefferson County Planning Department.</p> <p data-bbox="558 976 1433 1106">Floodplain ordinance: yes, #1-89/#5-82. "<i>Jefferson County Floodplain Management Ordinance</i>", adopted 1982, & updated 1989. Refer to Federal Emergency Management Agency, <i>National Flood Insurance Rate Maps</i>, for detailed boundaries.</p> <p data-bbox="558 1138 1405 1300">Wetlands Inventory: yes, adopted "<i>Ponding & Flooding</i>" designations January 1977: based on local field surveys and soil surveys National Wetlands Inventory, U.S. Fish & Wildlife Service, Washington Dept. of Ecology, 1987 maps are also on hand: paper inventory with some areas classified.</p> <p data-bbox="558 1332 1392 1407">Other: ordinance in place granting County discretion in sensitive area designation when not covered by map inventory designations.</p>

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

City of Port Townsend **General Contact:** Michael Hildt, Executive Assistant/Planner
City of Port Townsend
540 Water Street, Port Townsend, WA 98368-5724
(206) 385-3000

GMA: yes, opted in, 1992.

Critical Areas Ordinance: yes-interim, #2319, adopted October 19, 1992. Identifies and adopts "*Sensitive Area Determinations*", map drafted July 8, 1992-generalized inventory of: geological hazards, habitat conservation area, frequently flooded areas & critical drainage corridors, critical aquifer recharge areas, & wetlands.

Wetlands Inventory: yes, implemented by Environmentally Sensitive Areas Ordinance, July 8, 1992-paper inventory with some field delineation based on NWI maps, SCS soils, planimetric & DNR (streams) hydrography.

Kitsap County

General Contact: Ron Perkerewicz, Director
Kitsap County Department of Community Development
614 Division Street, MS 36
Port Orchard, WA 98366 (206) 876-7182, fax 895-4925

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes, -interim strategies adopted January 27, 1992. Classifies and designates critical areas including: aquifer recharge area, fish and wildlif habitat, geologically hazardous area, frequently flooded areas, streams & wetlands. Generalized inventory is available.

Contact: John P. Vodopich, Planner, Kitsap County DCD (206) 876-7181

Shorelines: Kitsap County Shoreline Management Master Program, July 11, 1977. Department of Community Development, Port Orchard, WA.

Wetlands Inventory: yes, refer to Environmentally sensitive/Critical areas map designations: paper inventory only.

Other: "*Strategies for Resource Lands Designations and Interim Development Regulations*" adopted April 20, 1992. Classifies and designates resources lands to include: agricultural, forest, and mineral resource lands. Inventory currently underway. **Contact:** JohnP. Vodopich, Planner.

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

City of Poulsbo

General Contact: Laurence Stockton, Planning Director
City of Poulsbo Planning Department, City Hall
19050 Jensen Way NE, Poulsbo, WA 98370
(206) 779-3006

GMA: yes, mandate effective July 1, 1990.

Critical Areas Ordinance: yes-interim, #91-17, adopted May 15, 1991. Identifies and adopts "*Environmentally Sensitive Area Map*", -generalized inventory of: steep slopes, shorelines, stream channels, & wetlands. Refer to the Federal Emergency Management Agency "*Flood Insurance Rate Maps*" for detailed floodplain inventory, available at the city offices.

Wetlands Inventory: yes, refer to "*Environmentally Sensitive Area Map*" -paper inventory based on National Wetlands Inventory, U.S. Fish & Wildlife Service, Department of Ecology maps.

Grays Harbor County

General Contact: Kenneth Kimura, Director
Grays Harbor County Planning and Building Dept.
100 West Broadway, P.O. Box 390
Montesano, WA 98563 (206) 249-5579

GMA: no.

Critical Areas Ordinance: yes, - resolution #92-32 adopted April 6, 1992. Designates Resource lands and Critical areas including: agricultural, forest, & mineral lands, geologically hazardous areas, frequently flooded areas, aquifer recharge areas, fish and wildlife habitat conservation areas, & wetlands. Partial inventory of resource lands in zoning code and Assessor's office, Federal Emergency Management Agency "Flood Insurance Rate Maps" referred to for floodplain identification, other area inventories not available.

Shorelines: Grays Harbor County Shoreline Management Master Program, June 3, 1974. Grays Harbor Planning and Building Department.

Wetlands Inventory: no, refer to National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology, map designations.

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
Pierce County	<p data-bbox="546 400 1372 559">General Contact: Joe Scorcio, Director Pierce County Department of Planning & Natural Resource Development 2401 South 35th Street, Suite 2 Tacoma, WA 98409 (206) 591-7158, SCAN 236</p> <p data-bbox="546 591 1050 623">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="546 655 1430 815">Critical Areas Ordinance: yes, -((interim # adopted November 1991.)) Identifies and adopts "<i>Critical Areas Atlas</i>" to include designations for: aquifer recharge areas, fish and wildlife habitat & streams, mine/seismic/ volcanic/landslide & erosion hazard areas. <u>Contact:</u> Department of Planning and Land Services</p> <p data-bbox="546 846 1438 942">Floodplain Ordinance: yes, ((# adopted)). Refer to: <i>National Flood Insurance Rate Maps</i>, Federal Emergency Management Agency, for detailed floodplain boundaries.</p> <p data-bbox="546 974 1438 1070">Shorelines: Pierce County Shoreline Management Master Program, ((July 11, 1977. Planning and Land Services Department . Refer to the "<i>Pierce County: Shoreline Environment Atlas</i>" at the Pierce Co.Development Center.</p> <p data-bbox="546 1102 1438 1229">Wetlands Inventory: yes, -governed by ordinance #88-182, adopted February 28, 1989. Designations are inventoried in "<i>Pierce County Wetlands Atlas: 1988</i>" -paper inventory with partial field verification and categorization.</p>
City of Puyallup	<p data-bbox="546 1300 1384 1427">General Contact: Michael Casey, Director Planning & Community Development Department Municipal Building, 330 Third Street SW Puyallup, WA 98371 (206) 841-5502</p> <p data-bbox="546 1459 1050 1491">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="546 1523 1438 1715">Critical Areas Ordinance: yes-#2324, adopted July 28, 1992. Designations include: geological hazards, recharging ground water areas, surface water systems, wildlife habitat areas, & wetlands. Mapped inventory covers all types except wildlife habitat areas. Also refer to the Federal Emergency Management Agency "<i>Flood Insurance Rate Maps</i>" for detailed floodplain inventory, available at the city offices.</p> <p data-bbox="546 1747 1191 1779">Wetlands Inventory: yes, refer to Critical areas maps.</p> <p data-bbox="546 1810 1438 1874">Other: Agricultural Resource areas are identified and protected by zoning overlay identified in the comprehensive plan.</p>

RESOURCE LIST:

WSDOT District 3 (Continued)

<u>JURISDICTION</u>	<u>Critical/Sensitive Areas Citations</u>
City of Sumner	<p data-bbox="551 391 1248 517">General Contact: Greg McCormick, Director Department Community Development City Hall, 1104 Maple Street Sumner, WA 98390 (206) 863-5263</p> <p data-bbox="551 551 1058 583">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="551 617 1471 808">Critical Areas Ordinance: yes-#1539-43, 1545-7, & 1551, adopted March 16, & April 6, 1992. Designations include: agricultural & mineral resources, wetlands, aquifer recharge areas, seismic & volcanic hazards, wildlife habitat areas, & frequently flooded areas. Mapped inventory available. Also refer to the Federal Emergency Management Agency "Flood Insurance Rate Maps" for detailed floodplain designations. <u>Contact:</u> John Doan, Planner, DCD.</p> <p data-bbox="551 842 1196 874">Wetlands Inventory: yes, refer to Critical areas maps.</p>
Thurston County	<p data-bbox="551 970 1430 1095">General Contact: Paula Ehlers or Pene L. Speaks Thurston County Planning Department 2000 Lakeridge Drive SW Olympia, WA 98502-6045 (206) 786-5554, fax 754-4462</p> <p data-bbox="551 1129 1053 1161">GMA: yes, mandate effective July 1, 1990.</p> <p data-bbox="551 1195 1405 1259">Critical Areas Ordinance: no, currently under review. <u>Contact:</u> Steve Morrison, Thurston Regional Planning Council (206)786-5480.</p> <p data-bbox="551 1293 877 1325">Floodplain Ordinance: no.</p> <p data-bbox="551 1359 1405 1423">Shorelines: Thurston County Shoreline Management Master Program, updated May 15, 1990. Thurston County Planning Department.</p> <p data-bbox="551 1457 1422 1583">Wetlands Inventory: yes, -governed by zoning: chapter 20.36 ordinance #67-08, adopted September 1, 1980. Designations are inventoried in "Thurston County Wetlands Inventory" -color infra-red aerial photography inventory with partial (20%) field verification and categorization.</p> <p data-bbox="551 1617 1455 1804">Other: Comprehensive plan identifies zoning overlay for marine bluffs, & includes unique habitats, geologic hazard areas, aquifers/ & sensitive areas, fish bearing streams, special plants & animal communities, & wetlands under "Environmentally Sensitive Areas" map set. Comprehensive plan also includes noise impact areas, farmland, forestry areas, open space and preserves designation maps.</p>

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Lacey	<p>General Contact: Robert L. Patrick, Director Department Community Development City Hall, 420 College Street SW, P.O. Drawer B Lacey, WA 98390 (206) 863-5263</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes-#1539-43, 1545-7, & 1551, adopted March 16, & April 6, 1992. Designations include: agricultural & mineral resources, wetlands, aquifer recharge areas, seismic & volcanic hazards, wildlife habitat areas, & frequently flooded areas. Refer to "<i>Environmental Protection and Resource Conservation Plan</i>" for inventory. Also refer to the Federal Emergency Management Agency "<i>Flood Insurance Rate Maps</i>" for detailed floodplain designations. <u>Contact:</u> John Doan, Planner, DCD.</p> <p>Wetlands Inventory: yes, refer to Critical areas maps.</p>
City of Olympia	<p>General Contact: Harold Robertson, Planning Director Department Community Development Building 1, Administration, 2000 Lakeridge Drive SW Olympia, WA 98502 (206) 753-8314</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes-interim #5272, adopted April 16, 1992. Identifies areas including: aquifer recharge areas, erosion, landslide, & seismic hazards, frequently flooded areas, significant upland habitat, streams, & wetlands. <u>Contact:</u> Todd Stamm, Environmental Review Officer</p> <p>Floodplains: yes, #4334 adopted 1981. Refer to the Federal Emergency Management Agency "<i>Flood Insurance Rate Maps</i>" for detailed floodplain designations.</p> <p>Wetlands Inventory: yes, refer to "<i>Thurston Regional Wetland & Stream Corridor Inventory</i>", maps for generalized aerial remote sensing survey as indicators with some classification & field verification.</p> <p>Other: The 1985 SEPA ordinance adopted "<i>Environmentally Sensitive Areas</i>" maps that are still referred to in addition to current inventories. 1985 designations included: woodlands, fishbearing streams, steep slopes, scenic vistas, and wetlands. Protections of some areas has been retained in some cases outside of the Critical Areas Ordinance.</p>

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Tumwater	<p>General Contact: Doug Baker, Director Department Community Development City Hall, 555 Israel Road Tumwater, WA 98501 (206) 754-4180</p> <p>GMA: yes, mandate effective July 1, 1990.</p> <p>Critical Areas Ordinance: yes-<i>"Conservation Plan"</i>, adopted August 20, 1991. Designations include: agricultural/forest/mineral resource lands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, fish & wildlife habitat areas, and wetlands. Refer to the Federal Emergency Management Agency <i>"Flood Insurance Rate Maps"</i> for detailed floodplain designations.</p> <p>Wetlands Inventory: yes, refer to local portion of the <i>"Thurston County Wetlands Inventory"</i> as indicators.</p>

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Land Use/Transportation Planning Contacts
Peninsula Regional Transp. Planning Organization	<u>RTPO Contact:</u> Bob Jones (Clallam& Jefferson County) District 3, WSDOT (509) 357-2644 began 1992, with " <i>Working Draft papers</i> ". Glen Huntingford, Jefferson County Commissioner Executive Council
Clallam County	Zoning/Planning policies: Wendy Clark, Associate Planner Department of Community Development 223 E. 4th Street, Port Angeles, WA 98362 (206) 452-7831, ext.240, fax (206) 452-0470 Publications to order: " <i>Transportation Facilities & Strategies</i> ", June 30, 1992.
City of Forks	Zoning/Planning policies: Phil A. Olbrechts, City Attorney/Planner P.O. Box 1998, Forks, WA 98331 (206)374-5412, SCAN 737
City of Port Angeles	Zoning/Planning policies: David Sawyer, Senior Planner City of Port Angeles Planning Department 321 East Fifth, P.O. Box 1150 Port Angeles, WA 98362 (206) 457-0411 ext.296, SCAN 538-1296
Jefferson County	Zoning/Planning policies: Bruce Laurie, Program Manager Jefferson County Dept. of Public Works P.O. Box 1220, Port Townsend, WA 98368 (206) 385-9168
City of Port Townsend	Zoning/Planning Policies: Kit Perkins, Planner City of Port Townsend 540 Water Street, Port Townsend, WA 98368 (206) 385-3000 Publications to Request: " <i>Gateway Development Plan</i> ", City of Port Townsend & WSDOT, adopted August 2, 1993.
Puget Sound Regional Council	RTPO Contact: Mary McCumber, Executive Director 216 First Avenue South Seattle, WA 98104 (206) 464-7090, fax 587-4825

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Land Use/Transportation Planning Contacts
Kitsap County	Transportation/Long-Range plan: Chuck Shank, Transportation Planner Kitsap County Dept. of Public Works 614 Division Street, MS 36 Port Orchard, WA 98366 (206) 876-7121, fax 895-4925 Zoning/Current policies: Holly Boothe, Planner Kitsap- Dept. of Community Development
City of Poulsbo	Zoning/Planning policies: Bonnie Whitson, Planning Technician City of Poulsbo Planning Department P.O. Box 98, Poulsbo, WA 98370 (206) 779-3006
Grays Harbor Regional Planning Commission	RTPO Contact: Sue Patnude, Executive Director 2109 Sumner Avenue, Suite 202 Aberdeen, WA 98520 (206) 532-8812, SCAN 325-1370
Grays Harbor County	Zoning/Planning policies: Robert D. Fink, Planner Grays Harbor Co. Planning and Building Dept. 100 West Broadway, P.O. Box 390 Montesano, WA 98563 (206) 249-5579
Pierce County	Zoning/Planning policies: Kimberly Freeman, Transportation Planner Pierce County Planning & Land Services 2401 South 35th Street Tacoma, WA 98409-7490 (206) 596-2722, fax (206) 291-3680 Transportation/Long-Range plan: "Pierce County Transportation Plan"- ordinance #92-147, adopted 12/28/92.
City of Puyallup	Zoning/Planning policies: Cathy Harbert, Planner Planning & Community Development Dept. Municipal Building, 330 Third Street SW Puyallup, WA 98371 (206) 841-5502
City of Sumner	Zoning/Planning policies: Department Community Development City Hall, 1104 Maple Street Sumner, WA 98390 (206) 863-5263

RESOURCE LIST:

WSDOT District 3 (Continued)

JURISDICTION	Land Use/Transportation Planning Contacts
Thurston Regional Planning Council	<p>RTPO Contact: Todd Carlson, Senior Transportation Planner Building #1, Administration, 2000 Lakeridge Drive SW Olympia, WA 98502 (206) 786-5480</p> <p>Publications to order: <i>"Transportation Future 2010: Making Connections"</i>, Thurston Regional Transportation Plan, March 1993.</p> <p><i>"Thurston Metropolitan Area Bicycle Plan"</i>, TRPC- Transportation Systems Planning, January 1987.</p>
Thurston County	<p>Zoning/Planning policies: Lynn Doscherry, Planner Thurston County Planning Department 2000 Lakeridge Drive SW Olympia, WA 98502-6045 (206) 786-5554</p> <p>Transportation/Long-Range plan: Todd Carlson, Senior Planner Thurston Regional Planning Council</p> <p>Publications to Order: <i>"Transportation Future 2010: Making Connections"</i>, Thurston County Regional Transportation Plan, TRPC, March 1993.</p> <p>Thurston Metropolitan Area Bicycle Plan, TRPC, January 1987.</p>
City of Lacey	<p>Zoning/Planning policies: Toni Fields, Planner Department Community Development City Hall, 420 College Street SW, P.O. Drawer B Lacey, WA 98390 (206) 491-5642</p>
City of Olympia	<p>Transportation/Long-Range plan: Randy Weffelman, Planner Department Community Development Building 1, Administration, 2000 Lakeridge Dr. SW Olympia, WA 98502 (206) 786-5745</p> <p>Zoning/Current policies: Steve Friddell, Planner Dept. of Community Development (206) 753-8591</p>
City of Tumwater	<p>Zoning/Planning policies: Department Community Development City Hall, 555 Israel Road Tumwater, WA 98501 (206) 754-4180</p>

RESOURCE LIST:

WSDOT: WSDOT District 4

JURISDICTION

Critical/Sensitive Areas Citations

Clark County

General Contact: Dave Wechner, Environmental Planner
Clark County Planning & Development Review Division
1408 Franklin, P.O. Box 9810
Vancouver, WA 98666-9810
(206) 699-2375

GMA: yes, mandated July 1, 1990.

Critical Areas Ordinance: no, in development/draft. Interim adoption of the following zoning code & ordinances accepted under GMA.

SEPA ordinance: yes, "Environmental Policy" ordinance #CCC chapter 20. Implements WAC 197-11-960 *Environmental Checklist*, and adopts countywide "Environmentally Sensitive Areas Map". Amended in 1991 to include wellhead protection areas, #1991-08-45.

Floodplains: regulated by the Floodplains Combining District in zoning code chapter #CCC 18.327. Refer to Federal Emergency Management Agency, *Flood Insurance Rate Maps*, for detailed floodplain boundaries.

Shorelines: Clark County Shoreline Management Master Program, #CCC 18.330.

Wetlands Inventory: yes, "Wetlands Atlas" -paper inventory based on the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology survey and hydric soil overlay. Future plans include field delineations of Class I & II wetlands. Governed by a separate ordinance #13.36, February 24, 1992.

Other: Natural Resource Lands are identified and protected under zoning ordinances #CCC 18.300-302, 18.329, 1991-08-50, as the special districts: Agriculture/Wildlife, Forest, & Surface Mining Combining District. #CCC 18.325 also identifies the Environmental Combining District which includes seven specific habitat areas and NWI wetlands. District mapping on current Comprehensive Plan map. Geological Hazard Areas are additionally protected by the *Water Drainage and Erosion Control Plan*, #CCC13.26.

Contact: Jerri L. Bohard, Senior Planner, Dept. of Community Development coordinator of an Agriculture Focus Group to address prime designations, etc. Fall 1993.

RESOURCE LIST:

WSDOT District 4 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
City of Battle Ground	<p>General Contact: Dean Hergeschiener, Planner 400 East Main Street, P.O. Box 37 Battle Ground, WA 98604 (206) 687-7131</p> <p>GMA: yes, mandated July 1, 1990.</p> <p>Critical Areas Ordinance: no.</p> <p>SEPA Ordinance: yes, #523, adopted 1984. Implements WAC 197-11-960 <i>Environmental Checklist</i>.</p> <p>Flood plain Ordinance: yes, #415 adopted 1981, revised #628-1988 & #634-1989. Refer to Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>, for detailed flood plain boundaries.</p> <p>Wetlands Inventory: yes, -paper inventory based on the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology survey and hydric soil overlay. Governed by ordinance #682 adopted 1992.</p>
City of Camas	<p>General Contact: Gary Stockhoff, Planning Director Public Works Department City Hall, 616 NE 4th Avenue, P.O. Box 1055 Camas, WA 98607 (206) 834-3451</p> <p>GMA: yes, mandated July 1, 1990.</p> <p>Critical Areas Ordinance: yes, -interim "<i>Sensitive Lands Ordinance</i>" #1823, April 12, 1991. Designates sensitive land areas to include: steep/unstable slopes, streams, fish & wildlife habitat, and wetlands.</p> <p>Flood plain Ordinance: yes, Chapter 15.28 #1638, 1987. Implemented by zoning overlay based on Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>.</p> <p>Wetlands Inventory: yes, -paper inventory based on the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology survey and hydric soil overlay.</p>

RESOURCE LIST:

WSDOT District 4 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

City of Vancouver

General Contact: Marian Lahave, Planner
Planning & Development Department
City Hall, 210 East 13th Street, P.O. Box 1995
Vancouver, WA 98668-1995
(206) 696-8005

GMA: yes, mandated July 1, 1990.

Critical Areas Ordinance: yes, -interim #M2992 adopted March 3, 1992. Designates sensitive land areas to include: agricultural, mineral, & forest resource lands, unstable slopes, aquifer recharge, fish & wildlife habitat, flood plains, geologic hazards, and wetlands.

Wetlands Inventory: yes, -paper inventory based on the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology survey and hydric soil overlay.

Cowlitz County

General Contact: Cathy Harndin, Planner
Department of Community Development
County Administration Building, 207 4th Avenue North
Kelso, WA 98626 (206) 577-3052, SCAN: 562

GMA: no.

Critical Areas Ordinance: no, -interim in progress. Contact: Mary Melik, Cowlitz-Wahkiakum Council of Governments, (206) 577-3041, SCAN: 562.

SEPA Ordinance: yes, #84-221 adopted October 1, 1984. Implements WAC 197-11-960 *Environmental Checklist*.

Flood plain Ordinance: yes, #87-126 adopted June 22, 1987. Refer to Federal Emergency Management Agency, *Flood Insurance Rate Maps*, for detailed floodplain boundaries.

Shorelines: Cowlitz County Shoreline Management Master Program, August 17, 1977. Cowlitz County Planning Department.

Wetlands Inventory: no, refer to the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps as indicators.

RESOURCE LIST:

WSDOT District 4 (Continued)

JURISDICTION

Critical/Sensitive Areas Citations

Klickitat County

General Contact: Francine Havercroft, Director
Klickitat County Planning Department
Courthouse Annex, 228 West Main Street, Room 150
Goldendale, WA 98620 (509) 773-5703

GMA: no.

Critical Areas Ordinance: no.

SEPA Ordinance: yes, #121084 adopted December 10, 1984. Implements WAC 197-11-960 *Environmental Checklist*, on case-by-case basis.

Flood plain ordinance: yes, #62981 adopted November 7, 1988 (revised #01107881). Refer to the Federal Emergency Management Agency, *Flood Insurance Rate Maps*, for detailed floodplain boundaries.

Shorelines: Klickitat County Shoreline Management Master Program, updated April 9, 1990. Klickitat County Planning Department.

Wetlands Inventory: no, refer to the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps as indicators.

Other: Resource lands are protected by special zoning codes: Agriculture (consistent with current use), & Forest Use (areas capable of supporting a merchantable stand of timber.).

RESOURCE LIST:

WSDOT District 4 (Continued)

JURISDICTION	Critical/Sensitive Areas Citations
Skamania County	<p>General Contact: Mark Mazeski, Planner Skamania County Planning Department Courthouse Annex-Vancouver Avenue, P.O. Box 790 Stevenson, WA 98648 (509) 427-9458</p> <p>GMA: no.</p> <p>Critical Areas Ordinance: no.</p> <p>SEPA Ordinance: yes, #1985-02, adopted into Skamania County Code, Title 16. Implements 197-11 WAC, <i>Environmental Checklist</i>.</p> <p>Flood plains: no ordinance, reviewed through County building codes.</p> <p>Shorelines: Skamania County Shoreline Management Master Program, 1974. Skamania County Planning Department.</p> <p>Wetlands Inventory: no, refer to the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps as indicators.</p> <p>Other: Zoning code identifies & governs sensitive areas under "Natural Area" zone, agriculture and forest lands are also protected by special zoning limitations.</p>

RESOURCE LIST:

WSDOT: WSDOT District 4

JURISDICTION	Land Use/Transportation Planning Contacts
Southwest Washington Assoc. of Governments	<u>RTPO Contact:</u> Rod Orlando, Executive Director P.O. Box 9810, Vancouver, WA 98668 (206) 699-2375, fax (206) 699-2011
Clark County	Zoning/Planning policies: Monty Anderson, Planner Planning & Development Review Division 1408 Franklin, P.O. Box 9810 Vancouver, WA 98666-9810 (206) 699-2375 Long-Range Plan: <i>Community Framework Plan, # 1993-05-41, May 26, 1993.</i>
City of Battle Ground	Zoning/Planning policies: Dean Hergeschiener, Planner 400 East Main Street, P.O. Box 37 Battle Ground, WA 98604 (206) 687-7131
City of Camas	Zoning/Planning policies: Gary Stockhoff, Planning Director Public Works Department City Hall, 616 NE 4th Avenue, P.O. Box 1055 Camas, WA 98607 (206) 834-3451
City of Vancouver	Zoning/Planning policies: Darin Atteberry, Transportation Planner Planning & Development Department City Hall, 210 East 13th Street, P.O. Box 1995 Vancouver, WA 98668-1995 (206) 696-8005
Cowlitz-Wahkiakum Council of Governments	<u>RTPO Contact:</u> Julie Menkin, Transportation Planner Administration Annex 207 Fourth Avenue North, Kelso, WA 98626 (206) 577-3041, fax (206) 423-9986, SCAN: 562
Cowlitz County	Zoning/Planning policies: Marjorie Pitcher, Planner Department of Community Development County Admin. Bldg, 207 4th Avenue North Kelso, WA 98626 (206) 577-3052, SCAN: 562

RESOURCE LIST:

WSDOT District 4 (Continued)

<u>JURISDICTION</u>	<u>Land Use/Transportation Planning Contracts</u>
Columbia River Gorge Commission	Long-Range Planning policies: Brian Litt, Transportation Planner P.O Box 730 White Salmon, WA 98672 (509) 493-3323
Klickitat County	Zoning/Planning Policies: Curt Dreyer, Planner Klickitat County Planning Department Courthouse Annex, 228 W. Main Street, Rm 150 Goldendale, WA 98620 (509) 773-5703
Skamania County	Zoning/Planning Policies: Mark Mazeski, Planner Skamania County Planning Department Courthouse Annex-Vancouver Ave, PO Box 790 Stevenson, WA 98648 (509) 427-5141

RESOURCE LIST:

WSDOT District 5

JURISDICTION	Critical Sensitive Areas Citations
Benton County	<p data-bbox="551 400 1430 523">General Contact: D. Larry Wright, Senior Planner Benton County Planning & Building Department County Courthouse, P.O. Box 910, Prosser, WA 99350 (509) 786-5612.</p> <p data-bbox="551 559 1103 587">GMA: yes, opted in effective November 1990.</p> <p data-bbox="551 623 1273 651">Critical Areas Ordinance: no, currently undergoing review.</p> <p data-bbox="551 687 1262 715">SEPA ordinance: no, refer directly to 197-11 WAC criteria.</p> <p data-bbox="551 751 1414 842">Floodplain Ordinance: yes, #208, adopted 1987. Refer to Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>, for detailed floodplain boundaries.</p> <p data-bbox="551 878 1215 906">Shorelines: Refer directly to 173-18 WAC designations.</p> <p data-bbox="551 942 1409 1006">Wetlands Inventory: no, refer to the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps as indicators.</p>
City of Richland	<p data-bbox="551 1108 1422 1234">General Contact: Scott Revell, Planner Department of Planning & Community Development 505 Swift, P.O. Box 190, Richland, WA 99352 (509) 943-7596, fax (509) 943-5666.</p> <p data-bbox="551 1270 1001 1298">GMA: yes, opted in November, 1990.</p> <p data-bbox="551 1334 1364 1361">Critical Areas Ordinance: no, currently undergoing council review.</p> <p data-bbox="551 1398 1281 1425">SEPA Ordinance: yes, #26-84. Implements WAC 197-11-960.</p> <p data-bbox="551 1461 1455 1525">Floodplain Ordinance: yes, #22-81. Implemented by zoning overlay based on Federal Emergency Management Agency, <i>Flood Insurance Rate Maps</i>.</p> <p data-bbox="551 1561 1452 1625">Shorelines: Richland Shoreline Management Master Program, June 1979. City of Richland Planning Commission, (map adopted September 16, 1974).</p> <p data-bbox="551 1661 1447 1753">Wetlands Inventory: yes, categorized GIS inventory of National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology survey. Future plans involve inventory with classified designations.</p> <p data-bbox="551 1789 1402 1853">Other: Chapter 23.60 of zoning code cites overlay districts for highway frontage, landing fields, agricultural, scenic, & floodplain areas.</p>

RESOURCE LIST:

WSDOT District 5 (Continued)

JURISDICTION	Critical Sensitive Areas Citations
Franklin County	<p data-bbox="560 401 1343 523">General Contact: Richard B. German, Director Franklin County Planning Department 1016 North Fourth Avenue Pasco, WA 99301 (509) 545-3521, SCAN: 726</p> <p data-bbox="560 558 997 590">GMA: yes, opted in October 1, 1990.</p> <p data-bbox="560 623 1463 750">Critical Areas Ordinance: yes, -interim #4-93, adopted July 1, 1993. Designates permitted uses in identified critical/natural areas including: critical recharge areas, fish & wildlife habitat conservation areas, frequently flooded areas, geologically hazardous areas & wetlands.</p> <p data-bbox="560 784 1463 849">Shorelines: Franklin County Shoreline Management Master Program, 1974 (updated July 8, 1983). Franklin County Planning Department.</p> <p data-bbox="560 883 1422 946">Wetlands Inventory: no, refer to the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps as indicators.</p>
City of Pasco	<p data-bbox="560 1019 1389 1146">General Contact: Larry Peterson, Associate Planner Department Community Development 412 West Clark, P.O. Box 293, Pasco, WA 99301 (509) 545-3441, fax (509) 545-3499 SCAN: 726-3441</p> <p data-bbox="560 1181 997 1213">GMA: yes, opted in October 1, 1990.</p> <p data-bbox="560 1246 1438 1310">Critical Areas Ordinance: yes-interim # 2923, February 16, 1993. Adopts existing SEPA ordinance and Shorelines Program.</p> <p data-bbox="560 1345 1438 1431">Floodplain Ordinance: yes, #2648, 1987. Refer to the Federal Emergency Management Agency "Flood Insurance Rate Maps" for detailed floodplain designations.</p> <p data-bbox="560 1466 1438 1565">Wetlands Inventory: no, primarily covered under Shoreline jurisdiction: refer to the National Wetlands Inventory, U.S. Fish & Wildlife, Dept. of Ecology maps as indicator.</p>

RESOURCE LIST:

WSDOT District 5 (Continued)

<u>JURISDICTION</u>	<u>Land Use/Transportation Planning Contracts</u>
Benton-Franklin Governmental Conference	<u>RTPO Contact:</u> Donald Morton, Executive Director 1622 Terminal Drive, P.O. Box 217 Richland, WA 99352 (509) 943-9185, SCAN: 526-2288
Benton County	Zoning/Planning policies: D. Larry Wright, Senior Planner Benton County Planning & Building Dept. County Courthouse, P.O. Box 910 Prosser, WA 99350 (509) 786-5612
City of Richland	Zoning/Planning policies: Scott Revell, Planner Dept. of Planning & Community Development 505 Swift, P.O. Box 190, Richland, WA 99352 (509) 943-7596, fax (509) 943-5666
Franklin County	Zoning/Planning policies: Richard B. German, Director Franklin County Planning Department 1016 North Fourth Avenue Pasco, WA 99301 (509) 545-3521, SCAN: 726
City of Pasco	Zoning/Planning Policies: David McDonald, Director Department Community Development 412 West Clark, P.O. Box 293, Pasco, WA 99301 (509) 545-3441

RESOURCE LIST:

WSDOT District 6

JURISDICTION

Critical/Sensitive Areas Citations

Spokane County

General Contact: Thomas G. Mosher, Senior Planner
Spokane County Planning Department
Public Works Building
1026 W. Broadway Avenue Spokane, WA 99260
(509) 456-2205, fax (509) 456-2243.

GMA: yes, mandate effective July 1, 1993.

Critical Areas Ordinance: no

SEPA ordinance: yes, Spokane Environmental Ordinance, October 1, 1984. Implements WAC 197-11-960 *Environmental Checklist*, and adds local *Aquifer Sensitive Area* to the list.

Shorelines: Spokane County Shorelines Master Program, Jan 1975. Spokane County Planning Department. Contact: Thomas G. Mosher.

Floodplain ordinance: yes, Spokane County Floodplain Resolution: 1975, & Ordinance: 1988. Refer to: *National Flood Insurance Rate Maps*, Federal Emergency Management Agency, Spokane County, WA (Unincorporated areas-cnty #530174, 625 panels, latest revisions 9-30-92. Contact: Tammie Williams, Spokane Co. Public Works, 99260-0170 (509) 456-3600, fax (509) 324-3478.

Wetlands Inventory: Spokane County Wetlands Inventory, 1991. preliminary field- checked paper inventory with some areas classified, completed April-May 1991, M.M. Folsom, Wetlands Geographer, EWU. Contact: Thomas G. Mosher, *request "Generalized Wetlands Area Maps".

Other: 1981 Comprehensive Plan identifies *Aquifer sensitive area* governed by EPA regulations.

Contact: Stan Miller, Water Quality Program, Spokane County Public Works Department, 99260-0170 (509) 456-3600, fax(509) 324-3478.

City of Cheney

General Contact: Glenn Scholten, City Planner
City of Cheney
609 Second Street, Cheney, WA 99004
(509) 235-7221, fax (509) 235-7206
SCAN: 545-2975.

GMA: yes, mandate effective July 1, 1993.

Critical Areas Ordinance: yes, City of Cheney: 1993.

Inventory: City of Cheney Critical Areas Inventory, 1992. field-verified paper inventory, with preliminary classifications. Identifies floodplains, habitat area, shorelines, & wetlands. Resource lands ordinance currently in development phase.

RESOURCE LIST:

WSDOT District 6 (Continued)

JURISDICTION	Land Use/Transportation Planning Contracts
Spokane Regional Council	<p><u>RTPO Contact:</u> Glen Miles, Transportation planner Spokane Regional Council West 808 Spokane Falls Blvd. Sixth Floor Municipal Building Spokane, WA 99201-3333 (509) 625-6370</p> <p>Publications to Order: <u>High Capacity Transportation System Plan Phase I</u>, June 30, 1993. <u>Spokane's 1985 Transportation Plan Update</u>, currently undergoing revision, expected by July '94. <u>Regional Transportation Improvement Program</u>, currently being collated, completion date unknown</p>
Spokane County	<p>Transportation plan/TIP: Pat Harper, Planner Division of Engineering and Roads Spokane County Public Works 1026 West Broadway Avenue Spokane, WA 99260-0170 (509) 456-3600, fax:(509) 324-3478</p> <p>Zoning/Current policies: Tim Lawhead, Current Planning Spokane County Planning Department</p> <p>Long-Range planning policies: Pat Francovich, Planner Long-Range Planning Spokane County Planning Department 1026 West Broadway Avenue Spokane, WA 99260 (509) 456-2205, fax:(509) 456-2243</p>
City of Cheney	<p>General Contact: Glenn Scholten, City Planner City of Cheney 609 Second Street, Cheney, WA 99004 (509) 235-7221, fax (509) 235-7206 SCAN: 545-2975.</p> <p>Publications to Order: <u>Capital Improvement Requests, 1994-1999</u>, Executive Summary & Arterial Street Fund. <u>Arterial Master Plan</u>, currently underway, completion date unknown.</p>

OTHER AGENCY RESOURCES:

SUBJECT	CONTACT
National Wetlands Inventory U.S. Fish and Wildlife Service	To Order Maps: Washington Department of Ecology Shorelands and Coastal Zone Management Program (206) 459-6836/6202, fax:(206) 438-7537 SCAN: 585 or USGS-ESIC 1-800-USA-MAPS. Publication: Annotated List of Statewide Inventories, see sections E,F,& G. <i>A Guide to Conducting Wetlands Inventories</i> , Pub. No: 89-60.
Wetlands database WSDOT G.I.S.	WSDOT Management Information Services & Geographic Services Technical Report No.: WA-RD 250.1, September 1991. Inquires: Bernie Chaplin, Environmental Program Manager Washington State Department of Transportation Environmental Branch, P.O. Box 47329 Olympia, WA 98504-7329 (206) 705-7924 Project Inquires: Mary Ossinger, Biologist (206) 664-0136 Jim Schafer, Biologist SCAN 705-7403
Highway Culvert Inventories Washington Dept. of Fisheries	Citation: <i>Fish Passage Program Progress Performance Report for Biennium 91-93.</i> Washington Department of Fisheries & WSDOT Interagency Agreement FY 92.30(1)GC 9392. Data Requests: Paul Sekulich, Resource Manager Habitat Management Division Department of Fisheries 1111 Washington St. S.E., PO Box 43155 Olympia, WA 98504-3155 (206) 902-2527, fax:(206) 902-2946, SCAN: 902.
Sole Source Aquifer Area Designations U.S. EPA	Data Requests: Chief, Office of Ground Water U.S. Environmental Protection Agency, Region 10 1200 Sixth Avenue, Mail Stop: 409 Seattle, WA 98101 (206) 553-0682

OTHER AGENCY RESOURCES:

SUBJECT	CONTACT
Forest Lands Designated & U.S.F.S. lands	DNR Area Contact: Department of Natural Resources Northwest Region, 919 N. Township St. Sedro Wooley, WA 98284 (206) 856-0083
	District 2: Chelan/Douglas Southeast Region, 713 E. Bowers Road Ellensburg, WA 98926 (509) 925-6131.
	Okanogen/FerryNortheast Region, 225 S. Silke Road Colville, WA 99114 (509) 684-5201.
	District 3: Thurston County -Central Region, 1405 Rush Road Chehalis, WA 98532 (206) 748-8616
	Olympic Region, Route 1, Box 1375 Forks, WA 98331 (206) 374-6131
	District 4: Central Region, 1405 Rush Road (Lewis & Pacific Co.) Chehalis, WA 98532 (206) 748-8616
	Southwest Region, 601 Bond Road Castle Rock, WA 98611 (206) 577-2025
	Southeast Region, 713 E. Bowers Road (Klickitat Co.) Ellensburg, WA 98926 (509) 925-6131.
	District 5: Southeast Region, (see above)
	District 6: Northeast Region, 225 S. Silke Road Colville, WA 99114 (509) 684-5201
	U.S. Forest Service: Supervisors Office, of local National Forest lands.
	Inquiries: Dan Bigger, Forest Practices (206) 902-1408 & David Larsen, Natural Resources Economist Land & Water Conservation, (206) 902-1699, fax:(206) 902-1788 Washington State Department of Natural Resources Olympia, WA 98504-7046

OTHER AGENCY RESOURCES:

SUBJECT	CONTACT
Soils/Agriculture land of Regional Significance	SCS Area Contact:
	District 1 & 3:
	Ronald E. Shavlik, Area Conservationist Soil Conservation Service, Area I U.S. Department of Agriculture Evergreen Plaza Building, Room 502, 711 Capitol Way Olympia, WA 98501-1278 (206) 753-9454
	District 2:
	Soil Conservation Service, Area II (Chelan: CD-42, Okanogen: CD-51) U.S. Department of Agriculture 32 C Street N.W., Room 317 Ephrata, WA 98823-1636 (509) 754-3553/4687.
	District 4:
	Jerry A. Jacoby, Area Conservationist Soil Conservation Service, Area III (see Area I, also) (Klickitat: CD-8, CD-31) U.S. Department of Agriculture Angus Plaza Building, Suite O, 513 N. Front Street Yakima, WA 98901-2378 (509) 575-5865
District 5:	
Soil Conservation Service, Area III (see above) (Benton: CD-19, Franklin: CD-67)	
District 6:	
Judson L. Melton, District Conservationist Soil Conservation Service, Spokane County CD-4 U.S. Department of Agriculture North 222 Havana Spokane, WA 99202-4724 (509) 353-2120	
Statewide Directory:	
James A. Carley, State Soil Scientist SCS, U.S. Department of Agriculture Rock Pointe Tower II, Suite 450 West 316 Boone Avenue Spokane, WA 99201-2348	
Existing Noise Impacts	Citation:
	Priority Study for Noise Abatement on Existing State Highways, District 1, November 1985. "Retrofit Noise Barrier Priority List, April 13, 1993". Contact: Sam Teitzel, WSDOT District 1. Directive D 22-22: <i>Noise Evaluation Procedures for Existing State Highways</i> , Appendix A, "Type II Noise Barrier Priority Listing", November 2, 1987. Environmental Procedures Manual, 3-1, WSDOT Highway Division, July 1992.

OTHER AGENCY RESOURCES:

SUBJECT	CONTACT
Non-attainment Areas TCM Inquiries & State Implementation Plan	Area Contact: Puget Sound Air Pollution Control Authority, (206) 689-4065 Northwest Air Pollution Authority, (206) 428-1617
	District 2: Central Regional Office: Chelan/Douglas/Okanogen (509) 575-2490. Eastern Regional Office: Ferry County. (509) 456-2926.
	District 3: Olympic Air Pollution Control Authority (206) 438-8768
	District 4: Central Regional Office: Klickitat County (509) 575-2490. Olympic Air Pollution Control Authority: Pacific County (206) 438-8768. Southwest Air Pollution Control Authority (509) 575-4116.
	District 5: Benton-Franklin-Walla Walla Counties Air Pollution Control Authority (509) 545-2354, (509) 946-4489. Central Regional Office: Kittitas County (509) 575-2490. Eastern Regional Office: Asotin, Columbia, Franklin, Garfield Counties, (509) 456-2926. Yakima County Clean Air Authority (509) 575-4116.
	District 6: Ronald J. Edgar, Chief Technical Services Spokane County Air Pollution Control Authority West 1101 College Spokane, WA 99201 (509) 456-4727, fax: (509) 459-6828
	Statewide: Gary Idleburg (206) 493-9354 & Doug Scheider(206) 438-7134 Air Quality Division, Washington State Department of Ecology <u>Citation:</u> <i>Appendices to the Washington State Implementation Plan,</i> January 22, 1993, Publication No: 93-06F.

OTHER AGENCY RESOURCES:

SUBJECT	CONTACT
Local Transit Service	<u>Area Contacts</u>
	District 1:
	Kenneth J. Graska, Executive Director Community Transit 1133 164th St. SW, Suite 200, Lynnwood, WA 98037 (206) 348-7101, fax 353-4749
	W.M. Link, Manager Everett Transit System 3200 Cedar Street, Everett, WA 98201 (206) 259-8803, fax 259-8864, SCAN 723
	Emmett Heath, Manager, Capital Planning & Development Metro Transit 821 Second Avenue, Seattle, WA 98104 (206) 684-1953, SCAN: 288-1953
	Jim Lair, Executive Director Skagit Transit System 700 South Second, Room 203, Mount Vernon, WA 98273 (206) 336-9333, fax 336-9307
	Martin Minkoff, General Manager Whatcom Transportation Authority 2200 Nevada Street, Bellingham, WA 98226 (206) 676-6843, fax 738-7302, SCAN: 644-6843
	District 2: Eric Phillips, Transportation Planner Link (Chelan & Douglas County PTBA) P.O. Box 3244, Wenatchee, WA 98807-3244 (509) 662-1155, fax (509) 662-1595 <u>Citation:</u> Route Maps & Timetables, 1993-1994.
	District 3: Timothy J. Fredrickson, General Manager Clallam Transit System 2417 West 19th, Port Angeles, WA 98362 (206) 452-1315, fax (206) 452-1316 <u>Citation:</u> Comprehensive Transportation Plan, 1993-1998.
	Dave Rostedt, Manager Grays Harbor Transportation Authority 3000 Bay Avenue, Hoquiam, WA 98550 (206) 532-2770, SCAN 325-9364
	Richard Hayes, Executive Director Kitsap Transit 234 South Wycoff Bremerton, WA 98312 (206) 479-6962/478-6230, fax (206) 377-7086

OTHER AGENCY RESOURCES:

SUBJECT	CONTACT
Local Transit Service	District 3: Don S. Monroe, Executive Director Pierce Transit 3701 96th Street SW, P.O. Box 99070 Tacoma, WA 98499-0070 (206) 581-8080, fax (206) 581-8075 <u>Publications:</u> Pierce Transit System Plan, December 1992.
	Stefan Fabian-Marks, Manager Advance Planning Intercity Transit 526 Pattison SE, P.O. Box 659 Olympia, WA 98507-0659 (206) 786-8585, SCAN 229-1011 <u>Publications:</u> Transit Development Plan, October 15, 1991.
	District 4: Leslie R. White, Executive Director C-TRAN 2524 NE 65th Avenue, P.O. Box 2529 Vancouver, WA 98668-2529 (206) 696-4494, fax (206) 696-1602 SCAN: 476-6799
	Leroy Gower, Director of Public Works Community Urban Bus Service(CUBS) (Cowlitz Transportation Authority) City of Longview, 254 Oregon Way, P.O. Box 128 Longview, WA 98632 (206) 259-8803, SCAN: 328-3399
	Dan DiGuilio, Director Pacific Transit 216 North Second Street, Raymond, WA 98577 (206) 875-9418, fax (206) 875-9419, SCAN: 541-9418
	District 5: Victoria Mata, Service Representative Ben Franklin Transit 1000 Columbia Drive SE, Richland, WA 98352 (509) 735-4131, fax (509) 735-1800
	District 6: Spokane Transit 1230 West Boone Avenue Spokane, WA 99201-2686 (509) 325-6000 <u>Citation:</u> Spokane Transit System Map, Fall 1992.

STATEWIDE DIRECTORIES:

Planning Agencies

Regional Councils of Washington
c/o Benton-Franklin Regional Council
1622 Terminal Drive, PO Box 217
Richland, WA 99352 (509)943-9185, fax:(509)943-6756
Citation: *Regional Councils of Washington Directory, 1993*

Barbara Gooding, Director
Washington State Department of Community Development
Local Government Assistance Division/Growth Management Office
906 Columbia Street S.W. PO Box 48300
Olympia, WA 98504-8300 (206) 586-0488
Citation: *The Directory of Planning & Community Development Agencies*

Transit Agencies

Rosalyn Wilmes, Public Transportaion Office
Transit Research & Intermodal Planning (TRIP) Division
WSDOT, Transportation Building, PO Box 47370
Olympia, WA 98504-7370 (206) 705-7921
Citation: *Washington State Transit Phone Book 1993-1994,.*

WSDOT PUBLICATIONS:

Environmental Procedures Manual, (revision #5), WSDOT, Program Development Division, Engineering Publications, No: M31-11, updated April 5, 1993. (206) 705-7430.

Transportation Planning and Environmental Relationships (workshop 4), 1992. Inquiries: Richard Filkins, WSDOT (206) 705-7956.

Washington State Four-tier Wetlands Rating System

September 1, 1990

The following rating system is designed to be used to assist in determining wetlands buffer widths, replacement ratios and criteria for avoiding wetlands impacts for Washington State. Guidance for implementation of the rating criteria will become available during the evaluation period. Regionalized systems may also be developed by the Department of Ecology.

The rating system is general and preliminary and is under a nine-month evaluation process that is designed to identify and make improvements, if necessary. The evaluation of the rating system will be an ongoing process.

(A) Category I Criteria

- (i) Documented habitat for endangered or threatened plant, fish, or animal species or for potentially extirpated plant species recognized by state or federal agencies;
- (ii) High quality native wetland communities, including documented category I or II quality Natural Heritage wetland sites and sites which qualify as a category I or II quality Natural Heritage wetland; or
- (iii) High quality, regionally rare wetland communities with irreplaceable ecological functions, including sphagnum bogs and fens, kelp and eelgrass beds, estuarine, wetlands, or mature forested swamps; or
- (iv) Wetlands of exceptional local significance. The criteria for such a designation shall be developed and adopted by the local jurisdiction under appropriate public review and administrative appeal procedures. The criteria may include, but not be limited to, rarity, groundwater recharge areas, significant habitats, unique educational sites or other specific functional values within a watershed or other regional boundary.

(B) Category II Criteria

- (i) Regulated wetlands that do not contain features outlined in category I; and
- (ii) Documented habitat for sensitive plant, fish or animal species recognized by federal or state agencies; or
- (iii) Rare wetland communities listed in subsection (A)(iii) which are not high quality; or
- (iv) Wetland types with significant functions which may not be adequately replicated through creation or restoration.
- (v) Wetlands with significant habitat value based on diversity and size.
- (vi) Wetlands which provide exceptionally high quality habitat, or represent regionally rare habitat to anadromous salmonid fish or priority fish species; or
- (vii) Wetlands with significant use by fish and wildlife.

(C) Category III Criteria

- (i) Wetlands that do not contain features outlined in category I, II or IV.

(D) Category IV Criteria

- (i) Wetlands which do not meet the criteria of a category I, II or III wetland; and
(ii) Wetlands that are less than or equal to one acre in size and have only one wetland class only one dominant plant species (monotypic vegetation); or
(iii) Isolated wetlands that are less than or equal to two acres in size, and have only one wetland class and a predominance of exotic species.

Table 1 - Selected Washington Wetlands Inventories - At A Glance

	KING	BELLEVUE	SNOHOMISH	PIERCE	BELLINGHAM	AUBURN
Date	1981	1983	1985-ongoing	1987-89	1988	1988-ongoing
	(expanded inventory planned)					
Types	P, E	P, L	P, E, R	P	P, E	P
Minimum Sizes (acres)	1.0	.17	.5	.25	.25	unk
Boundary determination	V	V	C	C	V/O	V/M
Data gathered	D	D	I-wetlands D-streams	I	L	D
Collection Process	L	L	I	B	I	L
Completion time (months)	18	unk	36	10	6	3
Area covered (sections) (% of total County/City including federal land)	800 (38%)	30 (100%)	275 (13%)	572 (34%)	19 (82%)	7.3 (37%)
Products	N, M, DB, P, R	S, M, AM/DB	M, DB, SI, P	M	N, M, DB	AM/DB, M
Staff Resources (FTE'S)	9	1	2.5	1.8	.15	1
	(staff also responsible for some non-inventory tasks)					

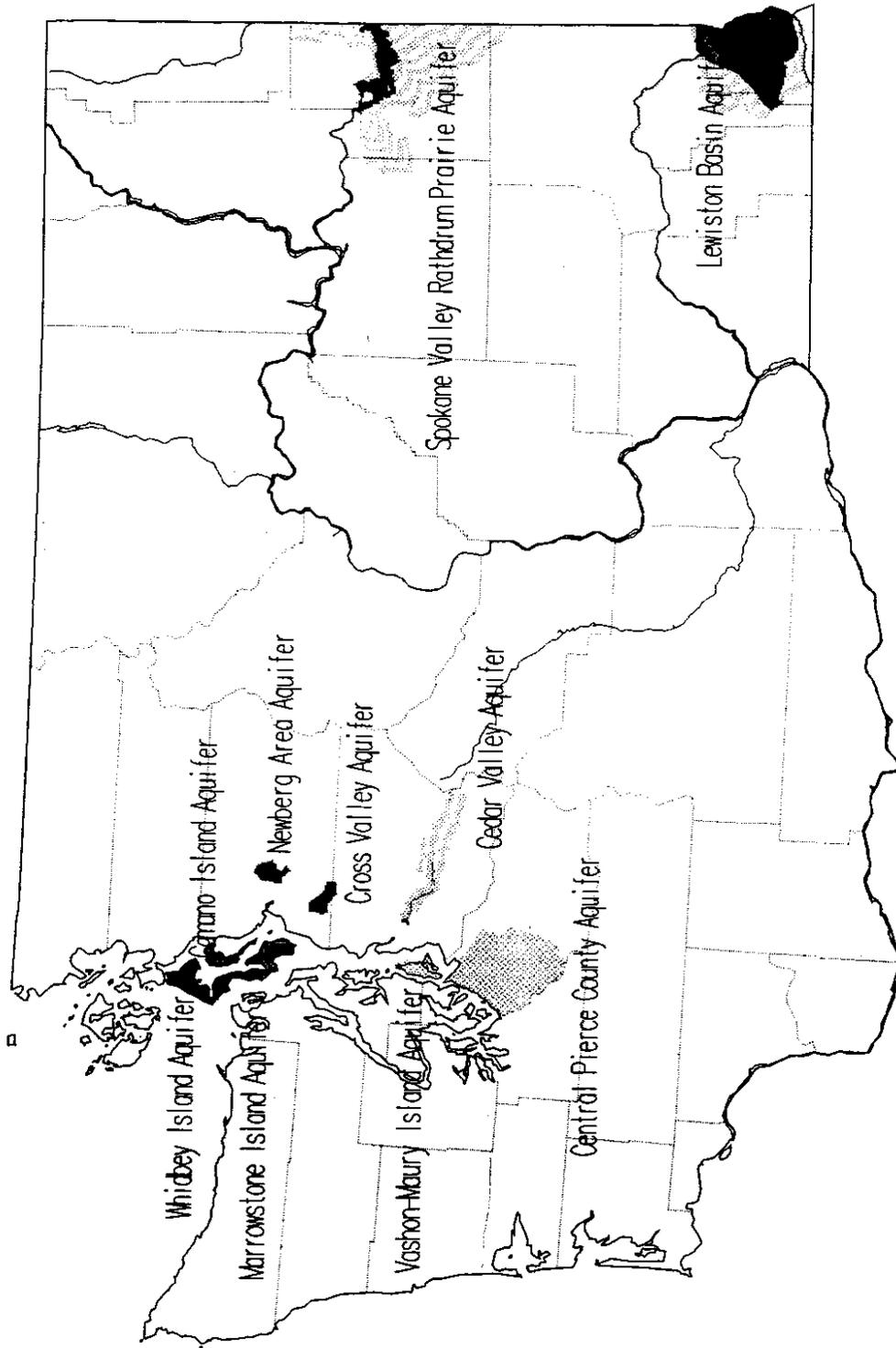
CODES:
unk = Unknown

Type	P - public use	Boundary Determination:	Collection Process:	Products:
E - estuarine	V/M verified using 9 parameters	L - largely visit priority qualitative	L - largely visit priority qualitative	N - notebook
R - riverine	V - verified	I - intermediate qualitative	I - intermediate qualitative	M - maps
L - lacustrine	C - combination verified and unverified	B - brief visit priority qualitative	B - brief visit priority qualitative	R - rubing
Data Gathered:	D - detailed	V/O - verified using obligate plants		DB - database (computerized)
I - intermittent	I - intermittent			SI - stream inventory
L - limited	L - limited			P - photos
				S - necessary in sensitive areas notebook
				AM - annotated mapping

Rev 9/12/89

Washington Sole Source Aquifers

revised July 1993



Explanation	
	Designated Aquifer
	Designated Source Area
	Petitioned Aquifer
	County Boundary
	Streams



0 10 20 30 40 50 60 70
Miles

SSA Petition Status by Region

*rec'd 7/93
Kee*

Region
Aquifer

Date Filed

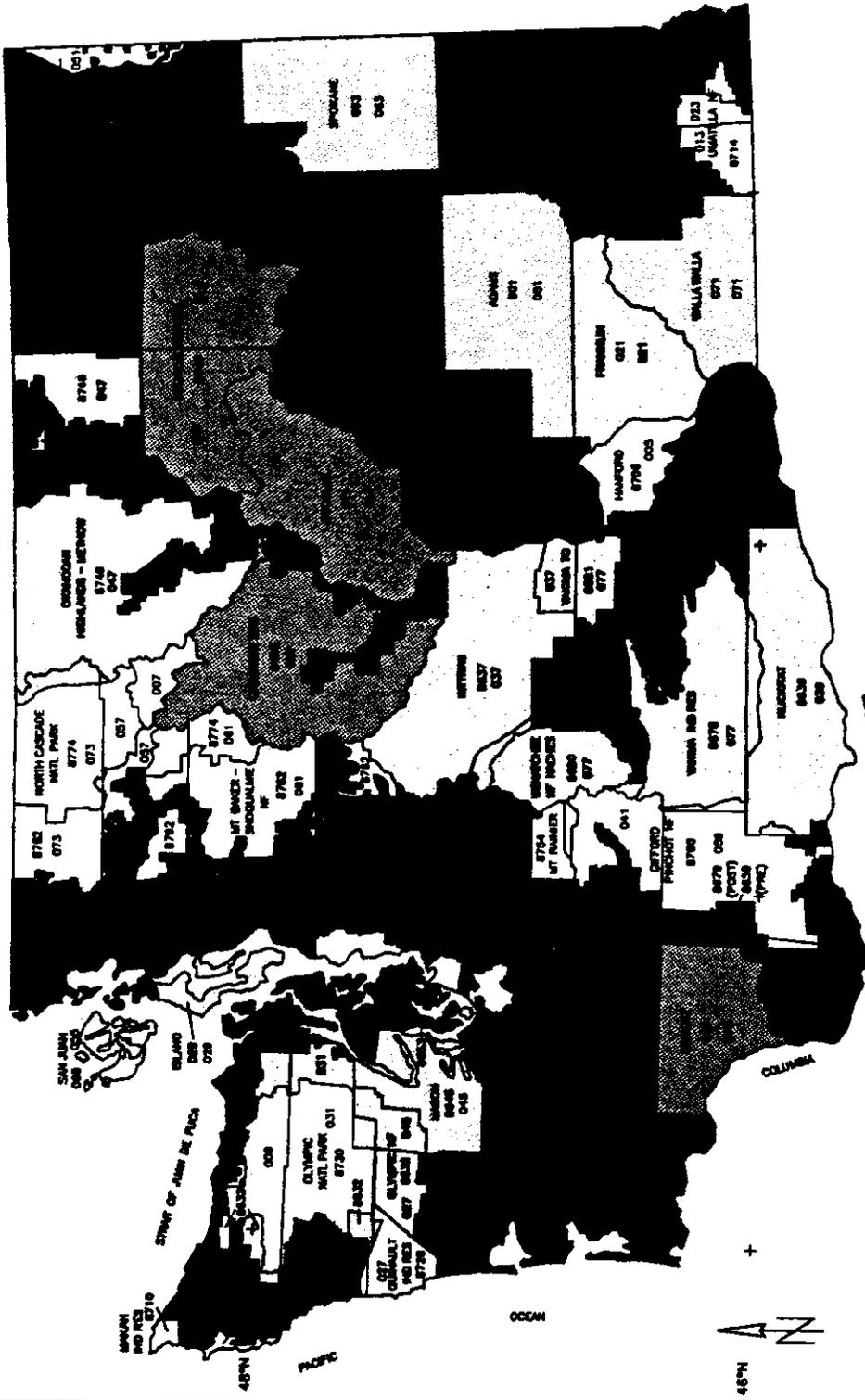
Pending SSA Petitions

* Region X

Central Pierce County Aquifer, WA	07/01/87
Marrowstone Island, WA	08/27/91
Vashon - Maury, WA	04/02/92
Eastern Columbia Plateau Aquifer System	01/28/93

Designated SSA Petitions

<u>Sole Source Aquifer</u>	<u>State</u>	<u>Federal Register Notice</u> <u>Citation</u>	<u>Publication Date</u>
1. Spokane Valley Rathdrum Prairie Aquifer	WA/ID	43 FR 5566	02/09/78
2. Camano Island Aquifer, Island County	WA	47 FR 14779	04/06/82
3. Whidbey Island Aquifer, Island County	WA	47 FR 14779	04/06/82
4. Cross Valley Aquifer, Snohomish & King Counties	WA	52 FR 18606	05/18/87
5. Newberg Area Aquifer, Snohomish County	WA	52 FR 37215	10/05/87
6. North Florance - Dunal Aquifer, Lane County	OR	52 FR 37519	10/07/87
7. Cedar Valley (Renton Aquifer)	WA	53 FR 38779	10/03/88
8. Lewiston Basin Aquifer	WA/ID	53 FR 49920	12/12/88
9. Eastern Snake River Plain Aquifer	ID	56 FR 50638	10/07/91



STATUS OF SOIL SURVEYS WASHINGTON MAY 1993

- LEGEND**
- PUBLISHED SOIL SURVEY (F)
 - FIELD MAPPING COMPLETE (P2)
 - PROJECT SOIL SURVEY (P1)
 - OUT OF DATE (O)
 - UPDATE IN PROGRESS (U1)
 - UPDATE FIELD MAPPING COMPLETE (U2)
 - NON PROJECT AREA (N)
 - SOIL SURVEY AREA BOUNDARY

SOURCE: DATA PROVIDED BY SCS FIELD PERSONNEL. MAP PREPARED BY USING AUTOMATED MAP CONSTRUCTION, AREA PROJECTION, NATIONAL CARTOGRAPHY AND GEOGRAPHIC INFORMATION SYSTEMS CENTER, FORT WORTH, TEXAS, 1993.

COPIES OF PUBLISHED SOIL SURVEYS CAN BE OBTAINED FROM THE LOCAL OFFICE OF THE SOIL CONSERVATION SERVICE FROM THE COUNTY AGENT, OR FROM COMMISSIONER. UNPUBLISHED SOIL SURVEYS ARE ON FILE IN THE LOCAL OFFICES OF THE SOIL CONSERVATION SERVICE.

SOIL CONSERVATION SERVICE

Soil Survey Area Name	Soil Survey Area Number	County	Number
Adams County	001		001
Asotin County Area (Parts of Adams Co.)	003		003
Benton County Area	005		005
Columbia River Area (Parts of Adams, Asotin, & Waiilatup Cos.)	007, 047		007, 047
Chelan County Area	009		009
Clallam County Area	011		011
Clark County	012		012
Colville Indian Reservation (Parts of Okanogan & Ferry Cos.)	014		014
Columbia County Area	015		015
Chelan County Area	017		017
Franklin County	021		021
Garfield County Area	023, 041, 042		023, 041, 042
Grant County	025		025
Harney County Area	027		027, 048
Jefferson County	029		029
King County Area	031		031
Kingston National Forest	033		033
Lincoln County Area	035		035
Liberty County Area	037		037
Linn County Area	039		039
Lewis & Clark County Area	043		043
Malheur Indian Reservation	045		045
Malheur County Area	047		047
Malheur National Forest	049		049
Malheur National Forest (Parts of Malheur, Wheeler, & Wasco Cos.)	051, 053, 054, 055, 056, 057, 058, 059, 060, 061, 062, 063, 064, 065, 066, 067, 068, 069, 070, 071, 072, 073, 074, 075, 076, 077, 078, 079, 080, 081, 082, 083, 084, 085, 086, 087, 088, 089, 090, 091, 092, 093, 094, 095, 096, 097, 098, 099, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000		

* Out of Print - Not available for distribution but a reference copy may be available in University or other libraries.

STATUS OF SOIL SURVEYS - WASHINGTON

PUBLISHED	SOIL SURVEY		SCHEDULED FOR PUBLICATION		SOIL SURVEY AREA NUMBER
	AREA NUMBER	DATE	1993	NONE	
ADAMS COUNTY*	001	1967			
ASOTIN COUNTY AREA (PARTS OF ASOTIN AND GARFIELD COUNTIES)	8603	1991		PLANNED PUBLICATION AFTER 1993	
BENTON COUNTY AREA	8605	1971		CASHMERE MOUNTAIN AREA (PARTS OF CHELAN & OKANOGAN COS.)	8608
CHELAN COUNTY AREA	8607	1975		COLVILLE INDIAN RESERVATION (PARTS OF OKANOGAN & FERRY COS.)	8648
CLALLAM COUNTY AREA	8609	1987		COWLITZ COUNTY (UPDATE)	015
CLARK COUNTY	011	1972		DOUGLAS COUNTY (UPDATE)	017
COLUMBIA COUNTY AREA	8613	1973		FRANKLIN COUNTY AREA	021
COWLITZ COUNTY AREA	015	1974		KITTITAS COUNTY AREA	8637
DOUGLAS COUNTY AREA	017	1981		KLICKITAT COUNTY AREA	8639
GARFIELD COUNTY AREA	8623	1974		OKANOGAN HIGHLANDS - METHOW AREA (PARTS OF CHELAN, OKANOGAN, & WHATCOM COUNTIES)	8749
GRANT COUNTY	025	1984		OLYMPIC NATIONAL FOREST (PARTS OF CLALLAM, GRAYS HARBOR, JEFFERSON & MASON COUNTIES)	8632
GRAYS HARBOR COUNTY AREA, PACIFIC AND WAHIAKUM COUNTIES	8627	1987		WENATCHEE NATIONAL FOREST, NACHES AREA (PARTS OF KITTITAS & YAKIMA COUNTIES)	8680
ISLAND COUNTY*	029	1958		YAKIMA TRAINING CENTER (PARTS OF KITTITAS & YAKIMA COS.)	8681
JEFFERSON COUNTY AREA	8631	1975		YAKIMA INDIAN RESERVATION (PARTS OF YAKIMA & KLICKITAT COS.)	8676
KING COUNTY AREA*	8633	1973			
KITSAP COUNTY AREA	8635	1980			
LEWIS COUNTY AREA	8641	1987			
LINCOLN COUNTY	043	1981			
MASON COUNTY AREA*	8645	1960			
NORTH FERRY AREA	8619	1979			
OKANOGAN COUNTY AREA	8647	1980			
PEND OREILLE COUNTY AREA	8651	1992			
PIERCE COUNTY AREA	8653	1979			
SAN JUAN COUNTY*	055	1962			
SKAGIT COUNTY AREA	8657	1989			
SKAMANIA COUNTY AREA	8679	1990			
SNOHOMISH COUNTY AREA	8661	1983			
SNOQUALMIE PASS AREA (PARTS OF KING AND PIERCE COUNTIES)	8634	1992			
SPOKANE COUNTY*	063	1968			
STEVENS COUNTY	065	1982			
THURSTON COUNTY AREA	067	1990			
WALLA WALLA COUNTY*	071	1964			
WHATCOM COUNTY AREA	8673	1992			
WHITMAN COUNTY	075	1980			
YAKIMA COUNTY AREA	8677	1986			
YAKIMA INDIAN RESERVATION, IRRIGATED AREA	8678	1976			
				AREA WHERE SOIL SURVEYS ARE NOT CURRENTLY PLANNED	
				GIFFORD PINCHOT NATIONAL FOREST (PARTS OF CLARK, COWLITZ, KLICKITAT, LEWIS, SKAMANIA & YAKIMA COUNTIES)	8760
				HANFORD	8706
				KANIKSU NATIONAL FOREST	8752
				MAKAH INDIAN RESERVATION	8710
				MT. BAKER - SNOQUALMIE NATIONAL FOREST AREA (PARTS OF SKAGIT, SNOHOMISH & WHATCOM COUNTIES)	8762
				MT. RAINIER NATIONAL PARK (PARTS OF PIERCE & LEWIS COS.)	8754
				NORTH CASCADE NATIONAL PARK (PARTS OF CHELAN, SKAGIT & WHATCOM COUNTIES)	8774
				OLYMPIC NATIONAL PARK (PARTS OF CLALLAM, GRAYS HARBOR, JEFFERSON & MASON COUNTIES)	8730
				QUINULT INDIAN RESERVATION (PARTS OF GRAYS HARBOR & JEFFERSON COUNTIES)	8728
				UMATILLA NATIONAL FOREST AREA (PARTS OF ASOTIN, COLUMBIA & GARFIELD COUNTIES)	8714

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Environmental protection is both an implicit and explicit goal of the GMA and strongly linked to land use planning and transportation. The GMA requires the classification of agricultural, forest, and mineral lands, and critical areas. It establishes development regulations for natural resource lands and critical areas and requires that all agencies designate these land uses in their jurisdictions by September 1991. Critical areas include land areas with natural development constraints: wetlands, floodplains, aquifer recharge areas, geologically hazardous areas, and fish and wildlife habitat.

Transportation activities require the dedication of land to transportation-related uses. These uses may or may not be compatible with adjacent or nearby land uses. Incompatibilities are most important when transportation facilities are located in such a manner which affects sensitive lands or habitat. Transportation systems produce pollutant byproducts (e.g. toxic chemical runoff, noise, and air pollution) which may have adverse effects on such environments. For example, water quality issues are important in the siting of transportation facilities due to the ease with which toxic pollutants from cars, trucks, buses, and trains can enter aquatic systems. Some critical areas, such as geologically hazardous lands, may also present potential hazards for the siting of transportation facilities. Also, some transportation facilities and activities may not be compatible with the maintenance of resource lands, such as agricultural lands and/or forest preserves. These direct environmental consequences should be considered in the GMA transportation planning process.



Important Laws and Regulations



The importance of the interrelationship of land use, transportation, and the environment as been recognized by recent federal and state legislation. Important laws and policy recommendations relating to land use and transportation include the following:

◆ High Capacity Transportation (HCT) Acts of 1990 and 1991 (RCW 81.104)



The High Capacity Transportation legislation provides potential revenue sources for state programs associated with high-capacity transportation systems, including passenger and freight rail, high-occupancy vehicle (HOV) support, and high-capacity transit. This legislation allows, among other

*David Evans Associates and WSDOT, 1992. (See References).

APPENDIX G

GENERAL GUIDELINE FOR USER BENEFIT CALCULATION

DRAFT

USER BENEFIT WORKSHEET
Capacity Improvement (additional GP Lane)

SR: _____ Posted Speed: _____
Project Title: _____
Subject Section: _____
Length of Subject Section: _____
Number of Lanes: _____ # of Lanes (w/ improvement): _____
Evaluated by: _____

Roadway Characteristics

Year 1 Working Peak hr Volumes: _____ **Year 20** Working Peak hr. Volumes: _____
% HOV: _____ % HOV: _____
% Trucks: _____ % Trucks: _____

Data Source/Procedures:

STEP ONE:

Determine Capacity for Subject Section with improvement and without improvement using procedures outlined in the Highway Capacity Manual. Account for ALL relevant factors (i.e., lane width, shoulder width, truck volumes, speed, grade) or cite justification for generalizing based on local/regional traffic counts [see HCM equations 3.2, 3.4, 8.1-3, etc.]. Refer to the base capacities below and attach additional calculations:

Urban Multilane Highway or Freeway	2200 vphpl
Rural/Small Urban Freeway	2000 vphpl
2 Lane Highway	1300 vphpl
Arterial	1600 vphpl
HOV lane	1500 vphpl

Capacity without improvement: _____ Capacity with improvement: _____

STEP TWO:

Given Volume and Capacity above, determine V/C (volume/capacity) for with and without the improvement:

Year 1: V/C w/o improvement: _____ Year 20: V/C w/o improvement: _____
V/C w/ improvement: _____ V/C w/ improvement: _____

STEP THREE:

If the above V/C ratio is over 1.0, then the following method should be used to determine the Travel Time. Record results in Travel Time section below.

$(\text{Volume} - \text{Capacity}) / (2) = \text{Travel Time (hrs)}$

If the V/C ratio is under 1.0, then the following method should be used to determine the Travel Time. Using appropriate charts (Figure 16.1, 8, 13, or 14) from Traffic Engineering Handbook (Second edition) and the V/C ratio determine Operating Speed:

Year 1: Operating Speed w/o imprvmnt: _____ Year 20: Operating Speed w/o imprvmnt: _____
Operating Speed w/ imprvmnt: _____ Operating Speed w/ imprvmnt: _____

DRAFT

Given Length of Subject Section and Operating Speed above, calculate Travel Time (hours) with the following equation:

$$\text{Travel Time} = (\text{Distance} \times \text{Volume}) / \text{Speed}$$

Record the results for Travel Time in the table below:

<u>Year 1:</u>	<u>Year 20:</u>
Travel Time w/o improvement: _____	Travel Time w/o improvement: _____
Travel Time w/ improvement: _____	Travel Time w/ improvement: _____

STEP FOUR:

Calculate Travel Time Savings (TTS) by taking the difference between the Travel Time with improvements (TT_{BUILD}) and without improvements (TT_{NO-BUILD}) for both Year 1 (1995) and Year 20 (2015):

$$TT_{\text{BUILD}} - TT_{\text{NO-BUILD}} = |TTS_{\text{Year 1 or 20}}|$$

Year 1 Travel Time Savings: _____ Year 20 Travel Time Savings: _____

If HOV percentage of traffic is known (%HOV %SOV), then convert Travel Time Savings (hrs) into Travel Time Savings (hrs) for SOV, HOV, and Trucks. This can be accomplished by multiplying the Travel Time Savings by %SOV(S), %HOV(H), and %Trucks (T). For example, if the Year 1(1995) factors are H=10% and T=10% then %SOV is S=80%:

$$TTS_{\text{Year 1}} * 0.80 = |TTS_{\text{Year 1 for SOV traffic}}|$$

<u>Year 1:</u>	<u>Year 20:</u>
Travel Time Savings - SOV: _____	Travel Time Savings- SOV: _____
Travel Time Savings - HOV: _____	Travel Time Savings - HOV: _____
Travel Time Savings - Trucks: _____	Travel Time Savings - Trucks: _____

If HOV percentage of traffic is not known, then multiply Travel Time Savings (hrs) by %Trucks (T) to determine Travel Time Savings for trucks (TTS_T). Also multiply Travel Time Savings by the remaining percentage (100%- %Trucks = %GP) to obtain a theoretical composition for general purpose use. For example, if Year 1 factors are: T=10% then %General Purpose is GP=90%:

$$TTS_{\text{Year 1}} * 0.90 = |TTS_{\text{Year 1 for GP traffic}}|$$

<u>Year 1:</u>	<u>Year 20:</u>
Travel Time Savings - GP: _____	Travel Time Savings - GP: _____
Travel Time Savings - Trucks: _____	Travel Time Savings - Trucks: _____

STEP FIVE:

Translate Delay estimates into User Benefits using the appropriate equation below:

$$\text{User Benefits}_{\text{Year 1 or 20}} = (TTS_{\text{SOV}} * CP_{\text{SOV}} * 260) + (TTS_{\text{HOV}} * CP_{\text{HOV}} * 260) + (TTS_{\text{T}} * CP_{\text{T}} * 260)$$

OR:

If the HOV percentage is NOT known and the theoretical composition is being used above for the Travel Time then the following equation should be used:

$$\text{User Benefits}_{\text{Year 1 or 20}} = (TTS_{\text{GP}} * CP_{\text{GP}} * 260) + (TTS_{\text{T}} * CP_{\text{T}} * 260)$$

DRAFT

where variables for each analysis year are: TTS_{SOV} = Time Savings (hrs) for SOV
 TTS_{HOV} = Time Savings (hrs) for HOV
 TTS_T = Time Savings (hrs) for Trucks
 TTS_{GP} = Time Savings (hrs) for GP traffic

and Cost Parameters (including operating costs) are:

CP_{GP} = \$6.30 * 1.35 [AVO]
 CP_{SOV} = \$6.30 * 1.21 [AVO]
 CP_{HOV} = \$6.30 * AVO_{HOV}
 CP_T = \$21.40 * 1.0 [AVO]

Enter the corresponding results below:

Year 1 (1995) User Benefits: _____ Year 20 (2015) User Benefits: _____

STEP SIX:

The final step is to calculate the present value of the User Benefits. Using Figure 5 from the AASHTO -Manual on User Benefit Analysis of Highway and Bus-Transit Improvements, 1977 (the Red book), find the Present Value Factor (PVF). The Period of the Estimate and the Analysis period will always be 20. The discount rate will be 4%. Please only refer to the nomograph as a guide, the formula should be used in ALL cases.

[Note that the AASHTO figure refers to the Net present worth (*f*) of a given project, this definition is consistent with the term Net present value (PVF) which WSDOT will refer to throughout the prioritization method. No adjustments are necessary.]

a) Calculate the Year 20/Year 1 ratio (α) = _____

b) Determine the Present Value Factor where: Y = Period of Estimate (20 yrs.)
 $r = \ln(\alpha) / Y$ [Annual Growth Rate]
 i = Discount Rate (4%)
 n = Analysis Period (20 years)

$$PVF = (e^{(r-i)n} - 1) / (r-i)$$

= _____

c) Multiply the Year 1 User Benefits (1995) by the PVF to determine the Present Value of the User Travel Time (and Operating) Savings Benefits. Record the results below and on the COST EFFICIENCY WORKSHEET:

Present Value of User Benefits (PV_B): _____

APPENDIX H
SUMMARY OF DELPHI ANALYSIS FOR WEIGHT SETTING

SUMMARY OF DELPHI ANALYSIS FOR WEIGHT SETTING

September, 1993
University of Washington Campus

Introductory Discussion:

- Presentation of ranking methodology and categories of evaluation criteria.
- Presentation of the Delphi Analysis framework and session proceedings.

ROUND 1 RESULTS:

	NPV	CMTY	ENV	MODE	L/U
Mean	51	17	12	11	9
Standard Deviation	18	11	7	3	5

Major Discussion Points:

- Concern that Community Support is not adequately represented
- Concern that project costs will eliminate certain high cost projects

ROUND 2 RESULTS:

	NPV	CMTY	ENV	MODE	L/U
Mean	53	17	11	10	9
Std Dev.	11	10	6	4	5

Major Discussion Points:

- That NPV represents a large number of policy goals and is not being given adequate emphasis
- Next round -resolved to give each sub-goal under NPV its own weight and sum total for NPV full weight.

ROUND 3 RESULTS:

	NPV	CMTY	ENV	MODE	L/U
Mean	65	14	8	7	6
Std Dev.	8	7	3	1	1

Major Discussion Points:

- The criteria objectives need to be repackaged to make it explicit that NPV carries a fair number of policy goals with it.
- These results shall be the committee recommendation to full WSTC for adoption.