

OFFICE OF
PLANNING AND DEVELOPMENT
GARY E. STOUT
ADMINISTRATOR

BUREAU OF
PLANNING
ERNEST R. BONNER
DIRECTOR

424 S.W. MAIN STREET
PORTLAND, OR. 97204

PLANNING
503 248-4253

ZONING
503 248-4250

27 April 77

Roger Budke
Transportation Division
CRAG
527 SW Hall St.
Portland OR 97201

Dear Roger,

Following our telephone discussion of the I-5 Corridor Project I looked through my files for information. They are fairly complete and available to you.

The Project produced three final documents:

PHASE I - Low Cost Improvements

FINAL REPORT - Executive Summary Technical Analysis, 2/76

FINAL REPORT - Executive Summary, 2/76

The files contain a number of drafts, staff papers and source documents.

Very truly yours,

William S. Dirker
Annexation Coordinator

WSD/rle

Bill

UNITRAN - SUBSIDIARY OF: POLLUTION CONTROL INDUSTRIES
2207 BORDER AVE., TORRANCE, CA 90501
(213) 320-2270

UNITRAN MONORAIL SYSTEMS COST-\$ PER MILE/UNIT

PORTLAND - VANCOUVER APPLICATION

<u>COMPONENT</u>	<u>UNITRAN</u>
I <u>LAND</u>	Depends on required acquisitions
II <u>EXCAVATION</u>	
Filing	
Utilities	
Landscaping	
Miscellaneous	200,000
III <u>GUIDEWAY</u>	
Span	
Pier Cap	
Pier	
Footing	
Rail & Fastener	
Miscellaneous	1,326,000
IV <u>STATIONS</u> (2 stations - one at each end of the	
Road Bed Interstate Bridge)	
Track	
Construction & Materials	
Electrification	
Parking	
Stairs	
Escalators	
Fare Collection	
Station Finish	
Miscellaneous	2,115,000
V <u>YARD & SHOPS</u>	250,000
VI <u>ELECTRIFICATION</u>	800,000
VII <u>VEHICLES</u> (55'-55 seated plus 25 standees - not crush)	
Structure	
Propulsion	
Suspension Brakes	
Control & Communication	
Interior	
Environmental Control	
Miscellaneous	200,000

VII COMMAND & CONTROL

Computers

Structures

Phones

Consoles

Guideway Installation of

Equipment

200,000

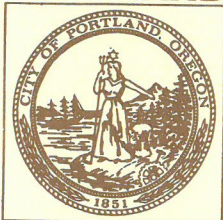
TOTALS

5,091,000

Costs are based on available prices as of September 1972.

Costs for site items are for standard installations - topography, soil conditions, constructions and costs by local contractors may have impact upon final price. Right-of-way and utility relocations are extra.

THE CITY OF
PORTLAND



OREGON

OFFICE OF
PLANNING AND DEVELOPMENT

GARY E. STOUT
ADMINISTRATOR

BUREAU OF
PLANNING

ERNEST R. BONNER
DIRECTOR

424 S.W. MAIN STREET
PORTLAND, OR. 97204

PLANNING
503 248-4253

ZONING
503 248-4250

MEMORANDUM

May 11, 1976

TO: GARY STOUT

FROM: BILL DIRKER

SUBJECT: I-5 CORRIDOR REPORT *D*

403.09
RECEIVED
MAY 14 1976
OFFICE OF PLANNING &
DEVEL.

Per Ernie Bonner, I suggest you put this subject on the Mayor's agenda.

CRAG completed this study early in this year and were scheduled to present it to the City Council in March. Tri-Met requested we defer this presentation until after the May 25th election as it may adversely affect support for their auto license fee, Measure No. 26-1. I discussed this with the Mayor and he agreed on 3/3/76.

why?
We should now put it on the Council regular agenda. CRAG staff will make the presentation. Commissioner Grainger, Chairman of the Task Force, will conduct the presentation. It should take no more than one hour. Good press coverage is desirable.

Major recommendations are: 1) Tri-Met acquire Vancouver-Portland Bus Company and extend service to Vancouver. 2) Clark County establish integrated public transit system and interface with Tri-Met. 3) OSHD begin preliminary engineering on a priority lane on I-5.

Urging and pressure is needed to cause all this to happen. This presentation, followed by a Resolution of endorsement and request for action, will be important.

DB:ce

cc: Ernie Bonner

Dirker: Noil thinks (1) is for UMTA, Tri-Met: Vancouver-Portland, (2) is for Clark County and Tri-Met, and (3) is for Stat.

*Why should we get into this process?
Why take it to Council?
Can you see me?*



Doug Baker

Tightly Corked

IT'S A BIT like one of those recurring bad dreams. Only this time it's for real.

You're driving south on Interstate 5 and as you enter Hazel Dell, Wash., you note that it's 5:30 p.m. You've got plenty of time to catch your 7:20 Continental flight at Portland International Airport for California.

And then, as you come up over a small rise just north of Fort Vancouver, you see the twinkling stoplights and the long double line of cars and trucks reaching northward for miles from the Interstate Bridge.

Deja vu is the fancy name for it. You've seen it all before. You've been here before. You take the next off-ramp into the business district, where the streets are just as choked with traffic as is the freeway. You turn to your son and tell him he might as well relax. He won't be making his flight out of the Portland airport. He's stuck — and most likely stuck for hours.

★ ★ ★ ★

OREGON STATE POLICE records show that last Saturday at 3:14 p.m. a heavy truck and trailer carrying building materials suffered a broken left front axle and overturned on I-5 just south of the Columbia Slough.

By the time the Oregon Highway Division was able to clear the highway of truck and scattered cargo, it was 8:15 p.m. During the ensuing five hours, traffic on I-5 backed up as far as Hazel Dell, a distance of 5 to 6 miles. It also chokes all of the off- and on-ramps in the vicinity of Fort Vancouver and four or five downtown streets.

Nobody keeps statistics on such traffic jams, but the arithmetic is easy enough. Figure a vehicle to each 20 feet and that's 260 or more vehicles to each mile. Extrapolate 8 miles of blocked traffic and you're talking about 2,000 or more vehicles with two or more persons to each vehicle.

But even when you get to a figure of 4,000 persons inconvenienced for four or five hours, you haven't begun to grasp the magnitude of such tieups. How many, like your son, have airplanes to catch? How many hours lost because of people late for work? How many dinners ruined? How many hostesses annoyed because of tardy guests? How many kidneys irretrievably damaged? How many hundreds of gallons of precious gasoline wasted? The unanswered questions stretch as far or farther than the blocked traffic. You're talking about the whole warp and woof of the social and economic fabric of a population group larger than that of many small cities.

And what of the rather frightening imagined possibilities? How

could fire trucks and other emergency vehicles get through that jam in downtown Fort Vancouver? What if the Interstate Bridge itself were so badly damaged by runaway ship or major accident that it would be out of commission for days or weeks? The nearest bridges other than the Interstate are as far away as Longview, Wash., and Cascade Locks. The Interstate, handling 87,400 vehicles a day, is one of the busiest traffic centers in the Northwest. Its closure would mean virtual paralysis of interstate commerce in this area.

Incidents such as Saturday's corking of our main north-south arterial have happened before and doubtless will happen again. Two or three years ago on a Monday morning, I was caught in the same place by a similar occurrence. A truckload of beer bottles was spilled at the same spot on the highway. That time the jam lasted four hours. I remember getting out of my traffic-bound car and ordering hamburgers for my family. We had plenty of time to order and consume an eight-course meal.

★ ★ ★ ★

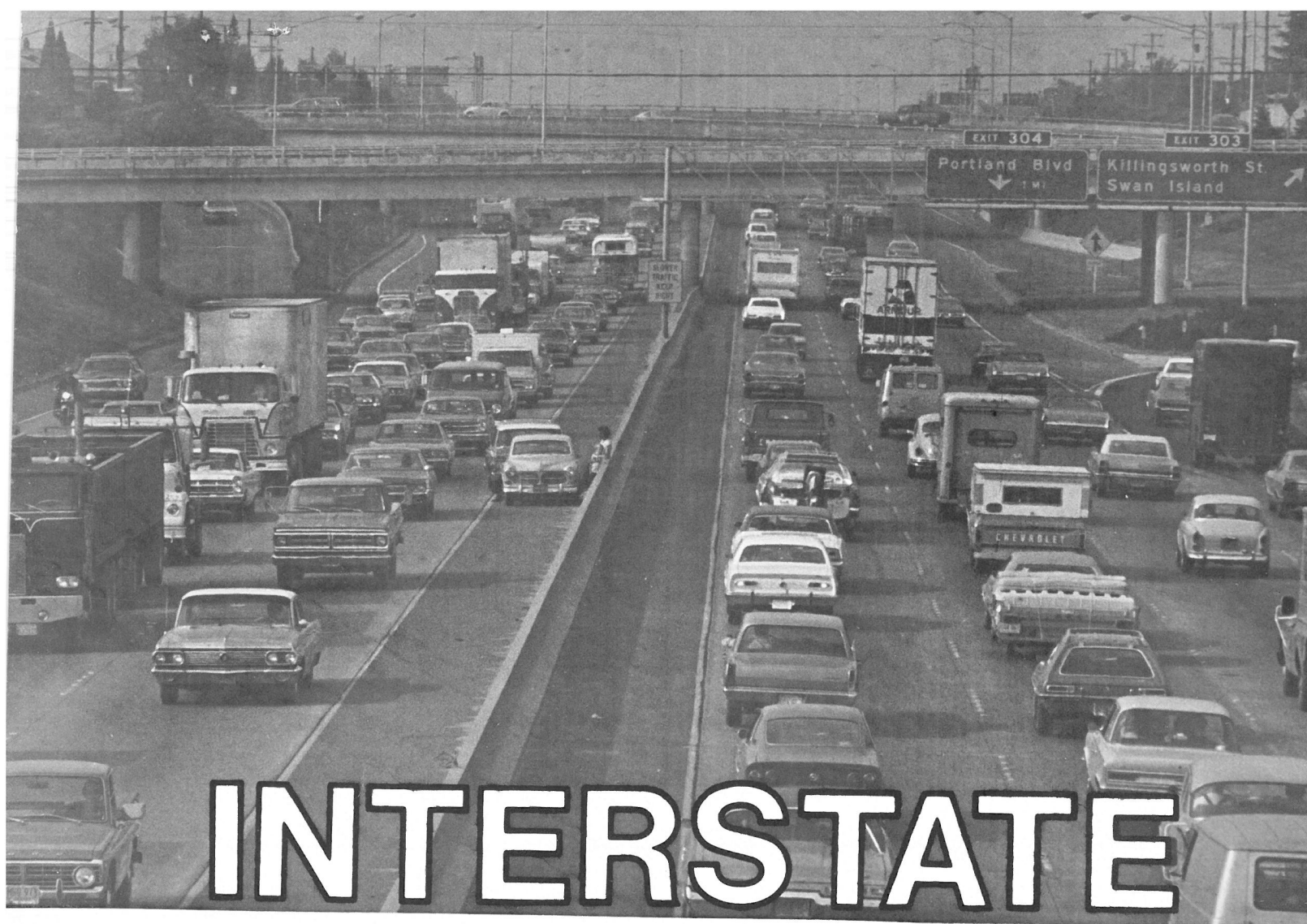
YOU HAVE TWO CHOICES when caught up in such a quagmire. You can fuss and fume and talk of a lawsuit against the trucking company. But how can you sue a guy for breaking an axle? You can curse the highway engineers and their lack of planning, the nonexistent new bridge.

Or you can do what most people do — accept your lot in a carnival spirit and make the best of it. Saturday evening, Fort Vancouver's usually quiet restaurants were jammed with stalled motorists seeking sustenance. The Main Street poker palaces had an unexpected infusion of business. (Glenn Jackson's policies not only cost me four hours of time, but the \$9 I dropped at a stud table.)

This week I discussed the problem with Oregon and Washington state police officials. They say they keep wreckers on hand for such emergencies, but no heavy cranes. They don't have the laws needed to pull stalled vehicles off the highway the way the California authorities do on the Oakland Bay Bridge when there's a threatened traffic tieup.

Police officials are critical of the engineering of I-5, particularly near the Union Avenue off-ramp near the Columbia Slough. They also wonder when, if ever, we'll get the long-promised new bridge.

Meanwhile, accidents can and do happen. The motoring public does little complaining and the Highway Division offers little hope of any foreseeable improvement as the traffic load steadily increases. Maybe it's time to think about a fleet of ferry boats.



INTERSTATE BRIDGE CORRIDOR PROJECT

Executive Summary

Final Report **February, 1976**
Columbia Region Association of Governments

COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS GENERAL ASSEMBLY

REGULAR MEMBERS

Clackamas County	Washington County
Barlow	Banks
Canby	Beaverton
Estacada	Cornelius
Gladstone	Durham
Happy Valley	Forest Grove
Johnson City	Gaston
Lake Oswego	Hillsboro
Milwaukie	King City
Molalla	North Plains
Oregon City	Sherwood
Rivergrove	Tigard
Sandy	Tualatin
West Linn	ASSOCIATE MEMBERS
Wilsonville	Clark County
Multnomah County	Camas
Fairview	Vancouver
Gresham	
Maywood Park	Columbia City
Portland	Scappoose
Troutdale	St. Helens
Wood Village	The Port of Portland
	Tri-Met
	The State of Oregon

EXECUTIVE DIRECTOR,
LARRY RICE

COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS BOARD OF DIRECTORS
FEBRUARY, 1976

CITY OF PORTLAND
MAYOR NEIL GOLDSCHMIDT

MULTNOMAH COUNTY
COMMISSIONER MEL GORDON

CITIES OF MULTNOMAH COUNTY
COUNCILMAN CHARLES BECKER

WASHINGTON COUNTY
COMMISSIONER RAY MILLER

CITIES OF WASHINGTON COUNTY
MAYOR DAVID MCBRIDE-CHAIRMAN

CLACKAMAS COUNTY
COMMISSIONER STAN SKOKO

CITIES OF CLACKAMAS COUNTY
MAYOR PHIL BALSIGER

CLARK COUNTY
COMMISSIONER DEAN COLE

CITIES OF CLARK COUNTY
MAYOR JIM GALLAGHER

CITIES OF COLUMBIA COUNTY
COUNCILMAN STAN PINTARICH

PORT OF PORTLAND
LLOYD ANDERSON, DIRECTOR

TRI-MET
GERARD DRUMMOND, PRESIDENT OF
THE BOARD

STATE OF OREGON
THOMAS WALSH, OREGON TRANS-
PORTATION COMMISSION

STATE OF WASHINGTON
JULIA BULTER HANSEN, EX-OFFICIO
WASHINGTON STATE HIGHWAY COM-
MISSION

*The preparation of this report has been
financed in part by funds from the United
States Department of Transportation, Urban
Mass Transportation Administration, under
the Urban Mass Transportation Act of 1964
as amended; and by funds from the Oregon
Department of Transportation and the
Washington State Department of Highways
in cooperation with the Federal Highway
Administration USDOT.*

INTERSTATE BRIDGE CORRIDOR PROJECT **Executive Summary**

Final Report February, 1976

Columbia Region Association of Governments

**Recommendations Adopted By CRAG
Board of Directors, February 19, 1976.**

LIST OF CONTRIBUTORS

TRANSPORTATION TECHNICAL ADVISORY COMMITTEE

Winston Kurth, Clackamas County
 J. Wayne Daigle, Cities of Clackamas Co.
 Jan Rosholt, Clark County
 Eric Oien, Cities of Clark County
 Dorothy Churchill, Cities of Columbia Co.
 Bebe Rucker, Multnomah County
 Kent Cox, Cities of Multnomah County
 John Crockett, Washington County
 Robert Royer, Ore. State Hwy. Div.
 Pierre Henrichsen, Wash. State Dept.
 of Highways
 Richard Arenz, Fed. Hwy. Admin.
 Ken Johnsen, Port of Portland
 Bill Hall, Tri-Met
 Mark Beisse, Federal Aviation Admin.
 F. William Fort, Urban Mass Transit
 Administration

PROJECT TASK FORCE

Commissioner Dick Granger, Chairman,
 Clark County
 Patricia Blackwell, Vice-Chairperson,
 Citizen Advisory Committee
 Councilman Dick Pokornowski, City
 of Vancouver
 Jerry Peck, Owner, V-P Bus Company
 Ed Wagner, Tri-Met
 Robert Bothman, Oregon State Highway
 Division
 Pierre Henrichsen, Wash. State
 Department of Highways
 George Palmer, Multnomah County
 William S. Dirker, City of Portland

CITIZEN'S ADVISORY COMMITTEE

Patricia Blackwell, Chairperson,
 League of Woman Voters
 Frank Barlow, Burlington Northern
 Railroad
 Julius Gaussoin, Silver Eagle Trucking
 Don Hughes, Camas Citizen
 Howard Martin, Camas Citizen
 Tim McNeil, Citizen
 Jim Howell, Sensible Trans. Options
 for People
 Lynn Hatcher, Citizen
 Richard Swennes, Convoy Company
 Ben Witt, Citizen
 Ray Brewer, Union Ave. Boosters
 Carol Hansen, American Assoc. of
 University Woman
 Mary Legry, League of Woman Voters
 John Martin, Citizen
 John Pierce, Vancouver Chamber
 of Commerce
 Susan Regan, League of Woman Voters
 Vern Rifer, Oregon Environmental
 Council
 Betsy Strong, Womens Highway
 Safety Leaders

CRAG STAFF PRINCIPALLY RESPONSIBLE FOR THIS REPORT

RICHARD ETHERINGTON, DIRECTOR
 TRANSPORTATION DIVISION
 A. REED GIBBY, SENIOR PLANNER
 JOHN KRAWCZYK, PLANNER
 WILLIAN PETTIS, PLANNER
 ROGER BUDKE, PLANNER
 PROJECT PRODUCTION--
 KAREN THACKSTON, LORI
 WOLCOTT, LESLIE SMITH
 ZONNIE BAUER

COVER PHOTO,
 ANCIL NANCE

COLUMBIA REGION ASSOCIATION
 OF GOVERNMENTS
 527 SW Hall
 Portland, OR 97201
 (503) 221-1646

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
RECOMMENDATIONS	3
PHASE I FINDINGS AND RECOMMENDATIONS	5
TRANSIT SERVICE	7
PRIORITY TREATMENT	10

LIST OF FIGURES

FIGURE

- I-1 VICINITY MAP
- R-1 I-5 CORRIDOR RECOMMENDATIONS

INTERSTATE BRIDGE CORRIDOR

VICINITY MAP

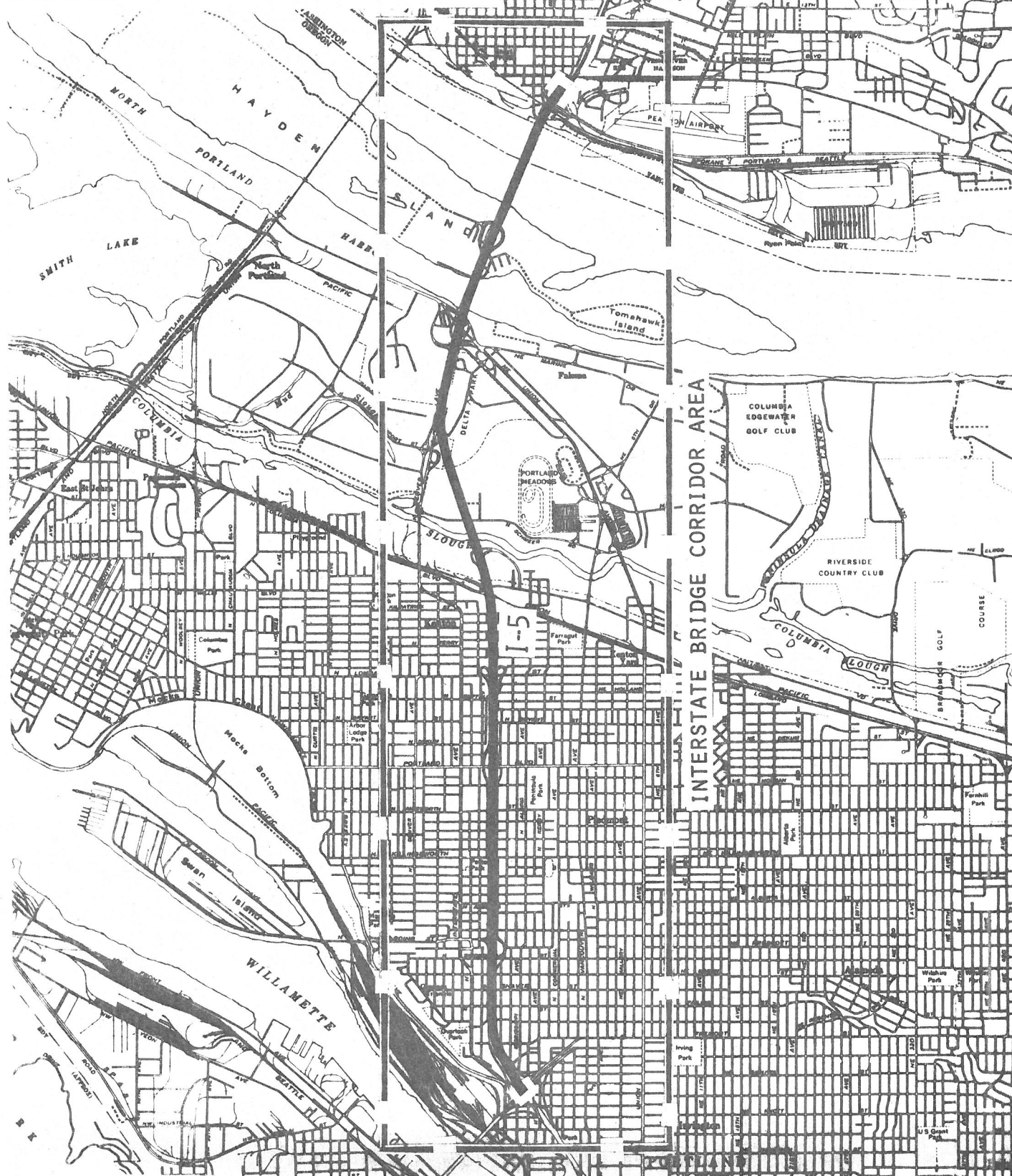
FIGURE I-1

FEBRUARY, 1976



1"=4000'

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



INTRODUCTION

This executive summary has been prepared to convey essential information obtained by the Interstate Bridge Corridor Project as well as the project's recommendations. Detailed information regarding findings and background material is contained in the Technical Analysis of the final report.

It is anticipated that decision makers and other interested parties will find this summary useful in obtaining a general understanding about the critical transportation problems in the corridor as well as the means which may be undertaken to address these problems.

The Interstate Bridge Corridor project was formed in late 1973 to address the problems of severe traffic congestion that had become a frequent occurrence on the I-5 Freeway between Vancouver and Portland. Since the corridor affects a number of jurisdictions including two states, two cities and two counties, a special interagency project was formed to analyze the conditions and present recommendations for improvement. In addition, four transit operators provide service within or near this transportation corridor. The project was designed to address the time period before I-205 becomes operational.

Traffic congestion in the Interstate Bridge corridor has become a critical problem for several reasons. First, I-5 is the major north-south Interstate Highway on the Pacific Coast. Substantial volumes of interregional traffic are carried by this highway. Second, this freeway is an important commuter route within the Portland-Vancouver Metropolitan area; each day, thousands of commuters use I-5 to reach their places of work. Finally, I-5 is important because it represents the only highway crossing of the Columbia River in the Portland Metropolitan area. People traveling between Clark County, Washington and the remainder of the metropolitan area have no choice except to use the I-5 corridor for travel between the two states. Traffic congestion in the corridor disrupts commercial, social and recreational travel in the urban area, as well as the north or south-bound interregional travel.

Traffic conditions in the corridor were examined during phase one of the project. The Phase I Report identified a number of low-cost, short term improvements which may be implemented quickly to provide a degree of immediate relief in the corridor. A summary of these recommendations is contained in the next section. This final report deals with capital intensive improvements to permanently alleviate the congested traffic conditions in the corridor. In particular, these improvements include upgrading of the transit service in the corridor and implementation of a system of priority treatment for high occupancy vehicles (buses and carpools) on Interstate 5.

INTERSTATE BRIDGE CORRIDOR RECOMMENDATIONS

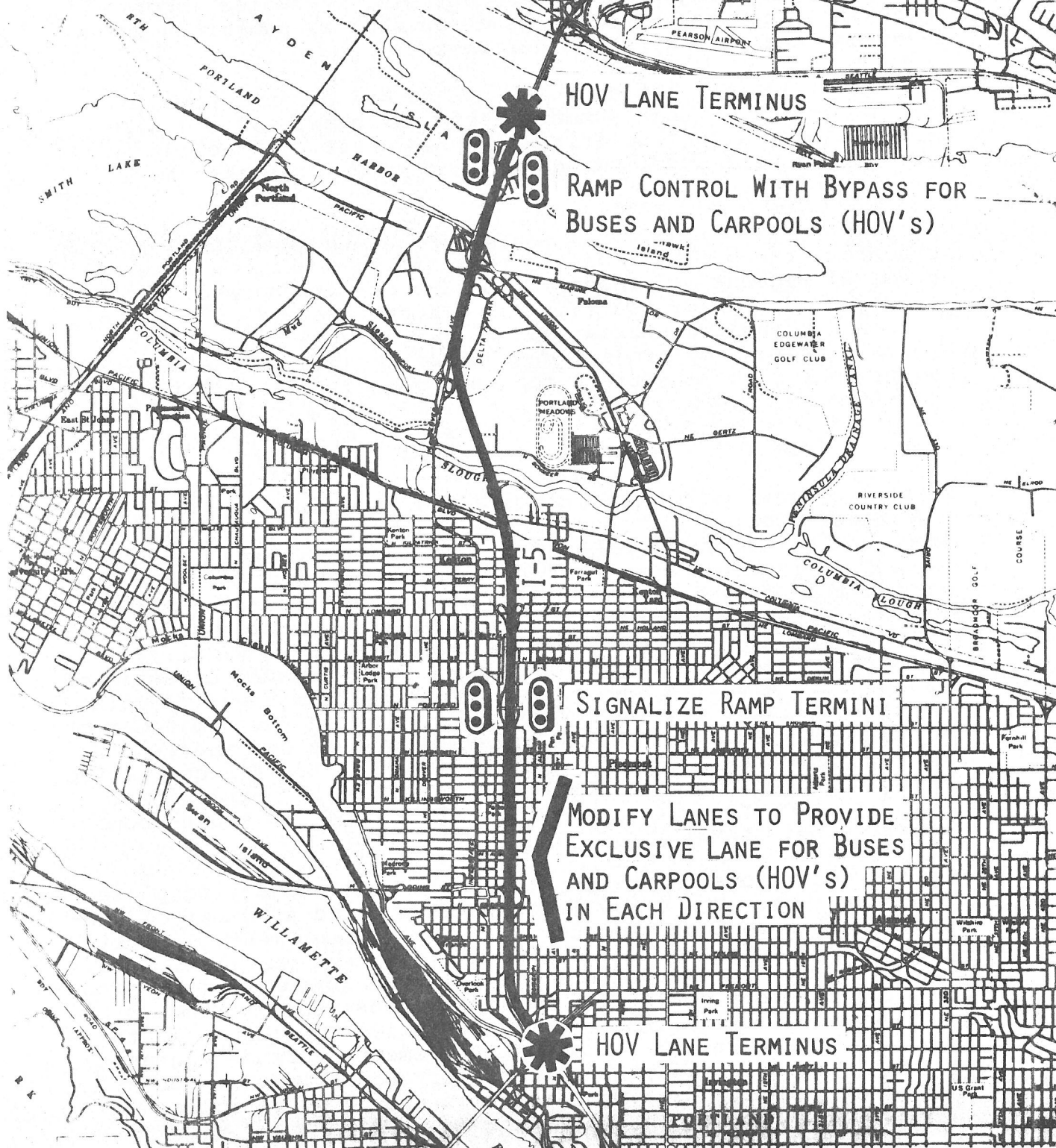
FIGURE R-1

FEBRUARY, 1976



1"=4000'

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Clark County, Vancouver and Portland.
2. Tri-Met should purchase Vancouver-Portland Bus Company immediately.
3. As the agency responsible for the regional carpool program, Tri-Met should expand aggressive carpool marketing efforts to Clark County.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows:
 - A. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - B. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - C. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with the Columbia Slough Bridge to an eight lane structure.
6. The Oregon Department of Transportation consider installation of traffic signals at the termini of the I-5 ramps at Portland Boulevard.

These recommendations should assist in the attainment of certain regional transportation goals such as conservation of fuel, improved safety, reduction of traffic congestion and improvement of regional air quality. Certain capital and operating costs will be incurred in the implementation of these recommendations.

These costs could be funded as follows:

Transit service in Clark County - Household utility tax, UMTA operating funds and state motor vehicle excise tax matching funds (if available).

Corridor service - UMTA operating funds: priority treatment.

Slough Bridge and signal - Interstate funds.

Carpool marketing - Federal Aid Urban System Funds

Action on some of these recommendations has already been taken. A public transportation improvement conference has been held in

Vancouver. It concluded that transit in the county should be provided through inter-governmental contracts between the City of Vancouver, Clark County and other cities interested in obtaining transit service.

The City of Vancouver and Clark County have approved a joint resolution supporting public acquisition of Vancouver-Portland Bus Company. Tri-Met is currently studying the legal and financial aspects of acquisition and operation of this line.

The City of Vancouver has agreed to purchase ten new diesel buses. The purchase of these buses is essential to the implementation of any city-county agreement to provide transit service outside the city limits of Vancouver.

PHASE 1 FINDINGS AND RECOMMENDATIONS

Phase I of the I-5 project included extensive study of traffic conditions in the I-5 corridor. A number of traffic operation problem areas were identified. In addition, it was found that the present transit systems operating in the corridor were severely fragmented resulting in high costs and time consuming transfers to commuters. Air, water, rail and highway systems were considered as possible means of solving some of the traffic problems as well as socio-economic means of reducing travel demand. It was concluded by the Task Force that only highway and transit improvements could be implemented within a short period of time at a fairly low cost.

Briefly, the Task Force recommendations included: 1) Express bus service in the corridor. The project recommended that the Vancouver-Portland Bus Company operate a demonstration express commuter bus service from Hazel Dell and the Mill Plain corridor to Lloyd Center and downtown Portland. 2) Inter-system transfers. It was recommended that Tri-Met, Vancouver-Portland Bus Company, Vancouver Transit and Evergreen Stage Lines honor each others transfers. 3) Consumer information service. Suggested improvements include: toll free information service, route maps, shelters and information brochures. 4) Expansion of the regional car pool program. It was recommended that the ODOT regional car pool program be expanded to include Clark County. 5) Evaluation of priority treatment for high occupancy vehicles. This recommendation called for detailed evaluation of priority treatment for high occupancy vehicles (HOVs) including priority lanes and ramp metering with bypasses for HOVs. 6) Interstate bikeway. Completion of a bikeway through the Interstate Bridge corridor from downtown Portland to Vancouver was recommended. 7). Highway operations. This recommendation called for highway safety improvements, signalization, ramp metering, utilization of the shoulder in limited areas to improve traffic flow and use of dynamic warning signs to advise motorists of congested conditions. 8) Analysis of long term improvements. These included proposed studies of a transit system. This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver - Portland Bus Company by Tri-Met.

Many of the above recommendations have been implemented to date. This report is in fact, the result of two recommendations; namely,

evaluation of priority treatment, and study of a transit district of Clark County. The demonstration express bus service has been successful in attracting new patrons to bus service. However, Vancouver-Portland Bus Company reports that the service is continuing to operate at a loss. Some of the service originally instituted has been curtailed for lack of ridership. The regional car pool program has been expanded to Clark County. Marketing efforts were conducted and car pool officials reported limited response to the program. Some traffic operation improvements are in the planning stage by the Oregon Department of Transportation. Many improvements are planned in conjunction with the reconstruction of the Columbia Slough Bridge and Union Avenue Interchange. The improvements relating to the information program, inter-system transfers and bikeway, have not been implemented. Long range system considerations will be studied at a later date as part of the regular CRAG work program. Traffic operation improvements of particular importance which have not been implemented or studied are noted in this reports' recommendations.

TRANSIT SERVICE

An effective transit system can provide a realistic alternative to the automobile. This is important in the I-5 corridor. If commuters can be encouraged to switch from their autos to transit, some decrease in the amount of traffic congestion can be expected. In addition, this more efficient means of travel reduces energy consumption and air pollution while increasing highway safety.

It is generally recognized that publicly owned transit systems can provide a higher service level than can private systems. Public systems can reduce fares and operate high service levels because the public system can use tax subsidies to make up operating deficits. The private system cannot obtain subsidies and is dependent on farebox revenues.

In order to improve transit service in this corridor, it is necessary to purchase the private transit service currently operating in the corridor and form a public transit system in Clark County. A Clark County system will support the service operating in the corridor by providing a transit feeder system to the corridor service.

Public transit districts, encompassing an entire metropolitan area, have been a reality in Oregon since 1969. The Tri-County Metropolitan District (Tri-Met) in the Portland area was formed under legislation which permits the creation of special purpose districts to provide transit service. However, Washington law has been amended only recently to permit jurisdictions, other than cities to fund and provide transit service.

The 1975 Washington Legislature amended Washington Law to modify the manner in which public transit is funded and administered. Under the revised legislation, transit districts larger than an individual city but smaller than a county are permitted. These districts are to be formed by action of a public transit improvement conference, which is an official body composed of representatives from a given county and the cities therein.

Transit service can now be financed by a household utility tax, a business and occupation tax or a retail sales tax at the rate of .1, .2, or .3 of one percent. The household utility tax and business and occupation tax can be used in combination with each other, the sales tax must be used alone. Imposition of any of these taxes requires a vote of the people. Receipts from the business tax and the utility tax may be matched by receipts from the state's motor vehicle excise tax.

The approval of this legislation provides Clark County with a variety of means of organizing financing and implementing transit service. The Task Force makes no specific recommendations on how

the service should be organized or funded. However, a transit system which would provide reasonable degrees of relief in the corridor needs a feeder system which is carefully coordinated with the operation of corridor service and which can serve populous areas with the urban service boundary. Development of a new system should carefully consider these factors.

The laws of both Oregon and Washington permit public transit agencies to contract with other transit agencies, public or private, to provide service. Therefore, it is possible for a Washington agency to contract with an Oregon system, such as Tri-Met, to provide all or part of its service. If a service contract is developed, it would be necessary for Washington agencies to subsidize any operating losses incurred by Tri-Met. Possible service arrangements are noted in the technical summary (see figure III-5).

A contractual service arrangement with Tri-Met has particular applicability in the I-5 Corridor between Vancouver and Portland. Service would be operated in an area not totally within the boundaries of any single transit district, city, or county or benefit area. This arrangement would permit an even distribution of the service costs on the basis of benefits received.

To assist in the implementation of a transit system in Clark County, the I-5 project has developed a transit planning information base for Clark County. The project staff's work has centered in four areas including service criteria, identifying types of service which may be operated in Clark County, estimating system operation and capital costs, and noting sources of and estimated revenue. Specific bus routings or identification of a service area have been avoided as these considerations are policy decisions which will be made at the County's Public Transportation Improvement Conference and the resulting planning efforts.

Planning efforts have identified six types of transit service which can be operated in Clark County. These included Arterial Service, Local Service, Intercity Service, Corridor Service, Shuttles and Special Transportation.

Arterial service is designed to operate on arterial highways. This service provides fast service at reasonably frequent intervals from residential communities and neighborhoods to the Vancouver central business district. Extra buses are provided during the peak periods to handle the demand created by commuters traveling to and from work.

Local service offers transportation to people dependant on the transit system for their travel needs. Local service emphasizes coverage and provides transportation to a variety of destinations. Dial-a-bus systems or other forms of "demand responsive transit" may be used to provide "door to door" service.

Intercity service provides transportation between the similar cities of Clark County and the Vancouver CBD. Service is scheduled according to need and may be operated on an hourly, daily or even a weekly basis.

Corridor service offers transportation between the downtown areas of Vancouver and Portland. The purpose of corridor service is to provide a fast, inexpensive alternative to automobile travel in the Interstate Bridge Corridor, encouraging commuters to use transit. Corridor service should utilize exclusive lanes described in the latter part of this report.

Shuttles are designed to transport workers to concentrated employment centers where there is a common starting and ending time. Factory shift changes, for example, can be effectively served by shuttles.

Special Transportation serves people unable, due to physical handicaps, to drive automobiles or board conventional transit buses. Provision of special transportation services is required by federal regulations and encouraged by CRAG policies.

The system will incur a number of capital expenditures in order to provide a high level of service. New buses must be purchased, a maintenance facility must be constructed and system amenities such as transit stations and bus shelters should be provided.

Operating expenses include those expenditures necessary to operate, service and administer the transit system. Current operating expenses of existing systems indicate that an operating cost of between \$14 and \$18 per bus hour* should be expected.

The service categories have been combined in two scenarios to illustrate examples of the type of service which could be provided for a given level of funding. Scenario One illustrates the moderate level of service within the Vancouver urban area with connections to Camas and Washougal. Operating expenses are anticipated to run approximately \$1.1 million per year and capital expenditures are estimated at \$2.2 million*. Scenario Two portrays a county-wide transit system for about \$2.2 million in operating expenses and a \$6.6 million* outlay. These scenarios are not recommendations but were developed as illustrations of the kind of service that is available for a particular cost. There are any number of detailed service possibilities between these two alternatives.

* The cost of operating one bus for one hour

* This represents the total capital costs. Federal funding can be expected to pay 80% of the capital cost. Therefore, the local share is estimated at \$440,000 for Scenario One and \$1.3 million for Scenario Two.

PRIORITY TREATMENT

To encourage commuters to make more efficient use of vehicles traveling the I-5 corridor and, therefore, increase the "passenger capacity" of the freeway, it has been recommended that incentives be provided to persons using transit and carpools. These incentives are designed so that persons using buses and carpools can bypass traffic congestion and arrive at their destinations more quickly than if they had traveled alone. The task force studied two kinds of priority treatment including an exclusive lane for HOV's (High Occupancy Vehicles - Buses and Carpools) and ramp control. The exclusive lane is a freeway lane on which use is restricted to HOV's. Ramp control is a method by which entrance to the freeway is restricted during those times when the freeway becomes congested. HOV's are permitted to bypass the control device without restriction. By encouraging the more efficient use of vehicles, ramp control and exclusive lanes will help reduce the overall level of traffic congestion on the affected highway. The technical analysis indicated that an express lane would double the number of carpools and transit ridership using the I-5 freeway. Increasing the number of carpools and transit usage, in turn, reduces the number of autos traveling on the freeway, thus reducing congestion.

An exclusive lane on the I-5 freeway could be provided with only minor reconstruction by using narrower lanes and a portion of the existing shoulder. The present highway shoulders could be reduced and the existing lanes narrowed slightly (to about 11') to provide another lane. The additional lane would be reserved for buses and carpools.

The cost and benefits of a closed circuit monitoring system should be studied. Such a system could be useful, not only in detecting violators, but also in helping to spot traffic accidents and other conditions which disrupt freeway operations.

An analysis was conducted which showed that congestion was significantly reduced with the implementation of an exclusive lane, ramp control and other improvements. In addition, improvements were realized in air pollution, energy conservation and safety. The greatest improvement occurred in the evening peak period.

The improvements recommended herein will significantly augment the operations of the traffic flow. This is illustrated by detailed study material contained in the Technical Analysis.

While provision of immediate relief is the major focus of the Interstate Bridge Corridor Project, long range considerations have also been studied. The completion of I-205 shortly after 1980, is expected to provide a degree of relief in the interstate bridge corridor. However, continued development in the Rivergate industrial area as well as in Clark County, will cause high traffic volumes on the I-5 freeway. By 1990 the traffic volumes in I-5 are expected to equal or exceed present day counts. In order to avoid traffic conditions even more congested than those currently experienced on the freeway, high occupancy vehicles (HOVs) will have to play a major role in increasing the people moving capacity of the interstate bridge corridor. Estimates prepared by the Governors Task Force on Transportation show that bus lanes operating on the freeway and on Union Avenue could carry approximately 30,000 daily riders. Transit operating on the freeway could maintain one minute headways during the peak periods, five minute headways during the daytime off peak and 30 minutes for evening and night service. Provision of bus lanes within the existing right-of-way would enable the planning staffs of ODOT, Tri-Met and WSHD to study the impacts of the low capital intensive HOV priority system prior to the development of a more permanent busway. In addition, the bus lanes would provide a means of gradually upgrading transit service in the corridor. Thus, ridership could be increased to a point where the development of the capital intensive busway would be justified.

47

THE CITY OF
PORTLAND



OREGON

OFFICE OF
THE MAYOR

NEIL GOLDSCHMIDT
MAYOR

1220 S. W. FIFTH AVE.
PORTLAND, OR. 97204
503 248 - 4120

2 March 1976

MEMORANDUM

TO: City Auditor

FROM: Neil Goldschmidt, Mayor

SUBJECT: Attached Resolution

The Commissioner of Finance and Administration transmits herewith the report of the Bureau of Planning dated 3/2/76 endorsing recommendations to increase capacity of Interstate Bridge Corridor.

WSD:bn
Attachment: a/s

3/3/76
Not filed
per decision of Mayor on
advice of Comm. Granger, Clark Co.
- Reintroduced in June '76

RESOLUTION

WHEREAS, the Council of the City of Portland regards the Interstate Freeway, I-5, through the north section of the City as extremely important to the City not only as a major regional transportation corridor but also as access to Swan Island, to North Portland industrial areas including Rivergate and to adjacent neighborhoods; and

WHEREAS, this freeway is extremely crowded now and this condition will increase even after an I-205 bridge and freeway are in being; and

WHEREAS, the City of Portland joined with several other agencies under the auspices of the Columbia Region Association of Governments (CRAG) and funded a special study known as the Interstate Bridge Corridor Project to determine ways to increase the capacity of this corridor in the near future and the CRAG Board of Directors has adopted the recommendations of the report.

WHEREAS, the Council has received the final report of this study dated November 1975 attached hereto as Exhibit "A"; NOW THEREFORE BE IT

RESOLVED, that the Council of the City of Portland endorses the recommendations of that report and urges the responsible agencies to implement these recommendations promptly; and BE IT FURTHER

RESOLVED, that the Council will extend its full cooperation to the implementing agencies.

Adopted by the Council

Auditor of the City of Portland

Mayor Goldschmidt

WSD:bn

3/2/76

RESOLUTION

A Resolution endorsing recommendations
to increase capacity of Interstate
Bridge Corridor.

RESOLUTION

WHEREAS, the Council of the City of Portland regards the Interstate Freeway, I-5, through the north section of the City as extremely important to the City not only as a major regional transportation corridor but also as access to Swan Island, to North Portland industrial areas including Rivergate and to adjacent neighborhoods; and

WHEREAS, this freeway is extremely crowded now and this condition will increase even after an I-205 bridge and freeway are in being; and

WHEREAS, the City of Portland joined with several other agencies under the auspices of the Columbia Region Association of Governments (CRAG) and funded a special study known as the Interstate Bridge Corridor Project to determine ways to increase the capacity of this corridor in the near future and the CRAG Board of Directors has adopted the recommendations of the report.

WHEREAS, the Council has received the final report of this study dated November 1975 attached hereto as Exhibit "A"; NOW THEREFORE BE IT

RESOLVED, that the Council of the City of Portland endorses the recommendations of that report and urges the responsible agencies to implement these recommendations promptly; and BE IT FURTHER

RESOLVED, that the Council will extend its full cooperation to the implementing agencies.

Adopted by the Council

Auditor of the City of Portland

Mayor Goldschmidt

WSD:bn

3/2/76

THE CITY OF
PORTLAND



OREGON

OFFICE OF
PLANNING AND DEVELOPMENT

GARY E. STOUT
ADMINISTRATOR

BUREAU OF
PLANNING

ERNEST R. BONNER
DIRECTOR

424 S.W. MAIN STREET
PORTLAND, OR. 97204

PLANNING
503 248-4253

ZONING
503 248-4250

26 February 1976

MEMORANDUM

TO: Neil Goldschmidt, Mayor
FROM: Bill Dirker, Transportation Coordinator *D*
SUBJECT: Interstate Bridge Corridor Report

CRAG Board will act on Thursday, February 26th on this report (agenda item V.D.1). They will be asked to adopt the recommendations (Attachment I) including an additional recommendation that the project task force continue (Attachment II).

It seems appropriate for the CRAG Board to adopt these recommendations and ask the task force for a progress report within 1 or 2 months. Some informal status report may be asked of Tri-Met, OSHD and Vancouver at this meeting to stress the Board's interest and concern.

Recommendation No. 2 is that Tri-Met purchase the Vancouver-Portland Bus Company. The TIP, as revised 2/26/76, still includes \$250,000 for FY '76 and \$750,000 for FY '77 by Tri-Met for this purpose. Inasmuch as they did not revise this, it appears to still be their intent to accomplish this (Attachment III).

Commissioner Granger will appear at the Board meeting to present the report. I suggest you support strong continuing action on this matter. Otherwise it runs the risk of being put aside as resources are allocated to other activities.

WSD:bn

RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Clark County, Vancouver and Portland.
2. Tri-Met should purchase Vancouver-Portland Bus Company immediately.
3. As the agency responsible for the regional carpool program, Tri-Met should expand aggressive carpool marketing efforts to Clark County.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows (figure 5):
 - A. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - B. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - C. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with the Columbia Slough Bridge to an eight lane structure.
6. The Oregon Department of Transportation consider installation of traffic signals at the termini's of the I-5 ramps at Portland Boulevard.

These recommendations should assist in the attainment of certain regional transportation goals such as conservation of fuel, improved safety, reduction of traffic congestion and improvement of regional air quality. Certain capital and operating costs will be incurred in the implementation of these recommendations.

These costs could be funded as follows:

Transit service in Clark County - Household utility tax, UMTA operating funds and state motor vehicle excise tax matching funds (if available).

Corridor service - UMTA operating funds: priority treatment.

Slough Bridge and signal - Interstate funds.

Carpool marketing - Federal Aid Urban System Funds

Action on some of these recommendations has already been taken. A public transportation improvement conference has been held in

ATTACHMENT I

mary of these recommendations is contained in the next section. This final report deals with capital intensive improvements to permanently alleviate the congested traffic conditions in the corridor. In particular, these improvements include upgrading of the transit service in the corridor and implementation of a system of priority treatment for high occupancy vehicles (buses and carpools) on Interstate 5.

Bill

COLUMBIA REGION ASSOCIATION of GOVERNMENTS

CRAG

527 S.W. HALL STREET
PORTLAND, OREGON 97201

(503) 221-1646

RECEIVED
JAN 28 1976

City of Portland
Bureau of Planning

MEMORANDUM

January 22, 1976

TO: Interstate Bridge Corridor Project Task Force
FROM: Project Staff
SUBJECT: Correction to Minutes of December 30, 1975 Meeting

Item No. 6 of the Minutes, as transmitted on January 9 was in error. All of Item 6 should be deleted with the following substituted in its place.

6. Continuation of the Project Management Board.

A motion was passed to recommend to the CRAG Board of Directors that the CRAG Board make a determination to retain the Interstate Bridge Corridor Project Management Board to (1) oversee and monitor the implementation of recommendations contained in the Interstate Bridge Corridor Report and (2) report to the Board of Directors on the progress made.

RB:nf
4:1

ATTACHMENT II

RICE, EXECUTIVE DIRECTOR

AR MEMBERS

AMAS COUNTY

arlow
anby
stacada
ladstone
appy Valley
ohnson City
ake Oswego
ilwaukie
olalla
regon City
ivergrove
andy
est Linn
ilsonville

OMAH COUNTY

irview
resham
aywood Park
ortland
outdale
ood Village

VGTON COUNTY

anks
eaverton
ornellius
rham
rest Grove
aston
ilsboro
ng City
orth Plains
erwood
gard
alatin

ATE MEMBERS

COUNTY

incouver
ashougai

ia City
ose
ns
t of Portland
le of Oregon

Capital Projects	FY 76	FY 77	FY 78	FY 79	FY 80	TOTAL
Transit Mall	\$4,438,000	\$6,200,000	\$4,619,000			\$15,257,000
Purchase 100 Buses	6,300,000				\$7,700,000	14,000,000
Shop Remodeling/Modernization	6,705,000	1,345,000				8,050,000
Operating Substation (Included in FAUS Projects)	(2,215,000)		1,800,000			1,800,000
Bus Passenger Shelters	1,176,000					1,176,000
Suburban Transit Stations		5,000,000	5,000,000	\$10,000,000	5,000,000	25,000,000
Elderly & Handicapped Equipment	620,000					620,000
Bus Replacement Allowance		2,700,000	2,850,000	3,000,000	3,150,000	11,700,000
25 Shuttle Buses	-	1,000,000				1,000,000
Rose City Transit Acquisition	4,340,000					4,340,000
Vancouver	250,000	750,000				1,000,000
Misc. Capital Improvements (HOV Buses Included in FAUS Projects)	1,073,500 (300,000)	200,000	100,000	100,000	100,000	1,273,500
Transit Operating Assistance, (UMTA Portion Only)	4,427,000	3,598,000	4,290,000	4,705,000	4,982,000	22,002,000
TOTAL	29,029,500	20,793,000	18,659,000	17,805,000	20,932,000	107,218,500

Table III-1 Tri-Met Five-Year Transit Improvement Program

ATTACHMENT III



THE CITY OF
PORTLAND



OREGON

OFFICE OF
PLANNING AND DEVELOPMENT
GARY E. STOUT
ADMINISTRATOR

BUREAU OF
PLANNING
ERNEST R. BONNER
DIRECTOR

424 S.W. MAIN STREET
PORTLAND, OR. 97204

PLANNING
503 248-4253

ZONING
503 248-4250

MEMORANDUM

May 11, 1976

TO: GARY STOUT
FROM: BILL DIRKER
SUBJECT: I-5 CORRIDOR REPORT

Per Ernie Bonner, I suggest you put this subject on the Mayor's agenda.

CRAG completed this study early in this year and were scheduled to present it to the City Council in March. Tri-Met requested we defer this presentation until after the May 25th election as it may adversely affect support for their auto license fee, Measure No. 26-1. I discussed this with the Mayor and he agreed on 3/3/76.

We should now put it on the Council regular agenda. CRAG staff will make the presentation. Commissioner Grainger, Chairman of the Task Force, will conduct the presentation. It should take no more than one hour. Good press coverage is desirable.

Major recommendations are: 1) Tri-Met acquire Vancouver-Portland Bus Company and extend service to Vancouver. 2) Clark County establish intergrated public transit system and interface with Tri-Met. 3) OSHD begin preliminary engineering on a priority lane on I-5.

Urging and pressure is needed to cause all this to happen. This presentation, followed by a Resolution of endorsement and request for action, will be important.

DB:ce

cc: Ernie Bonner



COLUMBIA REGION ASSOCIATION of GOVERNMENTS

527 S. W. HALL STREET
PORTLAND, OREGON 97201

(503) 221-1646

LARRY RICE, EXECUTIVE DIRECTOR

REGULAR MEMBERS

CLACKAMAS COUNTY

Barlow
Canby
Estacada
Gladstone
Happy Valley
Johnson City
Lake Oswego
Milwaukie
Molalla
Oregon City
Rivergrove
Sandy
West Linn
Wilsonville

MULTNOMAH COUNTY

Fairview
Gresham
Maywood Park
Portland
Troutdale
Wood Village

WASHINGTON COUNTY

Banks
Beaverton
Cornelius
Durham
Forest Grove
Gaston
Hillsboro
King City
North Plains
Sherwood
Tigard
Tualatin

ASSOCIATE MEMBERS

CLARK COUNTY

Vancouver
Washougal

Columbia City
Scappoose
St. Helens
The Port of Portland
Tri-Met
The State of Oregon

March 26, 1976

RECEIVED
MAR 30 1976

City of Portland
Bureau of Planning

TO THE MEMBERS OF THE PROJECT MANAGEMENT TASK
FORCE FOR THE INTERSTATE BRIDGE CORRIDOR STUDY:

The Board of Directors of CRAG has officially received the technical analysis of the Interstate Bridge Corridor Study and has adopted the recommendations contained in the executive summary of that Study. The Study represents a considerable amount of work on the part of yourselves, the citizens who have provided advice, and the staff and technical representatives of the various participating agencies.

An additional recommendaton has been made that the Task Force continue its existence in order to monitor progress on implementing the various recommendations and to report at intervals to the Board on that progress. The Board approved that continuation, and this letter is to notify you of that approval. Mr. Dick Granger of Clark County will continue to direct the Task Force.

I thank you for your help and participation in this important study and look forward to your continued surveillance of the Interstate Bridge Corridor.

Yours truly,

Larry Rice
Executive Director

LR:nf
5:7

1/22/76

IS Consider

1. Review & approve Feb. Meeting
2. History - Began late '73, joint effort of
Proj. Mgmt Board - Granger, Chairman.
Advisory Committee & CMAA Tech. Staff.
~~Prop Phase I Report - Contact Improvements.~~
~~Final - Nov.~~
3. Recommendation - EXEC. Summary - yellow P 4-5
Results. - last 4 pages

Essentially:

- * I Integrated Public System - Transit - Clark G.
- II Tax - Most Understandable Interest Series TRIMAS
- III Priority HOV Lanes - Brady, Smith. ODOT
- IV Proj. Mgmt Board - continue Monitor, Report

4. Recommendations are self-reinforcing.

P. 40 Shows increases & volume, fees
P. 63 Shows factors on which based - 10 bec. e.g.
P. 64 Shows benefits to public

PM - Nathaniel - Nov 29 minutes

Austin 17

Bus. Capital \$ 8

@ Columbia J. Langt - Nov 6000 PMH - 7000

241

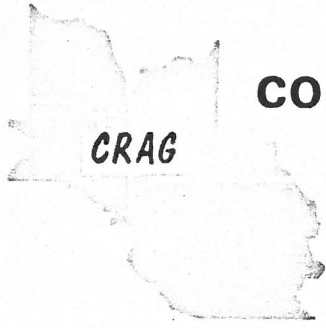
2000

1894

Ben. Franklin - Nov 24 1844

720

Bill



COLUMBIA REGION ASSOCIATION of GOVERNMENTS

CRAG

527 S. W. HALL STREET
PORTLAND, OREGON 97201

(503) 221-1646

RECEIVED
JAN 28 1976

City of Portland
Bureau of Planning

LARRY RICE, EXECUTIVE DIRECTOR

REGULAR MEMBERS

CLACKAMAS COUNTY

Barlow
Canby
Estacada
Gladstone
Happy Valley
Johnson City
Lake Oswego
Milwaukie
Molalla
Oregon City
Rivergrove
Sandy
West Linn
Wilsonville

MULTNOMAH COUNTY

Fairview
Gresham
Maywood Park
Portland
Troutdale
Wood Village

WASHINGTON COUNTY

Banks
Beaverton
Cornelius
Durham
Forest Grove
Gaston
Hillsboro
King City
North Plains
Sherwood
Tigard
Tualatin

ASSOCIATE MEMBERS

CLARK COUNTY

Vancouver
Washougal

Columbia City
Scappoose
St. Helens
The Port of Portland
Tri-Met
The State of Oregon

MEMORANDUM

January 22, 1976

TO: Interstate Bridge Corridor Project Task Force
FROM: Project Staff
SUBJECT: Correction to Minutes of December 30, 1975 Meeting

Item No. 6 of the Minutes, as transmitted on January 9 was in error. All of Item 6 should be deleted with the following substituted in its place.

6. Continuation of the Project Management Board.

A motion was passed to recommend to the CRAG Board of Directors that the CRAG Board make a determination to retain the Interstate Bridge Corridor Project Management Board to (1) oversee and monitor the implementation of recommendations contained in the Interstate Bridge Corridor Report and (2) report to the Board of Directors on the progress made.

RB:nf
4:1

THE CITY OF
PORTLAND



OREGON

OFFICE OF
PLANNING AND DEVELOPMENT

GARY E. STOUT
ADMINISTRATOR

BUREAU OF
PLANNING

ERNEST R. BONNER
DIRECTOR

424 S.W. MAIN STREET
PORTLAND, OR. 97204

PLANNING
503 248-4253

ZONING
503 248-4250

January 16, 1976

Commissioner Richard Granger
Clark County Court House
Vancouver, Washington

Dear Dick:

Upon reviewing the minutes of the Interstate Bridge Corridor meeting of December 30th, I wonder if Item 6 "Continuation of the Task Force" actually reflects what we recommended. My recollection was Task Force was going to recommend to the Board of Directors that the Board make a determination that the Task Force should remain in being to monitor implementation of the recommendations. The way the minutes read it would appear to leave it up to the Board's initiative to act rather than respond to a recommendation. If you agree with this recollection I wonder if you could ask Larry Rice to include that recommendation in whatever Resolution he prepares to accompany the final report when it's submitted to the Board.

Very truly yours,

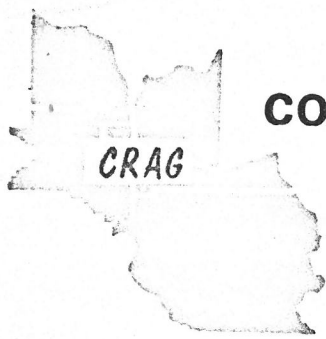
W. S. DIRKER
TRANSPORTATION COORDINATOR

WSD:ce

cc: Bob Bothman

Office of Planning
and Development
Office of the Mayor
Chronological copy
File copy

Bill



COLUMBIA REGION ASSOCIATION of GOVERNMENTS

527 S. W. HALL STREET
PORTLAND, OREGON 97201

(503) 221-1646

LARRY RICE, EXECUTIVE DIRECTOR

REGULAR MEMBERS

CLACKAMAS COUNTY

Barlow
Canby
Estacada
Gladstone
Happy Valley
Johnson City
Lake Oswego
Milwaukie
Molalla
Oregon City
Rivergrove
Sandy
West Linn
Wilsonville

MULTNOMAH COUNTY

Fairview
Gresham
Maywood Park
Portland
Troutdale
Wood Village

WASHINGTON COUNTY

Banks
Beaverton
Cornelius
Durham
Forest Grove
Gaston
Hillsboro
King City
North Plains
Sherwood
Tigard
Tualatin

ASSOCIATE MEMBERS

CLARK COUNTY

Camas
Vancouver

Columbia City
Scappoose
St. Helens
The Port of Portland
Tri-Met
The State of Oregon

MEMORANDUM

January 9, 1976

TO: Interstate Bridge Corridor Project
Task Force

FROM: Project Staff

SUBJECT: Minutes of December 30, 1975 Meeting

RECEIVED
JAN

City of Portland
Bureau of Planning

THOSE PRESENT

Dick Granger
Robert Bothman
Pierre Henriksen
Bill Dirker
Lila W. Trammell
Dick Etherington
John Krawczyk
Roger Budke
Larry Lange
(plus two other guests)

REPRESENTING

Clark County
ODOT
Washington State Highway Dept.
City of Portland
Camas City Council
CRAG
CRAG
CRAG
The Columbian

1. Called to order.

Commissioner Granger called the meeting to order.

2. Status Report.

John Krawczyk reported that a public transportation improvement conference had been held in Clark County. The participants supported an intergovernmental contract as a means of providing transit service outside Vancouver.

3. Review of Project Reports.

The Draft Executive Summary and Technical Analysis reports for the Interstate Bridge corridor project were presented for consideration.

4. Suggested Draft Report changes.

Bill Dirker suggested the following corrections and modifications to the reports:

- a. Indicate "Draft" on the cover.
- b. List agencies and interest groups represented by the Task Force and Citizen Advisory Committee members listed on the inside cover.
- c. Include a list of the other alternatives considered but not recommended. This would make the Technical Analysis report stand on its own without reference to the first report of this project.
- d. Add to the recommendations that Tri-Met, as the agency responsible for the regional carpool program, expand aggressive carpool marketing efforts to Clark County.
- e. Indicate the trip time from Portland to Vancouver with and without the recommended improvements.
- f. Add the source and the amounts of funding for the project study, with particular emphasis on the local funds expended prior to federal participation.
- g. Change the cover photo to a ground level, telephoto shot so that the current congestion on the Interstate Bridge Corridor is more graphically depicted.
- h. Add a table of contents to both reports.

Due to accounting procedures, recommendation "f" above was revised to add just the local agencies contributing funds to the project. In addition, the staff was directed to provide the Task Force an accounting of expenditures when final records become available.

Bob Bothman recommended the following modifications to the recommendations and the reports:

- a. Recommendation 3 - change "install" to "proceed with installation".

- b. Recommendation 4 - change "reconstruct" to "proceed with reconstruction".
- c. Recommendation 5 - change from "The Oregon Department of Transportation to install a traffic signal at the terminus of the north-bound I-5 offramps at Portland Boulevard" to "The Oregon Department of Transportation to consider installation of traffic signals at the termini of the I-5 ramps at Portland Boulevard".

5. Report approval.

A motion was passed to approve both Interstate Bridge Corridor reports, including the suggested changes, and to forward the reports on to the TTAC and the CRAG Board for approval.

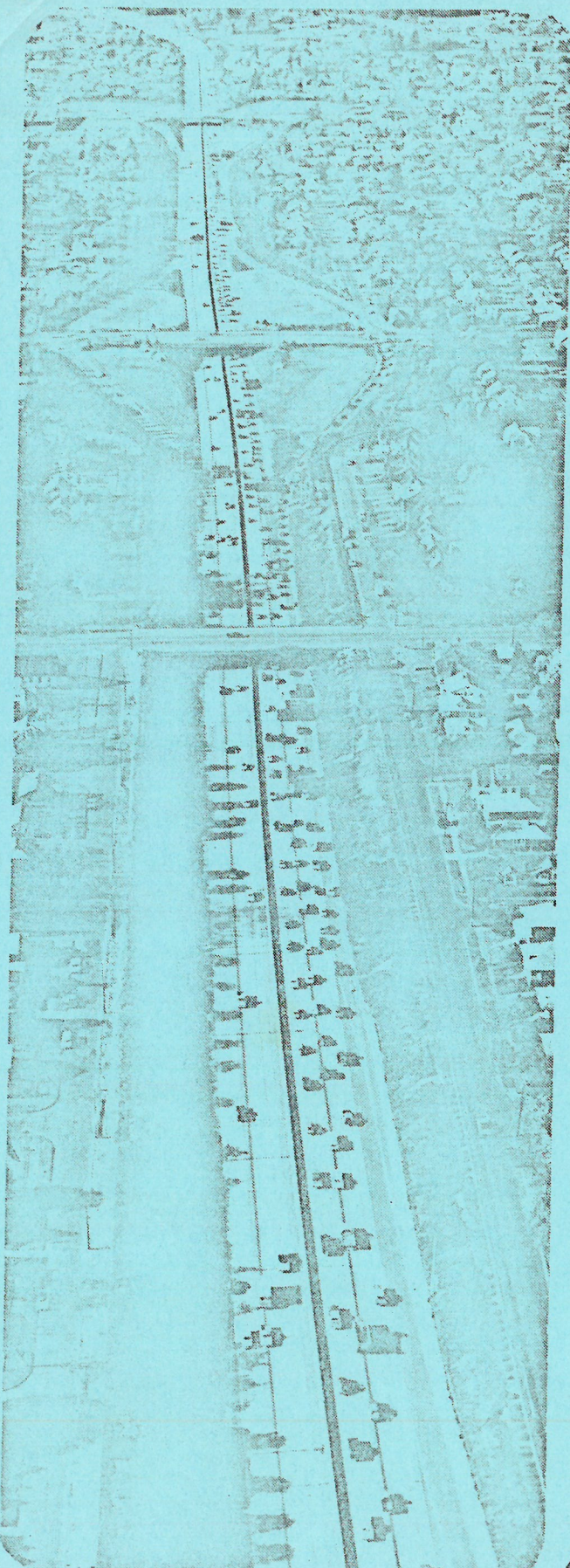
6. Continuation of the Task Force.

The subject of continuing the Task Force to monitor the implementation of the recommendations was discussed. It was determined that continuation was a matter for the CRAG Board to decide.

7. The meeting was adjourned.

NOTE: On January 9, 1976, the TTAC met and approved the Task Force Reports and recommended transmittal of the reports to the CRAG Board for approval.

RB:nf
5:2-4

An aerial photograph showing a long, straight bridge corridor crossing a body of water. The corridor is flanked by land with some buildings and vegetation. The image is framed by a thin black border.

INTERSTATE BRIDGE CORRIDOR PROJECT

DRAFT

FINAL REPORT EXECUTIVE SUMMARY

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

November 1975

COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS GENERAL ASSEMBLY

REGULAR MEMBERS

Clackamas County

Barlow
Canby
Estacada
Gladstone
Happy Valley
Johnson City
Lake Oswego
Milwaukie
Molalla
Oregon City
Rivergrove
Sandy
West Linn
Wilsonville

Multnomah County

Fairview
Gresham
Maywood Park
Portland
Troutdale
Wood Village

Washington County

Banks
Beaverton
Cornelius
Durham
Forest Grove
Gaston
Hillsboro
King City
North Plains
Sherwood
Tigard
Tualatin

ASSOCIATE MEMBERS

Clark County

Camas
Vancouver

Columbia City

Scappoose
St. Helens
The Port of Portland
Tri-Met
The State of Oregon

COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS BOARD OF DIRECTORS

CITY OF PORTLAND

MAYOR NEIL GOLDSCHMIDT

MULTNOMAH COUNTY

COMMISSIONER MEL GORDON

CITIES OF MULTNOMAH COUNTY

COUNCILMAN CHARLES BECKER

WASHINGTON COUNTY

COMMISSIONER ROD ROTH

CITIES OF WASHINGTON COUNTY

MAYOR DAVID MCBRIDE

CLACKAMAS COUNTY

COMMISSIONER STAN SKOKO

CITIES OF CLACKAMAS COUNTY

MAYOR PHIL BALSIGER-CHAIRMAN

CLARK COUNTY

COMMISSIONER DEAN COLE

CITIES OF CLARK COUNTY

MAYOR JIM GALLAGHER

CITIES OF COLUMBIA COUNTY

COUNCILMAN STAN PINTARICH

PORT OF PORTLAND

LLOYD ANDERSON, DIRECTOR

TRI-MET

GERARD DRUMMOND, PRESIDENT OF
THE BOARD

STATE OF OREGON

GEORGE BALDWIN, DIRECTOR
OREGON DEPT. OF TRANSPORTATION

STATE OF WASHINGTON

JULIA BULTER HANSEN, EX-OFFICIO
WASHINGTON STATE HIGHWAY
COMMISSION

*The preparation of this report has been
financed in part by funds from the United
States Department of Transportation, Urban
Mass Transportation Administration, under
the Urban Mass Transportation Act of 1964
as amended; and by funds from the Oregon
Department of Transportation, the Washington
State Department of Highways, the City of
Vancouver, Clark County, the City of Portland,
Multnomah County and Tri-Met.*

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

TRANSPORTATION TECHNICAL ADVISORY COMMITTEE

Winston Kurth, Clackamas County	Robert Royer, Ore. State Hwy. Div.
J. Wayne Daigle, Cities of Clackamas Co.	Pieree Henrichsen, Wash. State Dept of Highways
Jan Rosholt, Clark County	Richard Arenz, Fed. Hwy. Admin.
Eric Oien, Cities of Clark County	Ken Johnsen, Port of Portland
Dorothy Churchill, Cities of Columbia Co.	Bill Hall, Tri-Met
Bebe Rucker, Multnomah County	Mark Beisse, Federal Aviation Admin
Kent Cox, Cities of Multnomah County	F. William Fort, Urban Mass Transit Administration
John Crockett, Washington County	
Dave Bryan, Cities of Washington Co.	

PROJECT TASK FORCE

Commissioner Dick Granger, Chairman, Clark County	Ed Wagner, Tri-Met
Patricia Blackwell, Vice-Chairperson, Citizen Advisory Committee	Robert Bothman, Oregon State Highway Division
Councilman Dick Pokornowski, City of Vancouver	Pieree Henrichsen, Wash. State Department of Highways
Jerry Peck, Owner, V-P Bus Company	George Palmer, Multnomah County
	William S. Dirker, City of Portland

CITIZEN'S ADVISORY COMMITTEE

Patricia Blackwell, Chairperson, League of Woman Voters	Ray Brewer, Union Ave. Boosters
Frank Barlow, Burlington Northern Railroad	Carol Hansen, American Assoc. of University Woman
Julius Gaussoin, Silver Eagle Trucking	Mary Legry, League of Woman Voters
Don Hughes, Camas Citizen	John Martin, Citizen
Howard Martin, Camas Citizen	John Pierce, Vancouver Chamber of Commerce
Tim McNeil, Citizen	Susan Regan, League of Woman Voters
Jim Howell, Sensible Trans. Options for People	Vern Rifer, Oregon Environmental Council
Lynn Hatcher, Citizen	Betsy Strong, Womens Highway Safety Leaders
Richard Swennes, Convoy Company	
Ben Witt, Citizen	

INTERSTATE BRIDGE CORRIDOR PROJECT

VICINITY MAP

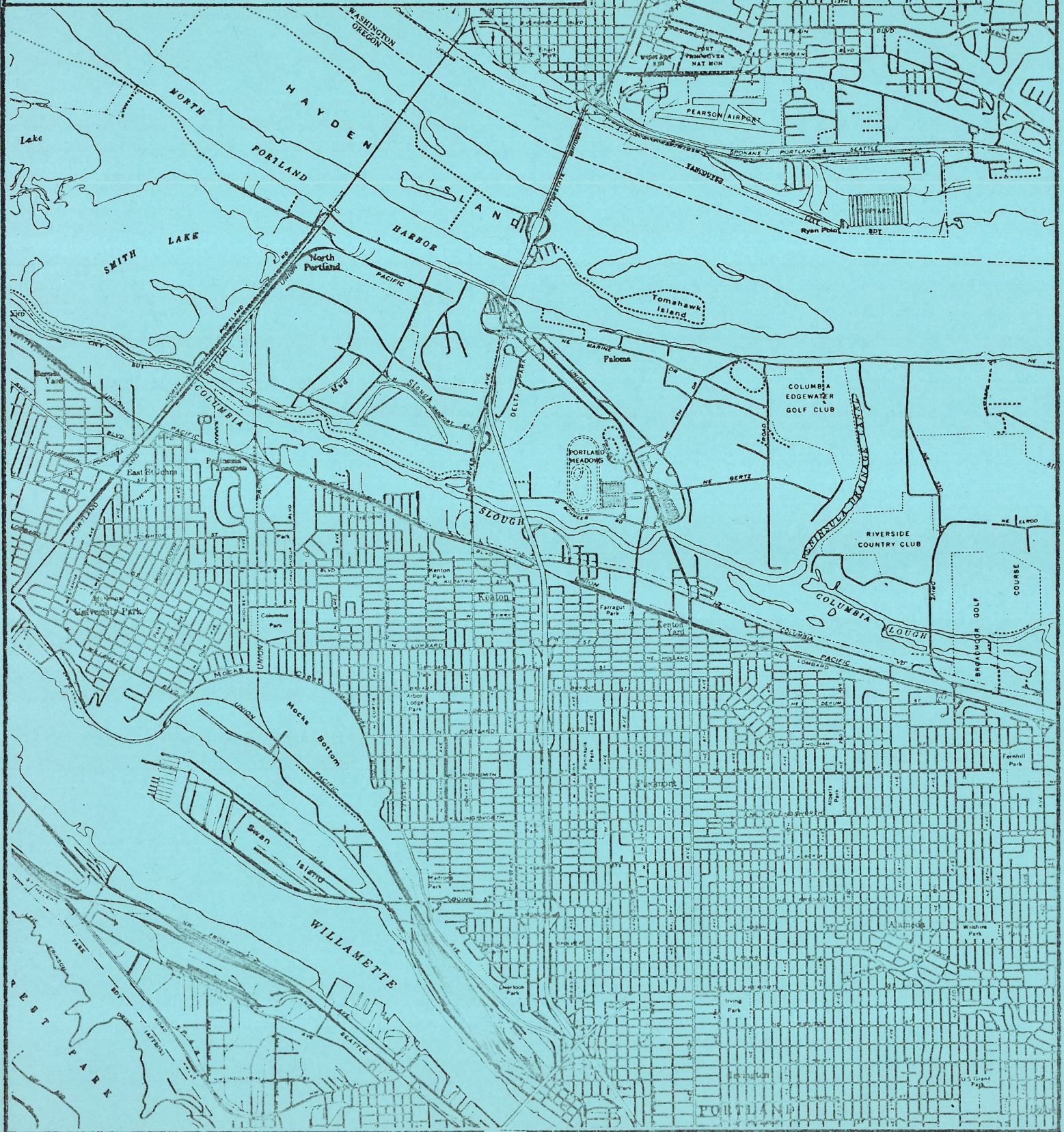
Columbia Region Association of Governments

July, 1975

Figure 1



Scale:
1" = 4000 ft.



INTRODUCTION

This executive summary has been prepared to convey essential information obtained by the Interstate Bridge Corridor Project as well as the project's recommendations. Detailed information regarding findings and background material is contained in the Technical Analysis of the final report.

It is anticipated that decision makers and other interested parties will find this summary useful in obtaining a general understanding about the critical transportation problems in the corridor as well as the means which may be undertaken to address these problems.

The Interstate Bridge Corridor project was formed in late 1973 to address the problems of severe traffic congestion that had become a frequent occurrence on the I-5 Freeway between Vancouver and Portland. Since the corridor affects a number of jurisdictions including two states, two cities and two counties, a special interagency project was formed to analyze the conditions and present recommendations for improvement. In addition, four transit operators provide service within or near this transportation corridor. The project was designed to address the time period before I-205 becomes operational.

Traffic congestion in the Interstate Bridge corridor has become a critical problem for several reasons. First, I-5 is the major north-south Interstate Highway on the Pacific Coast. Substantial volumes of interregional traffic are carried by this highway. Second, this freeway is an important commuter route within the Portland-Vancouver Metropolitan area; each day, thousands of commuters use I-5 to reach their places of work. Finally, I-5 is important because it represents the only highway crossing of the Columbia River in the Portland Metropolitan area. People traveling between Clark County, Washington and the remainder of the metropolitan area have no choice except to use the I-5 corridor for travel between the two states. Traffic congestion in the corridor disrupts commercial, social and recreational travel in the urban area, as well as the north or south-bound interregional travel.

Traffic conditions in the corridor were examined during phase one of the project. The Phase I Report identified a number of low-cost, short term improvements which may be implemented quickly to provide a degree of immediate relief in the corridor. A sum-

mary of these recommendations is contained in the next section. This final report deals with capital intensive improvements to permanently alleviate the congested traffic conditions in the corridor. In particular, these improvements include upgrading of the transit service in the corridor and implementation of a system of priority treatment for high occupancy vehicles (buses and carpools) on Interstate 5.

RECOMMENDATIONS

This Plan is ~~substantive~~

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Clark County, Vancouver and Portland.
2. Tri-Met should purchase Vancouver-Portland Bus Company immediately.
3. As the agency responsible for the regional carpool program, Tri-Met should expand aggressive carpool marketing efforts to Clark County.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows (figure 5):
 - A. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - B. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - C. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with the Columbia Slough Bridge to an eight lane structure.
6. The Oregon Department of Transportation consider installation of traffic signals at the termini's of the I-5 ramps at Portland Boulevard.

These recommendations should assist in the attainment of certain regional transportation goals such as conservation of fuel, improved safety, reduction of traffic congestion and improvement of regional air quality. Certain capital and operating costs will be incurred in the implementation of these recommendations.

These costs could be funded as follows:

Transit service in Clark County - Household utility tax, UMTA operating funds and state motor vehicle excise tax matching funds (if available).

Corridor service - UMTA operating funds: priority treatment.

Slough Bridge and signal - Interstate funds.

Carpool marketing - Federal Aid Urban System Funds

Action on some of these recommendations has already been taken. A public transportation improvement conference has been held in

Vancouver. It concluded that transit in the county should be provided through inter-governmental contracts between the City of Vancouver, Clark County and other cities interested in obtaining transit service.

The City of Vancouver and Clark County have approved a joint resolution supporting public acquisition of Vancouver-Portland Bus Company. Tri-Met is currently studying the legal and financial aspects of acquisition and operation of this line.

The City of Vancouver has agreed to purchase ten new diesel buses. The purchase of these buses is essential to the implementation of any city-county agreement to provide transit service outside the city limits of Vancouver.

PHASE 1 FINDINGS AND RECOMMENDATIONS

Phase I of the I-5 project included extensive study of traffic conditions in the I-5 corridor. A number of traffic operation problem areas were identified. In addition, it was found that the present transit systems operating in the corridor were severely fragmented resulting in high costs and time consuming transfers to commuters. Air, water, rail and highway systems were considered as possible means of solving some of the traffic problems as well as socio-economic means of reducing travel demand. It was concluded by the Task Force that only highway and transit improvements could be implemented within a short period of time at a fairly low cost.

Briefly, the Task Force recommendations included: 1) Express bus service in the corridor. The project recommended that the Vancouver-Portland Bus Company operate a demonstration express commuter bus service from Hazel Dell and the Mill Plain corridor to Lloyd Center and downtown Portland. 2) Inter-system transfers. It was recommended that Tri-Met, Vancouver-Portland Bus Company, Vancouver Transit and Evergreen Stage Lines honor each others transfers. 3) Consumer information service. Suggested improvements include: toll free information service, route maps, shelters and information brochures. 4) Expansion of the regional car pool program. It was recommended that the ODOT regional car pool program be expanded to include Clark County. 5) Evaluation of priority treatment for high occupancy vehicles. This recommendation called for detailed evaluation of priority treatment for high occupancy vehicles (HOVs) including priority lanes and ramp metering with bypasses for HOVs. 6) Interstate bikeway. Completion of a bikeway through the Interstate Bridge corridor from downtown Portland to Vancouver was recommended. 7). Highway operations. This recommendation called for highway safety improvements, signalization, ramp metering, utilization of the shoulder in limited areas to improve traffic flow and use of dynamic warning signs to advise motorists of congested conditions. 8) Analysis of long term improvements. These included proposed studies of a transit system. This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver - Portland Bus Company by Tri-Met.

Many of the above recommendations have been implemented to date. This report is in fact, the result of two recommendations; namely,

evaluation of priority treatment, and study of a transit district of Clark County. The demonstration express bus service has been successful in attracting new patrons to bus service. However, Vancouver-Portland Bus Company reports that the service is continuing to operate at a loss. Some of the service originally instituted has been curtailed for lack of ridership. The regional car pool program has been expanded to Clark County. Marketing efforts were conducted and car pool officials reported limited response to the program. Some traffic operation improvements are in the planning stage by the Oregon Department of Transportation. Many improvements are planned in conjunction with the reconstruction of the Columbia Slough Bridge and Union Avenue Interchange. The improvements relating to the information program, inter-system transfers and bikeway, have not been implemented. Long range system considerations will be studied at a later date as part of the regular CRAG work program. Traffic operation improvements of particular importance which have not been implemented or studied are noted in this reports' recommendations.

TRANSIT SERVICE

An effective transit system can provide a realistic alternative to the automobile. This is important in the I-5 corridor. If commuters can be encouraged to switch from their autos to transit, some decrease in the amount of traffic congestion can be expected. In addition, this more efficient means of travel reduces energy consumption and air pollution while increasing highway safety.

It is generally recognized that publicly owned transit systems can provide a higher service level than can private systems. Public systems can reduce fares and operate high service levels because the public system can use tax subsidies to make up operating deficits. The private system cannot obtain subsidies and is dependent on farebox revenues.

In order to improve transit service in this corridor, it is necessary to purchase the private transit service currently operating in the corridor and form a public transit system in Clark County. A Clark County system will support the service operating in the corridor by providing a transit feeder system to the corridor service.

Public transit districts, encompassing an entire metropolitan area, have been a reality in Oregon since 1969. The Tri-County Metropolitan District (Tri-Met) in the Portland area was formed under legislation which permits the creation of special purpose districts to provide transit service. However, Washington law has been amended only recently to permit jurisdictions, other than cities to fund and provide transit service.

The 1975 Washington Legislature amended Washington Law to modify the manner in which public transit is funded and administered. Under the revised legislation, transit districts larger than an individual city but smaller than a county are permitted. These districts are to be formed by action of a public transit improvement conference, which is an official body composed of representatives from a given county and the cities therein.

Transit service can now be financed by a household utility tax, a business and occupation tax or a retail sales tax at the rate of .1, .2, or .3 of one percent. The household utility tax and business and occupation tax can be used in combination with each other, the sales tax must be used alone. Imposition of any of these taxes requires a vote of the people. Receipts from the business tax and the utility tax may be matched by receipts from the state's motor vehicle excise tax.

The approval of this legislation provides Clark County with a variety of means of organizing financing and implementing transit service. The Task Force makes no specific recommendations on how

the service should be organized or funded. However, a transit system which would provide reasonable degrees of relief in the corridor needs a feeder system which is carefully coordinated with the operation of corridor service and which can serve populous areas with the urban service boundary. Development of a new system should carefully consider these factors.

The laws of both Oregon and Washington permit public transit agencies to contract with other transit agencies, public or private, to provide service. Therefore, it is possible for a Washington agency to contract with an Oregon system, such as Tri-Met, to provide all or part of its service. If a service contract is developed, it would be necessary for Washington agencies to subsidize any operating losses incurred by Tri-Met. Possible service arrangements are noted in the technical summary (see figure III-5).

A contractual service arrangement with Tri-Met has particular applicability in the I-5 Corridor between Vancouver and Portland. Service would be operated in an area not totally within the boundaries of any single transit district, city, or county or benefit area. This arrangement would permit an even distribution of the service costs on the basis of benefits received.

To assist in the implementation of a transit system in Clark County, the I-5 project has developed a transit planning information base for Clark County. The project staff's work has centered in four areas including service criteria, identifying types of service which may be operated in Clark County, estimating system operation and capital costs, and noting sources of and estimated revenue. Specific bus routings or identification of a service area have been avoided as these considerations are policy decisions which will be made at the County's Public Transportation Improvement Conference and the resulting planning efforts.

Planning efforts have identified six types of transit service which can be operated in Clark County. These included Arterial Service, Local Service, Intercity Service, Corridor Service, Shuttles and Special Transportation.

Arterial service is designed to operate on arterial highways. This service provides fast service at reasonably frequent intervals from residential communities and neighborhoods to the Vancouver central business district. Extra buses are provided during the peak periods to handle the demand created by commuters traveling to and from work.

Local service offers transportation to people dependant on the transit system for their travel needs. Local service emphasizes coverage and provides transportation to a variety of destinations. Dial-a-bus systems or other forms of "demand responsive transit" may be used to provide "door to door" service.

Intercity service provides transportation between the similar cities of Clark County and the Vancouver CBD. Service is scheduled according to need and may be operated on an hourly, daily or even a weekly basis.

Corridor service offers transportation between the downtown areas of Vancouver and Portland. The purpose of corridor service is to provide a fast, inexpensive alternative to automobile travel in the Interstate Bridge Corridor, encouraging commuters to use transit. Corridor service should utilize exclusive lanes described in the latter part of this report.

Shuttles are designed to transport workers to concentrated employment centers where there is a common starting and ending time. Factory shift changes, for example, can be effectively served by shuttles.

Special Transportation serves people unable, due to physical handicaps, to drive automobiles or board conventional transit buses. Provision of special transportation services is required by federal regulations and encouraged by CRAG policies.

The system will incur a number of capital expenditures in order to provide a high level of service. New buses must be purchased, a maintenance facility must be constructed and system amenities such as transit stations and bus shelters should be provided.

Operating expenses include those expenditures necessary to operate, service and administer the transit system. Current operating expenses of existing systems indicate that an operating cost of between \$14 and \$18 per bus hour* should be expected.

The service categories have been combined in two scenarios to illustrate examples of the type of service which could be provided for a given level of funding. Scenario One illustrates the moderate level of service within the Vancouver urban area with connections to Camas and Washougal. Operating expenses are anticipated to run approximately \$1.1 million per year and capital expenditures are estimated at \$2.2 million*. Scenario Two portrays a county-wide transit system for about \$2.2 million in operating expenses and a \$6.6 million* outlay. These scenarios are not recommendations but were developed as illustrations of the kind of service that is available for a particular cost. There are any number of detailed service possibilities between these two alternatives.

* The cost of operating one bus for one hour

* This represents the total capital costs. Federal funding can be expected to pay 80% of the capital cost. Therefore, the local share is estimated at \$440,000 for Scenario One and \$1.3 million for Scenario Two.

PRIORITY TREATMENT

To encourage commuters to make more efficient use of vehicles traveling the I-5 corridor and, therefore, increase the "passenger capacity" of the freeway, it has been recommended that incentives be provided to persons using transit and carpools. These incentives are designed so that persons using buses and carpools can bypass traffic congestion and arrive at their destinations more quickly than if they had traveled alone. The task force studied two kinds of priority treatment including an exclusive lane for HOV's (High Occupancy Vehicles - Buses and Carpools) and ramp control. The exclusive lane is a freeway lane on which use is restricted to HOV's. Ramp control is a method by which entrance to the freeway is restricted during those times when the freeway becomes congested. HOV's are permitted to bypass the control device without restriction. By encouraging the more efficient use of vehicles, ramp control and exclusive lanes will help reduce the overall level of traffic congestion on the affected highway. The technical analysis indicated that an express lane would double the number of carpools and transit ridership using the I-5 freeway. Increasing the number of carpools and transit usage, in turn, reduces the number of autos traveling on the freeway, thus reducing congestion.

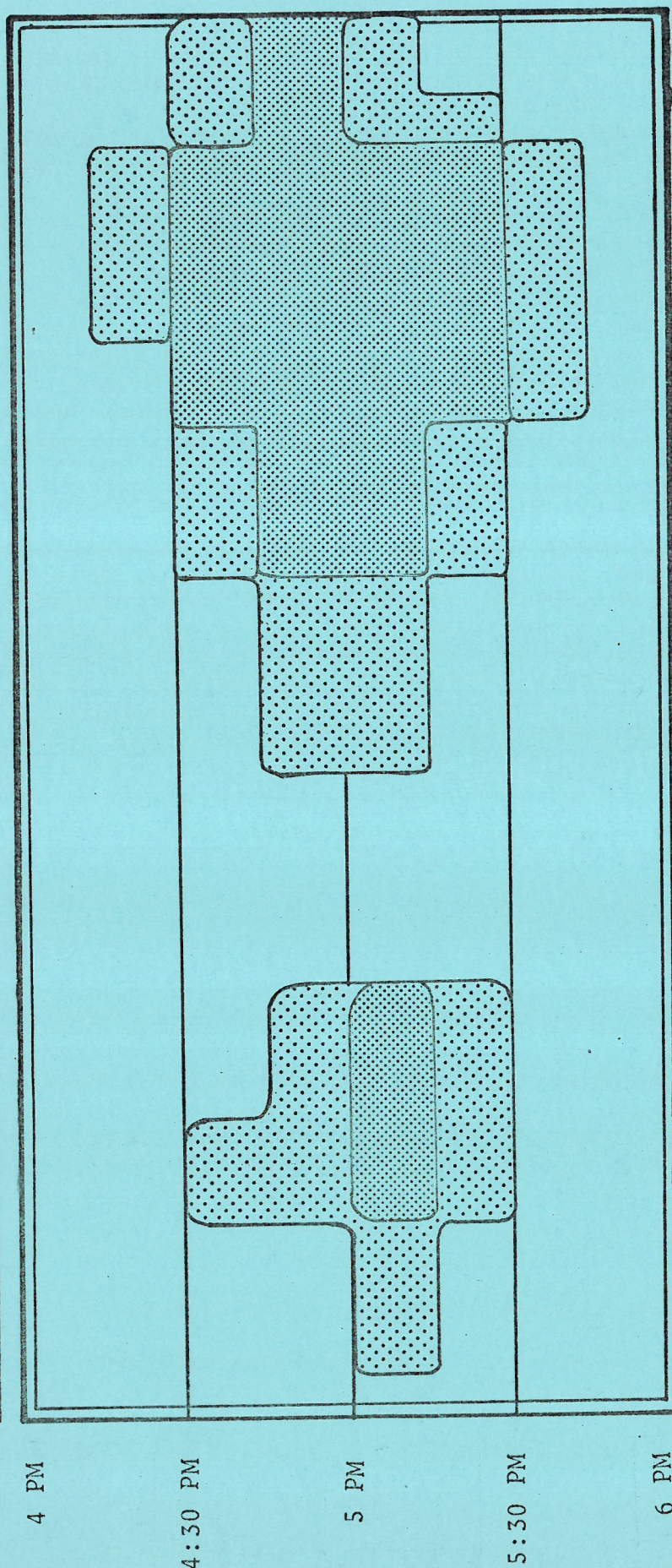
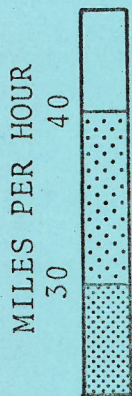
An exclusive lane on the I-5 freeway could be provided with only minor reconstruction by using narrower lanes and a portion of the existing shoulder. The present highway shoulders could be reduced and the existing lanes narrowed slightly (to about 11') to provide another lane. The additional lane would be reserved for buses and carpools.

The cost and benefits of a closed circuit monitoring system should be studied. Such a system could be useful, not only in detecting violators, but also in helping to spot traffic accidents and other conditions which disrupt freeway operations.

An analysis was conducted which showed that congestion was significantly reduced with the implementation of an exclusive lane, ramp control and other improvements. In addition, improvements were realized in air pollution, energy conservation and safety. The greatest improvement occurred in the evening peak period.

The improvements recommended herein will significantly augment the operations of the traffic flow. This is illustrated by comparing the existing conditions northbound (figure 2) and southbound (figure 3) with the expected operational conditions shown on figures 4 and 5. The detailed study material is contained in the Technical Analysis.

While provision of immediate relief is the major focus of the Interstate Bridge Corridor Project, long range considerations have also been studied. The completion of I-205 shortly after 1980, is expected to provide a degree of relief in the interstate bridge corridor. However, continued development in the Rivergate industrial area as well as in Clark County, will cause high traffic volumes on the I-5 freeway. By 1990 the traffic volumes in I-5 are expected to equal or exceed present day counts. In order to avoid traffic conditions even more congested than those currently experienced on the freeway, high occupancy vehicles (HOVs) will have to play a major role in increasing the people moving capacity of the interstate bridge corridor. Estimates prepared by the Governors Task Force on Transportation show that bus lanes operating on the freeway and on Union Avenue could carry approximately 30,000 daily riders. Transit operating on the freeway could maintain one minute headways during the peak periods, five minute headways during the daytime off peak and 30 minutes for evening and night service. Provision of bus lanes within the existing right-of-way would enable the planning staffs of ODOT, Tri-Met and WSHD to study the impacts of the low capital intensive HOV priority system prior to the development of a more permanent busway. In addition, the bus lanes would provide a means of gradually upgrading transit service in the corridor. Thus, ridership could be increased to a point where the development of the capital intensive busway would be justified.



South End of Interstate
Hayden Island
Overcrossing

Marine Drive

Swift St

Denver Ave

Delta Park
Overcrossing

Columbia Blvd

Lombard St

Portland Blvd

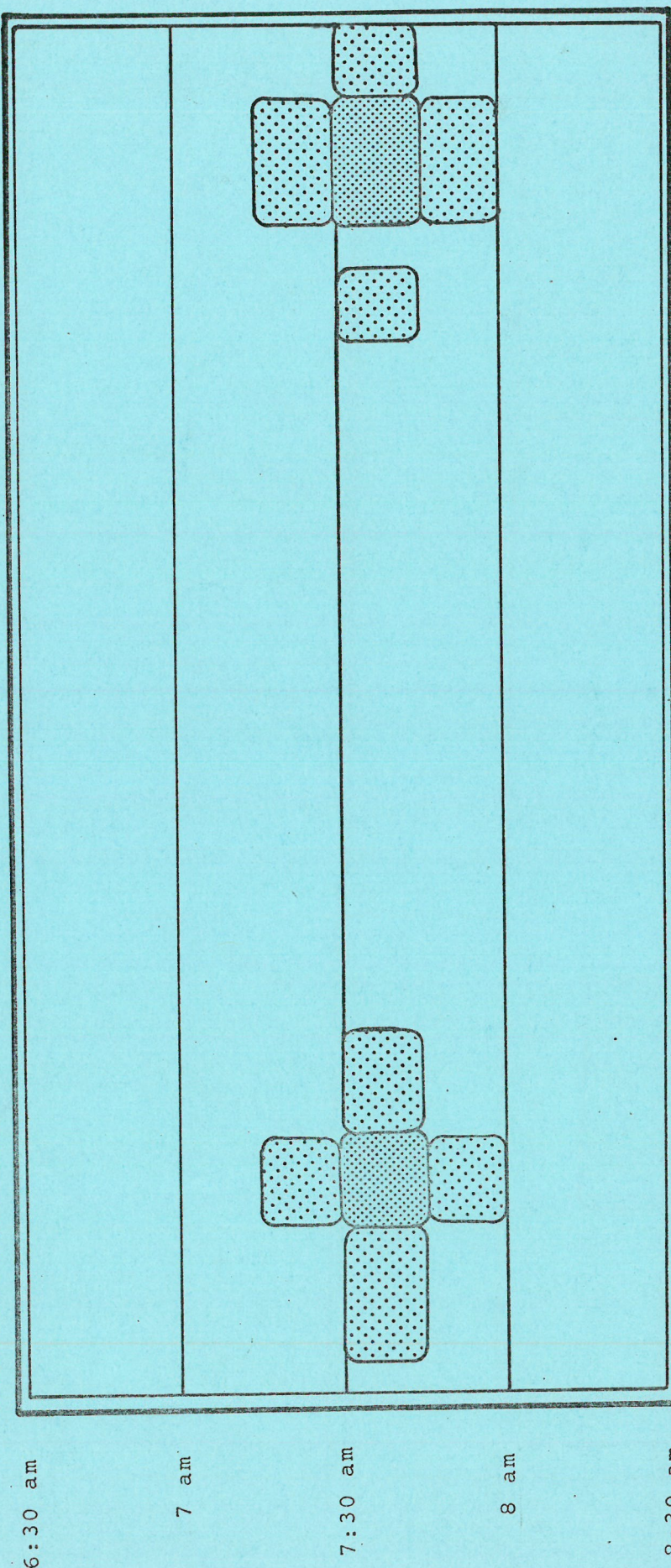
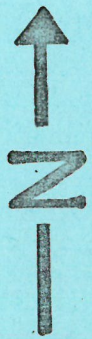
Ainsworth St

NORTHBOUND EVENING PEAK
TRAFFIC SPEEDS ON I-5 BETWEEN
AINSWORTH STREET AND HAYDEN ISLAND

FIGURE II

MILES PER HOUR

30 40



South End of Interstate
Hayden Island
Overcrossing

Marine Dr
Swift St

Denver Ave
Delta Park
Overcrossing

Columbia Blvd

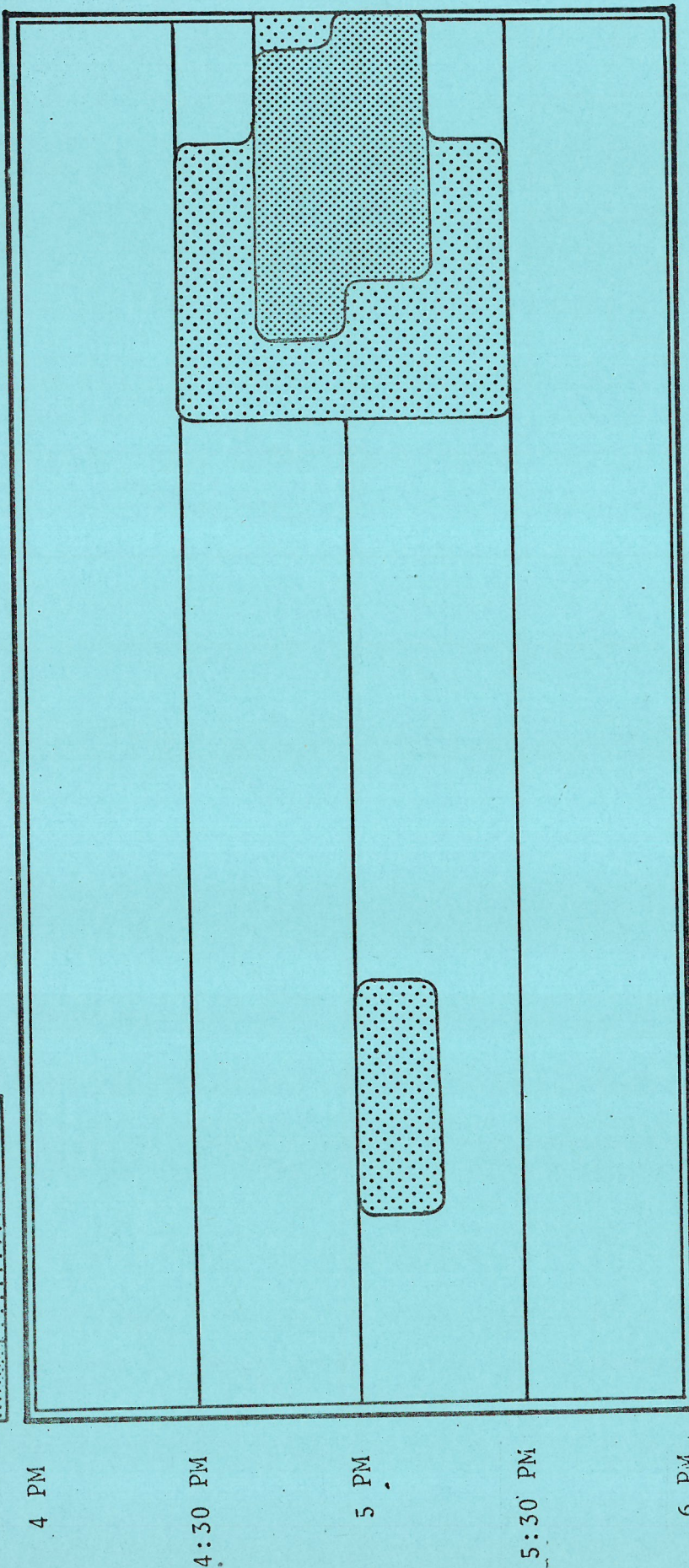
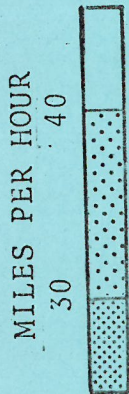
Lombard St

Portland Blvd

Ainsworth St

SOUTHBOUND MORNING PEAK
TRAFFIC SPEEDS ON I-5 BETWEEN
AINSWORTH STREET AND HAYDEN ISLAND (1974)

FIGURE III



South End of Interstate
Hayden Island
Overcrossing

Marine Dr

Swift St

Denver Ave

Delta Park
Overcrossing

Columbia Blvd

Lombard St

Portland Blvd

Ainsworth St

NORTHBOUND EVENING PEAK TRAFFIC
SPEEDS ON I-5 WITH RECOMMENDED IMPROVEMENTS
BETWEEN AINSWORTH STREET AND HAYDEN ISLAND

FIGURE IV

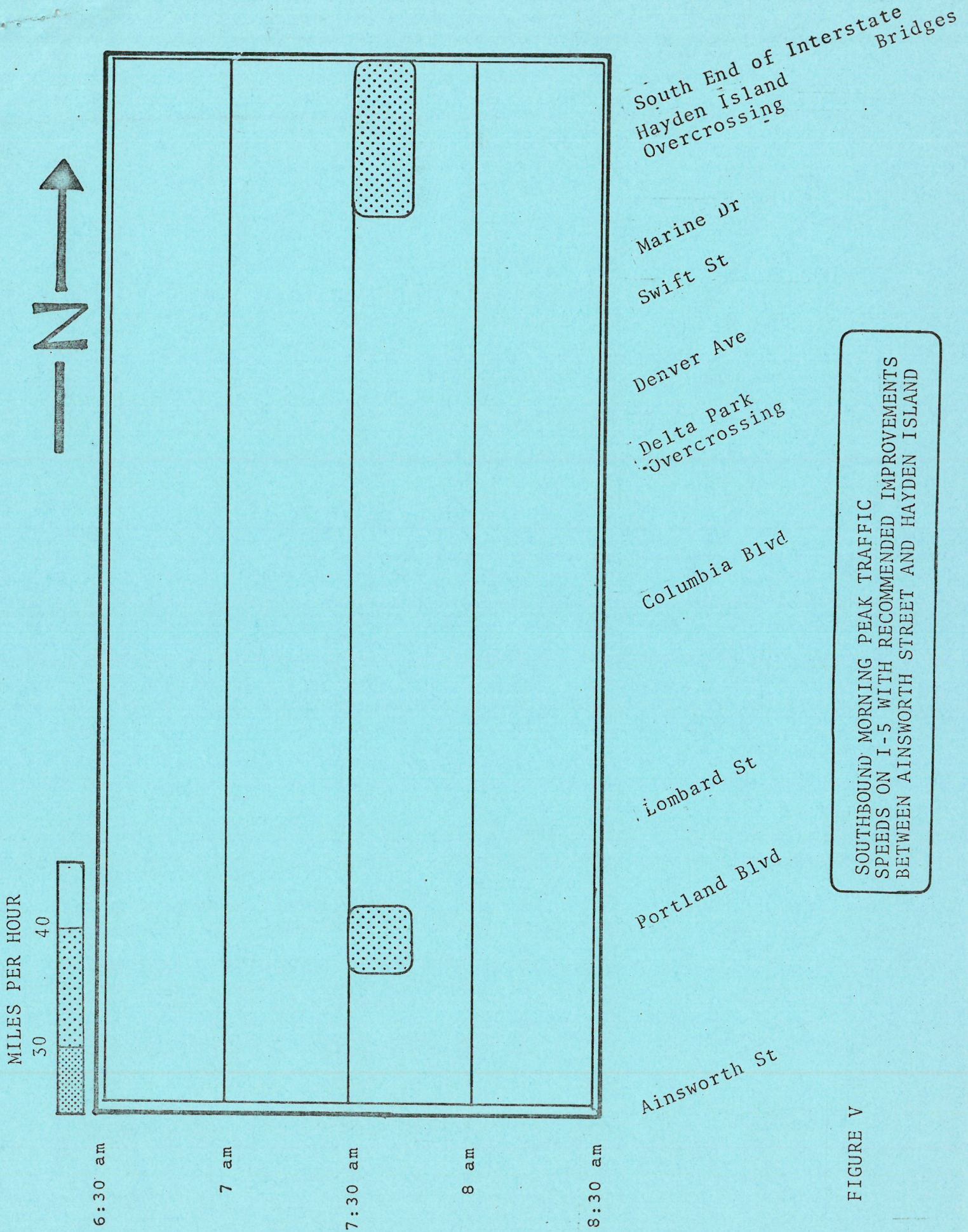
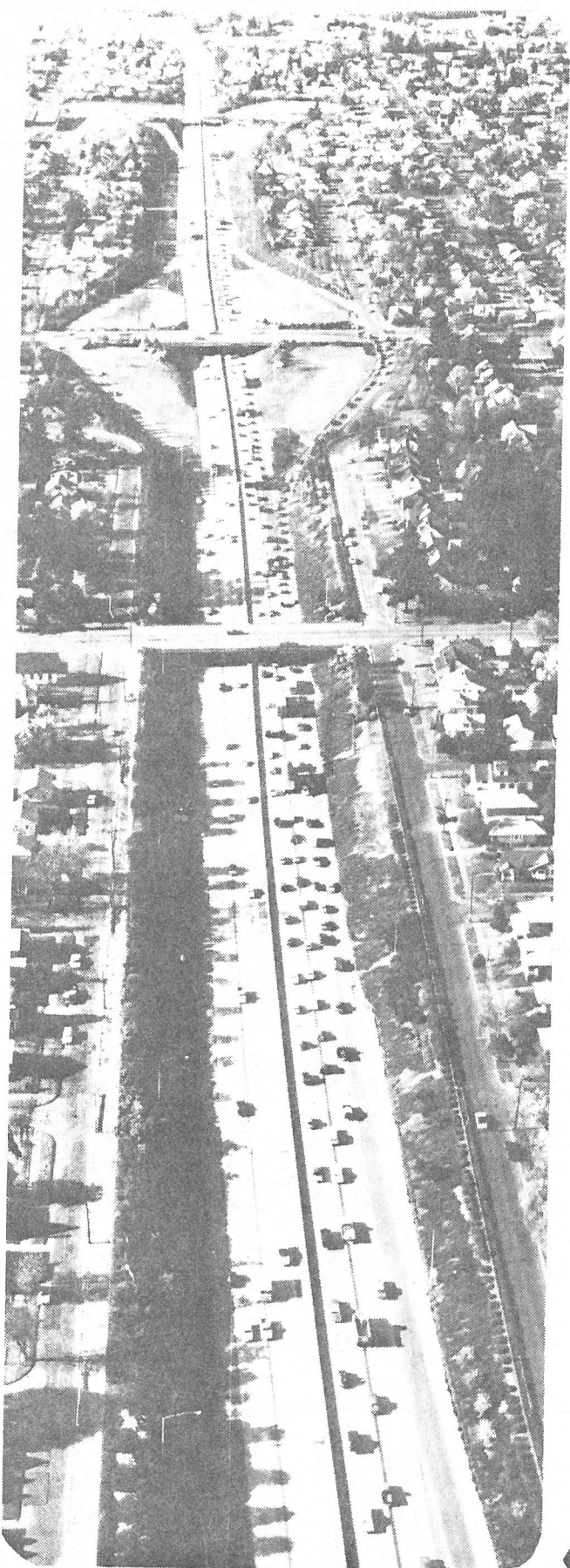


FIGURE V

STAFF PRINCIPALLY RESPONSIBLE
FOR THIS REPORT

LARRY RICE, EXECUTIVE DIRECTOR,
RICHARD ETHERINGTON, DIRECTOR,
TRANSPORTATION DIVISION

A. REED GIBBY, SENIOR PLANNING
WILLIAM PETTIS, PLANNER
PROJECT PRODUCTION-----
KAREN THACKSTON, LORI WOLCOTT,
LESLIE SMITH AND ZONNIE BAUER



INTERSTATE BRIDGE CORRIDOR PROJECT

DRAFT

FINAL REPORT TECHNICAL ANALYSIS



November 1975

COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS GENERAL ASSEMBLY

REGULAR MEMBERS

Clackamas County

Barlow
Canby
Estacada
Gladstone
Happy Valley
Johnson City
Lake Oswego
Milwaukie
Molalla
Oregon City
Rivergrove
Sandy
West Linn
Wilsonville

Multnomah County

Fairview
Gresham
Maywood Park
Portland
Troutdale
Wood Village

Washington County

Banks
Beaverton
Cornelius
Durham
Forest Grove
Gaston
Hillsboro
King City
North Plains
Sherwood
Tigard
Tualatin

ASSOCIATE MEMBERS

Clark County

Camas
Vancouver

Columbia City

Scappoose
St. Helens
The Port of Portland
Tri-Met
The State of Oregon

COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS BOARD OF DIRECTORS

CITY OF PORTLAND

MAYOR NEIL GOLDSCHMIDT

MULTNOMAH COUNTY

COMMISSIONER MEL GORDON

CITIES OF MULTNOMAH COUNTY

COUNCILMAN CHARLES BECKER

WASHINGTON COUNTY

COMMISSIONER ROD ROTH

CITIES OF WASHINGTON COUNTY

MAYOR DAVID MCBRIDE

CLACKAMAS COUNTY

COMMISSIONER STAN SKOKO

CITIES OF CLACKAMAS COUNTY

MAYOR PHIL BALSIGER-CHAIRMAN

CLARK COUNTY

COMMISSIONER DEAN COLE

CITIES OF CLARK COUNTY

MAYOR JIM GALLAGHER

CITIES OF COLUMBIA COUNTY

COUNCILMAN STAN PINTARICH

PORT OF PORTLAND

LLOYD ANDERSON, DIRECTOR

TRI-MET

GERARD DRUMMOND, PRESIDENT OF
THE BOARD

STATE OF OREGON

GEORGE BALDWIN, DIRECTOR
OREGON DEPT. OF TRANSPORTATION

STATE OF WASHINGTON

JULIA BULTER HANSEN, EX-OFFICIO
WASHINGTON STATE HIGHWAY
COMMISSION

*The preparation of this report has been
financed in part by funds from the United
States Department of Transportation, Urban
Mass Transportation Administration, under
the Urban Mass Transportation Act of 1964
as amended; and by funds from the Oregon
Department of Transportation, the Washington
State Department of Highways, the City of
Vancouver, Clark County, the City of Portland,
Multnomah County and Tri-Met.*

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

TRANSPORTATION TECHNICAL ADVISORY COMMITTEE

Winston Kurth, Clackamas County
J. Wayne Daigle, Cities of Clackamas Co.
Jan Rosholt, Clark County
Eric Oien, Cities of Clark County
Dorothy Churchill, Cities of Columbia Co.
Bebe Rucker, Multnomah County
Kent Cox, Cities of Multnomah County
John Crockett, Washington County
Dave Bryan, Cities of Washington Co.

Robert Royer, Ore. State Hwy. Div.
Pierre Henrichsen, Wash. State Dept
of Highways
Richard Arenz, Fed. Hwy. Admin.
Ken Johnsen, Port of Portland
Bill Hall, Tri-Met
Mark Beisse, Federal Aviation Admin.
F. William Fort, Urban Mass Transit
Administration

PROJECT TASK FORCE

Commissioner Dick Granger, Chairman,
Clark County
Patricia Blackwell, Vice-Chairperson,
Citizen Advisory Committee
Councilman Dick Pokornowski, City
of Vancouver
Jerry Peck, Owner, V-P Bus Company

Ed Wagner, Tri-Met
Robert Bothman, Oregon State Highway
Division
Pierre Henrichsen, Wash. State
Department of Highways
George Palmer, Multnomah County
William S. Dirker, City of Portland

CITIZEN'S ADVISORY COMMITTEE

Patricia Blackwell, Chairperson,
League of Woman Voters
Frank Barlow, Burlington Northern
Railroad
Julius Gaussoin, Silver Eagle Trucking
Don Hughes, Camas Citizen
Howard Martin, Camas Citizen
Tim McNeil, Citizen
Jim Howell, Sensible Trans. Options
for People
Lynn Hatcher, Citizen
Richard Swennes, Convoy Company
Ben Witt, Citizen

Ray Brewer, Union Ave. Boosters
Carol Hansen, American Assoc. of
University Woman
Mary Legry, League of Woman Voters
John Martin, Citizen
John Pierce, Vancouver Chamber
of Commerce
Susan Regan, League of Woman Voters
Vern Rifer, Oregon Environmental
Council
Betsy Strong, Womens Highway
Safety Leaders

INTERSTATE BRIDGE CORRIDOR PROJECT

VICINITY MAP

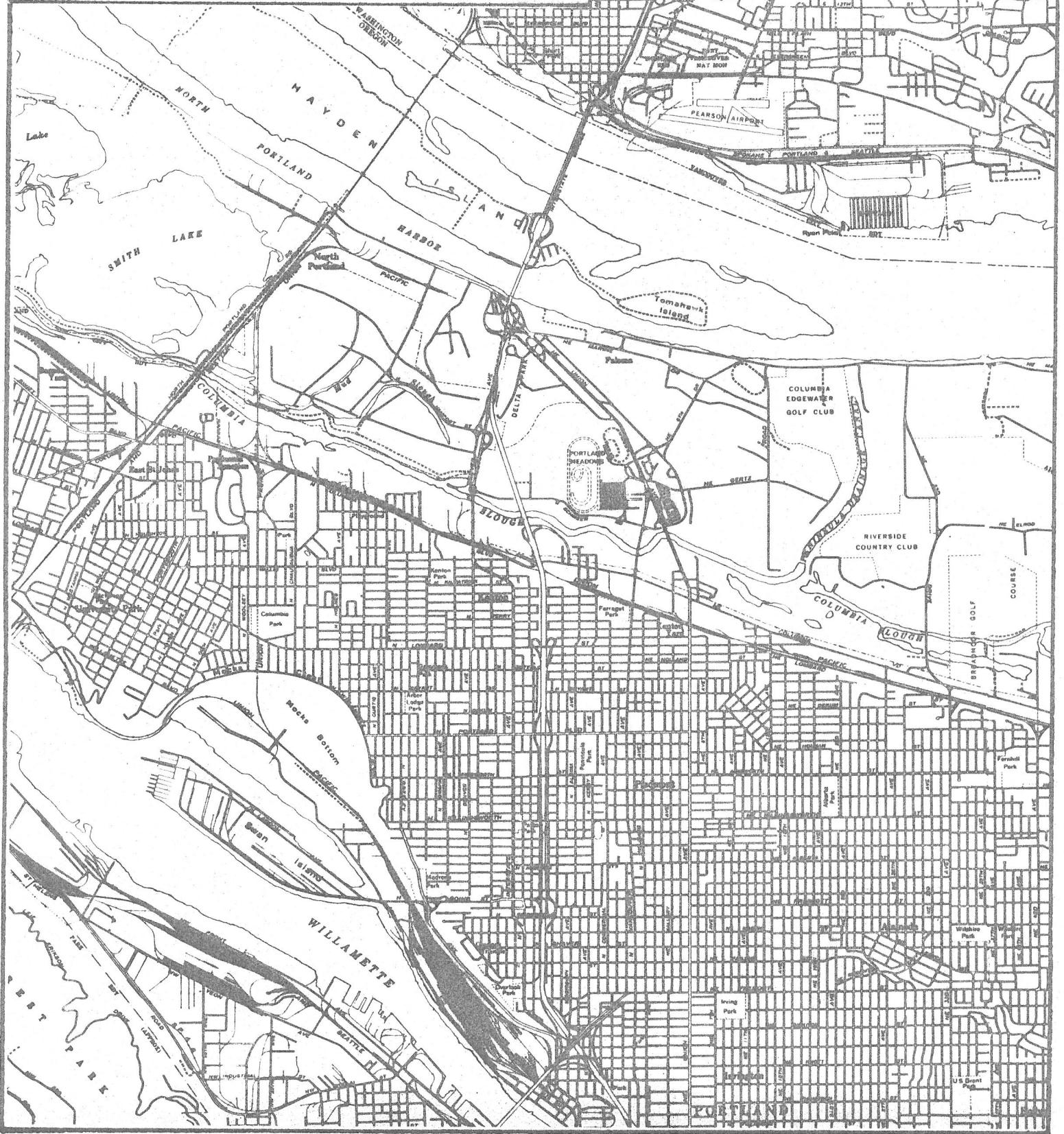
Columbia Region Association of Governments

July, 1975

Figure 1



Scale:
1" = 4000'



PREFACE

This document contains the technical analysis which forms the basis of the findings and recommendations included in the Executive Summary of the Final Report of the Interstate Bridge Corridor Project Task Force. The Technical Analysis is expected to provide sufficient justification to local, state and federal transportation officials for the implementation of the recommended improvements. The Executive Summary was prepared to convey appropriate background information about the analysis and recommendations to local decision-makers, non-technical staffs of local agencies, news media and interested citizens.

Table of Contents

Preface	
Summary of Recommendations	
I-5 Corridor Study	1
Summary of Previous Findings and Recommendations	4
Transit Planning in Clark County	13
Transit Service	26
Priority Treatment Analysis	35
Recommendations	58
Appendix A	64
Appendix B	66
Appendix C	71
Appendix D	73
Appendix E	76
Appendix F	79
Appendix G	82
Appendix H	87

SUMMARY OF RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Vancouver, Clark County and Portland.
2. Tri-County Metropolitan Service District (Tri-Met) should immediately purchase Vancouver-Portland Bus Company.
3. Carpooling should be promoted in Clark County by the regional carpool program.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows:
 - a. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - b. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - c. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with reconstruction of the Columbia Slough Bridge to an eight-lane structure.
6. The Oregon Department of Transportation should consider installation of traffic signals at the termini of the Portland Blvd. north-bound ramps.

I I-5 Corridor Study

A high degree of mobility is something that has come to be expected by most persons living in the Portland-Vancouver Metropolitan Area. Mobility in our society is necessary in most cases to obtain and keep a job, to gain an education, to shop, to procure professional services and to engage in recreational activities. Rare is the person who can walk to his place of employment and have all the necessary services within walking distance of his or her home. In fact, persons without means of travel, other than walking, find themselves socially and economically restricted.

Currently, most of our transportation service is provided by the private automobile. The problems associated with a strong dependence upon the automobile are so well known that they need little restating at this point. Concerns over energy and air pollution require that our society lessen its dependence on this mode of transportation.

Certain problems exist in the Portland-Vancouver Metropolitan Area which also require reduced dependence on the private auto. The Interstate Bridge Corridor, which contains the Interstate 5 Freeway between downtown Portland and Vancouver, represents one of the most severe traffic problems in the metropolitan area.

Interstate 5 is the major north-south interstate highway on the Pacific Coast, connecting nearly all the larger west coast cities. I-5 is, thus, a major national highway corridor of significant social, economic and commercial importance.

The Portland-Vancouver Metropolitan area is composed of four counties, including three counties in Oregon and one county in Washington. Clark County, Washington, is separated from the remainder of the metropolitan area by the Columbia River. Clark County has a population of 135,000, about 13% of the total urban area. Approximately 13,000 Clark County residents work on the "Portland side" of the river. Over 4,000 Oregon residents are employed in Clark County. In addition, Clark County and the remainder of the metropolitan areas have significant social, economic and cultural ties. The four counties comprise the Portland-Vancouver Standard Metropolitan Statistical Area (SMSA).

At this time Interstate 5 provides the only link across the Columbia River in the metropolitan area. No other river crossings exist either up or down river for about 50 miles. A second river crossing about seven miles upstream from the present Interstate Bridge is committed, but completion of the facility (I-205) is not anticipated until the early 1980s.

The combination of high daily volumes of commuter traffic,

Interstate 5's role as a major national highway, and the absence of any alternative river crossing within reasonable commuting distance, creates very congested conditions in the corridor, particularly during the peak period. The problem is further complicated by the fact that the Interstate Bridges are lift bridges and must be raised several times daily to permit river traffic to pass underneath. Until the new Interstate 205 Bridge is completed, the traffic situation in the I-5 Corridor will continue to deteriorate pending implementation of measures to reduce the number of vehicles using the corridor. (A complete description of the traffic conditions in the corridor is contained in the Interstate Bridge Corridor Project Phase I Report.)

To reduce auto traffic in the corridor, it has been suggested that the people moving capacity of the I-5 facility be increased. Specifically, this includes provision of priority treatment for high occupancy vehicles (buses and carpools) and creation of a unified public transit system in the corridor. Currently, transit service in the corridor is fragmented as it involves two public and two private carriers. Transit service is, therefore, very costly and time consuming for the commuter which partially explains why the modal split in the corridor is less than 1%.¹

A unified public transit system has been recommended to alleviate this service fragmentation. In addition, this single public system would be able to provide lower fares, better equipment, more extensive marketing, and higher quality service than the private carrier now operating in the corridor.

The private carrier providing interstate service is unable to significantly improve his service because he must operate only with fare box revenues. A publicly owned carrier, on the other hand, receives tax subsidies enabling the public carrier to improve service where fare box revenues will not meet costs.

Improved service within the corridor is only a partial answer. A feeder system that can serve the needs of commuters living in Clark County is essential to a successful corridor service. Currently, Clark County is served by three transit carriers, one public and two private. The public carrier (Vancouver Transit) is authorized to provide service only within the Vancouver city limits. Vancouver Transit operates on six routes, providing basic transportation service to the city's residents. While this system interfaces with the private carrier currently operating bus lines in the corridor, the relatively long headways, lack of a reduced cost transfer provision between the two lines, and the nature of the Vancouver Transit System routings make Vancouver Transit a relatively poor feeder service.

Vancouver-Portland Bus Company (a privately owned carrier) is the principle transit service operating in the corridor. Evergreen Stage Lines also operates in the corridor, but is not authorized to transport persons between downtown Vancouver and Portland. This carrier provides service between Camas, Washougal and Portland.

Revised Work Program

To address the significant transportation problems of the Interstate Bridge Corridor, the Interstate Bridge Corridor Project was formed in late 1973. Phase I of the study suggested low capital intensive solutions to the traffic problems of this corridor. Phase II was to develop a long range solution to the corridor transportation problems.

After the findings of the Phase I report were examined, it was decided to focus the remainder of the project's attention on implementing the recommendations of Phase I; in particular, the development of a program for a unified transit system in the corridor and in Clark County. An analysis of the impacts of a high-occupancy vehicle lane in the corridor was also to be studied. A third element, long range planning for the corridor will be based on the CRAG adopted Transportation Plan and continuing technical analysis by CRAG and ODOT. This document covers the technical analysis conducted to support the Executive Summary, a separate publication. The technical analysis contains the essence of the work performed in the three elements of the revised work program.

Element A, the transit element, of the revised work program, addresses the designation of service area, identification of potential routes, system financing and system administration. The work program for Element A was supervised by the Consolidated Transportation Staff of Clark County (CTS).

Element B, Priority Treatment Analysis, examined the feasibility of providing priority treatment for HOV (buses and carpools) on the I-5 facility. A volume analysis was conducted to determine the usage of a High Occupancy Vehicle (HOV) lane on I-5 between Portland Blvd. and Hayden Island. A survey of accident records of autos and buses was conducted to estimate possible safety consequences; and, an extensive quality study was made of non-traffic impacts. In addition, issues in law enforcement and carpooling were examined.

Element C, Long Range Corridor Planning, based on work done by the Governors Task Force and the CRAG ITP was prepared by ODOT Planning Section and has been included in the appendix.

The last portion of this report describes the recommendations of the I-5 Corridor study for the development of a Unified Transit System and priority treatment for high occupancy vehicles.

II SUMMARY OF PREVIOUS FINDINGS AND RECOMMENDATIONS*

This chapter provides a summary of the findings and recommendations made in the Interstate Bridge Corridor Project's Phase I Report. It contains (1) background information useful to the understanding of the corridor's problems with possible solutions and (2) a brief summary of the Phase I recommendations.

Data

Data on the tripmaking characteristics of commuters using the Interstate Bridge Corridor (ICB) were assembled from two sources. Data included census information and statistics obtained from an origin and destination survey conducted in the corridor.

Census Data

The 1970 Census Data for the Portland Metropolitan Area indicated that 12,212 Clark County residents work in Portland and the adjacent Oregon Counties. A total of 917 Clark County residents reported they were employed in the Portland Central Business District area and 8,350 reported that they worked in other parts of the city. It is important to note, however, that the Census Bureau limits its definition of a Central Business District to an area somewhat smaller than the Central Business District as defined for purposes of traffic planning. New construction which has increased the number of office facilities in the downtown area since 1970, may also contribute to an increased number of persons employed in the Central Business District. Persons from Clark County employed in other parts of the Portland area include:

Multnomah County (minus Portland)	1,650
Clackamas County	685
Washington County	610

There is considerable growth occurring in Clark County as evidenced by a 5% increase from 128,454 in 1970 to 135,154 in 1973. Columbia Region Association of Governments projections indicate that Clark County will continue to grow at a substantial rate, reaching a population of between 158,000 and 171,000 persons by 1980. Census data has also been useful in giving the staff an "area profile" on the social and economic characteristics of the residents of Vancouver and surrounding Clark County areas.

All data, of course, must be viewed within its limitations. The 1970 Census data may be somewhat dated due to the rapid growth in

*Note: Much of the material contained in this chapter is excerpted from the IBCP Phase I Report.

the region and particularly in Clark County, and a very high rate of inflation which has substantially affected economic conditions over the past three years.

Origin and Destination Survey

In December, 1973, between the hours of 6 and 9 a.m. on certain weekdays, the Washington State Highway Division (WSHD) conducted a survey of drivers entering the I-5 freeway in Vancouver and southern Clark County. Later, in February, 1974, an origin-destination survey was conducted on the Vancouver-Portland Bus Company lines operating in the corridor. The survey was to determine the points of origin of persons crossing the Interstate Bridge into Oregon, the destinations in the Portland area, and other travel characteristics and socio-economic data. The previous survey in this corridor was conducted in 1960.

Several methods of conducting the survey were considered. These included:

1. Photographing license plate numbers of cars passing a given point on the freeway, comparing the numbers with Washington Department Motor Vehicles records and mailing auto owners a survey questionnaire, and
2. Distributing questionnaires at freeway entrances in the Vancouver area.

Both of these methods were considered to be effective, however, the latter method was chosen since the former might be resented by some drivers who consider the photographing process an invasion of privacy and the ambient light in the morning may not be sufficient for photographing.

Questionnaire

The questionnaire contained 15 questions and provided information on the following subjects in addition to the trip origin and destination.

1. Type of vehicle
2. Parking costs
3. Purpose of trip
4. Willingness to use mass transit
5. Reasonable cost for mass transit trip
6. Carpool membership
7. Interest in carpool
8. Sex
9. Family size
10. Number of vehicles owned by the commuter
11. Age
12. Income bracket

Space was also reserved on the card for the respondent to comment on pertinent items of interest. Approximately 9500 questionnaires were distributed to motorists from which approximately 3400 responses were received. The sample return was about 36%; the value of 20% is considered the minimum sample size to obtain representative data. The origin-destination study provided a very detailed breakdown of the trip origins and destinations of those Clark County to Portland commuters who cross the Interstate Bridge during the period between 6 - 9 a.m. known as the morning peak period. The survey also provided a look at the commuter's social and economic condition as well as exploring some of his attitudes on such subjects as public transit and carpools.

Distribution of Trips

The survey demonstrates that there is a fairly uniform distribution of person trips to destinations in the Portland area because no single employment zone received more than 20% of the total trips from Clark County and only downtown Portland (which received 18% of the incoming trips) was significantly close to the 20% figures. Most Vancouver commuters were bound for the North Portland area (4,095 trips) and West Portland (3,679 trips). While these areas are very large (96 square miles) they both contain major employment centers which receive a significant number of person trips. These include:

1.	Downtown Portland	2,314
2.	Lloyd Center	1,384
3.	Northwest Industrial District	1,215
4.	Swan Island	820

Note: Trips are expanded and include transit trips.

Six transportation corridors were identified which appear to contain most of the points of origin of a large share of the Oregon-bound trips. These corridors are composed of those traffic zones which border on arterial streets. The number of person trips originating in each corridor bound for destinations in Oregon is shown below:

Mill Plain Corridor	2,486
Fourth Plain Corridor	2,190
Main St. - Hwy. 99 Corridor	2,056
78th Avenue Corridor	1,864
Hazel Dell and Vicinity	1,712
Lewis and Clark Highway - Camas Corridor	1,384

Note: Portions of some corridors overlap.

Trips originating from these corridors make up approximately 71% of the total Clark County to Oregon trips. The remaining trips originate in the following areas:

Southwest Vancouver	1,090
External Stations	1,039
Northeast Clark County	595
Northwest Clark County	47
Other Vancouver	155

Auto Occupancy

Auto occupancy for Oregon-bound trips tends to be somewhat low. The automobile occupancy of the vehicles sampled in the Origin-Destination survey was found to be 1.24 persons per automobile which is slightly lower than the national average of 1.28 persons per automobile for work trips.

In relation to destination, auto occupancy tends to be higher in those areas where employment is relatively concentrated and lower where places of employment are scattered. Distance from point of origin does not appear to affect the occupancy rate except that work destinations tend to be more scattered in distant employment locations. The one occupant auto trip was overwhelmingly dominant among Clark County to Oregon commuters. Over 81% of the commuting autos contain only the driver while only 14% contain two occupants with 5% containing three or more.

Transit Ridership

Only 3% of the total southbound work trips during the time of the survey were made by transit. The existing Vancouver-Portland bus routes are oriented to serving downtown Portland to which 87% of the total transit trips were made. The only other destination of any significance was the Lloyd Center area which received 6% of the total transit trips.

In response to the question, "If a fast, efficient and comfortable transit system were available from convenient Park-Ride lots in the Vancouver area to the major employment and business centers in the Portland area, would you use transit rather than drive your car in the same trip?", 37% responded in the affirmative, 35% responded "no" and 28% were undecided. However, caution must be used in interpreting these results because such surveys may not represent the behavior of the sampled population. Analysis of observed behavior and conditions is obviously a more accurate indicator of individual and group activities.

Existing Conditions

Transportation conditions in the corridor were also studied by the project staff. Analysis indicated that major highway facility (I-5) was operating above its design capacity. Public transit was also explored and it was found that fragmentation among the various carriers was partially responsible for the lack of use of public transit in the corridor. A more detailed description of the project findings is noted below:

Highways

Basically, Interstate Route 5 consists of four lanes with six on the interstate bridges, Hayden Island and south of Portland Boulevard. This facility expands to eight lanes south of Going Street and has full (10 foot) shoulders through the project limits except on the bridges. Generally, the traffic volumes exceed capacity from Fourth Plain Boulevard (Vancouver) on the north, to Portland Boulevard (Portland) on the south. In 1972, the traffic volume at the highest location (near Fremont Street) was about 87,700 ADT (average daily traffic) while at Delta Park the ADT was 54,700; Hayden Island - 80,400; and the lowest was 50,400 ADT at 39th Street in Vancouver.

A traffic flow analysis of the freeway revealed weaving problems (level of service E) between Hayden Island and Union Avenue and roadway deficiency (level of service E) at Portland Boulevard during the peak hour in the major direction of flow.

In recent years the safety quality has improved with the removal of roadway objects and the installation of concrete median barriers and water-cell impact devices at many off-ramp gores. The accident rate has been decreased to 1.8 A/MVM (accidents/million vehicle miles) as of 1972. The trend has persisted in spite of an increase in traffic volumes. However, in Vancouver, the outdated ramp design contributes to extremely high accident rates. For example, at one location the rate was almost 50.9 A/MV (accidents per million vehicles) in 1970 while similar ramps elsewhere in the state were approximately 6.0 A/MV.

The profile alignment is considered level except on the interstate bridges and in Vancouver. These sections have significant grades causing lower operating speeds for heavy vehicles which tend to develop queues in the traffic stream.

The project did examine means of reducing the accident rates on the southbound on-ramps. It was noted that the Washington State Highway Department has designed a ramp control device to reduce rear-end collisions on the ramps. An alternative to this device is the extension of the acceleration lanes at Fourth Plain Boulevard and Mill Plain Boulevard to a length of about 1300 feet. Since the southbound traffic volume in 1970 at 39th Street is only 3500 ADT (800 off-ramp and 2700 on-ramp) and the same movements could easily be provided at the Main Street Interchange (about one half mile to the north), these southbound ramps could be closed. The signal at Main Street and 39th Street should also be improved.

The interstate bridges with liftspans yielding the right of way to marine traffic are the only highway link across the Columbia River within 50 miles in either direction. The high traffic volumes cause queuing problems when the liftspans are open or an accident occurs when traffic flow is heavy. At times the queues have extended for miles on the freeway and blocked local street

networks in downtown Vancouver and Hayden Island; however, the river users have been very cooperative by reducing the use of the lift span during peak hours. This bridge has been of considerable interest and concern for some time; consequently, the Washington State Highway Department operates a system to warn southbound motorists when congestion occurs in the southbound lane. This "Advance Warning System" detects slow moving vehicles and activates warning signs. In Oregon there are signs interconnected with the lift bridge controls for the same purpose.

Aside from the interstate bridges, three specific problem areas exist in the northbound direction; namely, 1) Going Street off-ramp, 2) Portland Boulevard off-ramp and 3) Union Avenue-Delta Park on-ramps. Frequently, in the morning, northbound traffic existing at Going Street and Portland Boulevard backs up onto the freeway, partially blocking it. The southbound traffic at Portland Boulevard during the morning peak hour has level of service "E" while upstream sections are at level of service "D" or "C" and as the traffic enters the "E" section a shock wave develops and often causes a breakdown which is not eliminated until after the peak hour is over. The congestion from the shock wave often propagates as far north as Hayden Island. In the evening, the geometrics of the successive merges between Union Avenue produce low traffic operational speeds on Interstate Route 5. Many of the motorists entering Union Avenue from Swift Street do not merge with Union Avenue motorists until after they enter Interstate Route 5, thereby, adding to the problem of confusion and slow movement. Immediately after entering Interstate Route 5 the northbound traffic must negotiate a curve at the south end of the Columbia Slough bridge. The traffic merging from Denver Avenue also results in congestion.

In the evening, congestion in the northbound roadway develops at the Portland Boulevard overpass where the northbound peak volume also operates a level of service "E". From this point the queuing or congestion propagates south to the interchange with Interstate Route 405.

Prior to the construction of Interstate Route 5, Interstate Avenue was a section of the major national north-south highway on the west coast. Through north Portland it generally consisted of four lanes with parking on both sides and raised channelization in the median. The traffic volumes may be considered light to moderate since the ADT did not exceed 8,000 in 1972 except south of Greely Avenue. Near Fremont Street the volume increases to 16,000 ADT. The safety aspects are not as favorable as the freeway but considering the light volumes, the median and the adjacent land use which has low traffic flow frictional characteristics the safety quality does merit worthy mention. The accident rate has been decreasing in recent years and in 1972 was 4.07 A/MVM. The geometrical alignment is good except near Going Street and Greely Avenue. Since this was a national route, the roadway pavement is of good quality.

Union Avenue likewise consists of four lanes with parking except south of Hancock Street where it couplets with Grand Avenue. Generally, there is not a capacity problem; however, near Fremont Avenue, the volume exceeded 19,000 ADT in 1972 but elsewhere north of Hancock Street it did not exceed 11,000 ADT. Because of narrow lanes and roadway, considerable business activity along the street, (causing traffic flow friction), lack of a median barrier, there prevails a lower quality in safety as indicated by accident rate of 6.26 A/MVM. Alignment of this facility, except for the northbound one-way couplet transition, is very good.

Mass Transit

There are five passenger carriers locally serving the Interstate 5 corridor. Four of them use buses; namely, Tri-Met (Public), Vancouver-Portland Bus Company (Private), Evergreen Stage Lines (Private), and Vancouver Transit System (Public). The fifth carrier is Amtrak, a public rail operation, which does not provide commuter service. Most (about 95%) of the transit trips are made by bus; however, there exist several disincentives against using this mode in the corridor. Presently, there is little coordination of routes, lines and schedules among the several transit operators (except for Vancouver-Portland Bus Company and Vancouver Transit System which provide reasonable interfacing of lines and schedules at Fifth and Broadway in downtown Vancouver). Common line designation among carriers is also non-existent and each carrier maintains separate fares with no provision for free or reduced fare transfer between systems. (Note: Tri-Met and Vancouver-Portland Bus Company recently agreed to honor transfers between systems on their Hayden Island lines.) Of course, the issue of mixing public and private systems which can obtain tax revenues to offset deficits which may occur must be addressed.

To illustrate the problem of multiple carriers, a Vancouver resident will pay approximately \$2.80 a round trip to the St. Johns industrial area, ride three carriers each way, transfer four times during a round trip, wait up to 20 minutes at the transfer points and perhaps have a ten minute walk at each trip end. This partially explains why the modal split at the interstate bridges was only 1% of the average daily person trips.

According to another report, the freight rail traffic is so great on the present rail bridge that significant passenger service does not appear possible without disrupting freight service. The Amtrak terminal in Vancouver is located away from employment or residential areas; therefore, essentially all Amtrak passengers need a feeder system. However, the Vancouver Transit System does not presently serve the depot area.

Phase I

Recommendations

In addition to the data presented at the beginning of this chapter and the analysis of traffic conditions on the freeway, the project looked at a variety of alternative means of solving the corridor's transportation problems. Air, water, rail, and highway systems were considered as well as socio-economic means of reducing travel demand. (For a list of improvements considered see Appendix H.) It was concluded, by the project that only highway and transit improvement could be implemented within a short period of time at a low cost.

Briefly, the Project's recommendations included:

1. Express bus service in the corridor -- The project recommended that Vancouver Portland Bus Company operate a demonstration commuter express bus service from Hazel Dell and the Mill Plain corridor to the Lloyd Center and Downtown Portland.
2. Intersystem transfers -- It was recommended that Tri-Met, Vancouver Portland Bus Company, Vancouver Transit and Evergreen Stage Lines honor each other's transfers.
3. Customer Information Service -- Suggested improvements include toll free information service, route maps, shelters, and information brochures.
4. Expansion of the regional carpool program -- It was recommended that the ODOT Regional Carpool program be expanded to include Clark County.
5. Evaluation of priority treatment for High Occupancy Vehicles -- This recommendation called for detailed evaluation of priority treatment for High Occupancy Vehicles (HOV's), including priority lanes and ramp metering with bypasses for HOV's.
6. Interstate bikeway -- Completion of a bikeway through the Interstate Bridge Corridor from Downtown Portland to Vancouver was recommended.
7. Highway operations -- This recommendation called for highway safety improvements, signalization, ramp metering, utilization of the shoulder in limited areas to improve traffic flow, and use of dynamic warning signs to advise motorists of congested conditions.
8. Analysis of longer term improvements -- This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver-Portland Bus Company by Tri-Met.

9. Unified transit system -- This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver-Portland Bus Company by Tri-Met.

STATUS OF RECOMMENDATIONS

Many of the above recommendations have been implemented to date. This report, in fact, is the result of two of the recommendations, namely evaluation of priority treatment and study of a transit district of Clark County.

The demonstration express bus service has been successful in attracting new patrons to bus service, however, Vancouver-Portland Bus Company reports that the service is continuing to operate at a loss. Some of the service originally instituted has been curtailed for lack of ridership.

The regional carpool has been expanded to Clark County. Marketing efforts were conducted and carpool officials reported a limited response to the program.

Some traffic operations improvements are in the planning stage by the Oregon Department of Transportation. Major improvement are planned in conjunction with the reconstruction of the Columbia Slough Bridge and Union Avenue Interchange.

The improvements relating to the information program, intersystem transfers, and bikeway have not been implemented. Long range system considerations will be studied at a later date as part of the regular CRAG work program. Traffic operations improvement of particular importance, which have not been implemented or studied, are noted in this report recommendation.

ls:S
301/1-17

III TRANSIT PLANNING IN CLARK COUNTY

The transit planning process must consider a variety of factors in developing a transit system which will adequately serve the needs of the populace. The factors include development of service criteria, demographic characteristics of the population to be served, types of service which can be provided, operations, capital improvements and revenues.

This chapter provides a survey of the considerations which must be made in developing a transit system in Clark County. This system will be the Washington portion of coordinated regional transit operations.

Service Criteria

Criteria has been developed which links population distribution and density to levels of service. Tri-Met has developed one such set of criteria which may be applicable to providing public transit in Clark County.

The Tri-Met criteria divides the service area into three categories. These include urban areas, suburban areas and rural communities. Urban areas are those areas with over 3,200 persons per square mile or five persons per acre. Suburban areas are designed where the population is greater than 1,600 persons per square mile, but less than or equal to 3,200 persons per square mile. Rural communities are those population centers located in areas where the population does not exceed 1,600 persons per square mile (see Table III-A). In urban areas, a bus is to be provided within $\frac{1}{4}$ mile of every household. Lines operating in urban areas will provide service every 30 minutes during the midday period and at least every 10 minutes during the peak hours. Suburban areas shall have service within $\frac{1}{2}$ mile of every household. Lines will operate at least hourly during the midday period and at frequencies no greater than 15 minutes in the peak hours. In rural areas, bus service will be provided to the various community centers. Access to these lines will be supplemented by interim park and ride facilities. Service will be provided on the basis of demand.¹

The routing of transit lines is determined not only by the location of households (trip origins) but also by the destination (activity centers) to which persons will be traveling. These activity centers will include:

- Central Business Districts
- Industrial Facilities
- Major Medical Facilities

TABLE III-A, TRANSIT SERVICE CHARACTERISTICS

SERVICE	EQUIPMENT	PEAK PERIOD COMMUTER SERVICE	DOOR TO DOOR SERVICE	DEMAND RESPON- SIVE	PARK & RIDE	EXCLUSIVE BUS LANE	SERVICE AREA ¹		
							URBAN	SUBURBAN	RURAL
Arterial	Conventional Buses	YES	NO	NO	YES	NO	YES	YES	LIMITED ³
Local	Small Buses or Vans	NO	OPTIONAL	OPTIONAL	NO	NO	YES	NO	NO
Express (corridor)	Conventional Buses	YES	NO	NO	YES	YES	YES	YES ²	NO
Intercity	Conventional Buses	OPTIONAL	NO	NO	YES	NO	NO	NO	YES ⁴
Shuttles	Conventional Buses	YES	NO	NO	NO	NO	YES	NO	NO
Special Transportation	Vans Equipped with Wheelchair Lifts	NO	YES	YES	NO	NO	YES	YES	NO

1 See Table III-A for description of service

2 Arterial service connects with express service for easy transfers

3 May serve rural community centers located near urban areas

4 Serves rural community centers

Commercial Centers
Educational Facilities
Cultural Centers
Major Recreational Centers

The major activity centers in the Vancouver Urban Area are shown on Figure III-1.

Demographic Characteristics of Clark County

Clark County is a portion of the Portland-Vancouver Standard Metropolitan Statistical Area. The county contains about 135,000 people. The 1970 employment was listed as 45,300. About 13,000 Clark County residents are employed in the Oregon portion of the metro area.

Population centers in Clark County include:

Vancouver	Battleground
East Vancouver (unincorporated)	Ridgefield
Camas	Yacolt
Orchards (unincorporated)	LaCenter
Hazel Dell (unincorporated)	Washougal

Vancouver, East Vancouver, Hazel Dell and Orchards comprise the Vancouver Urban area which contains about 100,000 people, 3/4 of the county's population. The second major population area is Camas-Washougal with 11,000 people.

Several major arterial highways serve these populated areas in Clark County. The major north-south route is I-5, which has been described and analyzed in the Phase I report. Other major streets in the Vancouver Urban area include Mill Plain Blvd., Fourth Plain Blvd., St. Johns-St. James Streets, Main St.-Hwy. 99 and 78th Street. Two facilities (I-205 and SR 500) are under construction. The Lewis and Clark Highway, State Route 14, links downtown Vancouver with the cities of Camas and Washougal. These major transportation corridors are shown in figure III-2.

Densely populated neighborhoods in the Vancouver Urban Area tend to be located in the city center and adjacent to the major transportation corridors. Figure III-3 shows population densities in the urban area based on 1970 traffic zone statistics.

Type of Service

Careful consideration was given to the transportation needs of Clark County as well as the transportation, social and population characteristics of the county. On the basis of these considerations, six different kinds of transit service have been identified including: Radial Service, Local Service, Corridor Service, Intercity Service, Shuttles and Special Transportation. The

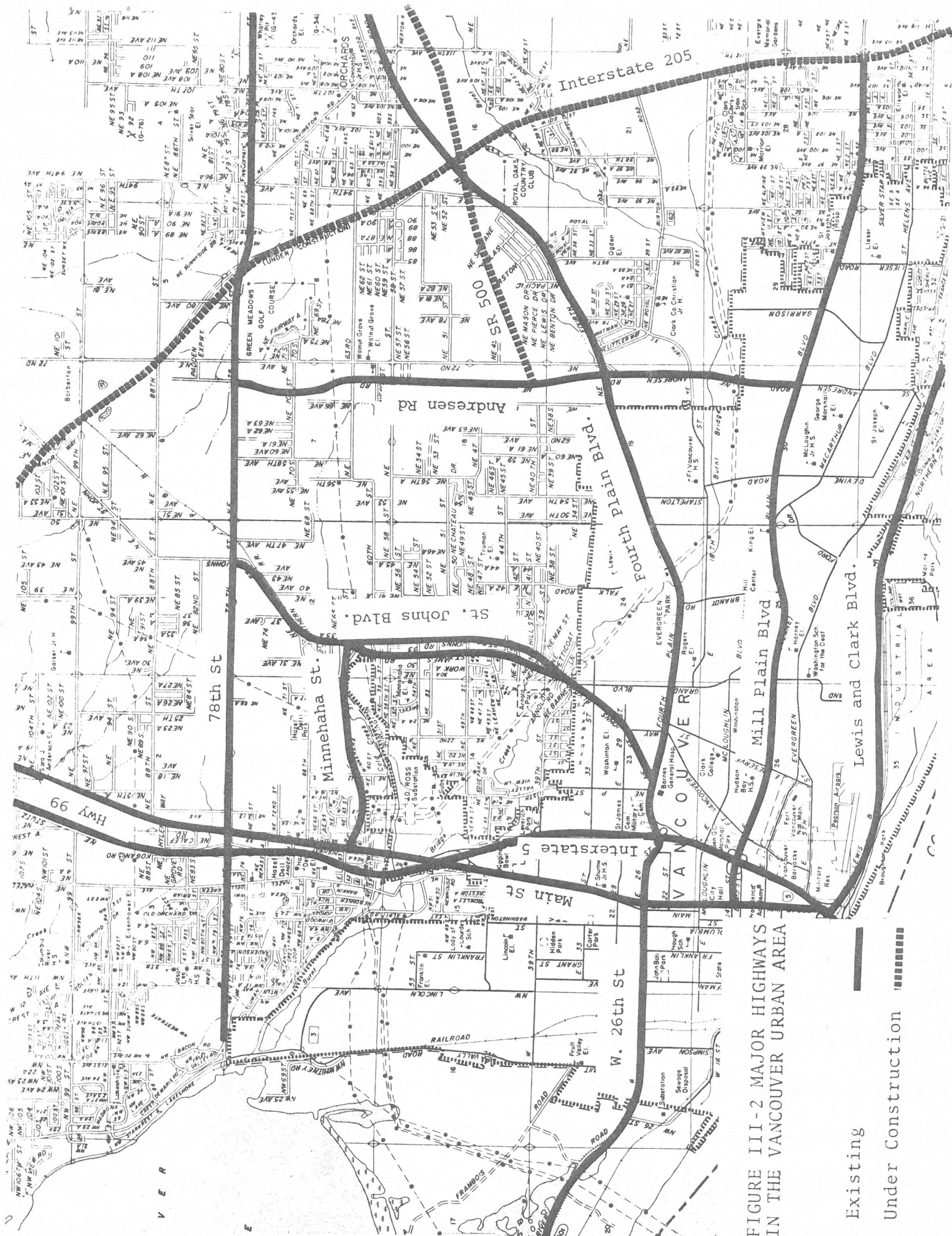


FIGURE III-2 MAJOR HIGHWAYS
IN THE VANCOUVER URBAN AREA

Existing

Under Construction

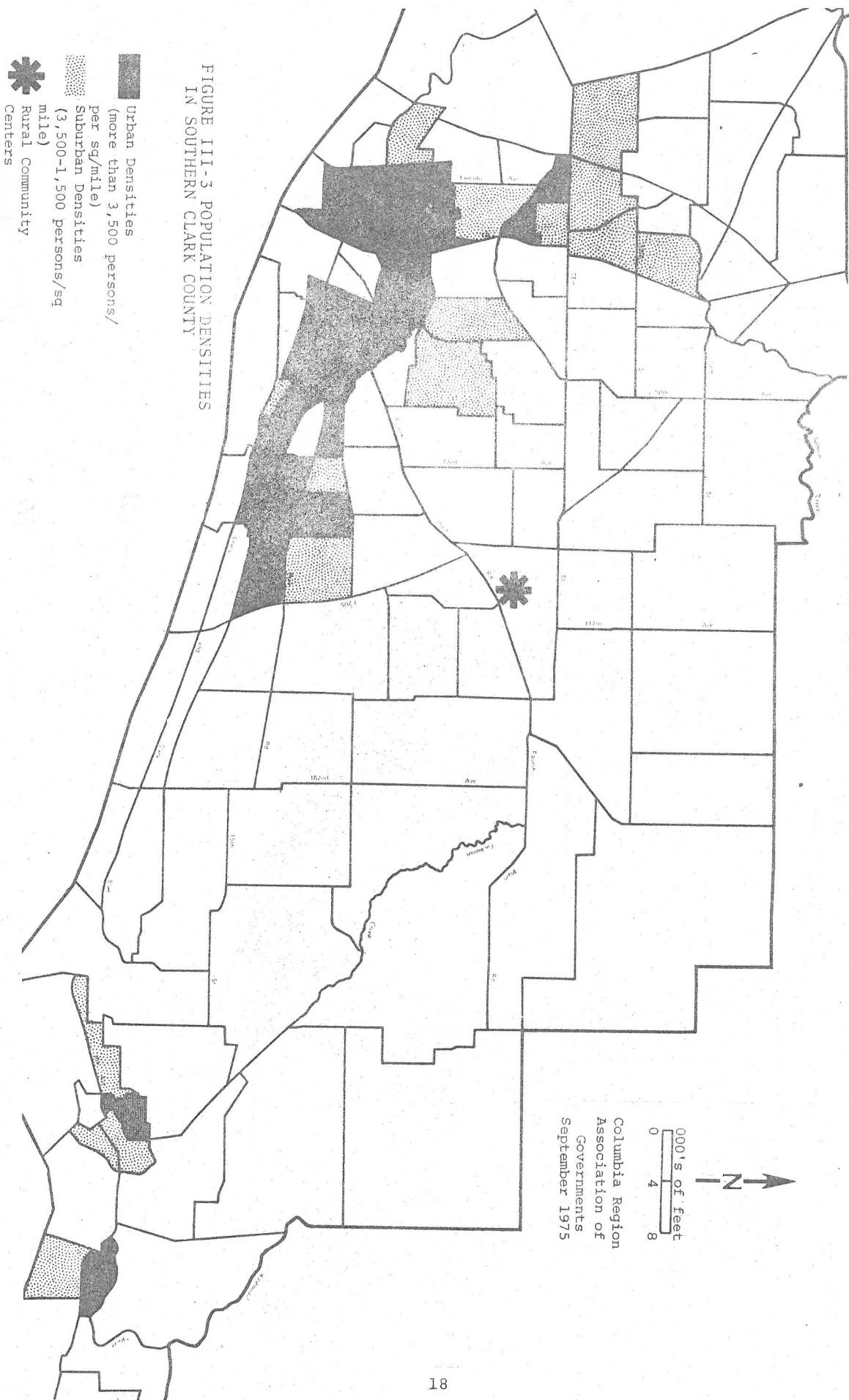


FIGURE III-3 POPULATION DENSITIES
IN SOUTHERN CLARK COUNTY

operating characteristics of these services are shown in Table III-B.

Radial Service

Radial service is composed of those lines which operate along major arterial highways. The service begins in outlying residential developments or community centers and terminates in Vancouver's central business district.

The purpose of this service is to provide rapid movement of people between their places of residence and the central business district. Buses will operate at selected headways throughout the day. In addition, extra buses will be added during the morning and evening peak periods to fill the demand created by persons commuting to and from work. The system should be designed so that convenient transfers can be made between this service and buses traveling to and from downtown Portland.

Park and ride stations can be useful in improving access to these lines. Also, radial service can be supplemented or "fed" by the local service described below.

Local Service

Local service is designed to provide transportation for persons having no access to private automobiles; and, if local service is provided at sufficiently frequent intervals, it can, in some families, reduce the need for a second car.

To be effective, local service should be available within a short walking distance of the people which it serves. Therefore, transit vehicles providing local service will probably operate a certain portion of the time on local streets. It may be desirable (or even necessary) to use smaller vehicles to provide this service. The presence of large buses on local streets is likely to be objectionable to persons living in areas where the system is operated.

Local service can be provided by any one or a combination of three routing systems including:

- Fixed Routes
- Variable Routes
- Dial-a-Bus

Fixed routing, the system presently used by Vancouver transit, is buses operating only on designated routes and adhering to a schedule. An extended discussion of demand responsive systems such as variable route and dial-a-bus contained in Appendix D.

Corridor Service

Service in the major north-south regional transportation corridor

TABLE III-B CRITERIA FOR TYPES OF TRANSIT SERVICE AREAS

TYPE OF SERVICE AREA	TRANSIT SERVICE CRITERIA			
	DENSITY (PERSONS PER SQUARE MILE)	TYPES OF SERVICE	MINIMUM HEADWAY FREQUENCIES IN MINUTES	DISTANCE FROM SERVICE
URBAN	MORE THAN 3,500	EXPRESS ARTERIAL LOCAL SHUTTLES SPECIAL TRANSPORTATION	PEAK: 10 OFF PEAK: 30	$\frac{1}{4}$ MILE FROM EVERY HOUSEHOLD
SUBURBAN	3,500 - - 1,500	ARTERIAL CORRIDOR SPECIAL TRANSPORTATION	PEAK: 15 OFF PEAK: 60	$\frac{1}{2}$ MILE FROM EVERY HOUSEHOLD
RURAL	LESS THAN 1,500	ARTERIAL INTERCITY	PEAK: AS NEEDED OFF PEAK: AS NEEDED	VARIABLE, SERVICE RURAL COMMUNITIES

(I-5) is the object of this service. The Interstate Bridge Corridor is currently served by a private carrier which is costly to patrons. As previously noted, a commuter traveling from East Vancouver to Swan Island by bus will pay a total one way fare of \$1.40 to ride three transit systems and will be unable to make free, convenient transfers from one system to the other. In addition, transit offers no time or speed advantage to commuters because buses are subject to the same congested traffic conditions that plague auto travel in the corridor.

A publicly operated corridor service linking downtown Vancouver with Portland would alleviate these constraints to travel by reducing fares and providing for free transfers. This service would also utilize the proposed priority lane for high occupancy vehicles. A priority lane would enable transit vehicles to bypass freeway congestion, thereby, obtaining total travel times competitive with automobiles.

Provision of corridor service requires the purchase of the Vancouver-Portland Bus Company (V.P. Bus). This action has been recommended in several previous reports. Tri-Met would be the most logical agency to accomplish this purchase, since it has the capability, established operating staff and equipment to easily take over V.P. Bus. In addition, most of the V.P. Bus routes are located in the Tri-Met service area.

Acquisition of V.P. Bus by Tri-Met also opens up the Regional Bus system to patrons on the Vancouver-Portland line. This is particularly important to Vancouver commuters since over 8,000 residents of Vancouver work in areas outside of downtown Portland. Free transfers make economical bus service available to these persons.

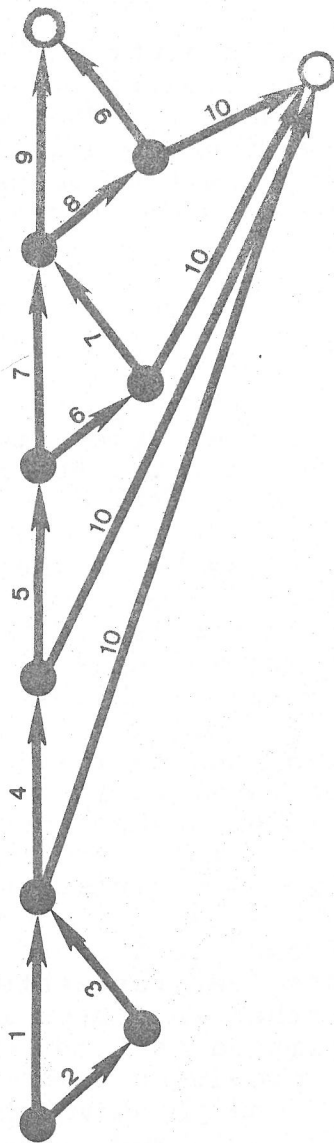
The 1973 Washington State Department of Highways origin and destination survey noted that substantial numbers of Vancouver commuters work in relatively concentrated employment locations in North Portland such as Swan Island and the Lloyd Center. Tri-Met should investigate opportunities to improve the interface between corridor service and routes serving these areas. Improved access to employment locations other than downtown would provide an alternative to automobile travel for Vancouver residents working in these Portland areas resulting in further increases in patronage on the corridor lines. It has been estimated that the Clark County-Vancouver share of the costs for providing this service would be approximately \$21,000 per year. One point which should be made clear is that the Tri-Met purchase of Vancouver-Portland Bus Company may be totally independent of the transit planning activities. This is illustrated on figure III-5.

Interurban Service

There are six small cities in Clark County that may benefit from the provision of public transit service. Currently, the four smallest cities (Battleground, Ridgefield, Yacolt and LaCenter) are without any public transportation service. The cities of

PURCHASE VANCOUVER-PORTLAND BUS COMPANY

1. City/County Request VP Bus Purchase
2. Form Transit Agency
3. Transit Agency Requests VP Bus Purchase
4. Tri-Met Concurs
5. Negotiate for Purchase
6. Litigation
7. UMTA Grant for Purchase
8. Other funding for Purchase
9. Purchase
10. Status Quo



○ - Terminal Point
● - Decision Point

FORM TRANSIT AGENCY

10. Status Quo
11. City/County Contract
12. Financing
13. Planning
14. Contract
15. Operations
16. Form Transit Agency
17. Transit Agency Contracts w/City
18. Transit Agency Contracts w/Private Operator
19. Transit Agency provides in-house Operations
20. Transit Agency Contracts w/Tri-Met
21. Contract for all Services
22. Contract for Operations Only
23. Set Policy
24. Hire Staff
25. Set Plan
26. Modify Plan
27. Implementation

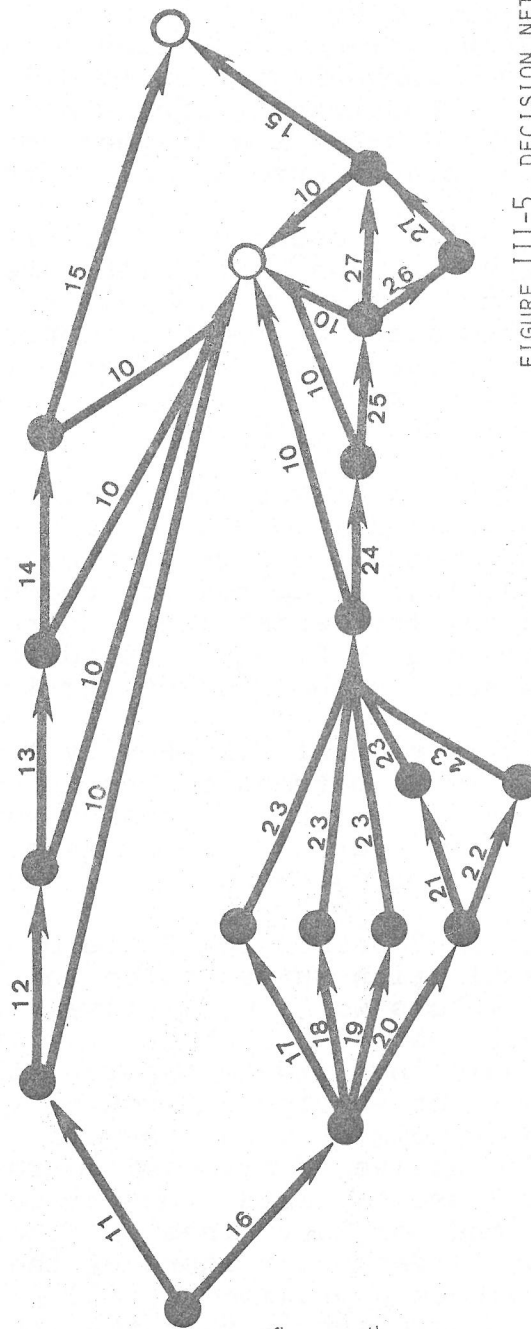


FIGURE III-5 DECISION NETWORK FOR ESTABLISHMENT OF A TRANSIT AGENCY IN CLARK COUNTY

Camas and Washougal are served by a private carrier operating three round trips daily between these cities and Portland.

Interurban service would provide regular service to some or all of these cities. It is likely that the size of the Camas-Washougal area justifies reasonably frequent service intervals. The other small cities might be adequately served on a daily or even weekly basis.

The provision of interurban service should be tied to the levying of taxes in the county. Should the transit benefit area include the entire county it would probably be desirable to serve all cities.

Shuttles

Two kinds of shuttle service having possible application in Vancouver have been identified. These include shuttles providing home to work transportation for industrial workers and shuttles operating in and between the city's major activity centers.

The industrial shuttle which would operate only during shift changes at Clark County's major industrial areas. This service could be operated on a subscription basis with routes designated according to origin points of the workers.

The second shuttle service would operate in the CBD area and between major activity centers. The downtown shuttle would provide a people moving service in the CBD and in some of the high density neighborhoods that surround this area. Another shuttle would connect major activity centers such as Clark Community College, Barnes General Hospital, the public library and the County Courthouse.

Since most industrial shift changes occur outside the normal peak period, it may be possible to utilize the equipment that is used for radial commuter serve to run the industrial shuttles. This would result in a very low operating cost for the service.

Special Transportation

Federal transportation policies require that the needs of the elderly and handicapped be considered in the provision of public transportation services. (Section 16, UMTA Act 1964.) Legislation provides that 1½% of the federal funding provided for transit shall be used to provide special transportation services.

Special transportation is needed because persons with physical, mental or age disabilities may be unable to board a conventional bus. Some minor improvements such as handles on the outside of the bus, reserved front row seating for the elderly and easy to read bus schedules can make the transit system more accessible to a substantial number of the transit disadvantaged. Demand responsive buses equipped with wheelchair lifts are in use in certain areas.

Federal requirements and CRAG policy requiring provision of special transportation make it imperative that special transportation be considered in the design of any regional transit system.

System Revenues

As noted in Chapter II, Washington State law provides a number of options by which a county can fund transit service. Briefly, the Washington state funding options include:

<u>Option</u>	<u>Rate</u>
General Sales Tax	.1, .2 or .3%
Household Utility Tax	Up to \$1.00 per household per month.
Business and Occupation Tax	Local option

In addition, Washington law permits local jurisdictions to use of the receipts from the motor vehicle excise tax for transit finance. The 1975 legislative session, however, failed to appropriate the necessary funds for this program.

The Urban Mass Transportation Administration has made available, to local transit agencies, funds for providing operating subsidies for service expansions. Table III-C lists the various funding options and the amount of revenue which can be obtained through intergovernmental transfers and taxes for transit. Figures include the amount of revenue which would be raised in the cities of Camas-Washougal.

Revenue would also be obtained through the farebox. Virtually all planning efforts in this area have assumed a 35¢ fare. With fare discounts offered for senior citizens and children, the average fare works out to about 31¢. Farebox revenues, therefore, will depend upon the system patronage.

Patronage, in turn, depends upon the level of service. Tri-Met has computed patron estimates based on existing condition in the urban area. These estimates and the revenue that the various levels of patronage would be expected to generate show shown on Table III-D.

ls:S
301/18-23

TABLE III-C
FUNDING OPTIONS

	<u>Annual Revenue</u>
SALES TAX (COUNTY WIDE)	
.1%	\$ 500,000
.2%	\$ 990,000
.3%	\$1,490,000
HOUSEHOLD UTILITY TAX (\$1 per month)	
County Wide	\$ 520,000
Vancouver Urban Area	\$ 403,000
Vancouver (City)	\$ 243,000
Camas-Washougal	\$ 45,000
BUSINESS AND OCCUPATION TAX	NA*
STATE MATCH FROM MOTOR VEHICLE EXCISE TAX	NA*
UMTA SECTION 5 OPERATING ASSISTANCE	
1976	\$ 237,000
1977	\$ 308,000
1978	\$ 367,000
1979	\$ 402,000
1980	\$ 426,000

* Estimate not available

TABLE III-D RIDERSHIP AND FAREBOX REVENUE PROJECTIONS IN CLARK COUNTY

Accessibility to Transit	Annual Ridership	
	<u>Vancouver only</u>	<u>Vancouver Urban Area</u>
As Is	336,000	--
Low	467,000	904,000
Medium	652,000	1,263,000
High	1,065,000	2,066,000

Farebox Revenues (Based on 31¢
Average Fare)

As Is	\$104,000	--
Low	145,000	\$ 280,000
Medium	202,000	391,000
High	330,000	640,000

NOTE:

See Appendix E for definition of service levels

IV TRANSIT SERVICE

In January, 1975, a joint meeting of the Vancouver City Council and Clark County Commissioners was held at which goals and objectives were developed to guide the transit planning efforts in Clark County. A summary of these goals and objectives is noted in Table IV-A. In addition, the meeting participants directed the Consolidated Transportation Staff of Clark County (CTS) to devise some scenarios portraying alternative levels of transit service which might be possible in Vancouver and Clark County. The CTS in conjunction with the IBC project staff has developed two scenarios. The scenarios represent what might be considered a moderate and high level of service. The status quo is assumed to be a low level of service. The scenarios were developed on the basis of the funding which is now available for transit operations in the state of Washington. (See Appendix E). It should be noted that there are any number of detailed service possibilities between the two scenarios.

Service options described in the two scenarios are based on the service elements noted in the previous chapter. These options have been combined in a system designed to serve a given area with regular transit service as well as to provide the I-5 Corridor with a feeder system.

In September, 1975, these scenarios, as modified by the staff of the Clark County Regional Planning Agency, were presented to a Public Transportation Improvement Conference held in Clark County. The conference, which under Washington Law, is an official body formed to develop a public transit system in a given county, expressed interest in the scenarios and has agreed to further consider these planning efforts.

Scenario 1

Scenario 1, proposes a system with annual operating expenses of approximately \$1.1 million. System capital costs are estimated at \$2.2 million with the local share totaling \$442 thousand.

System characteristics for Scenario 1 include the following:

1. Base service where population density exceeds five (5) persons per acre. Service is within one quarter mile of each household at no more than one (1) hour headways.
2. Radial (arterial) service in the major arterial corridors to provide transit service to the suburban areas at no more than one (1) hour headways. Park and ride sites will be located along the routes, where opportunities to obtain

- interim sites present themselves.
3. Service is provided to Camas and Washougal cities at one (1) hour headways.
 4. Base and commuter service between Portland and Vancouver will be provided much the same as is presently operated.
 5. Commuter service will also be provided in the major corridors to transport employees to downtown Vancouver.
 6. An industrial shuttle will be provided along the Columbia River to permit industrial employees to transfer in downtown Vancouver and be delivered to their places of work.
 7. Demand response (radio dispatched) transit will be provided in areas where the ridership is low to provide an additional incentive to ride transit with the intent of increasing ridership.
 8. A downtown transit station, with park and ride facilities is constructed to serve as a focal point for the system. The downtown station is also the system's major transfer point.
 9. Shuttle service in the downtown area and between downtown and major activity centers (such as Clark College) is provided.

Cost estimates for the various types of service utilized in Scenario 1 are listed on Table IV-B. A map of the proposed service area is shown on Figure IV-1.

Scenario 2

Scenario 2 proposes a county wide system with service extending to the smaller cities in Northern Clark County. System operating expenses are estimated at \$2.2 million annually. Total capital costs of \$6.6 million are forecast with the local share totaling \$1.3 million.

System characteristics for Scenario 2 include the following:

1. Base service where population density exceeds five (5) persons per acre. Service is within one quarter mile of each household at no more than one-half hour headways.
2. Radial (arterial) service in the major arterial corridors provide transit service to the suburban areas at no more than one-half hour headways. Park and ride locations will be appropriately located along the routes.
3. Service is provided to Camas and Washougal on one-half hour headways. At least four daily trips are provided to Ridgefield-LaCenter and Battleground.
4. Base and commuter service between Portland and Vancouver will be provided much the same as is presently operated.
5. Commuter service will also be provided in the major corridors to transport employees to downtown Vancouver.
6. An industrial shuttle will be provided along the Columbia River to permit industrial employees to transfer in downtown Vancouver and delivered to their places of work.
7. Demand responsive (radio dispatched) transit will be pro-

- vided for handicapped persons.
8. A downtown transit station with park and ride facilities is constructed to serve as a focal point for the system. The downtown station is also the system's major transfer point.
 9. Shuttle service in the downtown area and between downtown and major activity centers (such as Clark College) is provided.

Operating and capital cost estimates are shown in Table IV-C. The proposed service areas are noted on Figure IV-2.

Table IV-A

SUMMARY OF TENTATIVE GOALS AND OBJECTIVES

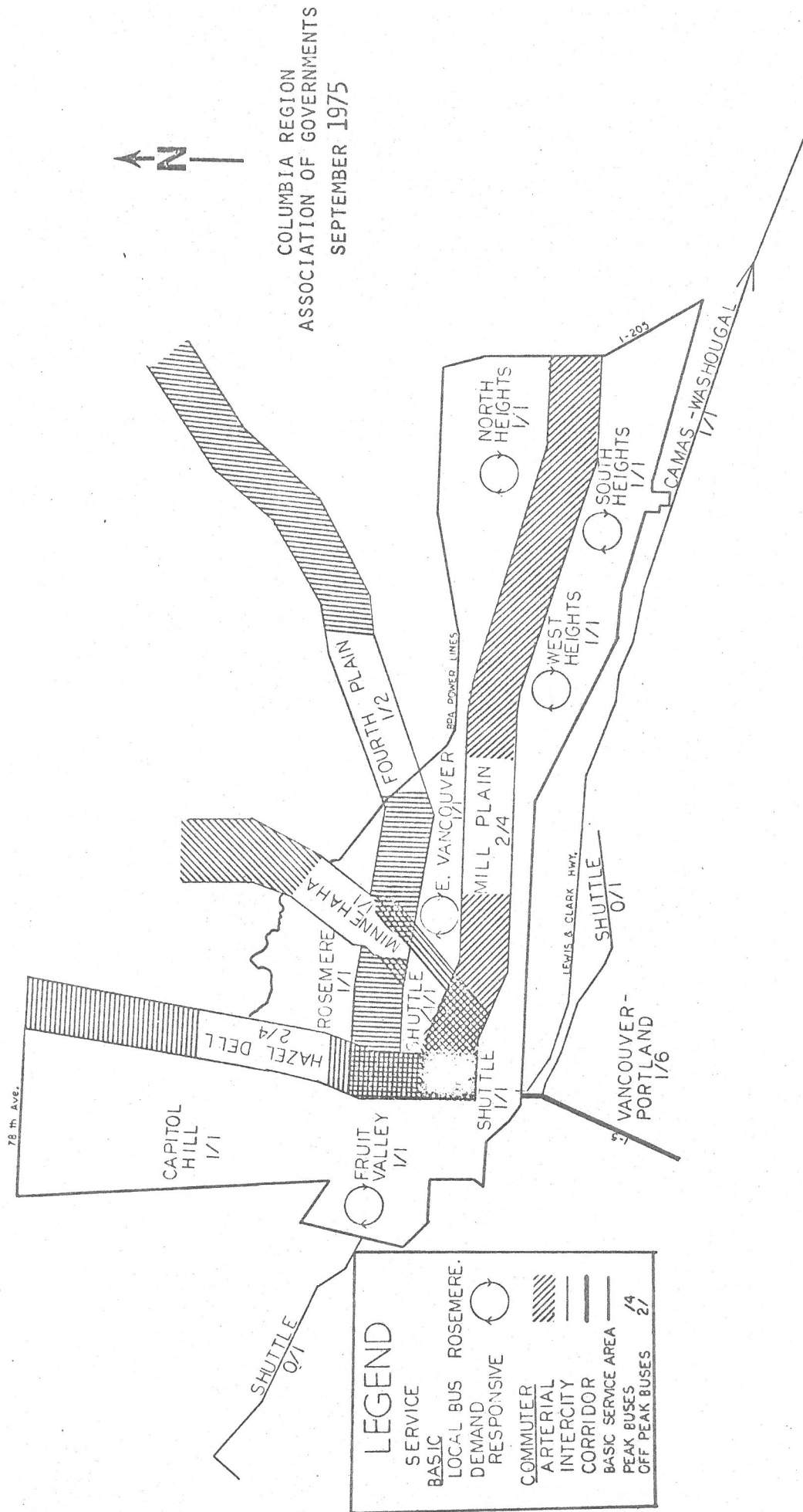
DEVELOPED ON JANUARY 9, 1975

1. The transportation system should support land use goals.
2. The transportation system should strengthen the CBD.
3. The transportation system must serve the needs of the County while maintaining some reasonable degree of fiscal integrity.
4. The system should provide incentives or disincentives for land use policy statements and political goals.
5. The system should be flexible enough to meet the needs of everyone (multi-modal).
6. The system should be designed to take advantage of future and existing state, Federal and local funding options.
7. The system should be a public system.
8. Expand City of Vancouver's system to the Clark County urban area.
9. The transportation system should recognize the changes in our life style and energy sources.
10. The transportation system should recognize the mobility needs of the citizens or individuals and provide transportation for those needs.
11. Future land use should be developed to such density that population support exists.
12. The system should provide a genuine alternative to the automobile.
13. The transportation system should ultimately be operationally economical.
14. The local system should now (or ultimately) tie into a regional system (CRAG).
15. The system should preserve the integrity of neighborhoods as well as different life styles.
16. The system should be flexible enough to take advantage of the changing state-of-the-art in fuel conservation and

changing Federal and State funding mechanisms.

17. The system should meet not only future needs of the community, but also have current benefits.
18. The system should support or serve current needs and expand to serve future needs as directed by the land use decisions.

ls:S
301/24-28



COLUMBIA REGION
ASSOCIATION OF GOVERNMENTS
SEPTEMBER 1975

FIGURE IV-1
SCENARIO 1

TABLE IV-B
ANNUAL OPERATING AND CAPITAL COSTS
Scenario 1

Capital

	Total Cost (000's)	Federal Match (000's)	Local Share (000's)	Annual Cost
Servicing Facility	\$ 250	\$ 200	\$ 50	
9 New Conv. Buses	540	432	108	
7 Demand Resp. Buses	105	84	21	
Downtown Transit Station (1)	1300	1040	260	
Bus Shelters	15	12	3	
Total Costs	2210	1768	442	

ANNUAL CAPITAL COST

(2)

Operations

Type of Service	Area Served	Number of Buses Peak	OFFPeak	Cost (000's)
Corridor	L-5 Corridor(3)	6	1	30
Arterial	Mill Plain	4	2	180
	Fourth Plain	2	1	90
	Minnehaha	1	1	60
	Hazel Dell	4	2	180
Local	Rosemere	1	1	60
	Capitol Hill	1	1	60
	Downtown Shuttle	1	1	60
	Clark Com. College Shuttle	1	1	60
	Industrial Shuttle	2	-	(4)
Demand Responsive	Fruit Valley	1	1	50
	E. Vancouver	1	1	50
	McLoughlin Hgts.	3	3	150
	Camas- Washougal	1	1	50
Intercity	Camas- Washougal	1	1	60
ANNUAL OPERATING COST				1,140,000

(1) A 500 auto capacity park and ride station - Source: 1990 Deleuw Cather Public Transportation Plan.

(2) Annual capital costs may vary depending on the means used to purchase capital equipment.

(3) Service provided by Tri-Met.

(4) Cost included in costs for arterial service.

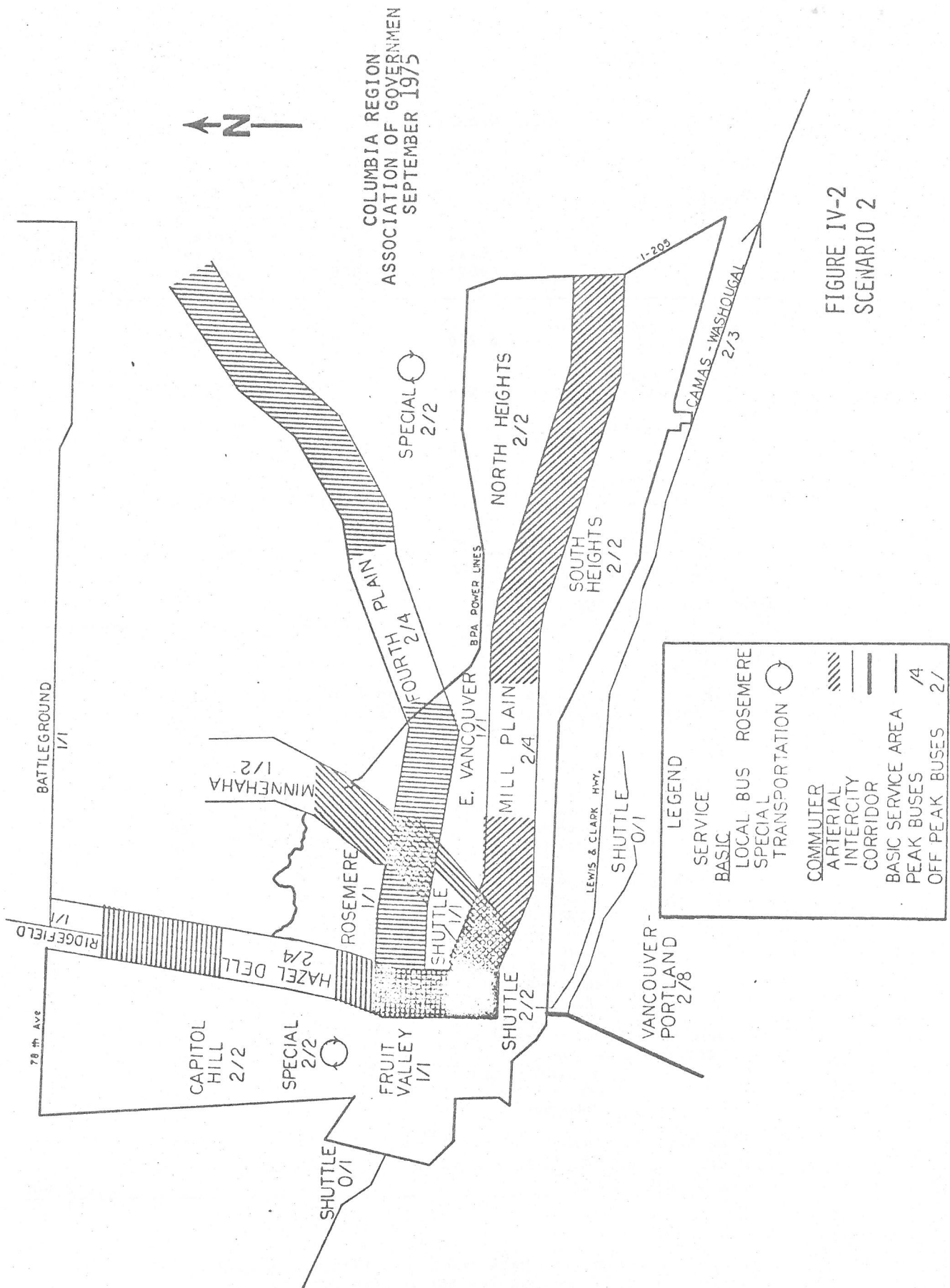


FIGURE IV-2
SCENARIO 2

TABLE IV-C

ANNUAL OPERATING AND CAPITAL COSTS
FOR
HIGH LEVEL OF SERVICE

Capital

	Total Cost (000's)	Federal Match (000's)	Local Share (000's)	Annual Cost
Servicing Facility	\$ 500	\$ 400	\$100	
New Conv. Buses	1800	1440	360	
4 Spec. Equip Demand Resp. Buses (1)	66	53	13	
Downtown Transit Station (2)	1300	1040	260	
Bus Shelters	140	112	28	
Park & Ride (3)	2826	2260	565	
Total Costs	6632	5306	1326	

ANNUAL CAPITAL COST

(4)

Operations

Type of Service	Area Served	Number of Buses Peak	OFFPeak	Cost (000's)
Corridor	I-5 Corridor(5)	8	2	60
Arterial	Mill Plain	4	2	180
	Fourth Plain	4	2	180
	Minnehaha	2	1	90
	Hazel Dell	4	2	180
Local	Rosemere	1	1	60
	Capitol Hill	2	2	120
	Fruit Valley	1	1	60
	E. Vancouver	1	1	60
	Downtown Shuttle	2	2	120
	Clark Com. College Shuttle	1	1	60
	McLoughlin Hgts.	4	4	240
	Camas	1	1	60
	Washougal	1	1	60
	Industrial Shuttle	2	-	(6)
Intercity	Camas- Washougal	3	2	150
	Ridgefield- LaCenter	1	1	60
	Battleground	1	1	60
Spec. Trans.	Urban Area	4	4	200
Evening	Arterial & Local	-	10	80
Sunday	Arterial & Local	-	10	100
ANNUAL OPERATING COST				2,180,000

- (1) Equipped with wheelchair lifts
 (2) 1972 dollars for 500 auto capacity P&R station. Source: DeLeuw
 Cather 1990 Public Transportation Plan
 (3) 1972 dollars - see DeLeuw Cather 1990 Public Transportation Plan
 (4) Annual capital costs may vary depending on the means used to
 purchase capital equipment
 (5) Service provided by Tri-Met
 (6) Cost included in costs for arterial service

V PRIORITY TREATMENT ANALYSIS

This section of the report describes the procedure utilized in the priority treatment analysis. After the prevailing conditions were determined, effort was devoted to how a high occupancy vehicle lane and ramp control measures could improve the conditions with other appropriate improvements also being considered. Some of the improvements mentioned have been identified previously and discussed in the Phase I report. After various improvements were identified, a determination was made on the probable consequences of the improvements on existing conditions. Some attention was given to law enforcement and carpooling issues; in addition, a number of other selected impacts were evaluated subjectively.

Existing Conditions

There are good records for traffic volumes on the I-5 facility at the permanent recorder count station located at the Interstate Bridges and Ainsworth Street. To supplement this data, additional portable recorder counters were set out and manual counts obtained. The manual counts included occupancy samples in peak and off-peak intervals. Travel time-delay studies were accomplished in the peak periods as well as numerous field trips on the part of the project staff. The traffic volumes and field trips were utilized to identify the location and intensity of the congestion problems

and the travel time-delay data determined the extent of the queueing caused by the congestion. Congestion occurs when the traffic flow is large and the backup propagates a considerable distance upstream. Congestion caused on Hayden Island has propagated as far south as the Fremont Interchange during the evening peak period. The existing conditions are illustrated on Figures IV-1 & 2. It is apparent that congestion problems occur at Portland Blvd. and between Union Avenue and Hayden Island (Columbia Slough Bridge). The identification of the congestion problems has been supported by work accomplished by ODOT Planning Section in Salem. This analysis is in the appendix.

Utilizing existing counts and occupancy rates, the level of service of the freeway and ridership (passengers per hour) of each lane was estimated at Portland Blvd. and the Columbia Slough¹. These sites were selected since congestion normally initiates from them and propagates to other areas.

HOV Lane Analysis

This portion of the work effort dealt specifically with an exclusive lane for HOV and utilized the most recent information². This analysis of the HOV lane analyzed impacts of the lane and on

000-AM PLAK HOUR VOLUMES
(000J-PM PLAK HOUR VOLUMES

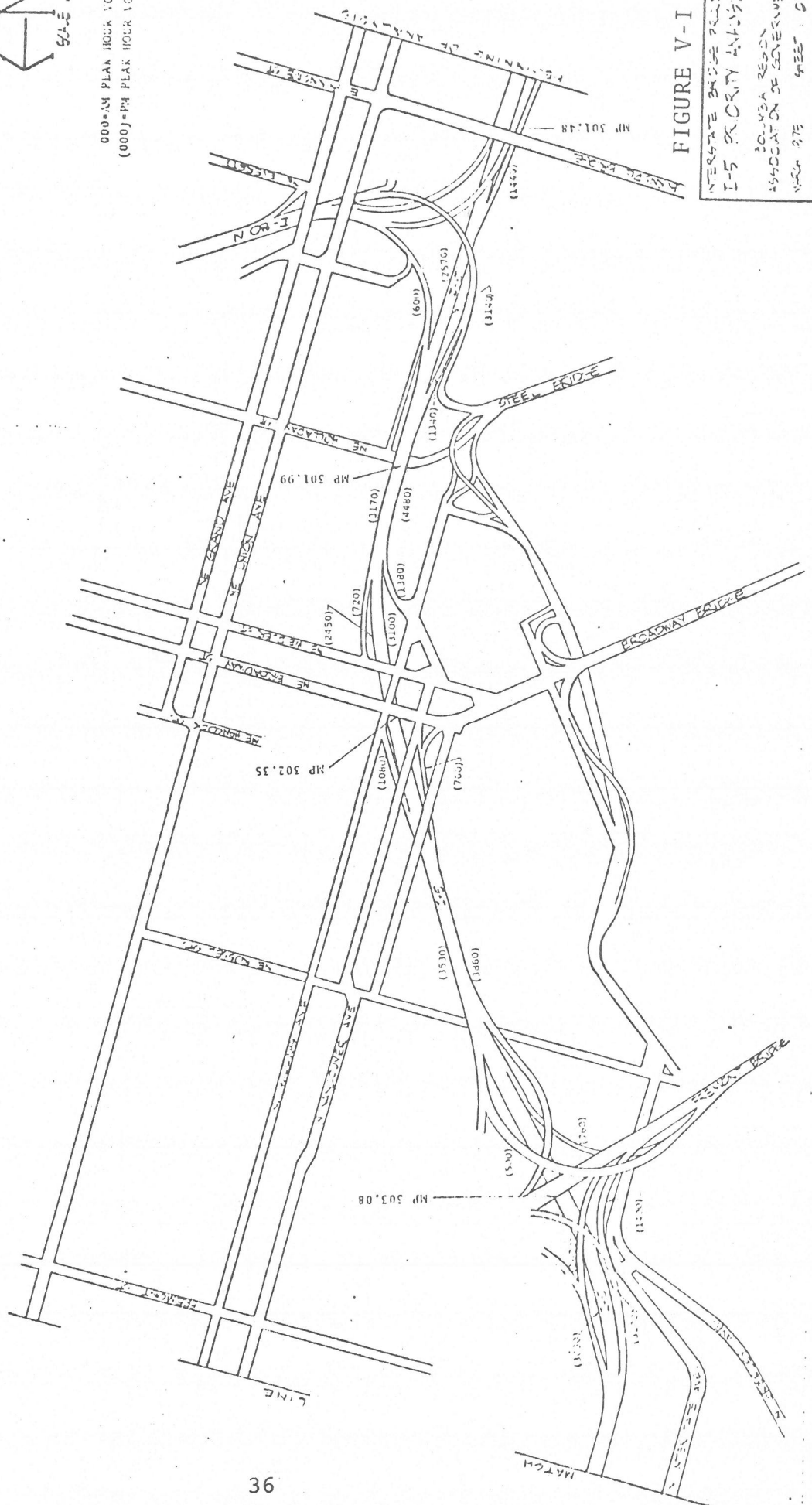
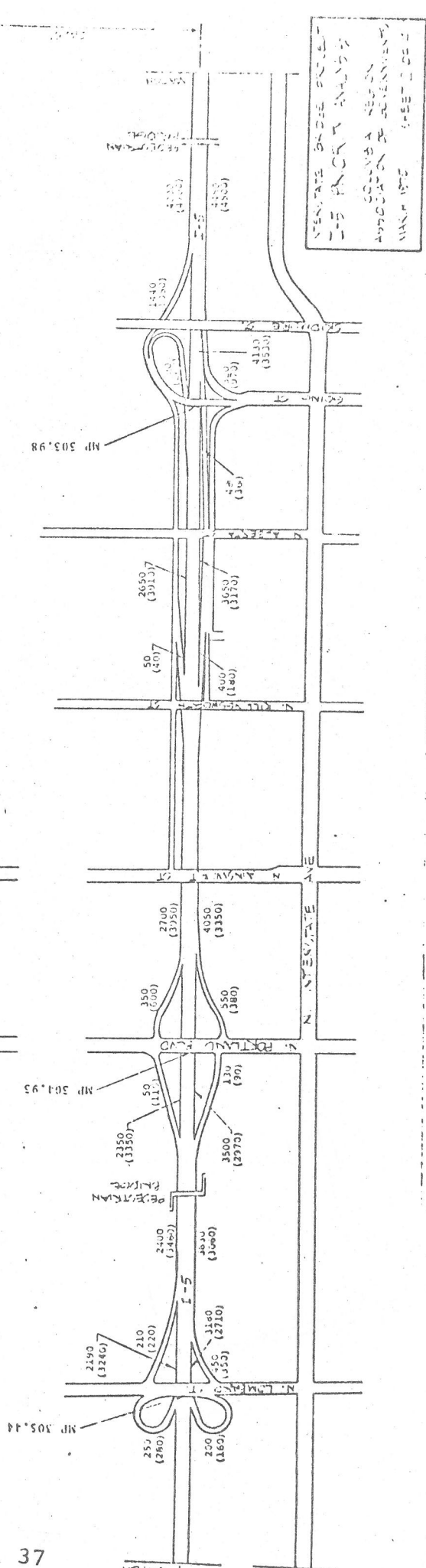


FIGURE V-1

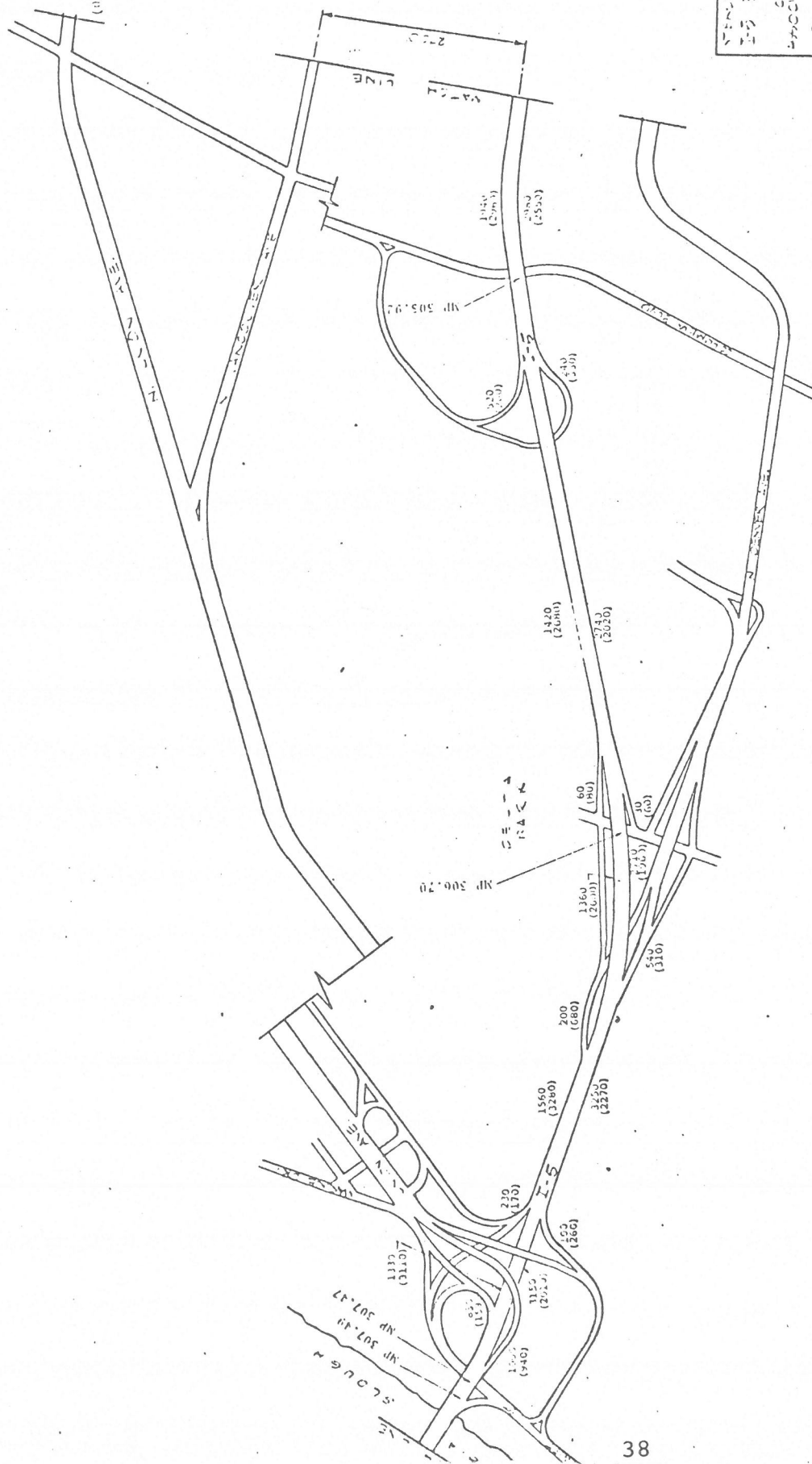
[illegible]

← N →

1000 = 10 PEAK HOUR VOLUMES
(1000) = 10 PEAK HOUR VOLUMES



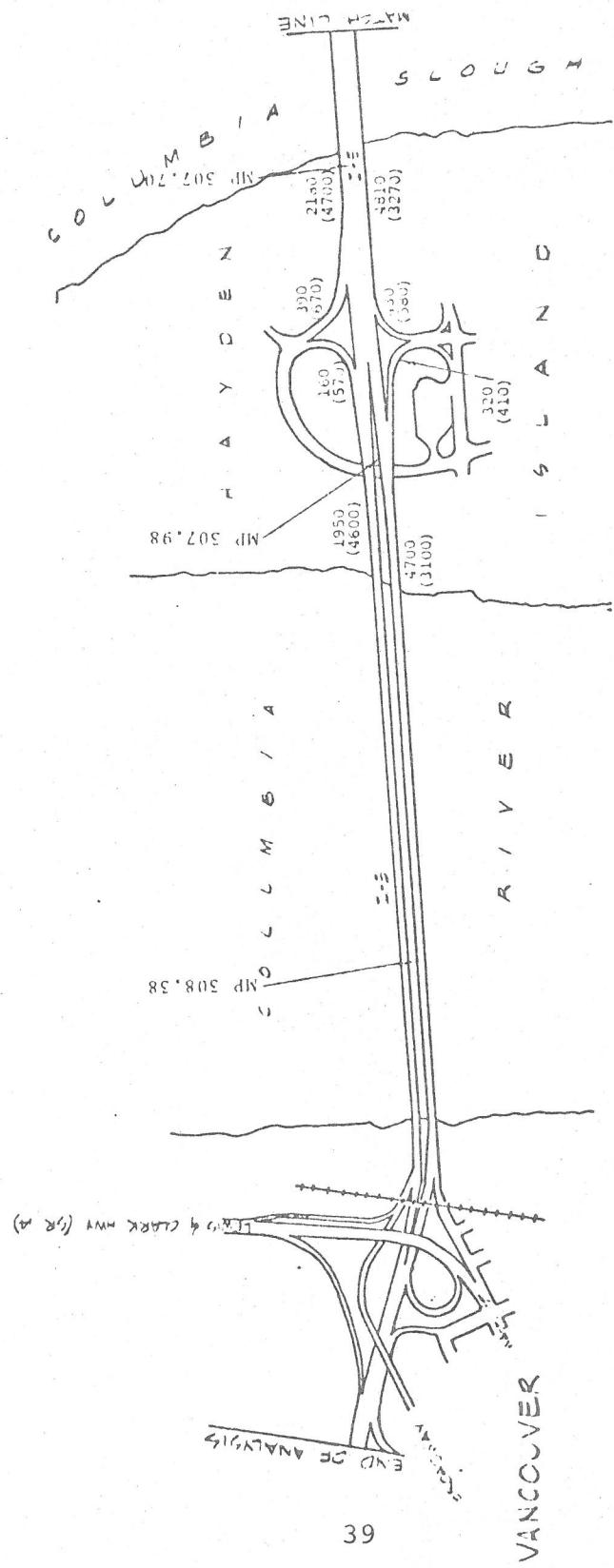
000-AM PEAK HOUR VOL. 1000
(100)-PM PEAK HOUR VOL. 1000



1. 1000 2. 1000 3. 1000 4. 1000 5. 1000 6. 1000 7. 1000 8. 1000 9. 1000 10. 1000 11. 1000 12. 1000 13. 1000 14. 1000 15. 1000 16. 1000 17. 1000 18. 1000 19. 1000 20. 1000 21. 1000 22. 1000 23. 1000 24. 1000 25. 1000 26. 1000 27. 1000 28. 1000 29. 1000 30. 1000 31. 1000 32. 1000 33. 1000 34. 1000 35. 1000 36. 1000 37. 1000 38. 1000 39. 1000 40. 1000 41. 1000 42. 1000 43. 1000 44. 1000 45. 1000 46. 1000 47. 1000 48. 1000 49. 1000 50. 1000 51. 1000 52. 1000 53. 1000 54. 1000 55. 1000 56. 1000 57. 1000 58. 1000 59. 1000 60. 1000 61. 1000 62. 1000 63. 1000 64. 1000 65. 1000 66. 1000 67. 1000 68. 1000 69. 1000 70. 1000 71. 1000 72. 1000 73. 1000 74. 1000 75. 1000 76. 1000 77. 1000 78. 1000 79. 1000 80. 1000 81. 1000 82. 1000 83. 1000 84. 1000 85. 1000 86. 1000 87. 1000 88. 1000 89. 1000 90. 1000 91. 1000 92. 1000 93. 1000 94. 1000 95. 1000 96. 1000 97. 1000 98. 1000 99. 1000 100. 1000



0000-AM PEAK HOUR VOLUMES
(0000)=PM PEAK HOUR VOLUMES



VERSTATE BRIDGE ROUTE
IS PRIORITY ANALYSIS
COLUMBIA REGION
ASSOCIATION OF GOVERNMENTS
MARCH 1975 SHEET 4 OF 4

TABLE IV-A PRIORITY ANALYSIS FOR I-5 BETWEEN PORTLAND BLVD. AND COLUMBIA SLOUGH

Location	Lane	Existing		W/ HOV Lane		W/ Ramp Control	W/ HOV Lane & Ramp Control	W/ Utilizing Shoulder at Portland Blvd.
		vph	pph	vph	pph	vph	pph	vph
Portland Blvd AM	3 (HOV)	---	---	90	840	90	840	3 (38%) 1330
	2	2070	2500	2010	2510	1800	2240	2 (41%) 1440
	1 (41%)	1430	1740	1400	1680	1200	1400	1 (21%) 730
Level of Service		F	4240	E	4920	D ¹	4410	*C
PM	3 (HOV)	---	---	300	1570	300	1570	
	2	1940	2630	1830	2290	1800	2250	
	1 (41%)	1410	1830(40%)	1220	1530(40%)	1200	1506	
Level of Service		F	4460	*E	5290	D ²	5526	
Columbia Slough AM	3 (HOV)	---	---	270	1470	270	1460	
	3 (40%)	1920	2330(39%)	1770	2050(39%)	1760	2038	
	2 (38%)	1830	2210(39%)	1770	2050(39%)	1760	2038	
Level of Service	1 (22%)	1060	1280(22%)	1000	1160(22%)	980	1136	
		E	5820	E	6620	*D ³	6572	
PM	4 (HOV)	---	---	440	2060	440	2060	
	3 (40%)	1880	2430(39%)	1660	2010	1760	2010	
	2 (38%)	1790	2300(40%)	1700	2060	1760	2060	
Level of Service	1 (22%)	1030	1330(21%)	900	1090	900	1090	
		E	6060	*D	7120	D ⁴	7123	

NOTE: vph - Vehicles per hour
 pph - Passengers per hour
 (xx) - Lane distribution of traffic volumes
 * - Recommended Control

DATA AND ASSUMPTIONS: See Appendix A

FOOTNOTES:

1. About 500 vph (of the 650) must be diverted from Lombard St. "On" ramp to Portland Blvd. "On" ramps, etc.
2. About 350 vph (of the possible 440 vph) must be diverted from Williams Ave. and Going St. to other facilities.
3. About 310 vph at Hayden Island or Vancouver must be queued and held until volume reduces.
4. About 200 vph at Delta Park or Union Ave. must be queued and held until volume reduces.
5. About 410 vph must be diverted as in note 1.
6. About 50 vph must be diverted as in note 2.
7. About 40 vph must be queued as in note 3.
8. No ramp control required.

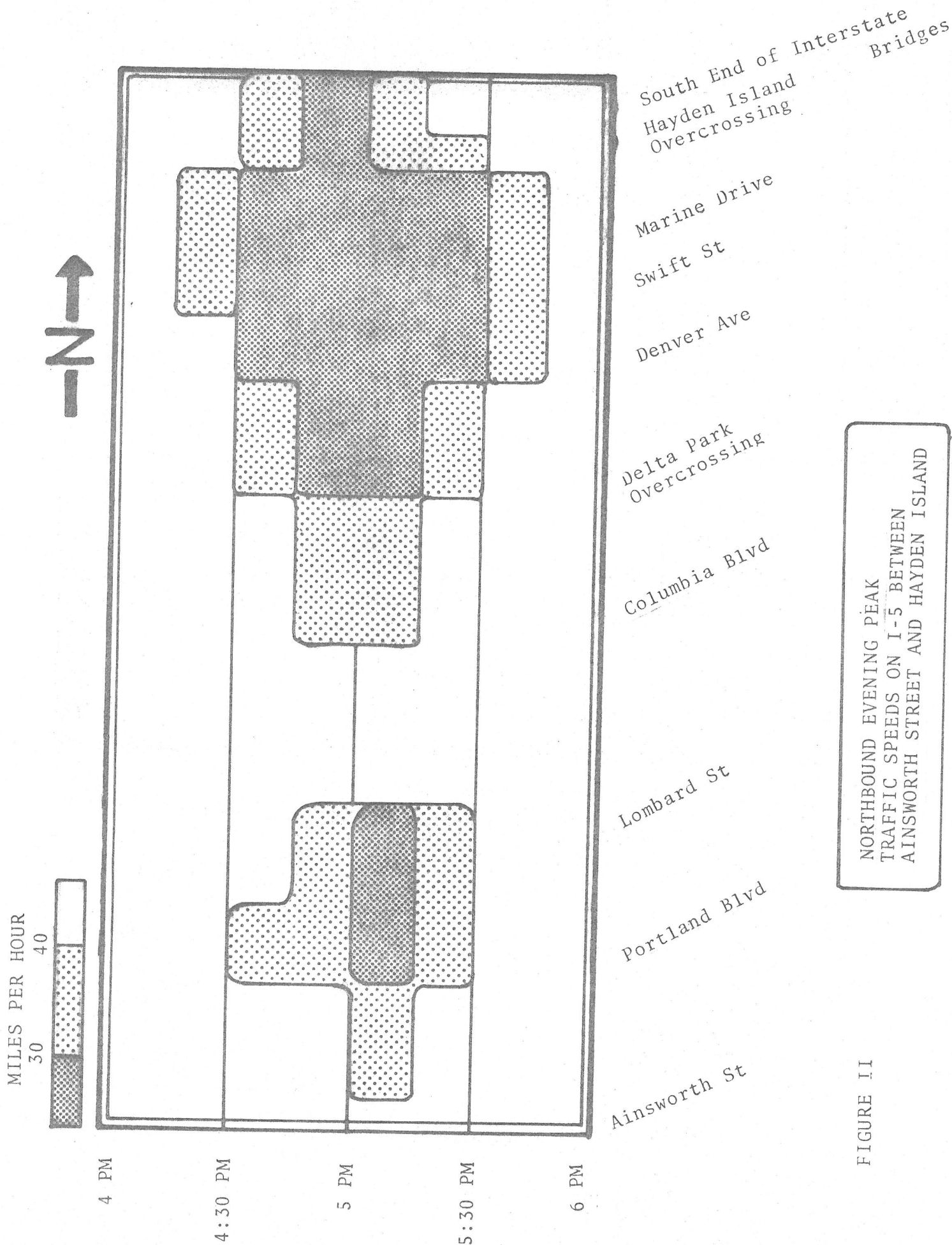


FIGURE 11

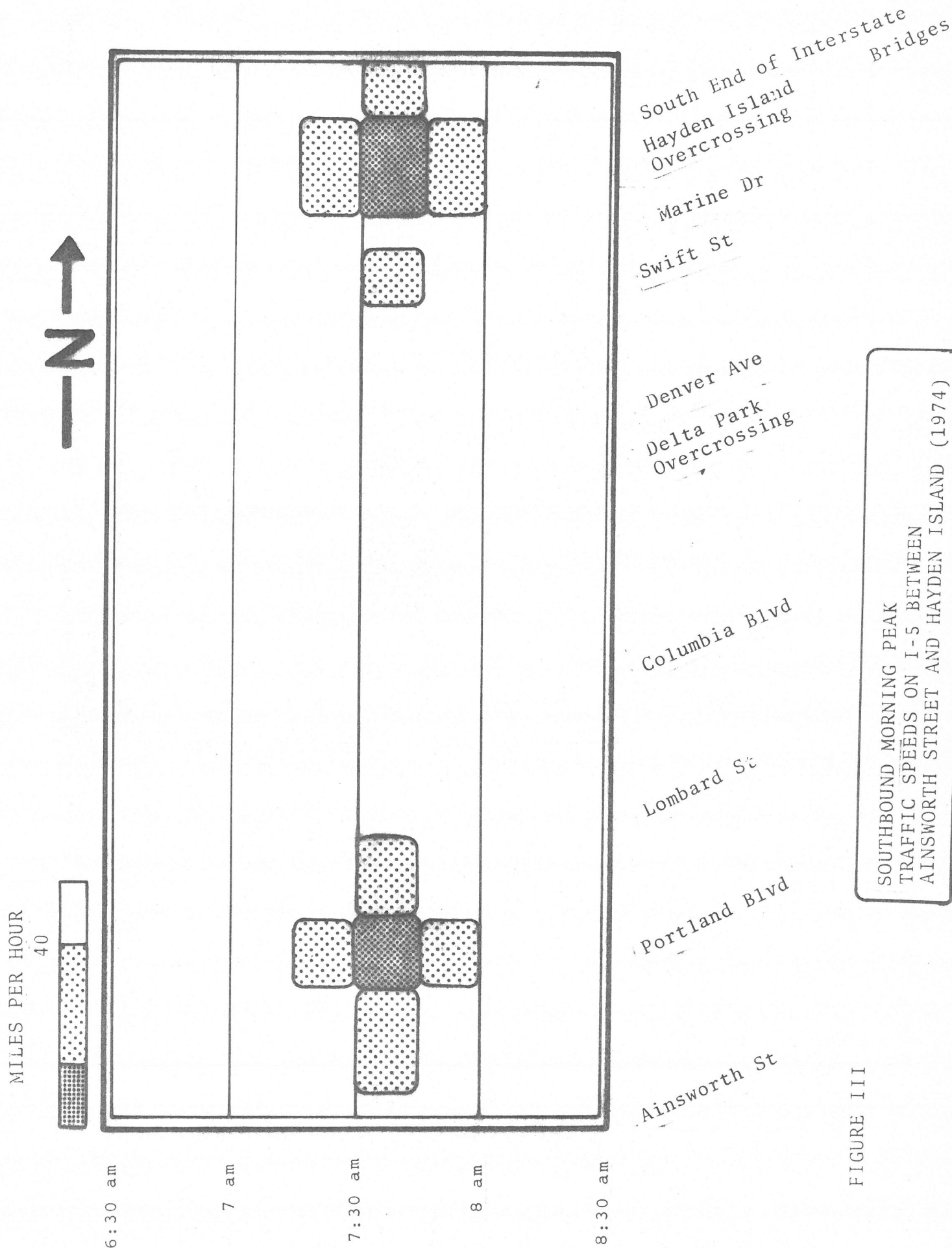


FIGURE I I I

the remainder of the roadway. Using the same method of assessing existing conditions, the analysis was repeated assuming the installation of a HOV lane of the freeway. The results of these exercises (Table IV-A) indicated considerable improvement in the level of service in the non-priority traffic flow during the evening peak hour. There was also some improvement in the morning peak hour but not as much. The HOV lane was assumed to contain buses and carpools with three or more persons. It was also assumed that the number of carpools and transit ridership doubled with the installation of the HOV lane. This assumption was based on the experience of the Oakland-Bay Bridge priority treatment program for carpools and the Tri-Met fare reduction for transit ridership.²

The assumption that the transit ridership would double after the improvements recommended herein is substantiated in the following ways:

1. The ridership on several Tri-Met lines (Forest Grove/Hillsboro/Beaverton, Sherwood/Tigard, and Somerset West) increased about 1.56 times six months after the 35¢ flat fare structure went into effect. These lines are approximately equal in length or in travel time to the lines between Downtown Vancouver and Portland.
2. There will be a city-county transit system in Washington with a free transfer for interstate passengers.
3. Fuel costs will continue to increase for the immediate present.

It was estimated that the northbound HOV lane in the evening peak hour would service approximately 1570 passengers per hour at Portland Blvd. and 2060 at the Columbia Slough Bridge. Respectively, the morning peak hour volumes in the southbound direction were expected to be 840 and 1470.

One conclusion of the capacity analysis, was that the Columbia Slough Bridge needs to be widened to eight lanes. Southbound on Interstate 5 the fourth lane may be added at the Hayden Island Interchange and dropped at Union Avenue while the third may be dropped at Denver or retained through the Portland Blvd. interchange if an HOV lane is installed. Northbound the improvement should be symmetrical. The third lane could begin at Portland Blvd. or be added at Union Avenue and terminated at the Hayden Island interchange.

To ensure safety and smooth traffic flow, shoulders should be provided in the sections having a HOV lane. It appears that this can be accomplished with a minimum of widening and utilization of 11' lanes.

It might be desirable to extend the priority lanes south from Portland Blvd. to the Fremont Bridge to improve traffic operations. This could be accomplished either by using an existing

lane in the three and four lane sections of I-5 or by creating four and five lanes respectively in these sections of the freeway. This might be accomplished with a minor amount of widening and utilizing 11' lanes in this section.

Ramp Control

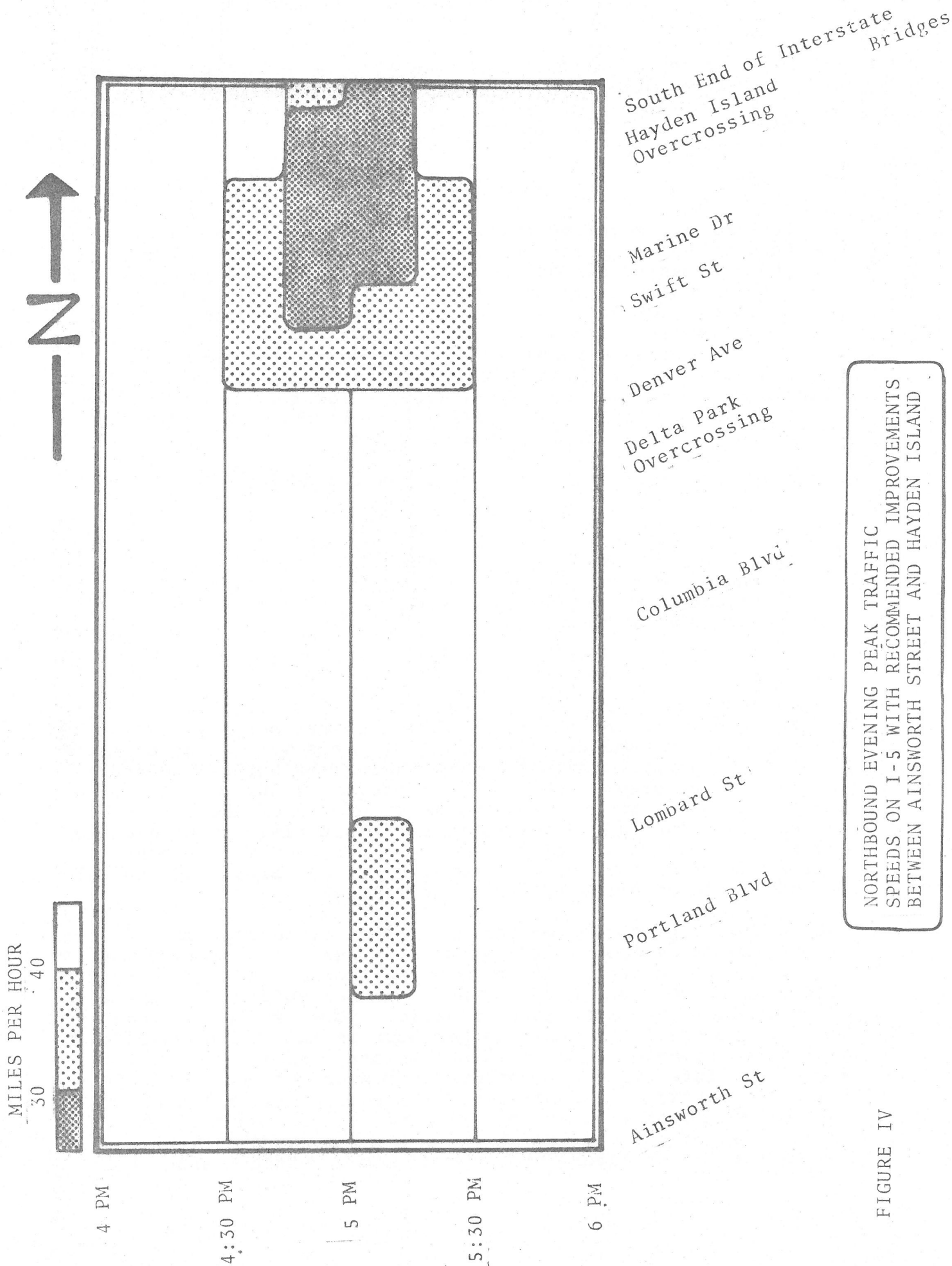
Ramp control and metering systems have been previously treated and the various modes of control identified and described. For this analysis "capacity-demand" mode was considered the most appropriate control for this situation. It was selected because (1) the "on" ramp acceleration lanes were not seriously deficient, (2) it is traffic responsive and will respond to varying flow conditions and (3) it is less expensive than more sophisticated modes. Ramp metering usually is applied to a facility which has a parallel alternative for those who are directed from the freeway (Figure IV-3); however, motorists crossing the Slough or Interstate Bridge do not have an alternate route.

Possible northbound ramp control sites include:

	<u>PM Pk. HR.</u>	<u>*</u>
Williams Ave NB "On"	1080	357
Going St NB "On"	260	85
Portland Blvd NB "On"	110	44
Denver Ave NB "On"	680	
		<u>486</u>

Of the northbound peak hour, approximately 486 vehicles are subject to diversion, about 440 vehicles per hour may be diverted to reduce the demand at Portland Blvd. This would reduce traffic demand to approximately 2910 vehicles per hour. The actual diversion was based on level of service "D" (1500 vehicles per hour per lane). The freeway volume in excess of 1500 vehicles per hour per lane was diverted to other arterials up to a maximum diversion of 440 vehicles per hour. Since the PM peak hour volume was 3350 vehicles per hour at Portland Blvd., 350 vehicles per hour were diverted to other facilities.

Southbound ramp control at Lombard Street could improve the level of service at Portland Blvd. which has been shown as deficient on Figure VI-2. In fact, the Lombard southbound "on" ramps could be closed since Portland Blvd. is near and has sufficient capacity to accommodate the additional traffic. However, 500 vehicles per hour of the total 650 vehicles per hour is the number which will need to be diverted. There is sufficient capacity on the local arterials (Interstate and Vancouver Avenues) to accommodate this diverted traffic. It would be appropriate, however, to consider the renovation of some of the existing signals and the installation of new ones at the Portland Blvd. interchange and left turn channelization on Interstate Avenue, Lombard Street and Portland Blvd.



NORTHBOUND EVENING PEAK TRAFFIC SPEEDS ON I-5 WITH RECOMMENDED IMPROVEMENTS BETWEEN AINSWORTH STREET AND HAYDEN ISLAND

FIGURE IV

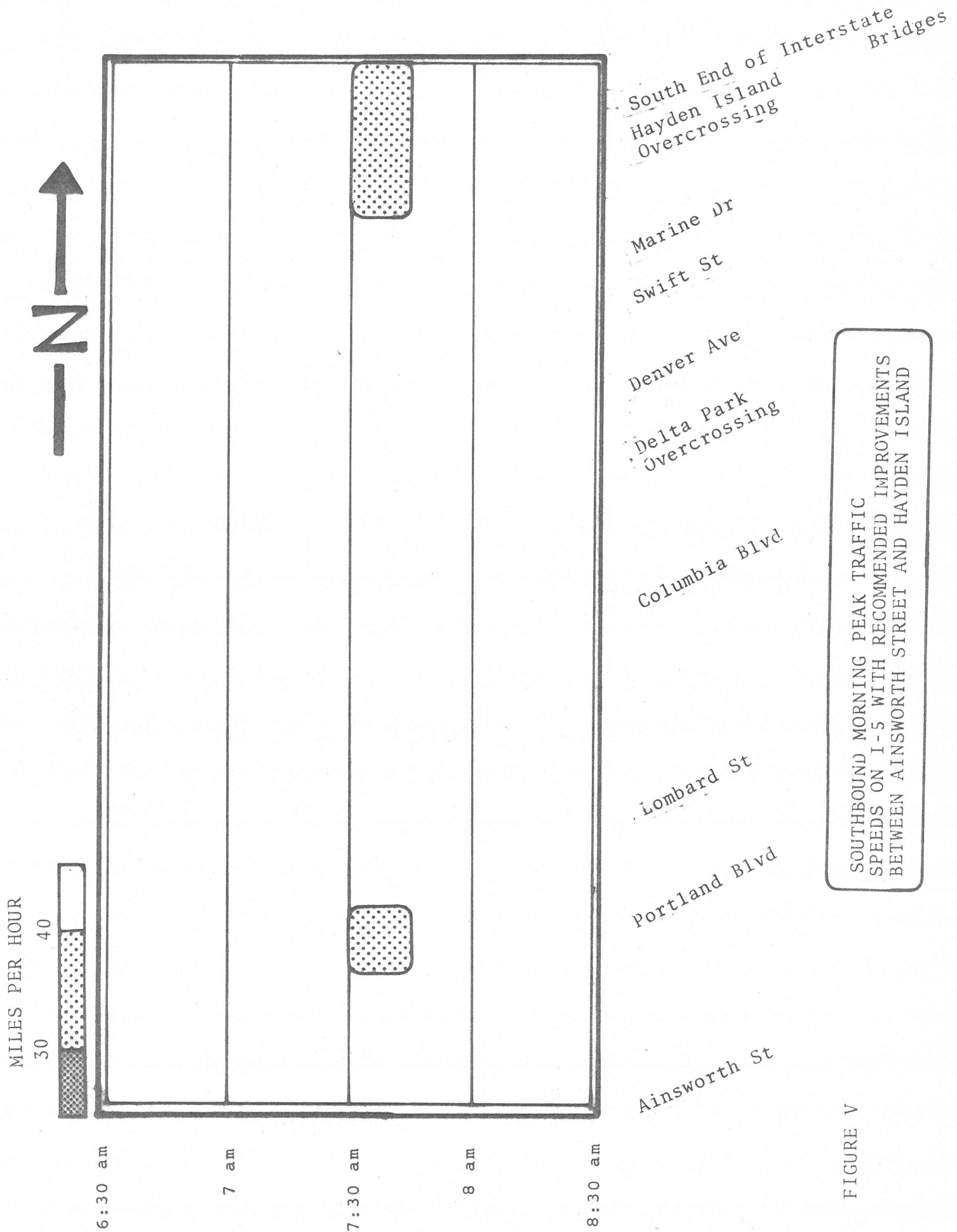


FIGURE V

Even though the HOV lane northbound and widening southbound will improve the traffic flow, there is reason for concern on Hayden Island. There have been land development proposals which will generate more trips.⁴ Currently, a comprehensive plan for development on the island is being prepared. In view of this interest and the obvious economic and social incentives for additional development, some method to maintain reasonable level of service on Interstate 5 is desirable. Ramp control at the northbound and southbound on-ramps with HOV bypasses would maintain a sufficient level of service. While this application of ramp control would not have an alternate route for motorists, there would exist an alternative: utilization of carpools or transit.

The consequences of not using ramp control are (1) to stop all traffic generating development on the Island, or (2) to tolerate additional congestion on Interstate 5.

Law Enforcement Control System

A very important component of an efficient and effective functional transportation system is that of enforcement. Effective law enforcement measures can improve the efficiency of a transportation system particularly when accidents or other incidents occur which may adversely affect the traffic flow. This section addresses the law enforcement issue by describing lane delineation and signing controls. In addition, the concept of closed circuit television (CCTV) is also discussed.

Whenever preferential treatment is permitted for a portion of the traffic flow, enforcement can be difficult. By designating one lane to be used by buses and carpools there will be a tendency for those motorists who do not qualify for the priority treatment to violate the control. Experience elsewhere indicates that there is a number of violations when any priority treatment is first established. However, through effective law enforcement measures, conformance to this practice can be established.

The utilization of this kind of priority treatment may be referred to as a free access high occupancy vehicle lane and differs from previous applications elsewhere in the country which utilize traffic cones or some other means of physical separation from the normal traffic flow. Such separated application permits access to and from the HOV lane only at selected opportunities. The application recommended in this instance does not provide a physical barrier throughout the length of the HOV lane on Interstate 5. This type of design tends to increase the confusion, weaving, and conflicts which will occur from vehicles entering and leaving the HOV lane. Legally, access to the HOV lane can be restricted or eliminated by the utilization of a double solid white line between the HOV lane and the adjacent lane since

crossing the line is not legal. At frequent locations one of the double white lines can be discontinued, which permits motorists to cross the line with care. This is based on national policy.⁵

In addition to the lane markings, considerable signing would not only be appropriate but necessary to convey information to the motorist about the use of the HOV lane. Since the operation of an HOV lane is not common, special attention to signing would be essential. Extra effort and care is proper whenever the motorist is required to cope with new and/or unusual control measures.

To assist the law enforcement effort, since violators are expected, CCTV surveillance was explored and appeared to have considerable merit. The CCTV could monitor the lane for violators, patrol units could be notified and warnings issued to violators when they leave the HOV lane. Also, dynamic message signs would emphasize the lane control as violators approach the signs. Another benefit, identified and discussed in the Phase I report, is the detection of accidents, disabled vehicles or other incidents which may intensify congestion. If the time of incident detection can be substantially reduced, emergency equipment can arrive at the scene in much less time because the queues will be still relatively small. Currently, in peak hours the queues often extend for miles before the incident is reported to the law enforcement agency. The immediate detection of an accident may be the strongest reason for utilizing CCTV.

The utilization of an HOV lane in one direction only will tend to increase violations because motorists will tend to be confused as to which direction they may use the HOV lane. This lends additional support to the concept of providing an HOV lane in both directions.

Carpooling Considerations

In recent years the practice of carpooling has received considerable attention and emphasis in an attempt to increase the efficiency and passenger capacity of transportation facilities. On a nationwide basis, approximately 30% of all work trips occur in carpools. The definition of a carpool is two or more persons per vehicle. On Interstate 5 during the peak period carpools represent approximately 22% of all work trips. In a report by the U. S. Department of Transportation on carpool incentives and opportunities it was noted that a small increase in vehicle occupancy will result in a significant decrease in vehicle mileage. Subsequently, rather small changes in the automobile occupancy can have substantial improvements in the savings of fuel and at the same time increase the capacity of the transportation system. It has been further determined that carpoolers can save approximately \$200 to \$850 per year depending upon the number of persons participating in the carpool.

Some have been concerned with possible detrimental affects on transit ridership by marketing and emphasizing carpools. How-

ever, actual experience has shown that effective carpool programs have had no significant adverse impacts on transit ridership. Further, the most effective and successful carpooling activities have occurred when employers have provided incentives such as discriminatory parking in favor of carpoolers. The most promising and innovative concept in this area has been that of Vanpooling. This consists of the company providing a 10 to 12 passenger van which is funded by the participants at no cost to the company. The USDOT will participate in financing losses which may result from companies trying this method.

Throughout the nation, in general, it has been reported that too few urbanized areas have systematically pursued priority treatment for HOV's. It appeared that many state and local transportation officials have not given sufficient emphasis to this matter. In fact, in some cases they have even resisted such measures. This action is not new because often new or innovative concepts meet some institutional resistance; institutional momentum changes are required to use new ideas. In the CRAG region it is fortunate that the state and local officials have voiced support for the use of priority treatment for high occupancy vehicles.

Generally, carpooling and vanpooling can develop into a significant component of the transportation system. One of the major difficulties in the development of transportation facilities is the matter of designing for peak period utilization. The actual demand on the transportation facilities during the peak periods is much greater than the off peak. By utilizing a substantial number of carpools and vanpools it is possible to accommodate the peak period demand without having to invest in additional rolling stock for transit service and additional roadway capacity, illustrated in figure IV-4. Much of the cost of public transportation funds the purchase of rolling stock for peak period service: rolling stock that is idle the rest of the day. In addition, and perhaps more important, more drivers are required for the peak period, and with the present labor contracts the work day must extend beyond the peak periods. Carpools and vanpools would reduce the amount of rolling stock and the number of drivers required during the peak period.

Cost Considerations

An important issue in any decision-making process is, of course, the cost. No solution merits serious consideration unless it is within the realm of financial capability of the implementing agency. For this reason the improvements studied in the project work tasks have been compared with other alternatives and appear as follows:

<u>Alternative</u>	<u>Estimate (Millions)</u>
1. Exclusive HOV Roadway and Ramps	\$35
2. Exclusive HOV Lane with Interstate	16

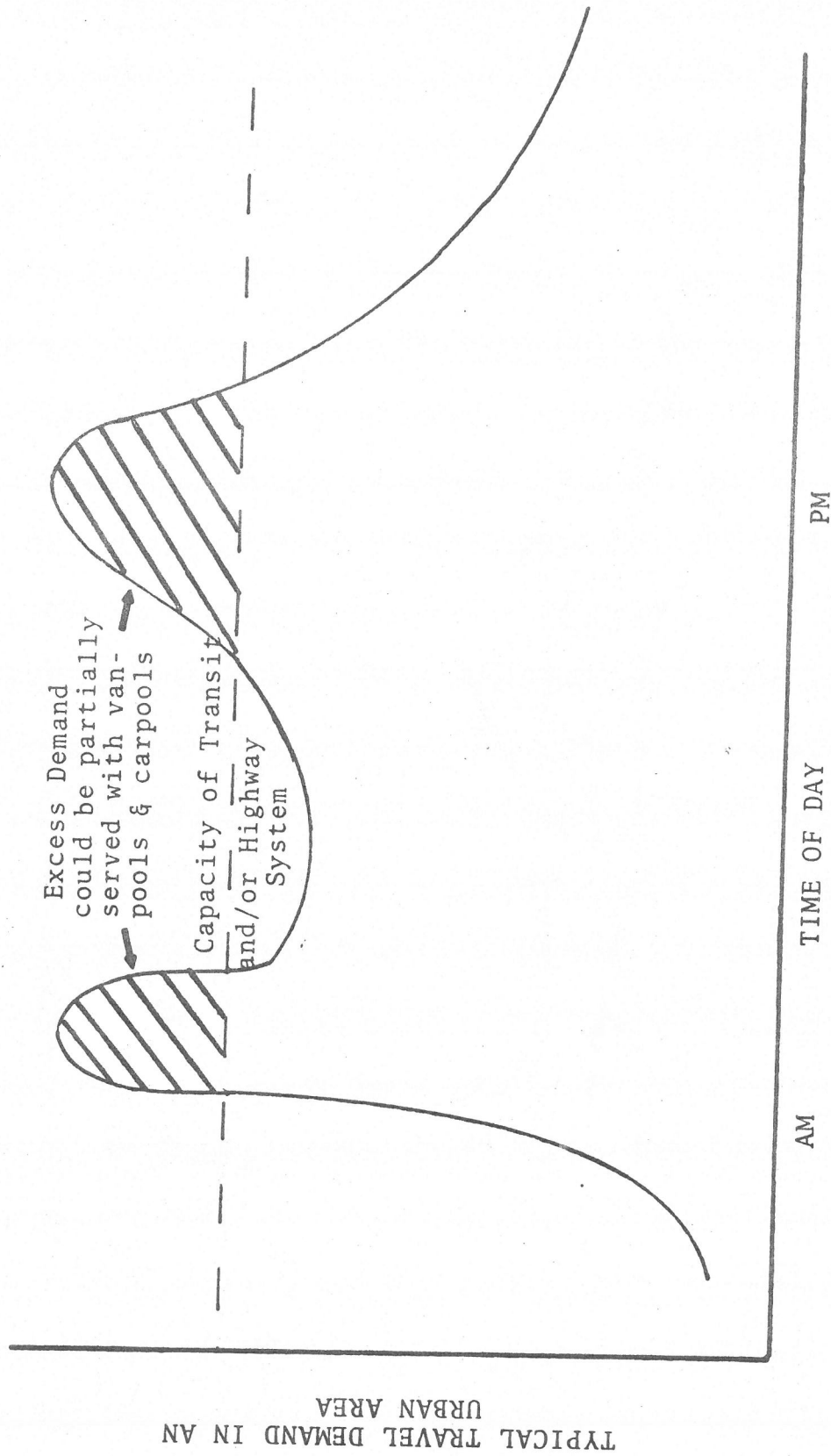


FIGURE V-7 PROVIDING FOR EXCESS DEMAND ON TRANSPORTATION SYSTEM

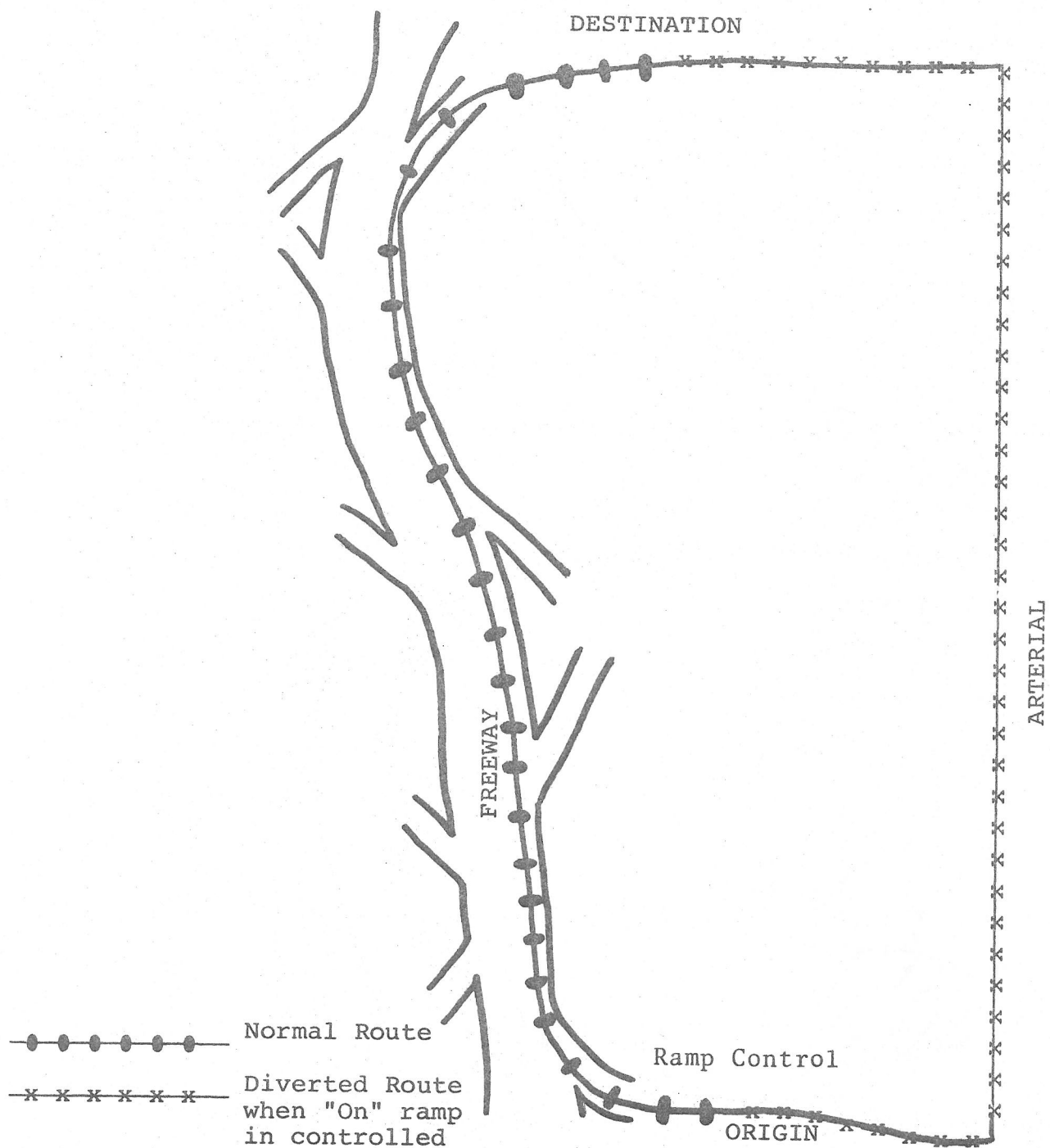


FIGURE V-4 PRINCIPLE OF TRIP DIVERSION RESULTING FROM RAMP CONTROL

Roadway Standards
3. Exclusive HOV Lane with Sub
standard Geometrics

1.3

An apparent conclusion of the cost estimates suggest that the improvements evaluated herein are extremely reasonable when compared with other alternatives which may be considered for Interstate 5 corridor.

Selected Impacts of Improvements

Whenever changes are made in one aspect or component of a system, changes usually occur elsewhere. So likewise the improvement in this section are expected to cause changes in other aspects. A number of the less obvious impacts have been identified and subjectively evaluated. This evaluation is summarized on table IV-B. Travel Time reductions for non HOV's are shown in Appendix A.

ls:S
301/29-35

TABLE V-B SELECTED IMPACTS OF A PRIORITY LANE FOR HIGH OCCUPANCY VEHICLES IN THE I-5 CORRIDOR

FACTOR IMPACTED	CAUSE OF IMPACT	MEASUREMENT	AREA IMPACTED	ANTICIPATED RESULT
1) Air Quality	Reduce the number of auto's emitting pollutants by providing incentives to increase vehicle occupancy	Amount of gases, particles etc, in the air	Regional and Corridor Airshed	Improvement in region's air
2) Energy Conservation	Reduce consumption of fossil fuels (i.e. gasoline) by encouraging use of more efficient means of transportation	Gasoline Consumption	Corridor and Clark County	Reduction in per capita energy consumption
3) Land Use: Downtown Portland	Encourage additional employment in the Portland CBD by improving commuter transportation access to the CBD	CBD Employment	Portland CBD	Increase employment in Portland CBD
4) Land Use: Downtown Vancouver	Improved transportation access to Vancouver CBD resulting in increased economic activity	Employment Retail Sales	Vancouver CBD	The economic viability of downtown Vancouver will increase
5) Land Use: Vancouver Transit Station	Increased activity around transit station	Land Values	Vancouver CBD	Land values in areas surrounding the transit station will increase
6) Land Use: Clark County	Improved Transportation opportunities to employment centers	Increased Clark Co. Population and work force	Developable land in Clark County	Development in Clark County will increase until land costs are driven up

TABLE V-B (continued)

FACTOR IMPACTED	CAUSE OF IMPACT	MEASUREMENT	AREA IMPACTED	ANTICIPATED RESULT
7) Safety	Reduction in the reliance of autos in the corridor due to encouragement of express bus. Earlier detection of incidents occurring on the free- cidents way. Elimination of shoulder.	Accident Rates: 4 Auto-1.2A/MPM Bus-.14A/MPM (A/MPM-Accidents per million vehicle miles)	I-5 Freeway	Reduction in corridor's accident rate and improved response to incidents. Some adverse affect may result because of elimination of shoulder.
8) Noise Pollution	More buses will be using the corridor increasing noise levels	Decibels	Primary impact along corridor	Increase in noise levels in corridor may result
9) Public Finance	Additional subsidy needed to operate transit buses in corridor	Public Expenditures	Clark County Tri County Metropolitan transit district	Increased taxes in Clark County and in Tri-Met District
10) Employment (short term)	Construction of priority lane	Employment	SMSA Work Force	Slight increase in area employment
11) Employment (long term)	Operation and maintenance of buses	Employment	SMSA Work Force	Slight increase in area employment
12) Commerce	Slightly lower demand for gasoline and related products	Retail Sales	Clark County	Slight decline in sales relating to motor fuel and related services and projects
13) Parking	Lower demand for parking in Portland CBD: Increased demand in Vancouver CBD	Parking Rates	Vancouver and Portland CBD's	Slight decline in parking spaces in Portland CBD as land is converted to other uses. Increasing demand for parking in and around Vancouver CBD as park and ride increases

TABLE V-B (Continued)

FOOTNOTES:

1. Additional economic impacts (such as #4) likely to result in overall employment increases.
2. Increased employment in Portland CBD plus increased development in Clark County may encourage more downtown workers to live in Clark County, thus further complicating transportation in the I-5 Corridor until property values rise sufficiently to curb development.
3. Care should be taken in the design of the termination of priority lanes to assure that there is adequate opportunity to merge. Since highway design standards encourages merging from the right in contrast to the left, perhaps, it would be advantageous to merge normal traffic into the HOV lane at the terminous on Hayden Island.
4. One of the measures of highway safety is that of traffic accidents. The accident rate on I-5 was found to be 1.2 A/MPM this was determined by converting the 1.8 A/MVM accident rate asuming a daily occupancy rate of 1.5 passengers per vehicle. A similar accident rate for Tri-Met buses were found to be 2.82 A/MPM for all lines. The accident rate for buses operating on lines utilizing freeways and expressways was .14 A/MPM. From this data it is apparent that any incentive to utilize transit-such as a HOV lane-would tend to improve the level of safety.

LONG RANGE PLANNING CONSIDERATIONS

While the provision of immediate relief is the major focus of the Interstate Bridge Corridor Project, long range considerations have also been studied.

The completion of I-205, shortly after 1980, is expected to provide a degree of relief in the Interstate Bridge Corridor. However, continued development in the Rivergate Industrial Area, as well as, in Clark County will cause continued high traffic volumes on the I-5 freeway. By 1990, the traffic volumes on I-5 are expected to equal or exceed present day counts; congestion in the corridor is expected to be a long term problem. Estimates prepared by the Oregon Department of Transportation (ODOT) show the following traffic projections:

Point of Measurement	1974 ADT (000s)	1990* ADT (000s)	% Increase (Decrease)
Interstate Bridges	83	87	5%
Lombard St to Portland Blvd	73	73	--
Ainsworth to Killingsworth St	81	101	25%

In order to avoid traffic conditions even more congested than those experienced on the freeway at this time, High Occupancy Vehicles will have to play a major role in increasing the people moving capacity of the Interstate Bridge Corridor.

Estimates prepared by the Governor's Task Force on Transportation show that bus lanes operating on the freeway and on Union Avenue could carry approximately 30,000 daily riders.** Transit operating on the freeway would maintain one minute headways during the peak periods, five minute headways during the daytime off peak and thirty minutes for evening and night service.⁵

*NOTE: These estimates are based on assumptions made in the CRAG Interim Transportation Plan which includes completion of I-205 and a busway on I-5.

** The Union Avenue project has recommended that bus lanes not be included in the proposed rebuilding of Union Avenue.

Following the findings of the Governor's Task Force Report, the CRAG Interim Transportation Plan has recommended the provision of an exclusive busway on I-5. The Busway would connect the Portland Downtown Transit Mall with the Vancouver Transit station. The frequent headways noted in the Governor's Task Force Report would be maintained.

Provision of bus lanes within the existing right of way would enable the planning staffs of ODOT, Tri-Met and WSHD to study the impacts of a low capital intensive HOV priority system prior to the development of a more permanent busway. In addition, the bus lanes would provide a means of gradually upgrading transit service in the corridor. Thus, ridership could be increased up to a point where development of the capital intensive busway would be justified.

RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Clark County, Vancouver and Portland.
2. Tri-Met should purchase Vancouver-Portland Bus Company immediately.
3. As the agency responsible for the regional carpool program, Tri-Met should expand aggressive carpool marketing efforts to Clark County.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows (figure 5):
 - A. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - B. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - C. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with the Columbia Slough Bridge to an eight lane structure.
6. The Oregon Department of Transportation consider installation of traffic signals at the termini's of the I-5 ramps at Portland Boulevard.

These recommendations should assist in the attainment of certain regional transportation goals such as conservation of fuel, improved safety, reduction of traffic congestion and improvement of regional air quality. Certain capital and operating costs will be incurred in the implementation of these recommendations.

These costs could be funded as follows:

Transit service in Clark County - Household utility tax, UMTA operating funds and state motor vehicle excise tax matching funds (if available).

Corridor service - UMTA operating funds: priority treatment.

Slough Bridge and signal - Interstate funds.

Carpool marketing - Federal Aid Urban System Funds

Action on some of these recommendations has already been taken. A public transportation improvement conference has been held in

Vancouver. It concluded that transit in the county should be provided through inter-governmental contracts between the City of Vancouver, Clark County and other cities interested in obtaining transit service.

The City of Vancouver and Clark County have approved a joint resolution supporting public acquisition of Vancouver-Portland Bus Company. Tri-Met is currently studying the legal and financial aspects of acquisition and operation of this line.

The City of Vancouver has agreed to purchase ten new diesel buses. The purchase of these buses is essential to the implementation of any city-county agreement to provide transit service outside the city limits of Vancouver.

INTERSTATE BRIDGE CORRIDOR PROJECT

RECOMMENDATIONS

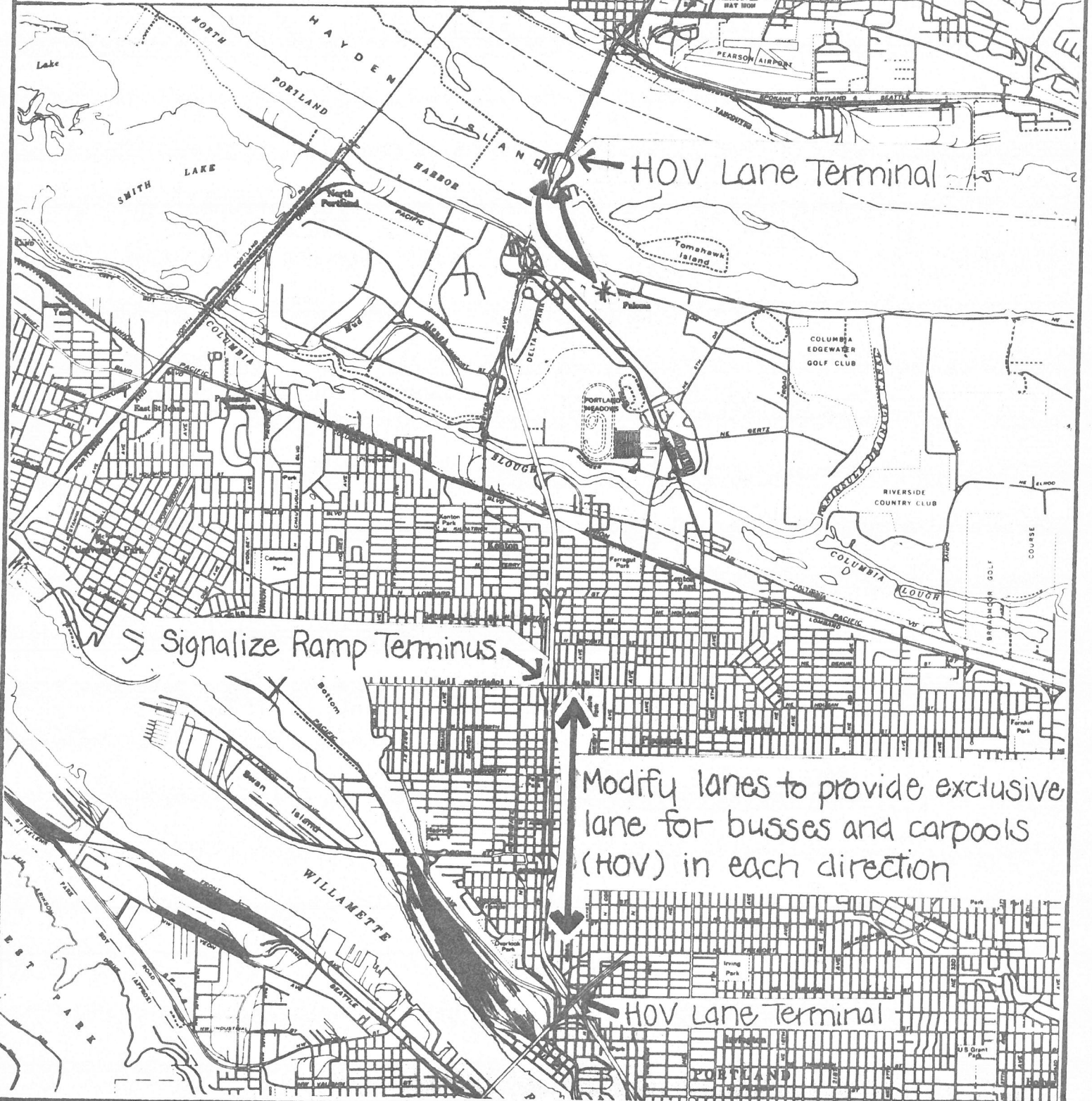
Columbia Region Association of Governments

* Ramp control with bypass
for busses and carpools (HOV)

July, 1975

Figure 2

Scale: 1" = 4000 FT.



References

Chapter 1

1. Interstate Bridge Corridor Project Phase I Low Cost Improvements: Analysis and Recommendations Columbia Region Association of Governments September 1974

Chapter II

1. See Tri-Met Service Criteria Appendix A in the Transportation Improvement Program for the Portland Vancouver Metropolitan Area Columbia Region Association of Governments August 1975

Chapter V

1. Highway Capacity Manual - 1965, Transportation Research Board, SR 87, Washington, D.C., 1965
2. Priority Techniques for High Occupancy Vehicles (Working Draft), US Department of Transportation, February 1975
3. Interstate Bridge Corridor Project Phase I Low Cost Improvements: Analysis and Recommendations Columbia Region Association Of Governments September 1974
4. "Traffic Impact of Tomahawk Island Proposed Development", Interstate Bridge Corridor Project Task Force, December 1974
5. (UMTCD) Manual on Uniform Traffic Control Devices U.S. Department of Transportation U.S. Government Printing Office Washington, D.C. 1974
6. (SYDC Report) The Cooperative Transportation Planning Process In the Metropolitan Area System Design Concepts Inc. January 1975

APPENDICIES

APPENDIX A
DATA FOR HIGH OCCUPANCY VEHICLE

LANE ANALYSIS

	PORTLAND BLVD		COLUMBIA SLOUGH		
	AM	PM	AM	PM	
Occupancy for all autos ¹ (persons/auto)	1.21	1.33	1.21	1.29	1
Occupancy for autos with more than 3 persons (persons/auto)	3.50	3.50	3.50	3.50	2
Occupancy for autos with less than 3 persons (persons/auto)	1.20	1.25	1.16	1.21	3
Autos with one person	81.9%	75.6%	79.5%	71.8%	4
Autos with two persons	15.3%	19.3%	19.3%	23.7%	5
Carpools (more than 3 persons) without HOV Lane	2.8%	9.0%	5.6%	9.4%	6
Carpools (more than 3 persons) with HOV Lane ²	5.6%	18.0%	11.2%	18.8%	7
Bus Volumes without HOV Lane	4	4	4	4	8
Bus Volumes with HOV Lane ³	10	10	10	10	9
Occupancy of Buses ⁴	52	52	52	52	10

1. The 3 to 5% trucks were treated as autos
2. Carpools were doubled, based on experience on Bay Bridge in California
3. Number of buses are doubled based on 1) Tri-Met fare reduction, 2) Tri-Met operates corridor service 3) There is an urban public transit system in Clark County with free transfer arrangement with Tri-Met, and 4) $\frac{1}{2}$ of Tri-Met peak period service to Hayden Island is routed on to I-5
4. Source of bus occupancy: Vancouver-Portland Bus Company
5. The total number of auto trips remained same, based on experience on the Bay Bridge in California

TRAVEL TIME COMPARISON
For
NON-HOV LANES

<u>Direction of Flow</u>	<u>Travel Time</u>		<u>TIME SAVED</u>
	<u>BEFORE HOV LANES</u>	<u>AFTER HOV LANES</u>	
Northbound PM Peak (5pm)	29 Minutes	17 Minutes	12 Minutes
Southbound AM Peak (7:30am)	15 Minutes	9 Minutes	6 Minutes

NOTE: All automobile travel time estimates are based on the assumption that travel speeds in the most congested areas average 5 mph. Travel time estimates shown are from the east bank of the Fremont Bridge to SR 14 north of the Interstate Bridge.

TRAVEL TIME ESTIMATE
For
HOV LANES

Travel speeds in the HOV lanes are estimated to average 50 to 55 miles per hour. Assuming an unconstrained merging movement at the end of the HOV lane, the travel time on the HOV lane from the Fremont Bridge to SR 14 will be about 7 to 8 minutes.

APPENDIX B

This contains extracts from an analysis conducted by Oregon State Department of Transportation - Planning Section in Salem, Oregon.

DEPARTMENT OF TRANSPORTATION
Planning Section
Plan Analysis Unit

I-5 Corridor
Going Street-Interstate Bridge

Introduction

Pursuing the I-5 Study further, this report focuses more directly on specific improvements to I-5 north of Delta Park Interchange and at the Portland Boulevard Interchange. Several design changes are suggested to improve traffic operations on the subject sections of I-5. Southbound and northbound analyses were separated and the findings are summarized below:

I-5 Southbound

- a) Widen the Oregon Slough Bridge section to four lanes.
- b) Improve the curvature of the existing Swift Road off-ramp or combine the Union-Swift off ramps into a single two-lane off-ramp.
- c) Improve I-5 to three lanes at the Portland Boulevard Interchange.

I-5 Northbound

- a) Widen the Oregon Slough Bridge section to four lanes.
- b) Close the Union-Swift off-ramp to eliminate the short weave section north of the Delta Park Interchange.
- c) Improve I-5 between the Denver Avenue and Union-Swift entrance ramps by providing an extended acceleration lane for Denver Avenue on-ramp traffic.
- d) Improve I-5 to three lanes at the Portland Boulevard Interchange.

Analysis

The emphasis of this analysis is to study today's traffic problems and determine appropriate solutions. The 1974 peak hour volumes were used for this study. Assuming traffic growth will be regulated by the Interstate Bridges, future traffic projections were not used in the analysis. Shortly, an updated version of future projections will be available reflecting I-205 traffic diversion, current land use plans, and higher transit estimates.

Figure I illustrates the peaking characteristics of traffic flow on the Interstate Bridges. The southbound bridge peaks from 7:00 to 8:00 AM while the northbound bridge peaks from 4:00 to 5:00 PM.* Solutions to relieve the peak hour delays and congestion existing today on the Minnesota Freeway will be discussed.

Summary

This analysis assumes the automobile will continue to be the predominant mode of travel in the subject I-5 corridor. With this assumption, emphasis was directed at the highway system's capability to satisfy the demands. Ramp metering systems or busway proposals to modify auto travel demand were not considered in this study.

The completion date of I-205 (1980-1981) is expected to provide considerable relief on I-5. In the meantime, traffic generated from new developments at Hayden Island and Rivergate Industrial Park are anticipated to further strain congested conditions already existing in the study

* Manual counts by the Washington State Department of Highways in 1972 indicated that the evening peak hour on the Interstate Bridge was 4:30 to 5:30 PM.

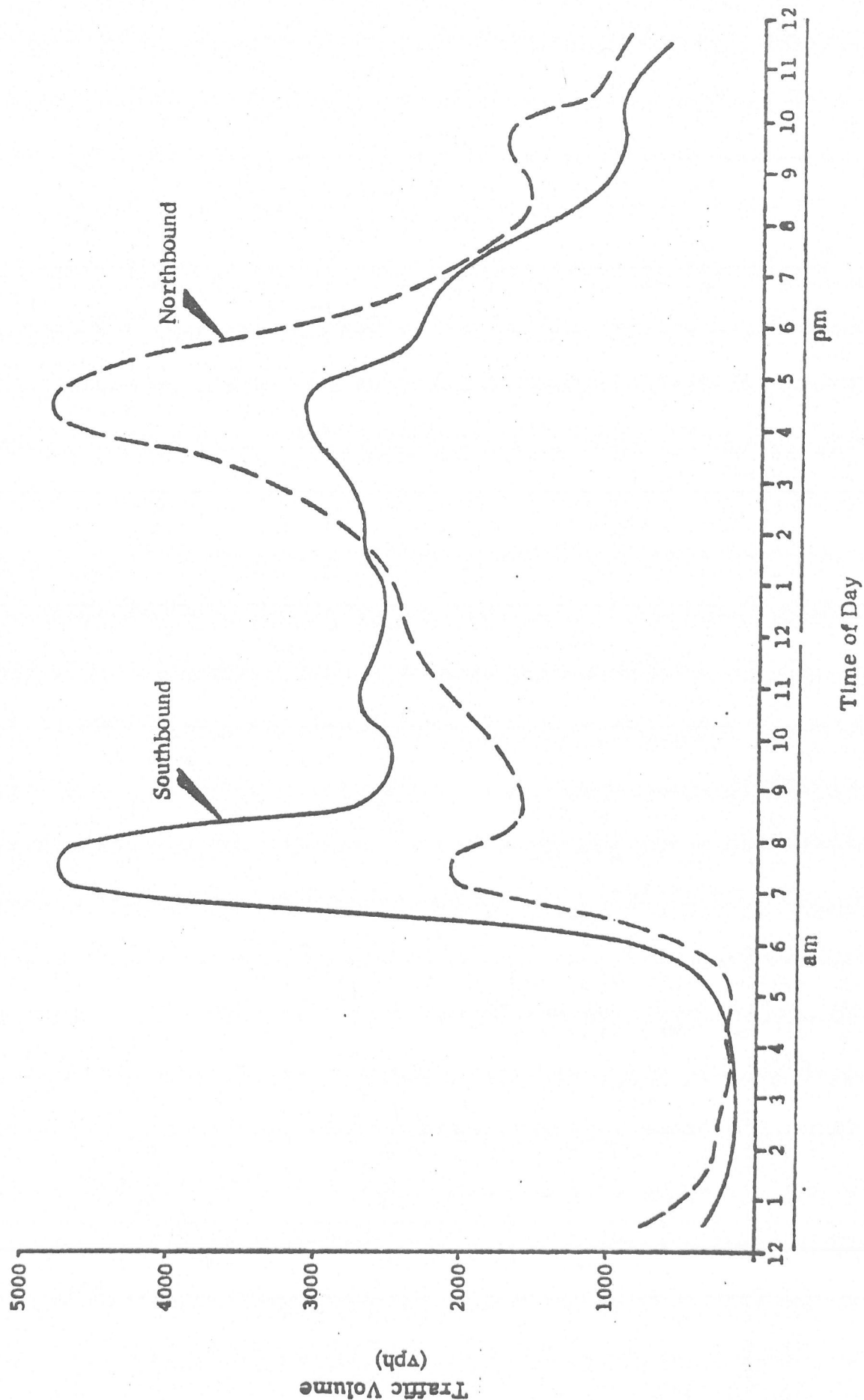
corridor. Therefore, the "worst case" traffic condition would exist just prior to the completion of I-205.

With the proposed improvements, traffic operations during the "worst case" condition should be acceptable. It is estimated that peak hour traffic growth is limited to 300 to 600 vehicles due to the capacity limitations of the Interstate Bridges. The proposed improvements would provide the needed capacity to handle this traffic growth at a tolerable level of service.

Jim Branch
Bob Jurica
6-30-75

Figure 1

INTERSTATE BRIDGE Weekday Traffic Distribution (Nov. 26, 1974)



APPENDIX C

COSTS FOR CORRIDOR SERVICE

The following is a computation of the estimated costs for corridor service, as well as an estimate of the subsidy needed for Vancouver and Clark County. The service provides 34 daily trips, including extra peak period service, 27 Saturday trips and 12 Sunday trips. This is essentially a continuation of the present level of service provided by Vancouver-Portland Bus Co., with the addition of evening service. The lines operate at ½ hour headways 6:30am-6:00pm, 10 minute headways during the peak and hourly headways after 6pm. All Sunday service runs on hourly headways. Additional assumptions are made as follows:

- Tri-Met operates this service
- Tri-Met's current operating costs are used
- The fare is 35¢ with reduced fares for children and senior citizens. This produces an average fare of 31¢
- Patronage on this line will double over a period of a year as a result of reduced fares and free transfers
- Peak service operates on a self sustaining basis (no subsidy needed)
- Clark County and Vancouver will subsidize the service operated beyond Jantzen Beach

Tri-Met Cost per Bus Hour	\$ 17.20
Tri-Met Cost per Bus Mile	1.21
Average Bus Speed	14.7 mph
Number of Daily Trips	34
Less peak trips	-13
Off peak daily trips	21
Saturday trips	27
Sunday trips	12
Estimated 2 Way Trip Length	15 miles
Estimated 2 Way running time	1 hour
Estimated 2 Way distance from Jantzen Beach to Downtown Vancouver	4 miles
Estimated running time from Jantzen Beach to Downtown Vancouver	16 minutes
Current average Vancouver-Portland off peak patronage (including weekends)	320

COSTS (off peak including weekends)

On hourly basis

Daily Service Hours	Cost/Bus Hour	Weekdays in a Year		Weekend Service Hours	Cost/Bus Hour	Weekends in a Year	
((21 x	\$17.20)	225)	+	((39 x	\$17.20)	52)	= \$98,000

On mileage basis

Daily Service Hours	Cost/Bus Mile	Weekdays in a Year	Weekend Bus Hours	Cost/Bus Mile	Weekends in a Year	
((315 x \$1.21)		255	+	((585 x \$1.21)	52	= \$134,000

Average

\$98,000	+	134,000	=	\$116,000
<u>2</u>				

Revenues

Average weekday off peak patronage (at the beginning of Tri-Met service)	320	
Average daily off peak revenues .31 x 320	\$	99.00
Annual revenue at initial patronage level	\$	36,000.00
Average weekday off peak patronage (after 1 year)	640	
Average daily off peak revenues .31 x 640	\$	198.00
Annual revenue after 1 year	\$	71,000.00
Estimated first year revenue	<u>71,000 + 36,000</u>	\$ 53,500.00
	2	

Subsidy

Costs	\$116,000.00
Less Revenues	\$-53,500.00
Subsidy Needed	\$ 62,500.00
Portion of route attributable to Clark County/Vancouver	

4 ÷ 15 = 27%

16 min ÷ 60 min = 27% 27%

Subsidy attributable to Clark County (.27 x \$62,500)	\$ 17,000.00
--	--------------

Subsidy attributable to Tri-Met (\$62,500 - \$17,000)	\$ 45,500.00
--	--------------

* This includes 285 weekday passengers
600 Saturday passengers
200 Sunday passengers

Estimates provided by Vancouver-Portland Bus Company

APPENDIX D

Variable routing and dial-a-bus represent the two forms of public transportation known as "demand responsive transit". The basic element of this system is communication between the patron and the transit vehicle prior to the time the patron boards the bus. The patron makes his travel desires known to the transit company which in turn responds by routing its vehicles according to the travel demands of its riders.

Route deviation is a system where a bus is deviated from its regular route (within a given service area) to provide "doorstep" service to its patrons. The deviation is generally limited to a few blocks.

"Pure" demand responsive transportation or dial-a-bus, like the route deviation system provides doorstep service. However, no route is adhered to. There are three variations of this type of service which includes:

Many-to-one pattern - providing transport from several origins to a common destination such as a shopping center or bus terminal.

Many-to-few - providing transport from multiple origins to a few destinations, such as major activity centers or points on a downtown loop.

Many-to-many - providing transport between any origin-destination pair in the service area without limitation.

Note: These service patterns may be used, in reverse, or in combination throughout a service area or on a zonal basis depending on the characteristics of the service area. (See Demand Responsive Transit, p.3)

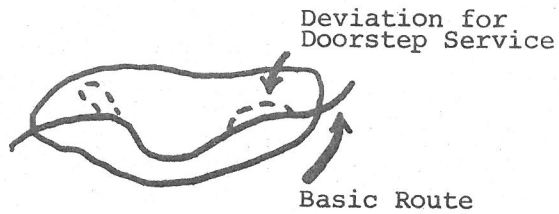
A schematic diagram of these service patterns is provided in figure D.

Demand-responsive transit is usually activated by a patron calling the transit agency and requesting the service at a given place and time. A few demand-responsive systems are operated on a subscription basis. The patron subscribes to the service by requesting the service at a given time on a daily or otherwise basis.

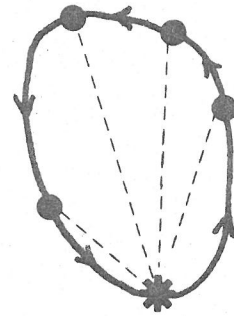
Demand responsive transit has certain advantages over conventional transit. It provides more direct service, thus encouraging ridership. Demand responsive service is more flexible and can better serve the needs of persons unable to use the conventional bus service such as the elderly and the handicapped. Its main disadvantage is cost. A transit system operating both conventional and demand responsive service reported costs 14% higher for its demand responsive service. This is due to additional labor costs. Personnel are needed to receive requests for

service and dispatching buses to meet these requests. In addition, little or no savings can be expected from the use of smaller vehicles. Small vehicles generally require more maintenance than their larger counterparts and are usually fueled by gasoline which is more expensive than diesel fuel.

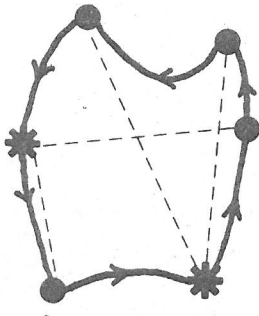
FIGURE D SERVICE PATTERN ALTERNATIVES FOR DEMAND RESPONSIVE TRANSIT



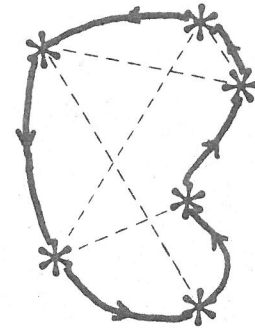
(1) Route Deviation



(2) Many-to-One



(3) Many-to-Few



(4) Many-to-Many

- Origin Point
- * Main Terminal, Transfer Point, Activity Center
- Desire Line
- One possible dynamic routing
- * Origin and destination pairs

APPENDIX E

TRANSIT FUNDING IN THE STATE OF WASHINGTON

The operation of publicly owned transit systems in Washington and Oregon is regulated by state law. In addition, certain federal assistance programs make publicly owned transit systems eligible for federal funds; therefore, a knowledge of restrictions placed upon local transit operating agencies by federal regulations and state law is extremely important in the development of a transit system.

This chapter contains an analysis of the legal requirements governing the establishment of planning and funding transit systems in the State of Washington. In addition, a brief overview of Oregon law relating to contracts between systems and a description of federal regulations governing assistance to transit operators is provided.

In the State of Washington, prior to 1974, only cities and King County (Seattle) had the authority to establish and provide public transit service. Cities are authorized to levy a household utility tax for the support of transit. This tax is to be levied on all households in the city and is limited to a maximum charge of \$1 per household per month. Operations of these transit systems are restricted to service within the city limits. Household utility tax collections are matched with state receipts from the motor vehicle excise tax. The state had originally been authorized to match local collections on a dollar for dollar basis. However, a total statewide limit was placed on the dollar amount which could be used to match local funds for transit service. Thus, the motor vehicle excise tax has, to this point, provided cities with somewhat less than a full possible match.

In 1974, Washington State law was amended to permit counties to operate transit systems which could be financed through a county-wide, 3/10 of one percent general sales and use tax. The activities of such a system were to be directed by a policy board comprised of the county commissioners, the mayor of the largest city, a representative of cities with more than 5,000 population, and a mayor chosen by cities of less than 5,000 population. The transit authority could be formed by a majority vote of the county commissioners. However, funding through the 3/10 of one percent sales tax would be permitted only after its approval by a vote of the people. This legislation was not attractive to the elected officials in Clark County because Oregon (just across the river) does not have a sales tax and increases in the sales tax in Clark County are not popular.

In the 1975 legislative session, substantial modifications were made in this law. These changes modified the manner in which counties form transit agencies, create service areas, and

provide financing for the transit service. The new legislation has given the cities and counties four means of funding transit systems. These include:

1. Imposition of a 1/10, 2/10 or 3/10 percent general sales and use tax;
2. Imposition of a business and occupation tax;
3. Imposition of a household utility tax of up to one dollar per household per month;
4. A combination of 2 and 3.

While the business and occupation (B&O) tax and household utility tax (HUT) may be used in combination, the sales tax must be used alone. Imposition of any of these taxes is, of course, subject to a vote of the people. The B&O tax and the HUT are eligible for a motor vehicle excise tax match; however, the sales tax is not.

Previously, taxes for transit service had to be levied uniformly throughout an entire city or an entire county as noted above. Under the 1975 legislation, a public transit benefit area (PTBA) may be formed to provide transit service in areas larger than a city and smaller than a county. Each county is permitted to establish one PTBA. A single PTBA can be established in two or more counties. The boundaries of the benefit area must be contiguous and may not contain islands of territory not included in the PTBA. For purposes of representation, the PTBA must include or exclude entire cities. Should only a portion of a city be included, the city may not be represented on the PTBA governing body. The means of representation on the governing body is to be determined by the jurisdictions involved in the PTBA. Single county benefit areas are limited to a nine member governing body. Multi-county areas may have up to a 15 member board. Cities not included in the transit benefit area may send a non-voting representative to the governing body to represent their interest.

Prior to the formation of a PTBA, a public transportation improvement conference is to be held. The conference shall be attended by representatives from the county and each of the cities in the county. The conference shall determine the desirability of establishing a public transportation benefit area. After completion of the initial conference, a public hearing shall be held. Prior to the convening of the hearing, the local legislative body shall advise the county governing body of their desire to be included or excluded from transit benefit area.

Following the conclusion of the hearing, PTBA conference shall adopt a resolution fixing the boundaries of the PTBA. The decision of the conference may be reviewed by the county governing body which may modify the boundaries to include areas which will benefit from transit service and exclude areas that will not. If the county does not approve a resolution nullifying or modifying the decision of the conference, the transit benefit area will stand as approved by the conference.

Within 60 days of the establishment of the boundaries of the PTBA, the county commissioners and elected representatives of the cities within the area shall provide for selection of the governing body of the PTBA. Governing bodies shall consist of elected officials selected by and serving at the pleasure of the governing bodies of component cities within the PTBA and county commissioners of each county within the area. Cities are given the option to withdraw from the PTBA if they act to do so by resolution within 60 days of the formation of the benefit area.

The PTBA is required to prepare a transportation plan. This plan shall include but is not limited to the following:

1. The levels of transit service that can be reasonably provided for various portions of the benefit areas;
2. The funding requirements including local tax sources, state and federal funds necessary to provide the various levels of service within the area;
3. The impact of such a transportation program on other transit systems operating within that county or adjacent counties;
4. The future enlargement of the benefit area of the consolidation of such benefit area with other transit systems.

The transit plan as developed by the PTBA shall be reviewed by the planning and community affairs agency of the State of Washington. This agency may approve the transit plan or request that the plan be modified. Plan approval is necessary for the PTBA to become eligible to receive matching funds from the state's motor vehicle excise tax.

The PTBA shall have the normal corporation and governmental powers granted to special purpose districts in the State of Washington. This includes the power to contract with other transit agencies, public or private for the purpose of providing service.

Competition between the PTBA and privately operated transit systems is forbidden by this legislation. The PTBA, however, is authorized to make special arrangements with private carriers to continue operations even after PTBA service has been established. If such arrangements can not be made, PTBA shall purchase by condemnation the private transit operation. City systems which are operating prior to the formation of the PTBA may continue to operate after the PTBA has been formed. The PTBA may acquire such systems. However it may do so only with the permission of the governing body of the city which owns the system.

Territory may be annexed to the PTBA by election of the persons involved in the affected territory. Annexation elections may be requested by: 1. Resolution of a PTBA; 2. By petition calling for such an election, signed by at least 4% of the qualified voters residing within the area to be annexed; 3. By resolution of PTBA authority upon request of any city for annexation.

Counties that have established a county transportation authority or public transportation benefit area that have been established pursuant to this legislation are eligible to receive a one time advanced financial support payment from the state to assist in the development of the initial comprehensive transit plan. The support payment is limited to one dollar per person residing within each county or \$50,000, whichever is the least. Repayment of an advanced financial support payment shall be made to the public transportation account in the general fund. Such repayment shall be waived within two years of the date that the advanced payment was recieved if the voters in the appropriate counties of PTBA areas do not elect to levy and collect taxes provided under this legislation.

In Oregon, special purpose districts for transit service may be formed in those counties comprising a standard metropolitan statistical area. Two such districts are presently operational in Oregon. These are the Lane Transit District in the Eugene-Springfield Metropolitan Area and the Tri-Met District in Portland. Oregon districts are permitted to contract with other jurisdictions to provide service outside of the transit district boundaries. (See ORS 267.560) Therefore, Tri-Met may enter into a contractual arrangement with the Washington agency for purposes of providing transit service. If Tri-Met operates across state lines, however, it is necessary to obtain an operating permit from the Interstate Commerce Commission. In addition, the private carrier now providing service in the corridor must be purchased by Tri-Met. Federal regulations prohibit a public carrier, receiving federal assistance, from competing with a privately owned carrier.

Federal law provides for assistance for both operations and capital expenditures for local transit systems. The Urban Mass Transportation Administration is authorized to allocate funds to urban transit systems to pay operating costs for service improvements or expansions. A total of 1.8 million dollars is expected to be available to the Washington portion of the Portland urban area over a six year period ranging from 1975 through 1980. The City of Vancouver and Tri-Met are presently the designated recipients for this funding. The UMTA money must be matched by locally raised non-farebox revenues. This program is known as UMTA Section 5 Operating Funds. (See Federal Register, January 13, 1975, page 2534).

Assistance is also available from UMTA for purchase of capital equipment or for capital construction. UMTA will pay 80% of the cost of capital acquisition for eligible projects. These projects may include purchase of buses and other rolling stock, as well as construction of terminal facilities, shelters, exclusive rights-of-way, acquisition or private transit companies and construction of maintenance facilities.

APPENDIX F RIDERSHIP ESTIMATES

For a given population and fare, ridership will be determined by:

1. Accessibility which is determined by the extent of feeder coverage, and availability of park and ride facilities;
2. Convenience which is determined by the length of headways, availability of shelters and various operating characteristics;
3. Speed which is measured by the ratio of auto to transit travel time.

These projections are based on a Clark County system whose convenience and speed characteristics are comparable to the Tri-Met system. Ridership will become a function of accessibility. A low, medium, and high level of accessibility will be compared to existing service.

During the early 1970's, Tri-Met averaged 31.5 annual rides per suburban household within $\frac{1}{4}$ mile of each route¹. This ride generation figure will be used for the low accessibility scenario. In 1974, Washington County generated 44 rides per household.² Forty-four rides per household represents a mid-level of accessibility. In 1974, the tri-county metropolitan area averaged 72 originating rides per household³. Vancouver service is currently attracting 18 annual rides per household⁴.

The following chart shows expected ridership for each level of accessibility, based on 1974 housing data⁵:

<u>Annual Ridership</u>					
<u>Service Area:</u>	<u>Access:</u>	<u>As Is</u>	<u>Low</u>	<u>Medium</u>	<u>High</u>
Vancouver (18,911 units)		336,000	467,000	652,000	1,065,000
Vancouver & urbanized (32,804 units)		590,000	904,000	1,263,000	2,066,000

These figures are adjusted for interstate transit trips which do not interface with internal transit trips.⁶

- 1 Information derived from DeLeuw, Cather, PVMATS Study, "Step I".
- 2 1970 Washington County population = 157,920
 1974 Washington County population = 182,500; increase factor = 1.156
 1970 housing units = 52,038
 Derived 1974 housing units = $1.156 \times 52,038 = 60,156$
 1974 Washington County ridership = 2,626,106
 1974 rides per housing unit = $2,626,106 / 60,156 = 43.7 = 44$
- 3 1970 Tri-County population = 878,676
 1974 Tri-County population = 931,200; increase factor = 1.059
 1970 housing units = 316,000
 Derived 1974 housing units = 334,964
 1974 Tri-County ridership = 24,000,000 originating riders
 1974 rides per housing unit = $24,000,000 / 334,964 = 72$
- 4 1970 Vancouver population = 42,493
 1974 Vancouver population = 50,100; increase factor = 1.177
 1970 housing units = 16,067
 Derived 1974 housing units = 18,911
 1974 Vancouver ridership = 335,793
 1974 rides per housing unit = $335,793 / 18,911 = 18$
- 5 Vancouver, as is = 18,911 housing units x 18 rides/housing unit = 340,398 rides
 Vancouver, low access = 18,911 housing units x 31.5 rides/h.u. = 595,697 - adjustment factor
 Vancouver, medium access = 18,911 housing units x 44 rides/h.u. = 832,084 - adjustment factor
 Vancouver, high access = 18,911 housing units x 72 rides/h.u. = 1,361,592 - adjustment factor
 Vancouver and urbanized area, as is = 32,804 housing units x 18 rides/h.u. = 590,472 rides
 Vancouver and urbanized area, low access = 32,804 housing units x 31.5 rides/h.u. = 1,033,326 - adjustment factor
 Vancouver and urbanized area, medium access = 32,804 housing units x 44 rides/h.u. = 1,443,376 - adjustment factor
 Vancouver and urbanized area, high access = 32,804 housing units x 72 rides/h.u. = 2,361,888 - adjustment factor

6 Adjustment Factor

One-third of Clark County labor force works in Oregon. Assume 1/3 of Vancouver originating trips will have an Oregon destination.

Assume 65% of Vancouver-Oregon trips will not rely on internal Vancouver transit.

Therefore, the adjustment factor = $\frac{\text{Vancouver internal trips}}{3} \times .65$

Appreciation is expressed to members of the Tri-Met planning staff for assistance in compiling this information.

APPENDIX G

TRANSIT OPERATIONS

Operations

The largest single aspect of any transit system is the day to day operations effort. This activity is comparable to the production function of an industry with operations being the systems largest expenditure.

Operations can be broken down into four major subcatagories including:

- Operations Administration
- Supervision
- Service and Maintenance
- Vehicle Operation

The operations administrator performs the standard administrative tasks. These may include budgeting, planning, scheduling, contract administration, and supervision of subordinates. In smaller transit companies the operations administrator may be the general manager. In larger operations, the administrator will be a department head working under a general manager.

Supervisors are responsible for insuring that maintenance and servicing tasks are properly assigned and carried out. In addition, they may be responsible for developing and administering the maintenance and service program of the transit company.* Supervisors are also needed to insure that bus operators are adhering to designated routes and schedules. Like the administrative function, the number of supervisors will depend on the size of the operation. In very small companies, this function may be performed by the general manager. As the system gets larger, this function will be assigned to a greater number of persons.

Service and maintenance will be performed by teams of individuals with specialized skills in all but the smallest companies. Buses must be fueled, cleaned and maintained at regular intervals. In addition, mechanical assistance must be on hand to deal with those equipment breakdowns and accidents which invariably occur.

* For a complete description of the elements involved in a maintenance and service program see Mass Transit Management: A Handbook for Smaller Cities, Institute for Urban Transport, February, 1971.

Vehicle operation is performed by the system's drivers. Usually the drivers wages will be the single most costly item in the system's expenditures. Since proper (or improper) operation will go a long way toward influencing patronage and image, it is imperative that drivers be well trained and adequately supervised.

Table G provides a listing of those materials, equipment and labor which are necessary to maintain transit operations. In addition, a list of related costs is also noted.

A transit system must perform other functions, in addition to operations. If the system is publicly owned, it will be necessary to work with a governing body or other public agencies to set system policy. A budget must also be prepared. Personnel policies must be drafted and administered. It is also necessary to monitor and evaluate system performance.

Most transit systems will maintain a planning function which provides eventual service improvement and expansion.

Finally, a marketing program is essential to system development. Marketing has proven its effectiveness in attracting riders to transit systems. The system should anticipate spending about 5% of its revenues for this function.*

Planning and marketing costs are presented in Table III-B.

Capital Improvements

System capital improvements may be broken down into three general catagories including:

- Rolling Stock
- System Maintenance and Storage Facilities
- System Anemities

It is important to keep in mind that the Urban Mass Transportation Administration will fund 80% of the cost of most capital improvements. Cost estimates (where provided) are made on the basis of total cost and are not necessarily the costs that would be incurred by the local transit agency.

Rolling stock includes all transit vehicles which are used in transporting passengers on the system. In this area, all public transit rolling stock is powered by internal combustion engines (gas or diesel). It is likely that this trend will be continued with the Clark County transit system.

* For a discussion of marketing effectiveness see Advertising and Promotion Demonstration Project Final Report, UMTA.

Currently, a full size diesel bus costs about \$65,000. A modified bus, containing a good deal of special equipment will cost up to \$75,000. (See Passenger Transport, May 16, 1975, p.9)

Smaller demand responsive vehicles cost somewhat less. A 15 passenger radio equipped van, modified for transit service can be purchased for about \$15,000. A small radio equipped transit bus will cost up to \$41,000. (Demand Responsive Transportation, p. 39)

The number of buses needed by the system will be determined by the number of routes, frequency of service and route length. In addition, it is generally considered necessary to have a number of spare buses on hand as a contingency against equipment breakdowns. Usually one spare for every 10 buses needed for operations is considered adequate.

Maintenance Facilities

Preventive maintenance is essential to the efficient, safe and economic operation of the transit system. To accomplish a high level of preventive and essential maintenance it is necessary to have an adequate maintenance service and storage facility.

Industry standards suggest that the transit system have facilities available for performing maintenance on about 8% of the fleet. Thus, a system having 25 buses should have two service bays. In addition, room is needed for the following functions:

- * Fueling and Service
- Cleaning
- Greasing
- Body Repair
- Painting
- Machine Shop
- Stocking
- Storage or Parts
- Offices
- Storage of Coaches
- Storage of Fuel
- Storage of Batteries

*Mass Transit Management, p. 155-156

Facility costs will vary depending on the size of the system. It has been estimated that a maintenance facility for 25 buses will cost about \$250,000.

System Amenities

System amenities are those features which improve access to the transit system or make use of the system or make the system more pleasant for the patron. The most common amenities include park and ride sites, bus stations, and bus shelters.

Park and ride facilities may range in design from simple parking lots to elaborate transit stations complete with waiting rooms, comfort stations and ticket offices. In some cases, agreements may be worked out between the transit agency and merchants, churches or civic groups which have under utilized parking facilities. In other cases, the cost of the facilities will depend on size, elaborateness and location.

The unadopted 1990 transit plan for the Portland-Vancouver area describes eight transit stations for Clark County. These stations were to be constructed at a total cost of \$3.6 million. A scaled down version of this plan has been adopted in the Interim Transportation Plan (ITP). The ITP recommends two transit stations for Clark County. The first station would be located in downtown Vancouver. The design and precise siting of this station is under study. Another station would be constructed near I-205 in East Vancouver or in Orchards. Siting of this station is to be studied at a later date.

Bus shelters are also a useful addition to a transit system. Bus shelters not only protect passengers in inclement weather, but also serve to call attention to the system and its routings; system information such as routes, fares and schedules can be posted on the shelters. The cost of shelters averages about \$1,500 per installation.

TABLE G SAMPLE OPERATING COSTS

(Dollars Pre Bus Operating Hour)

OPERATIONS	TRI-MET	VANCOUVER TRANSIT
Driver Labor	6.46	4.54
Maintenance Labor	1.53	1.59
Scheduling	.15	----
Operations Supervision & Administration	.69	1.11
Overtime	1.06	1.05
Fringe Benefits	1.49	1.42
Operations Materials & Supplies	<u>2.19</u>	<u>3.43</u>
TOTAL OPERATIONS	13.57	13.14
ADMINISTRATION, PLANNING & MARKETING		
Executive	.19	(1)
Personnel	.68	(1)
Finance	.20	(1)
Contract Administration	.25	(1)
Marketing	.93	(2)
Planning	.43	(2)
Insurance	.52	.60
Overhead	<u>--</u>	<u>.64</u>
	3.20	1.24
Depreciation	<u>.43</u>	<u>NA</u>
TOTAL COSTS	17.20	14.38 (3)

- (1) Personnel, finance, contract administration and executive functions are performed by the City of Vancouver and funded through overhead expenses
- (2) Vancouver Transit has no marketing or planning program comparable to Tri-Met's
- (3) Excludes depreciation

Appendix H

Potential Improvements Considered in Phase I

Surface

- Bus Transit
- Priority Treatment for High Occupancy Vehicles
- Bicycle
- Public Automobile Service
- Highway Improvements

Rail

- Mono Rail
- Light Rail
- Heavy Rail
- Levitating Vehicles
- Palleted Automatic System
- Horizontal Elevator
- Subway
- Peplemover

Water

- Hydrofoils
- Ferry (Conventional)

Air

- Helicopter/Taxi
- Airship

Socio-Economic

- Staggered Work Hours
- Staggered Work Days
- Communication (Travel Substitutes)
- Carpools

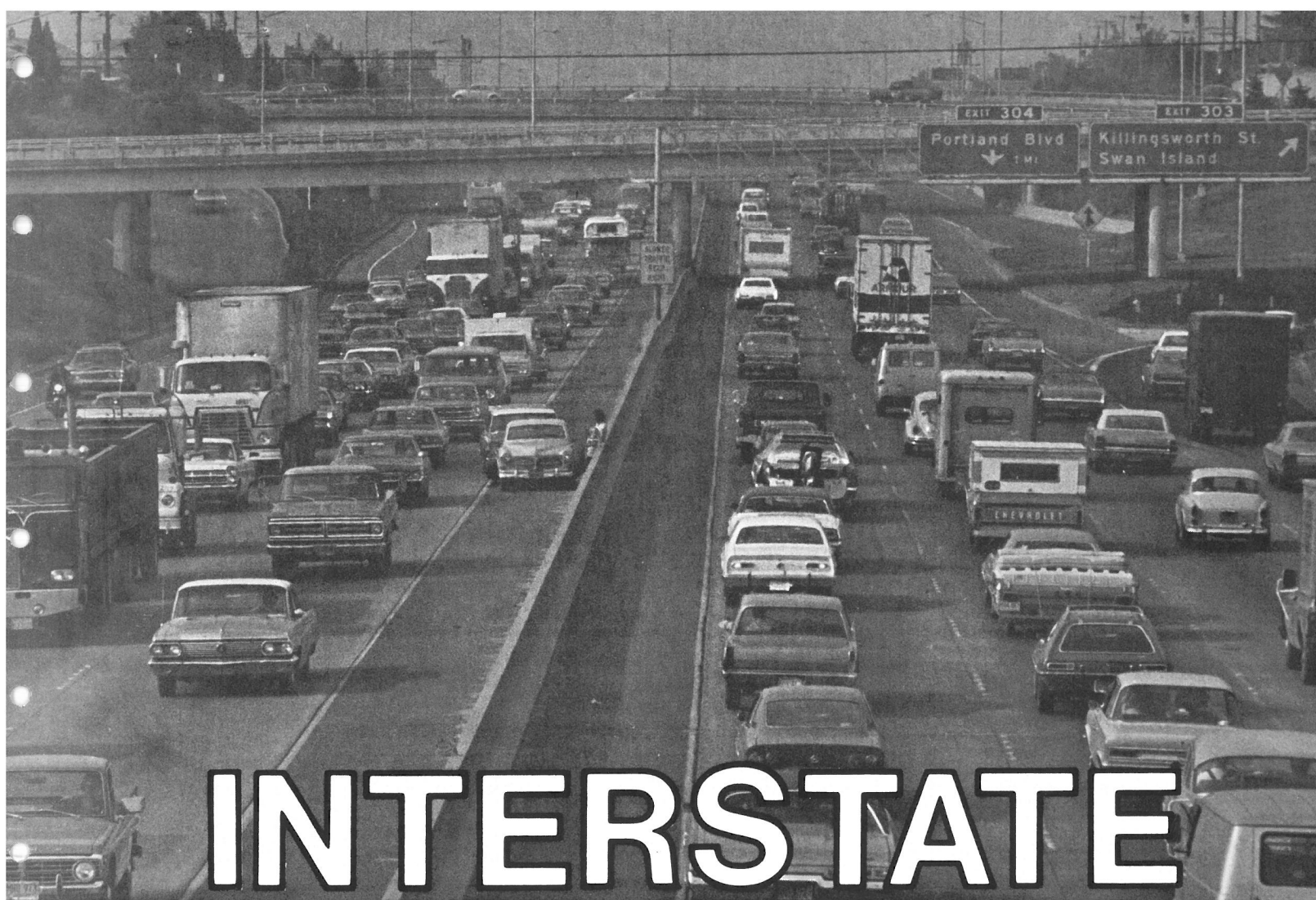
Potential improvements are detailed in Interstate Bridge Corridor
Project Phase I Report
Low Cost Improvements
Analysis and Recommendations
Columbia Region Association of Governments
September 1974

STAFF PRINCIPALLY RESPONSIBLE
FOR THIS REPORT

LARRY RICE, EXECUTIVE DIRECTOR
RICHARD ETHERINGTON, DIRECTOR,
TRANSPORTATION DIVISION

A. REED GIBBY, SENIOR PLANNER
JOHN KRAWCZYK, PLANNER
WILLIAM PETTIS, PLANNER
PROJECT PRODUCTION--

KAREN THACKSTON, LORI WOLCOTT,
LESLIE SMITH, AND ZONNIE BAUER



INTERSTATE

BRIDGE

CORRIDOR

PROJECT

Executive Summary
Technical Analysis

Final Report

February, 1976

Columbia Region Association of Governments

**COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS GENERAL ASSEMBLY**

REGULAR MEMBERS

Clackamas County	Washington County
Barlow	Banks
Canby	Beaverton
Estacada	Cornelius
Gladstone	Durham
Happy Valley	Forest Grove
Johnson City	Gaston
Lake Oswego	Hillsboro
Milwaukie	King City
Molalla	North Plains
Oregon City	Sherwood
Rivergrove	Tigard
Sandy	Tualatin
West Linn	ASSOCIATE MEMBERS
Wilsonville	Clark County
Multnomah County	Camas
Fairview	Vancouver
Gresham	
Maywood Park	Columbia City
Portland	Scappoose
Troutdale	St. Helens
Wood Village	The Port of Portland
	Tri-Met
	The State of Oregon

**EXECUTIVE DIRECTOR,
LARRY RICE**

The preparation of this report has been financed in part by funds from the United States Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964 as amended; and by funds from the Oregon Department of Transportation and the Washington State Department of Highways in cooperation with the Federal Highway Administration USDOT.

**COLUMBIA REGION ASSOCIATION OF
GOVERNMENTS BOARD OF DIRECTORS
FEBRUARY, 1976**

CITY OF PORTLAND

MAYOR NEIL GOLDSCHMIDT

MULTNOMAH COUNTY

COMMISSIONER MEL GORDON

CITIES OF MULTNOMAH COUNTY

COUNCILMAN CHARLES BECKER

WASHINGTON COUNTY

COMMISSIONER RAY MILLER

CITIES OF WASHINGTON COUNTY

MAYOR DAVID MCBRIDE-CHAIRMAN

CLACKAMAS COUNTY

COMMISSIONER STAN SKOKO

CITIES OF CLACKAMAS COUNTY

MAYOR PHIL BALSIGER

CLARK COUNTY

COMMISSIONER DEAN COLE

CITIES OF CLARK COUNTY

MAYOR JIM GALLAGHER

CITIES OF COLUMBIA COUNTY

COUNCILMAN STAN PINTARICH

PORT OF PORTLAND

LLOYD ANDERSON, DIRECTOR

TRI-MET

**GERARD DRUMMOND, PRESIDENT OF
THE BOARD**

STATE OF OREGON

**THOMAS WALSH, OREGON TRANS-
PORTATION COMMISSION**

STATE OF WASHINGTON

**JULIA BULTER HANSEN, EX-OFFICIO
WASHINGTON STATE HIGHWAY COM-
MISSION**

INTERSTATE BRIDGE CORRIDOR PROJECT

Executive Summary

Final Report February, 1976

Columbia Region Association of Governments

**Recommendations Adopted By CRAG
Board of Directors, February 19, 1976.**

LIST OF CONTRIBUTORS

TRANSPORTATION TECHNICAL ADVISORY COMMITTEE

Winston Kurth, Clackamas County
J. Wayne Daigle, Cities of Clackamas Co.
Jan Rosholt, Clark County
Eric Oien, Cities of Clark County
Dorothy Churchill, Cities of Columbia Co.
Bebe Rucker, Multnomah County
Kent Cox, Cities of Multnomah County
John Crockett, Washington County
Robert Royer, Ore. State Hwy. Div.
Pierre Henrichsen, Wash. State Dept.
of Highways
Richard Arenz, Fed. Hwy. Admin.
Ken Johnsen, Port of Portland
Bill Hall, Tri-Met
Mark Beisse, Federal Aviation Admin.
F. William Fort, Urban Mass Transit
Administration

PROJECT TASK FORCE

Commissioner Dick Granger, Chairman,
Clark County
Patricia Blackwell, Vice-Chairperson,
Citizen Advisory Committee
Councilman Dick Pokornowski, City
of Vancouver
Jerry Peck, Owner, V-P Bus Company
Ed Wagner, Tri-Met
Robert Bothman, Oregon State Highway
Division
Pierre Henrichsen, Wash. State
Department of Highways
George Palmer, Multnomah County
William S. Dirker, City of Portland

CITIZEN'S ADVISORY COMMITTEE

Patricia Blackwell, Chairperson,
League of Woman Voters
Frank Barlow, Burlington Northern
Railroad
Julius Gaussoin, Silver Eagle Trucking
Don Hughes, Camas Citizen
Howard Martin, Camas Citizen
Tim McNeil, Citizen
Jim Howell, Sensible Trans. Options
for People
Lynn Hatcher, Citizen
Richard Swennes, Convoy Company
Ben Witt, Citizen
Ray Brewer, Union Ave. Boosters
Carol Hansen, American Assoc. of
University Woman
Mary Legry, League of Woman Voters
John Martin, Citizen
John Pierce, Vancouver Chamber
of Commerce
Susan Regan, League of Woman Voters
Vern Rifer, Oregon Environmental
Council
Betsy Strong, Womans Highway
Safety Leaders

CRAG STAFF PRINCIPALLY RESPONSIBLE FOR THIS REPORT

RICHARD ETHERINGTON, DIRECTOR
TRANSPORTATION DIVISION
A. REED GIBBY, SENIOR PLANNER
JOHN KRAWCZYK, PLANNER
WILLIAM PETTIS, PLANNER
ROGER BUDKE, PLANNER
PROJECT PRODUCTION--
KAREN THACKSTON, LORI
WOLCOTT, LESLIE SMITH
ZONNIE BAUER

COVER PHOTO,
ANCIL NANCE

COLUMBIA REGION ASSOCIATION
OF GOVERNMENTS
527 SW Hall
Portland, OR 97201
(503) 221-1646

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
RECOMMENDATIONS	3
PHASE I FINDINGS AND RECOMMENDATIONS	5
TRANSIT SERVICE	7
PRIORITY TREATMENT	10

LIST OF FIGURES

FIGURE

I-1 VICINITY MAP

R-1 I-5 CORRIDOR RECOMMENDATIONS

INTERSTATE BRIDGE CORRIDOR

VICINITY MAP

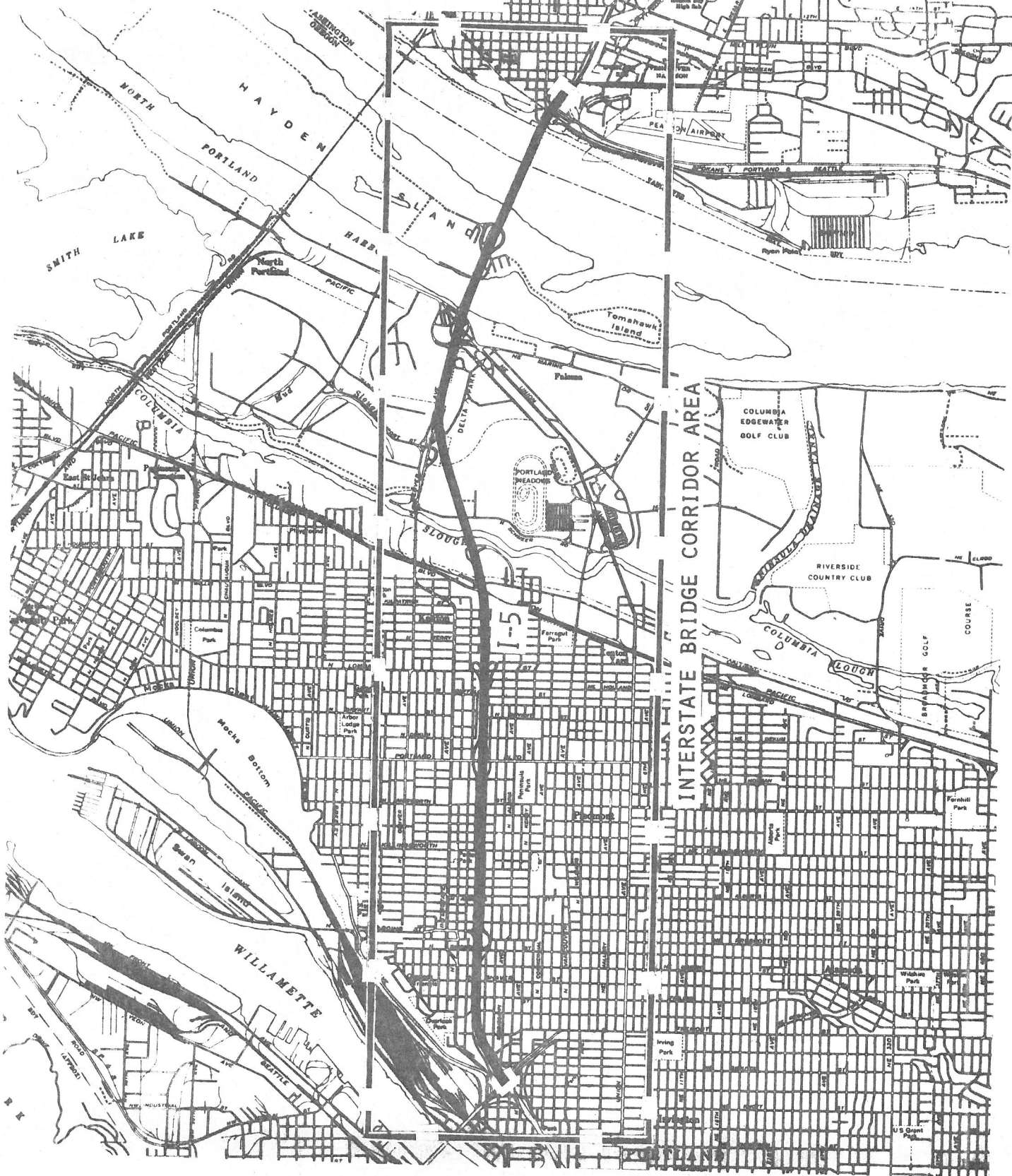
FIGURE I-1

FEBRUARY, 1976



1"=4000'

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



INTRODUCTION

This executive summary has been prepared to convey essential information obtained by the Interstate Bridge Corridor Project as well as the project's recommendations. Detailed information regarding findings and background material is contained in the Technical Analysis of the final report.

It is anticipated that decision makers and other interested parties will find this summary useful in obtaining a general understanding about the critical transportation problems in the corridor as well as the means which may be undertaken to address these problems.

The Interstate Bridge Corridor project was formed in late 1973 to address the problems of severe traffic congestion that had become a frequent occurrence on the I-5 Freeway between Vancouver and Portland. Since the corridor affects a number of jurisdictions including two states, two cities and two counties, a special interagency project was formed to analyze the conditions and present recommendations for improvement. In addition, four transit operators provide service within or near this transportation corridor. The project was designed to address the time period before I-205 becomes operational.

Traffic congestion in the Interstate Bridge corridor has become a critical problem for several reasons. First, I-5 is the major north-south Interstate Highway on the Pacific Coast. Substantial volumes of interregional traffic are carried by this highway. Second, this freeway is an important commuter route within the Portland-Vancouver Metropolitan area; each day, thousands of commuters use I-5 to reach their places of work. Finally, I-5 is important because it represents the only highway crossing of the Columbia River in the Portland Metropolitan area. People traveling between Clark County, Washington and the remainder of the metropolitan area have no choice except to use the I-5 corridor for travel between the two states. Traffic congestion in the corridor disrupts commercial, social and recreational travel in the urban area, as well as the north or south-bound interregional travel.

Traffic conditions in the corridor were examined during phase one of the project. The Phase I Report identified a number of low-cost, short term improvements which may be implemented quickly to provide a degree of immediate relief in the corridor. A summary of these recommendations is contained in the next section. This final report deals with capital intensive improvements to permanently alleviate the congested traffic conditions in the corridor. In particular, these improvements include upgrading of the transit service in the corridor and implementation of a system of priority treatment for high occupancy vehicles (buses and carpools) on Interstate 5.

INTERSTATE BRIDGE CORRIDOR RECOMMENDATIONS

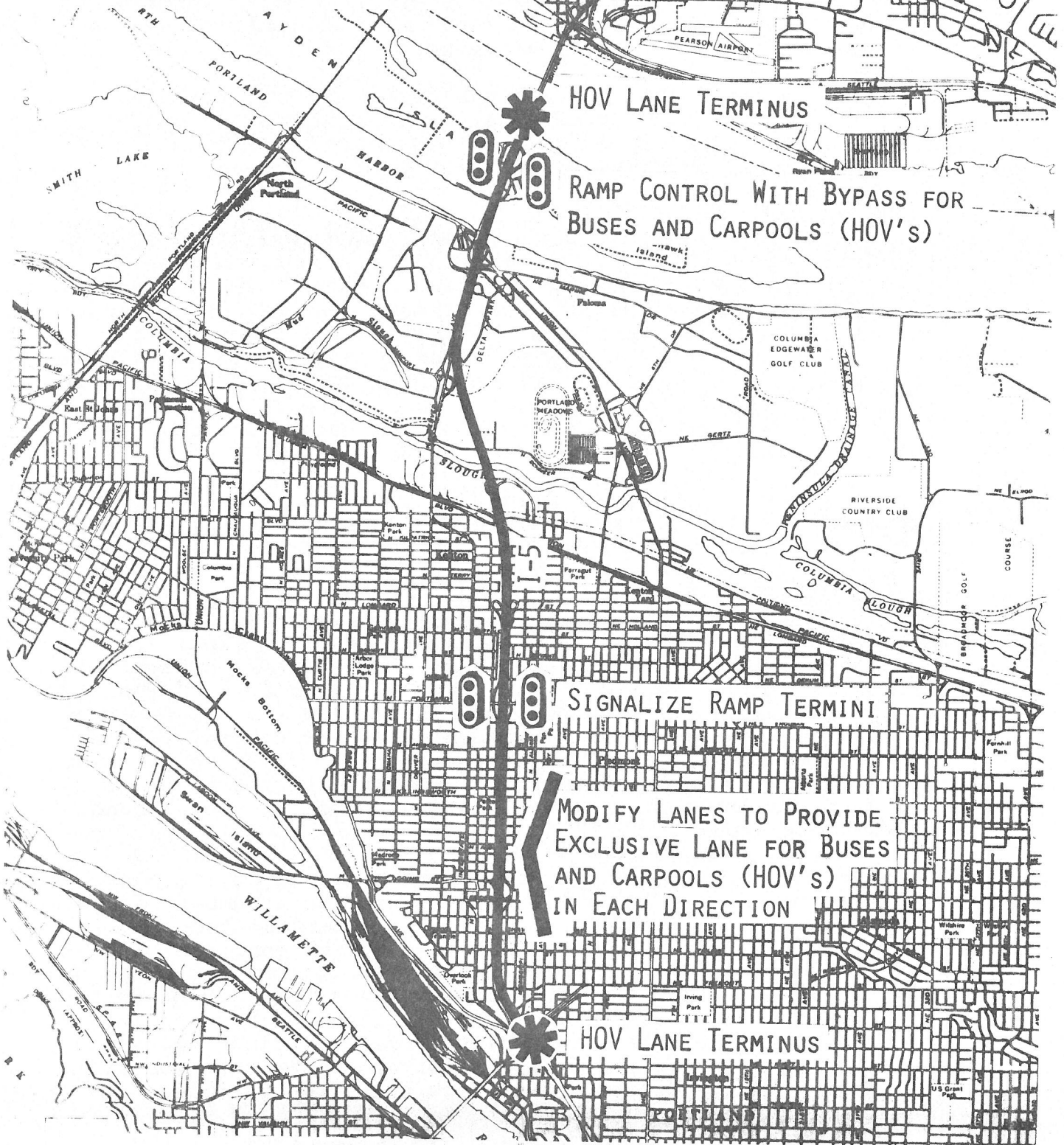
FIGURE R-1

FEBRUARY, 1976



1"=4000'

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Clark County, Vancouver and Portland.
2. Tri-Met should purchase Vancouver-Portland Bus Company immediately.
3. As the agency responsible for the regional carpool program, Tri-Met should expand aggressive carpool marketing efforts to Clark County.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows:
 - A. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - B. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - C. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with the Columbia Slough Bridge to an eight lane structure.
6. The Oregon Department of Transportation consider installation of traffic signals at the termini of the I-5 ramps at Portland Boulevard.

These recommendations should assist in the attainment of certain regional transportation goals such as conservation of fuel, improved safety, reduction of traffic congestion and improvement of regional air quality. Certain capital and operating costs will be incurred in the implementation of these recommendations.

These costs could be funded as follows:

Transit service in Clark County - Household utility tax, UMTA operating funds and state motor vehicle excise tax matching funds (if available).

Corridor service - UMTA operating funds: priority treatment.

Slough Bridge and signal - Interstate funds.

Carpool marketing - Federal Aid Urban System Funds

Action on some of these recommendations has already been taken. A public transportation improvement conference has been held in

Vancouver. It concluded that transit in the county should be provided through inter-governmental contracts between the City of Vancouver, Clark County and other cities interested in obtaining transit service.

The City of Vancouver and Clark County have approved a joint resolution supporting public acquisition of Vancouver-Portland Bus Company. Tri-Met is currently studying the legal and financial aspects of acquisition and operation of this line.

The City of Vancouver has agreed to purchase ten new diesel buses. The purchase of these buses is essential to the implementation of any city-county agreement to provide transit service outside the city limits of Vancouver.

PHASE 1 FINDINGS AND RECOMMENDATIONS

Phase I of the I-5 project included extensive study of traffic conditions in the I-5 corridor. A number of traffic operation problem areas were identified. In addition, it was found that the present transit systems operating in the corridor were severely fragmented resulting in high costs and time consuming transfers to commuters. Air, water, rail and highway systems were considered as possible means of solving some of the traffic problems as well as socio-economic means of reducing travel demand. It was concluded by the Task Force that only highway and transit improvements could be implemented within a short period of time at a fairly low cost.

Briefly, the Task Force recommendations included: 1) Express bus service in the corridor. The project recommended that the Vancouver-Portland Bus Company operate a demonstration express commuter bus service from Hazel Dell and the Mill Plain corridor to Lloyd Center and downtown Portland. 2) Inter-system transfers. It was recommended that Tri-Met, Vancouver-Portland Bus Company, Vancouver Transit and Evergreen Stage Lines honor each others transfers. 3) Consumer information service. Suggested improvements include: toll free information service, route maps, shelters and information brochures. 4) Expansion of the regional car pool program. It was recommended that the ODOT regional car pool program be expanded to include Clark County. 5) Evaluation of priority treatment for high occupancy vehicles. This recommendation called for detailed evaluation of priority treatment for high occupancy vehicles (HOVs) including priority lanes and ramp metering with bypasses for HOVs. 6) Interstate bikeway. Completion of a bikeway through the Interstate Bridge corridor from downtown Portland to Vancouver was recommended. 7). Highway operations. This recommendation called for highway safety improvements, signalization, ramp metering, utilization of the shoulder in limited areas to improve traffic flow and use of dynamic warning signs to advise motorists of congested conditions. 8) Analysis of long term improvements. These included proposed studies of a transit system. This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver - Portland Bus Company by Tri-Met.

Many of the above recommendations have been implemented to date. This report is in fact, the result of two recommendations; namely,

evaluation of priority treatment, and study of a transit district of Clark County. The demonstration express bus service has been successful in attracting new patrons to bus service. However, Vancouver-Portland Bus Company reports that the service is continuing to operate at a loss. Some of the service originally instituted has been curtailed for lack of ridership. The regional car pool program has been expanded to Clark County. Marketing efforts were conducted and car pool officials reported limited response to the program. Some traffic operation improvements are in the planning stage by the Oregon Department of Transportation. Many improvements are planned in conjunction with the reconstruction of the Columbia Slough Bridge and Union Avenue Interchange. The improvements relating to the information program, inter-system transfers and bikeway, have not been implemented. Long range system considerations will be studied at a later date as part of the regular CRAG work program. Traffic operation improvements of particular importance which have not been implemented or studied are noted in this reports' recommendations.

TRANSIT SERVICE

An effective transit system can provide a realistic alternative to the automobile. This is important in the I-5 corridor. If commuters can be encouraged to switch from their autos to transit, some decrease in the amount of traffic congestion can be expected. In addition, this more efficient means of travel reduces energy consumption and air pollution while increasing highway safety.

It is generally recognized that publicly owned transit systems can provide a higher service level than can private systems. Public systems can reduce fares and operate high service levels because the public system can use tax subsidies to make up operating deficits. The private system cannot obtain subsidies and is dependent on farebox revenues.

In order to improve transit service in this corridor, it is necessary to purchase the private transit service currently operating in the corridor and form a public transit system in Clark County. A Clark County system will support the service operating in the corridor by providing a transit feeder system to the corridor service.

Public transit districts, encompassing an entire metropolitan area, have been a reality in Oregon since 1969. The Tri-County Metropolitan District (Tri-Met) in the Portland area was formed under legislation which permits the creation of special purpose districts to provide transit service. However, Washington law has been amended only recently to permit jurisdictions, other than cities to fund and provide transit service.

The 1975 Washington Legislature amended Washington Law to modify the manner in which public transit is funded and administered. Under the revised legislation, transit districts larger than an individual city but smaller than a county are permitted. These districts are to be formed by action of a public transit improvement conference, which is an official body composed of representatives from a given county and the cities therein.

Transit service can now be financed by a household utility tax, a business and occupation tax or a retail sales tax at the rate of .1, .2, or .3 of one percent. The household utility tax and business and occupation tax can be used in combination with each other, the sales tax must be used alone. Imposition of any of these taxes requires a vote of the people. Receipts from the business tax and the utility tax may be matched by receipts from the state's motor vehicle excise tax.

The approval of this legislation provides Clark County with a variety of means of organizing financing and implementing transit service. The Task Force makes no specific recommendations on how

the service should be organized or funded. However, a transit system which would provide reasonable degrees of relief in the corridor needs a feeder system which is carefully coordinated with the operation of corridor service and which can serve populous areas with the urban service boundary. Development of a new system should carefully consider these factors.

The laws of both Oregon and Washington permit public transit agencies to contract with other transit agencies, public or private, to provide service. Therefore, it is possible for a Washington agency to contract with an Oregon system, such as Tri-Met, to provide all or part of its service. If a service contract is developed, it would be necessary for Washington agencies to subsidize any operating losses incurred by Tri-Met. Possible service arrangements are noted in the technical summary (see figure III-5).

A contractual service arrangement with Tri-Met has particular applicability in the I-5 Corridor between Vancouver and Portland. Service would be operated in an area not totally within the boundaries of any single transit district, city, or county or benefit area. This arrangement would permit an even distribution of the service costs on the basis of benefits received.

To assist in the implementation of a transit system in Clark County, the I-5 project has developed a transit planning information base for Clark County. The project staff's work has centered in four areas including service criteria, identifying types of service which may be operated in Clark County, estimating system operation and capital costs, and noting sources of and estimated revenue. Specific bus routings or identification of a service area have been avoided as these considerations are policy decisions which will be made at the County's Public Transportation Improvement Conference and the resulting planning efforts.

Planning efforts have identified six types of transit service which can be operated in Clark County. These included Arterial Service, Local Service, Intercity Service, Corridor Service, Shuttles and Special Transportation.

Arterial service is designed to operate on arterial highways. This service provides fast service at reasonably frequent intervals from residential communities and neighborhoods to the Vancouver central business district. Extra buses are provided during the peak periods to handle the demand created by commuters traveling to and from work.

Local service offers transportation to people dependant on the transit system for their travel needs. Local service emphasizes coverage and provides transportation to a variety of destinations. Dial-a-bus systems or other forms of "demand responsive transit" may be used to provide "door to door" service.

Intercity service provides transportation between the similar cities of Clark County and the Vancouver CBD. Service is scheduled according to need and may be operated on an hourly, daily or even a weekly basis.

Corridor service offers transportation between the downtown areas of Vancouver and Portland. The purpose of corridor service is to provide a fast, inexpensive alternative to automobile travel in the Interstate Bridge Corridor, encouraging commuters to use transit. Corridor service should utilize exclusive lanes described in the latter part of this report.

Shuttles are designed to transport workers to concentrated employment centers where there is a common starting and ending time. Factory shift changes, for example, can be effectively served by shuttles.

Special Transportation serves people unable, due to physical handicaps, to drive automobiles or board conventional transit buses. Provision of special transportation services is required by federal regulations and encouraged by CRAG policies.

The system will incur a number of capital expenditures in order to provide a high level of service. New buses must be purchased, a maintenance facility must be constructed and system amenities such as transit stations and bus shelters should be provided.

Operating expenses include those expenditures necessary to operate, service and administer the transit system. Current operating expenses of existing systems indicate that an operating cost of between \$14 and \$18 per bus hour* should be expected.

The service categories have been combined in two scenarios to illustrate examples of the type of service which could be provided for a given level of funding. Scenario One illustrates the moderate level of service within the Vancouver urban area with connections to Camas and Washougal. Operating expenses are anticipated to run approximately \$1.1 million per year and capital expenditures are estimated at \$2.2 million*. Scenario Two portrays a county-wide transit system for about \$2.2 million in operating expenses and a \$6.6 million* outlay. These scenarios are not recommendations but were developed as illustrations of the kind of service that is available for a particular cost. There are any number of detailed service possibilities between these two alternatives.

* The cost of operating one bus for one hour

* This represents the total capital costs. Federal funding can be expected to pay 80% of the capital cost. Therefore, the local share is estimated at \$440,000 for Scenario One and \$1.3 million for Scenario Two.

PRIORITY TREATMENT

To encourage commuters to make more efficient use of vehicles traveling the I-5 corridor and, therefore, increase the "passenger capacity" of the freeway, it has been recommended that incentives be provided to persons using transit and carpools. These incentives are designed so that persons using buses and carpools can bypass traffic congestion and arrive at their destinations more quickly than if they had traveled alone. The task force studied two kinds of priority treatment including an exclusive lane for HOV's (High Occupancy Vehicles - Buses and Carpools) and ramp control. The exclusive lane is a freeway lane on which use is restricted to HOV's. Ramp control is a method by which entrance to the freeway is restricted during those times when the freeway becomes congested. HOV's are permitted to bypass the control device without restriction. By encouraging the more efficient use of vehicles, ramp control and exclusive lanes will help reduce the overall level of traffic congestion on the affected highway. The technical analysis indicated that an express lane would double the number of carpools and transit ridership using the I-5 freeway. Increasing the number of carpools and transit usage, in turn, reduces the number of autos traveling on the freeway, thus reducing congestion.

An exclusive lane on the I-5 freeway could be provided with only minor reconstruction by using narrower lanes and a portion of the existing shoulder. The present highway shoulders could be reduced and the existing lanes narrowed slightly (to about 11') to provide another lane. The additional lane would be reserved for buses and carpools.

The cost and benefits of a closed circuit monitoring system should be studied. Such a system could be useful, not only in detecting violators, but also in helping to spot traffic accidents and other conditions which disrupt freeway operations.

An analysis was conducted which showed that congestion was significantly reduced with the implementation of an exclusive lane, ramp control and other improvements. In addition, improvements were realized in air pollution, energy conservation and safety. The greatest improvement occurred in the evening peak period.

The improvements recommended herein will significantly augment the operations of the traffic flow. This is illustrated by detailed study material contained in the Technical Analysis.

While provision of immediate relief is the major focus of the Interstate Bridge Corridor Project, long range considerations have also been studied. The completion of I-205 shortly after 1980, is expected to provide a degree of relief in the interstate bridge corridor. However, continued development in the Rivergate industrial area as well as in Clark County, will cause high traffic volumes on the I-5 freeway. By 1990 the traffic volumes in I-5 are expected to equal or exceed present day counts. In order to avoid traffic conditions even more congested than those currently experienced on the freeway, high occupancy vehicles (HOVs) will have to play a major role in increasing the people moving capacity of the interstate bridge corridor. Estimates prepared by the Governors Task Force on Transportation show that bus lanes operating on the freeway and on Union Avenue could carry approximately 30,000 daily riders. Transit operating on the freeway could maintain one minute headways during the peak periods, five minute headways during the daytime off peak and 30 minutes for evening and night service. Provision of bus lanes within the existing right-of-way would enable the planning staffs of ODOT, Tri-Met and WSHD to study the impacts of the low capital intensive HOV priority system prior to the development of a more permanent busway. In addition, the bus lanes would provide a means of gradually upgrading transit service in the corridor. Thus, ridership could be increased to a point where the development of the capital intensive busway would be justified.

INTERSTATE BRIDGE CORRIDOR PROJECT **Technical Analysis**

Final Report February, 1976

Columbia Region Association of Governments

**Recommendations Adopted By CRAG
Board of Directors, February 19, 1976.**

LIST OF CONTRIBUTORS

TRANSPORTATION TECHNICAL ADVISORY COMMITTEE

Winston Kurth, Clackamas County
 J. Wayne Daigle, Cities of Clackamas Co.
 Jan Rosholt, Clark County
 Eric Oien, Cities of Clark County
 Dorothy Churchill, Cities of Columbia Co.
 Bebe Rucker, Multnomah County
 Kent Cox, Cities of Multnomah County
 John Crockett, Washington County
 Robert Royer, Ore. State Hwy. Div.
 Pierre Henriksen, Wash. State Dept.
 of Highways
 Richard Arenz, Fed. Hwy. Admin.
 Ken Johnsen, Port of Portland
 Bill Hall, Tri-Met
 Mark Beisse, Federal Aviation Admin.
 F. William Fort, Urban Mass Transit
 Administration

PROJECT TASK FORCE

Commissioner Dick Granger, Chairman,
 Clark County
 Patricia Blackwell, Vice-Chairperson,
 Citizen Advisory Committee
 Councilman Dick Pokornowski, City
 of Vancouver
 Jerry Peck, Owner, V-P Bus Company
 Ed Wagner, Tri-Met
 Robert Bothman, Oregon State Highway
 Division
 Pierre Henriksen, Wash. State
 Department of Highways
 George Palmer, Multnomah County
 William S. Dirker, City of Portland

CITIZEN'S ADVISORY COMMITTEE

Patricia Blackwell, Chairperson,
 League of Woman Voters
 Frank Barlow, Burlington Northern
 Railroad
 Julius Gaussoin, Silver Eagle Trucking
 Don Hughes, Camas Citizen
 Howard Martin, Camas Citizen
 Tim McNeil, Citizen
 Jim Howell, Sensible Trans. Options
 for People
 Lynn Hatcher, Citizen
 Richard Swennes, Convoy Company
 Ben Witt, Citizen
 Ray Brewer, Union Ave. Boosters
 Carol Hansen, American Assoc. of
 University Woman
 Mary Legry, League of Woman Voters
 John Martin, Citizen
 John Pierce, Vancouver Chamber
 of Commerce
 Susan Regan, League of Woman Voters
 Vern Rifer, Oregon Environmental
 Council
 Betsy Strong, Womans Highway
 Safety Leaders

CRAG STAFF PRINCIPALLY RESPONSIBLE FOR THIS REPORT

RICHARD ETHERINGTON, DIRECTOR
 TRANSPORTATION DIVISION
 A. REED GIBBY, SENIOR PLANNER
 JOHN KRAWCZYK, PLANNER
 WILLIAN PETTIS, PLANNER
 ROGER BUDKE, PLANNER
 PROJECT PRODUCTION--
 KAREN THACKSTON, LORI
 WOLCOTT, LESLIE SMITH
 ZONNIE BAUER

COVER PHOTO,
 ANCIL NANCE

COLUMBIA REGION ASSOCIATION
 OF GOVERNMENTS
 527 SW Hall
 Portland, OR 97201
 (503) 221-1646

PREFACE

This document contains the technical analysis which forms the basis of the findings and recommendations included in the Executive Summary of the Final Report of the Interstate Bridge Corridor Project Task Force. The Technical Analysis is expected to provide sufficient justification to local, state and federal transportation officials for the implementation of the recommended improvements. The Executive Summary was prepared to convey appropriate background information about the analysis and recommendations to local decision-makers, non-technical staffs of local agencies, news media and interested citizens.

TABLE OF CONTENTS

	<u>Page</u>
Title Page	i
List of Contributors	ii
Preface	iii
Table of Contents	iv
List of Tables	v
List of Figures	vi
 <u>CHAPTER</u>	
SUMMARY OF RECOMMENDATIONS	1
I. I-5 CORRIDOR STUDY	7
Revised Work Program	9
II. SUMMARY OF PREVIOUS FINDINGS & RECOMMENDATIONS	13
Data	13
Existing Conditions	16
PHASE I Recommendations	20
Status of Recommendations	21
III. TRANSIT PLANNING IN CLARK COUNTY	25
Service Criteria	25
Demographic Characteristics of Clark County	27
Type of Service	27
System Revenues	36
IV. TRANSIT SERVICE	41
Scenario 1	41
Scenario 2	42
V. PRIORITY TREATMENT ANALYSIS	53
Existing Conditions	53
HOV Lane Analysis	53
Ramp Control	60
Law Enforcement Control System	62
Carpooling Considerations	63
Cost Considerations	64
Long Range Planning Considerations	70
References	72
VI. RECOMMENDATIONS	75

APPENDICES

A.	DATA FOR HIGH OCCUPANCY VEHICLE LANE ANALYSIS	81
B.	EXCERPTS FROM ODOT I-5 CORRIDOR ANALYSIS	83
C.	COST FOR CORRIDOR SERVICE	88
D.	DEMAND RESPONSIVE TRANSIT	90
E.	TRANSIT FUNDING IN THE STATE OF WASHINGTON	93
F.	RIDERSHIP ESTIMATES	97
G.	TRANSIT OPERATIONS	99
H.	POTENTIAL IMPROVEMENTS CONSIDERED IN PHASE I	104

LIST OF TABLES

		<u>Page</u>
III-A	TRANSIT SERVICE CONSIDERATIONS	26
III-B	CRITERIA FOR TYPES OF TRANSIT SERVICE AREAS	32
III-C	FUNDING OPTIONS	37
III-D	RIDERSHIP & FAREBOX REVENUE PROJECTIONS IN CLARK COUNTY	38
IV-A	SUMMARY OF TENTATIVE GOALS & OBJECTIVES	44
IV-B	ANNUAL OPERATING & CAPITAL COSTS	47
IV-C	ANNUAL OPERATING & CAPITAL COSTS FOR HIGH LEVEL OF SERVICE	49
V-A	PRIORITY ANALYSIS FOR I-5 BETWEEN PORTLAND BLVD. AND COLUMBIA SLOUGH	59
V-B	SELECTED IMPACTS OF A PRIORITY LANE FOR HOV'S IN THE I-5 CORRIDOR	67

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
R-1	INTERSTATE BRIDGE CORRIDOR RECOMMENDATIONS	
I-1	VICINITY MAP	
III-1	MAJOR ACTIVITY CENTERS IN VANCOUVER URBAN AREA	
III-2	MAJOR HIGHWAYS IN THE VANCOUVER AREA	
III-3	POPULATION DENSITIES IN SOUTHERN CLARK COUNTY	
III-4	DECISION NETWORK FOR ESTABLISHMENT OF A TRANSIT AGENCY IN CLARK COUNTY	
IV-1	SCENARIO 1	
IV-2	SCENARIO 2	
V-1	I-5 CORRIDOR PEAK HOUR TRAFFIC VOLUMES, MARCH, 1974	
V-2	I-5 CORRIDOR PEAK HOUR TRAFFIC VOLUMES, MARCH, 1974	
V-3	EXISTING NORTHBOUND EVENING PEAK TRAFFIC SPEEDS ON I-5	
V-4	EXISTING SOUTHBOUND MORNING PEAK TRAFFIC SPEEDS ON I-5	
V-5	PRINCIPLE OF TRIP DIVERSION RESULTING FROM RAMP CONTROL	
V-6	PROVIDING FOR EXCESS DEMAND OF TRANSPORTATION SYSTEM	
R-1	INTERSTATE BRIDGE CORRIDOR RECOMMENDATIONS	
R-2	NORTHBOUND EVENING PEAK TRAFFIC SPEEDS ON I-5 WITH RECOMMENDED IMPROVEMENTS	
R-3	SOUTHBOUND MORNING PEAK TRAFFIC SPEEDS ON I-5 WITH RECOMMENDED IMPROVEMENTS	

SUMMARY OF RECOMMENDATIONS

INTERSTATE BRIDGE CORRIDOR RECOMMENDATIONS

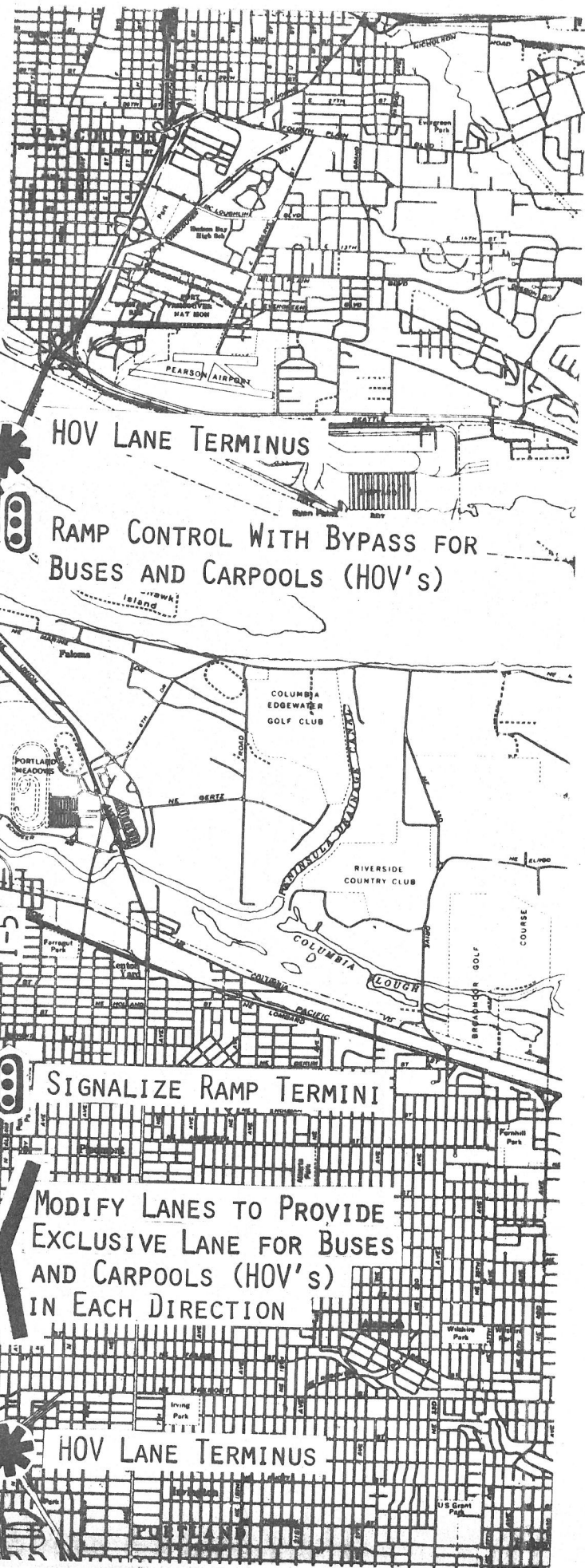
FIGURE R-1

FEBRUARY, 1976



1"=4000'

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



SUMMARY OF RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Vancouver, Clark County and Portland.
2. Tri-County Metropolitan Transportation District (Tri-Met) should immediately purchase Vancouver-Portland Bus Company.
3. Carpooling should be promoted in Clark County by the regional carpool program.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows:
 - a. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - b. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - c. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with reconstruction of the Columbia Slough Bridge to an eight-lane structure.
6. The Oregon Department of Transportation should consider installation of traffic signals at the termini of the I-5 ramps at Portland Boulevard.

CHAPTER I
I-5 CORRIDOR STUDY

INTERSTATE BRIDGE CORRIDOR

VICINITY MAP

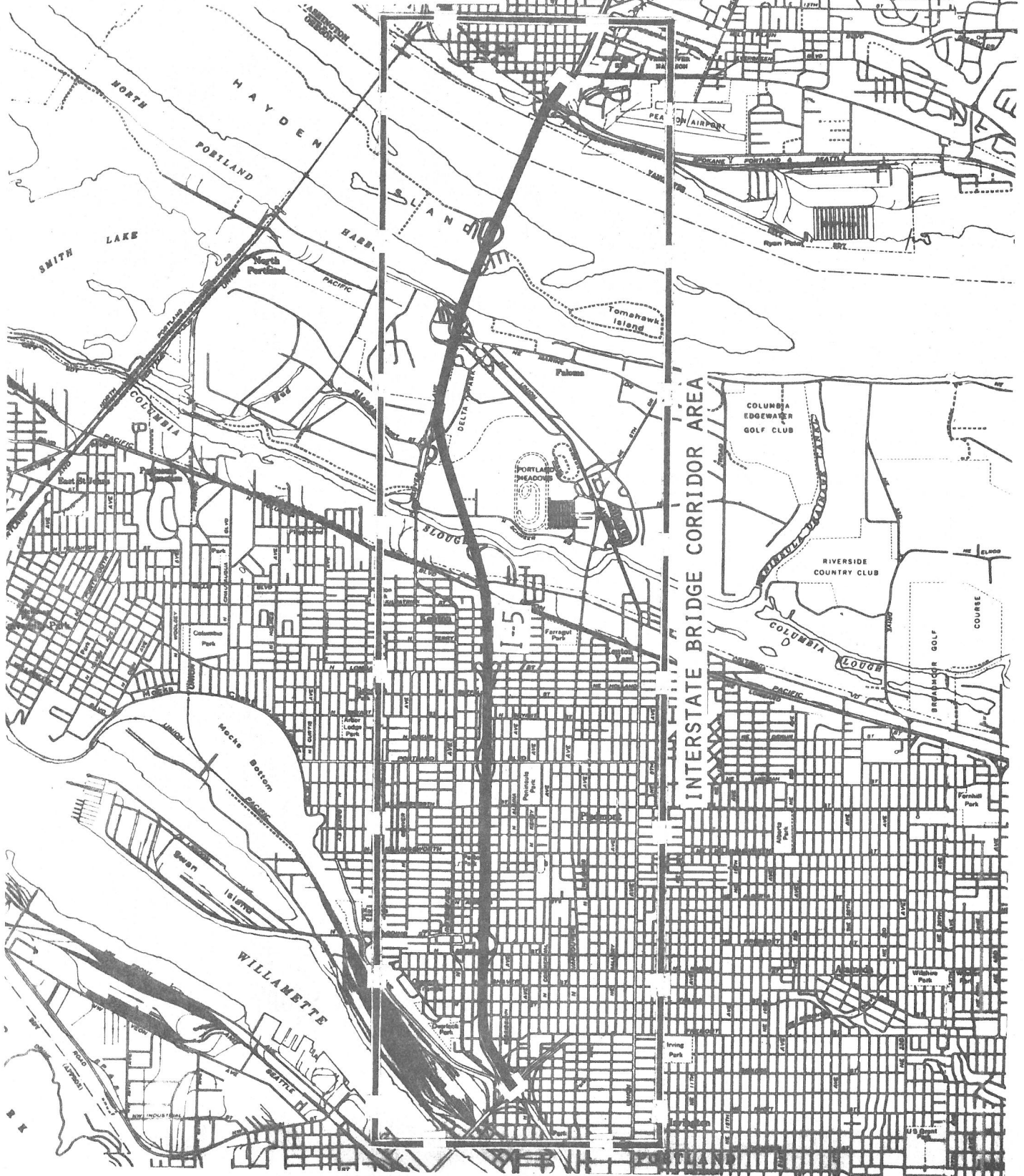
FIGURE I-1

FEBRUARY, 1976



1"=4000'

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



Chapter I

I-5 CORRIDOR STUDY

A high degree of mobility is something that has come to be expected by most persons living in the Portland-Vancouver Metropolitan Area. Mobility in our society is necessary in most cases to obtain and keep a job, to gain an education, to shop, to procure professional services and to engage in recreational activities. Rare is the person who can walk to his place of employment and have all the necessary services within walking distance of his or her home. In fact, persons without means of travel, other than walking, find themselves socially and economically restricted.

Currently, most of our transportation service is provided by the private automobile. The problems associated with a strong dependence upon the automobile are so well known that they need little restating at this point. Concerns over energy and air pollution require that our society lessen its dependence on this mode of transportation.

Certain problems exist in the Portland-Vancouver Metropolitan Area which also require reduced dependence on the private auto. The Interstate Bridge Corridor, which contains the Interstate 5 Freeway between downtown Portland and Vancouver, represents one of the most severe traffic problems in the metropolitan area.

Interstate 5 is the major north-south interstate highway on the Pacific Coast, connecting nearly all the larger west coast cities. I-5 is, thus, a major national highway corridor of significant social, economic and commercial importance.

The Portland-Vancouver Metropolitan area is composed of four counties, including three counties in Oregon and one county in Washington. Clark County, Washington, is separated from the remainder of the metropolitan area by the Columbia River. Clark County has a population of 135,000, about 13% of the total urban area. Approximately 13,000 Clark County residents work on the "Portland side" of the river. Over 4,000 Oregon residents are employed in Clark County. In addition, Clark County and the remainder of the metropolitan areas have significant social, economic and cultural ties. The four counties comprise the Portland-Vancouver Standard Metropolitan Statistical Area (SMSA).

At this time Interstate 5 provides the only link across the Columbia River in the metropolitan area. No other river crossings exist either up or down river for about 50 miles. A second river crossing about seven miles upstream from the present Interstate Bridge is committed, but completion of the facility (I-205) is not anticipated until the early 1980s.

The combination of high daily volumes of commuter traffic,

Interstate 5's role as a major national highway, and the absence of any alternative river crossing within reasonable commuting distance, creates very congested conditions in the corridor, particularly during the peak period. The problem is further complicated by the fact that the Interstate Bridges are lift bridges and must be raised several times daily to permit river traffic to pass underneath. Until the new Interstate 205 Bridge is completed, the traffic situation in the I-5 Corridor will continue to deteriorate pending implementation of measures to reduce the number of vehicles using the corridor. (A complete description of the traffic conditions in the corridor is contained in the Interstate Bridge Corridor Project Phase I Report.)

To reduce auto traffic in the corridor, it has been suggested that the people moving capacity of the I-5 facility be increased. Specifically, this includes provision of priority treatment for high occupancy vehicles (buses and carpools) and creation of a unified public transit system in the corridor. Currently, transit service in the corridor is fragmented as it involves two public and two private carriers. Transit service is, therefore, very costly and time consuming for the commuter which partially explains why the modal split in the corridor is less than 1%.¹

A unified public transit system has been recommended to alleviate this service fragmentation. In addition, this single public system would be able to provide lower fares, better equipment, more extensive marketing, and higher quality service than the private carrier now operating in the corridor.

The private carrier providing interstate service is unable to significantly improve his service because he must operate only with fare box revenues. A publicly owned carrier, on the other hand, receives tax subsidies enabling the public carrier to improve service where fare box revenues will not meet costs.

Improved service within the corridor is only a partial answer. A feeder system that can serve the needs of commuters living in Clark County is essential to a successful corridor service. Currently, Clark County is served by three transit carriers, one public and two private. The public carrier (Vancouver Transit) is authorized to provide service only within the Vancouver city limits. Vancouver Transit operates on six routes, providing basic transportation service to the city's residents. While this system interfaces with the private carrier currently operating bus lines in the corridor, the relatively long headways, lack of a reduced cost transfer provision between the two lines, and the nature of the Vancouver Transit System routings make Vancouver Transit a relatively poor feeder service.

Vancouver-Portland Bus Company (a privately owned carrier) is the principle transit service operating in the corridor. Evergreen Stage Lines also operates in the corridor, but is not authorized to transport persons between downtown Vancouver and Portland. This carrier provides service between Camas, Washougal and Portland.

Revised Work Program

To address the significant transportation problems of the Interstate Bridge Corridor, the Interstate Bridge Corridor Project was formed in late 1973. Phase I of the study suggested low capital intensive solutions to the traffic problems of this corridor. Phases II was to develop a long range solution to the corridor transportation problems.

After the findings of the Phase I report were examined, it was decided to focus the remainder of the project's attention on implementing the recommendations of Phase I; in particular, the development of a program for a unified transit system in the corridor and in Clark County. An analysis of the impacts of a high-occupancy vehicle lane in the corridor was also to be studied. A third element, long range planning for the corridor will be based on the CRAG adopted Transportation Plan and continuing technical analysis by CRAG and ODOT. This document covers the technical analysis conducted to support the Executive Summary, a separate publication. The technical analysis contains the essence of the work performed in the three elements of the revised work program.

Element A, the transit element, of the revised work program, addresses the designation of service area, identification of potential routes, system financing and system administration. The work program for Element A was supervised by the Consolidated Transportation Staff of Clark County (CTS).

Element B, Priority Treatment Analysis, examined the feasibility of providing priority treatment for HOV (buses and carpools) on the I-5 facility. A volume analysis was conducted to determine the usage of a High Occupancy Vehicle (HOV) lane on I-5 between Portland Blvd. and Hayden Island. A survey of accident records of autos and buses was conducted to estimate possible safety consequences; and, an extensive quality study was made of non-traffic impacts. In addition, issues in law enforcement and carpooling were examined.

Element C, Long Range Corridor Planning, based on work done by the Governors Task Force and the CRAG ITP was prepared by ODOT Planning Section and has been included in the appendix.

The last portion of this report describes the recommendations of the I-5 Corridor study for the development of a Unified Transit System and priority treatment for high occupancy vehicles.

CHAPTER II
SUMMARY OF PREVIOUS FINDINGS AND
RECOMMENDATIONS

Chapter II

SUMMARY OF PREVIOUS FINDINGS AND RECOMMENDATIONS*

This chapter provides a summary of the findings and recommendations made in the Interstate Bridge Corridor Project's Phase I Report. It contains (1) background information useful to the understanding of the corridor's problems with possible solutions and (2) a brief summary of the Phase I recommendations.

Data

Data on the tripmaking characteristics of commuters using the Interstate Bridge Corridor (ICB) were assembled from two sources. Data included census information and statistics obtained from an origin and destination survey conducted in the corridor.

Census Data

The 1970 Census Data for the Portland Metropolitan Area indicated that 12,212 Clark County residents work in Portland and the adjacent Oregon Counties. A total of 917 Clark County residents reported they were employed in the Portland Central Business District area and 8,350 reported that they worked in other parts of the city. It is important to note, however, that the Census Bureau limits its definition of a Central Business District to an area somewhat smaller than the Central Business District as defined for purposes of traffic planning. New construction which has increased the number of office facilities in the downtown area since 1970, may also contribute to an increased number of persons employed in the Central Business District. Persons from Clark County employed in other parts of the Portland area include:

Multnomah County (minus Portland)	1,650
Clackamas County	685
Washington County	610

There is considerable growth occurring in Clark County as evidenced by a 5% increase from 128,454 in 1970 to 135,154 in 1973. Columbia Region Association of Governments projections indicate that Clark County will continue to grow at a substantial rate, reaching a population of between 158,000 and 171,000 persons by 1980. Census data has also been useful in giving the staff an "area profile" on the social and economic characteristics of the residents of Vancouver and surrounding Clark County areas.

All data, of course, must be viewed within its limitations. The 1970 Census data may be somewhat dated due to the rapid growth in

*Note: Much of the material contained in this chapter is excerpted from the IBCP Phase I Report.

the region and particularly in Clark County, and a very high rate of inflation which has substantially affected economic conditions over the past three years.

Origin and Destination Survey

In December, 1973, between the hours of 6 and 9 a.m. on certain weekdays, the Washington State Highway Division (WSHD) conducted a survey of drivers entering the I-5 freeway in Vancouver and southern Clark County. Later, in February, 1974, an origin-destination survey was conducted on the Vancouver-Portland Bus Company lines operating in the corridor. The survey was to determine the points of origin of persons crossing the Interstate Bridge into Oregon, the destinations in the Portland area, and other travel characteristics and socio-economic data. The previous survey in this corridor was conducted in 1960.

Several methods of conducting the survey were considered. These included:

1. Photographing license plate numbers of cars passing a given point on the freeway, comparing the numbers with Washington Department Motor Vehicles records and mailing auto owners a survey questionnaire, and
2. Distributing questionnaires at freeway entrances in the Vancouver area.

Both of these methods were considered to be effective, however, the latter method was chosen since the former might be resented by some drivers who consider the photographing process an invasion of privacy and the ambient light in the morning may not be sufficient for photographing.

Questionnaire

The questionnaire contained 15 questions and provided information on the following subjects in addition to the trip origin and destination.

1. Type of vehicle
2. Parking costs
3. Purpose of trip
4. Willingness to use mass transit
5. Reasonable cost for mass transit trip
6. Carpool membership
7. Interest in carpool
8. Sex
9. Family size
10. Number of vehicles owned by the commuter
11. Age
12. Income bracket

Space was also reserved on the card for the respondent to comment on pertinent items of interest. Approximately 9500 questionnaires were distributed to motorists from which approximately 3400 responses were received. The sample return was about 36%; the value of 20% is considered the minimum sample size to obtain representative data. The origin-destination study provided a very detailed breakdown of the trip origins and destinations of those Clark County to Portland commuters who cross the Interstate Bridge during the period between 6 - 9 a.m. known as the morning peak period. The survey also provided a look at the commuter's social and economic condition as well as exploring some of his attitudes on such subjects as public transit and carpools.

Distribution of Trips

The survey demonstrates that there is a fairly uniform distribution of person trips to destinations in the Portland area because no single employment zone received more than 20% of the total trips from Clark County and only downtown Portland (which received 18% of the incoming trips) was significantly close to the 20% figures. Most Vancouver commuters were bound for the North Portland area (4,095 trips) and West Portland (3,679 trips). While these areas are very large (96 square miles) they both contain major employment centers which receive a significant number of person trips. These include:

1.	Downtown Portland	2,314
2.	Lloyd Center	1,384
3.	Northwest Industrial District	1,215
4.	Swan Island	820

Note: Trips are expanded and include transit trips.

Six transportation corridors were identified which appear to contain most of the points of origin of a large share of the Oregon-bound trips. These corridors are composed of those traffic zones which border on arterial streets. The number of person trips originating in each corridor bound for destinations in Oregon is shown below:

Mill Plain Corridor	2,486
Fourth Plain Corridor	2,190
Main St. - Hwy. 99 Corridor	2,056
78th Avenue Corridor	1,864
Hazel Dell and Vicinity	1,712
Lewis and Clark Highway - Camas Corridor	1,384

Note: Portions of some corridors overlap.

Trips originating from these corridors make up approximately 71% of the total Clark County to Oregon trips. The remaining trips originate in the following areas:

Southwest Vancouver	1,090
External Stations	1,039
Northeast Clark County	595
Northwest Clark County	47
Other Vancouver	155

Auto Occupancy

Auto occupancy for Oregon-bound trips tends to be somewhat low. The automobile occupancy of the vehicles sampled in the Origin-Destination survey was found to be 1.24 persons per automobile which is slightly lower than the national average of 1.28 persons per automobile for work trips.

In relation to destination, auto occupancy tends to be higher in those areas where employment is relatively concentrated and lower where places of employment are scattered. Distance from point of origin does not appear to affect the occupancy rate except that work destinations tend to be more scattered in distant employment locations. The one occupant auto trip was overwhelmingly dominant among Clark County to Oregon commuters. Over 81% of the commuting autos contain only the driver while only 14% contain two occupants with 5% containing three or more.

Transit Ridership

Only 3% of the total southbound work trips during the time of the survey were made by transit. The existing Vancouver-Portland bus routes are oriented to serving downtown Portland to which 87% of the total transit trips were made. The only other destination of any significance was the Lloyd Center area which received 6% of the total transit trips.

In response to the question, "If a fast, efficient and comfortable transit system were available from convenient Park-Ride lots in the Vancouver area to the major employment and business centers in the Portland area, would you use transit rather than drive your car in the same trip?", 37% responded in the affirmative, 35% responded "no" and 28% were undecided. However, caution must be used in interpreting these results because such surveys may not represent the behavior of the sampled population. Analysis of observed behavior and conditions is obviously a more accurate indicator of individual and group activities.

Existing Conditions

Transportation conditions in the corridor were also studied by the project staff. Analysis indicated that major highway facility (I-5) was operating above its design capacity. Public transit was also explored and it was found that fragmentation among the various carriers was partially responsible for the lack of use of public transit in the corridor. A more detailed description of the project findings is noted below:

Highways

Basically, Interstate Route 5 consists of four lanes with six on the interstate bridges, Hayden Island and south of Portland Boulevard. This facility expands to eight lanes south of Going Street and has full (10 foot) shoulders through the project limits except on the bridges. Generally, the traffic volumes exceed capacity from Fourth Plain Boulevard (Vancouver) on the north, to Portland Boulevard (Portland) on the south. In 1972, the traffic volume at the highest location (near Fremont Street) was about 87,700 ADT (average daily traffic) while at Delta Park the ADT was 54,700; Hayden Island - 80,400; and the lowest was 50,400 ADT at 39th Street in Vancouver.

A traffic flow analysis of the freeway revealed weaving problems (level of service E) between Hayden Island and Union Avenue and roadway deficiency (level of service E) at Portland Boulevard during the peak hour in the major direction of flow.

In recent years the safety quality has improved with the removal of roadway objects and the installation of concrete median barriers and water-cell impact devices at many off-ramp gores. The accident rate has been decreased to 1.8 A/MVM (accidents/million vehicle miles) as of 1972. The trend has persisted in spite of an increase in traffic volumes. However, in Vancouver, the outdated ramp design contributes to extremely high accident rates. For example, at one location the rate was almost 50.9 A/MV (accidents per million vehicles) in 1970 while similar ramps elsewhere in the state were approximately 6.0 A/MV.

The profile alignment is considered level except on the interstate bridges and in Vancouver. These sections have significant grades causing lower operating speeds for heavy vehicles which tend to develop queues in the traffic stream.

The project did examine means of reducing the accident rates on the southbound on-ramps. It was noted that the Washington State Highway Department has designed a ramp control device to reduce rear-end collisions on the ramps. An alternative to this device is the extension of the acceleration lanes at Fourth Plain Boulevard and Mill Plain Boulevard to a length of about 1300 feet. Since the southbound traffic volume in 1970 at 39th Street is only 3500 ADT (800 off-ramp and 2700 on-ramp) and the same movements could easily be provided at the Main Street Interchange (about one half mile to the north), these southbound ramps could be closed. The signal at Main Street and 39th Street should also be improved.

The interstate bridges with liftspans yielding the right of way to marine traffic are the only highway link across the Columbia River within 50 miles in either direction. The high traffic volumes cause queuing problems when the liftspans are open or an accident occurs when traffic flow is heavy. At times the queues have extended for miles on the freeway and blocked local street

networks in downtown Vancouver and Hayden Island; however, the river users have been very cooperative by reducing the use of the lift span during peak hours. This bridge has been of considerable interest and concern for some time; consequently, the Washington State Highway Department operates a system to warn southbound motorists when congestion occurs in the southbound lane. This "Advance Warning System" detects slow moving vehicles and activates warning signs. In Oregon there are signs interconnected with the lift bridge controls for the same purpose.

Aside from the interstate bridges, three specific problem areas exist in the northbound direction; namely, 1) Going Street off-ramp, 2) Portland Boulevard off-ramp and 3) Union Avenue-Delta Park on-ramps. Frequently, in the morning, northbound traffic existing at Going Street and Portland Boulevard backs up onto the freeway, partially blocking it. The southbound traffic at Portland Boulevard during the morning peak hour has level of service "E" while upstream sections are at level of service "D" or "C" and as the traffic enters the "E" section a shock wave develops and often causes a breakdown which is not eliminated until after the peak hour is over. The congestion from the shock wave often propagates as far north as Hayden Island. In the evening, the geometrics of the successive merges between Union Avenue produce low traffic operational speeds on Interstate Route 5. Many of the motorists entering Union Avenue from Swift Street do not merge with Union Avenue motorists until after they enter Interstate Route 5, thereby, adding to the problem of confusion and slow movement. Immediately after entering Interstate Route 5 the northbound traffic must negotiate a curve at the south end of the Columbia Slough bridge. The traffic merging from Denver Avenue also results in congestion.

In the evening, congestion in the northbound roadway develops at the Portland Boulevard overpass where the northbound peak volume also operates a level of service "E". From this point the queuing or congestion propagates south to the interchange with Interstate Route 405.

Prior to the construction of Interstate Route 5, Interstate Avenue was a section of the major national north-south highway on the west coast. Through north Portland it generally consisted of four lanes with parking on both sides and raised channelization in the median. The traffic volumes may be considered light to moderate since the ADT did not exceed 8,000 in 1972 except south of Greely Avenue. Near Fremont Street the volume increases to 16,000 ADT. The safety aspects are not as favorable as the freeway but considering the light volumes, the median and the adjacent land use which has low traffic flow frictional characteristics the safety quality does merit worthy mention. The accident rate has been decreasing in recent years and in 1972 was 4.07 A/MVM. The geometrical alignment is good except near Going Street and Greely Avenue. Since this was a national route, the roadway pavement is of good quality.

Union Avenue likewise consists of four lanes with parking except south of Hancock Street where it couplets with Grand Avenue. Generally, there is not a capacity problem; however, near Fremont Avenue, the volume exceeded 19,000 ADT in 1972 but elsewhere north of Hancock Street it did not exceed 11,000 ADT. Because of narrow lanes and roadway, considerable business activity along the street, (causing traffic flow friction), lack of a median barrier, there prevails a lower quality in safety as indicated by accident rate of 6.26 A/MVM. Alignment of this facility, except for the northbound one-way couplet transition, is very good.

Mass Transit

There are five passenger carriers locally serving the Interstate 5 corridor. Four of them use buses; namely, Tri-Met (Public), Vancouver-Portland Bus Company (Private), Evergreen Stage Lines (Private), and Vancouver Transit System (Public). The fifth carrier is Amtrak, a public rail operation, which does not provide commuter service. Most (about 95%) of the transit trips are made by bus; however, there exist several disincentives against using this mode in the corridor. Presently, there is little coordination of routes, lines and schedules among the several transit operators (except for Vancouver-Portland Bus Company and Vancouver Transit System which provide reasonable interfacing of lines and schedules at Fifth and Broadway in downtown Vancouver). Common line designation among carriers is also non-existent and each carrier maintains separate fares with no provision for free or reduced fare transfer between systems. (Note: Tri-Met and Vancouver-Portland Bus Company recently agreed to honor transfers between systems on their Hayden Island lines.) Of course, the issue of mixing public and private systems which can obtain tax revenues to offset deficits which may occur must be addressed.

To illustrate the problem of multiple carriers, a Vancouver resident will pay approximately \$2.80 a round trip to the St. Johns industrial area, ride three carriers each way, transfer four times during a round trip, wait up to 20 minutes at the transfer points and perhaps have a ten minute walk at each trip end. This partially explains why the modal split at the interstate bridges was only 1% of the average daily person trips.

According to another report, the freight rail traffic is so great on the present rail bridge that significant passenger service does not appear possible without disrupting freight service. The Amtrak terminal in Vancouver is located away from employment or residential areas; therefore, essentially all Amtrak passengers need a feeder system. However, the Vancouver Transit System does not presently serve the depot area.

Phase I

Recommendations

In addition to the data presented at the beginning of this chapter and the analysis of traffic conditions on the freeway, the project looked at a variety of alternative means of solving the corridor's transportation problems. Air, water, rail, and highway systems were considered as well as socio-economic means of reducing travel demand. (For a list of improvements considered see Appendix H.) It was concluded, by the project that only highway and transit improvement could be implemented within a short period of time at a low cost.

Briefly, the Project's recommendations included:

1. Express bus service in the corridor -- The project recommended that Vancouver Portland Bus Company operate a demonstration commuter express bus service from Hazel Dell and the Mill Plain corridor to the Lloyd Center and Downtown Portland.
2. Intersystem transfers -- It was recommended that Tri-Met, Vancouver Portland Bus Company, Vancouver Transit and Evergreen Stage Lines honor each other's transfers.
3. Customer Information Service -- Suggested improvements include toll free information service, route maps, shelters, and information brochures.
4. Expansion of the regional carpool program -- It was recommended that the ODOT Regional Carpool program be expanded to include Clark County.
5. Evaluation of priority treatment for High Occupancy Vehicles -- This recommendation called for detailed evaluation of priority treatment for High Occupancy Vehicles (HOV's), including priority lanes and ramp metering with bypasses for HOV's.
6. Interstate bikeway -- Completion of a bikeway through the Interstate Bridge Corridor from Downtown Portland to Vancouver was recommended.
7. Highway operations -- This recommendation called for highway safety improvements, signalization, ramp metering, utilization of the shoulder in limited areas to improve traffic flow, and use of dynamic warning signs to advise motorists of congested conditions.
8. Analysis of longer term improvements -- This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver-Portland Bus Company by Tri-Met.

9. Unified transit system -- This recommendation called for study and development of a transit district in Clark County and purchase of the Vancouver-Portland Bus Company by Tri-Met.

Status of Recommendations

Many of the above recommendations have been implemented to date. This report, in fact, is the result of two of the recommendations, namely evaluation of priority treatment and study of a transit district of Clark County.

The demonstration express bus service has been successful in attracting new patrons to bus service, however, Vancouver-Portland Bus Company reports that the service is continuing to operate at a loss. Some of the service originally instituted has been curtailed for lack of ridership.

The regional carpool has been expanded to Clark County. Marketing efforts were conducted and carpool officials reported a limited response to the program.

Some traffic operations improvements are in the planning stage by the Oregon Department of Transportation. Major improvement are planned in conjunction with the reconstruction of the Columbia Slough Bridge and Union Avenue Interchange.

The improvements relating to the information program, intersystem transfers, and bikeway have not been implemented. Long range system considerations will be studied at a later date as part of the regular CRAG work program. Traffic operations improvement of particular importance, which have not been implemented or studied, are noted in this report recommendation.

CHAPTER III
TRANSIT PLANNING IN CLARK COUNTY

Chapter III

TRANSIT PLANNING IN CLARK COUNTY

The transit planning process must consider a variety of factors in developing a transit system which will adequately serve the needs of the populace. The factors include development of service criteria, demographic characteristics of the population to be served, types of service which can be provided, operations, capital improvements and revenues.

This chapter provides a survey of the considerations which must be made in developing a transit system in Clark County. This system will be the Washington portion of coordinated regional transit operations.

Service Criteria

Criteria has been developed which links population distribution and density to levels of service. Tri-Met has developed one such set of criteria which may be applicable to providing public transit in Clark County.

The Tri-Met criteria divides the service area into three categories. These include urban areas, suburban areas and rural communities. Urban areas are those areas with over 3,200 persons per square mile or five persons per acre. Suburban areas are designed where the population is greater than 1,600 persons per square mile, but less than or equal to 3,200 persons per square mile. Rural communities are those population centers located in areas where the population does not exceed 1,600 persons per square mile (see Table III-A). In urban areas, a bus is to be provided within $\frac{1}{4}$ mile of every household. Lines operating in urban areas will provide service every 30 minutes during the midday period and at least every 10 minutes during the peak hours. Suburban areas shall have service within $\frac{1}{2}$ mile of every household. Lines will operate at least hourly during the midday period and at frequencies no greater than 15 minutes in the peak hours. In rural areas, bus service will be provided to the various community centers. Access to these lines will be supplemented by interim park and ride facilities. Service will be provided on the basis of demand.¹

The routing of transit lines is determined not only by the location of households (trip origins) but also by the destination (activity centers) to which persons will be traveling. These activity centers will include:

- Central Business Districts
- Industrial Facilities
- Major Medical Facilities

TABLE III-A, TRANSIT SERVICE CHARACTERISTICS

SERVICE	EQUIPMENT	PEAK PERIOD COMMUTER SERVICE	DOOR TO DOOR SERVICE	DEMAND RESPON- SIVE	PARK & RIDE	EXCLUSIVE BUS LANE	SERVICE AREA ¹		
							URBAN	SUBURBAN	RURAL
Arterial	Conventional Buses	YES	NO	NO	YES	NO	YES	YES	LIMITED ³
Local	Small Buses or Vans	NO	OPTIONAL	OPTIONAL	NO	NO	YES	NO	NO
Express (corridor)	Conventional Buses	YES	NO	NO	YES	YES	YES	YES ²	NO
Intercity	Conventional Buses	OPTIONAL	NO	NO	YES	NO	NO	NO	YES ⁴
Shuttles	Conventional Buses	YES	NO	NO	NO	NO	YES	NO	NO
Special Transportation	Vans Equipped with Wheelchair Lifts	NO	YES	YES	NO	NO	YES	YES	NO

1 See Table III-A for description of service

2 Arterial service connects with express service for easy transfers

3 May serve rural community centers located near urban areas

4 Serves rural community centers

Commercial Centers
Educational Facilities
Cultural Centers
Major Recreational Centers

The major activity centers in the Vancouver Urban Area are shown on Figure III-1.

Demographic Characteristics of Clark County

Clark County is a portion of the Portland-Vancouver Standard Metropolitan Statistical Area. The county contains about 135,000 people. The 1970 employment was listed as 45,300. About 13,000 Clark County residents are employed in the Oregon portion of the metro area.

Population centers in Clark County include:

Vancouver	Battleground
East Vancouver (unincorporated)	Ridgefield
Camas	Yacolt
Orchards (unincorporated)	LaCenter
Hazel Dell (unincorporated)	Washougal

Vancouver, East Vancouver, Hazel Dell and Orchards comprise the Vancouver Urban area which contains about 100,000 people, 3/4 of the county's population. The second major population area is Camas-Washougal with 11,000 people.

Several major arterial highways serve these populated areas in Clark County. The major north-south route is I-5, which has been described and analyzed in the Phase I report. Other major streets in the Vancouver Urban area include Mill Plain Blvd., Fourth Plain Blvd., St. Johns-St. James Streets, Main St.-Hwy. 99 and 78th Street. Two facilities (I-205 and SR 500) are under construction. The Lewis and Clark Highway, State Route 14, links downtown Vancouver with the cities of Camas and Washougal. These major transportation corridors are shown in figure III-2.

Densely populated neighborhoods in the Vancouver Urban Area tend to be located in the city center and adjacent to the major transportation corridors. Figure III-3 shows population densities in the urban area based on 1970 traffic zone statistics.

Type of Service

Careful consideration was given to the transportation needs of Clark County as well as the transportation, social and population characteristics of the county. On the basis of these considerations, six different kinds of transit service have been identified including: Radial Service, Local Service, Corridor Service, Intercity Service, Shuttles and Special Transportation. The

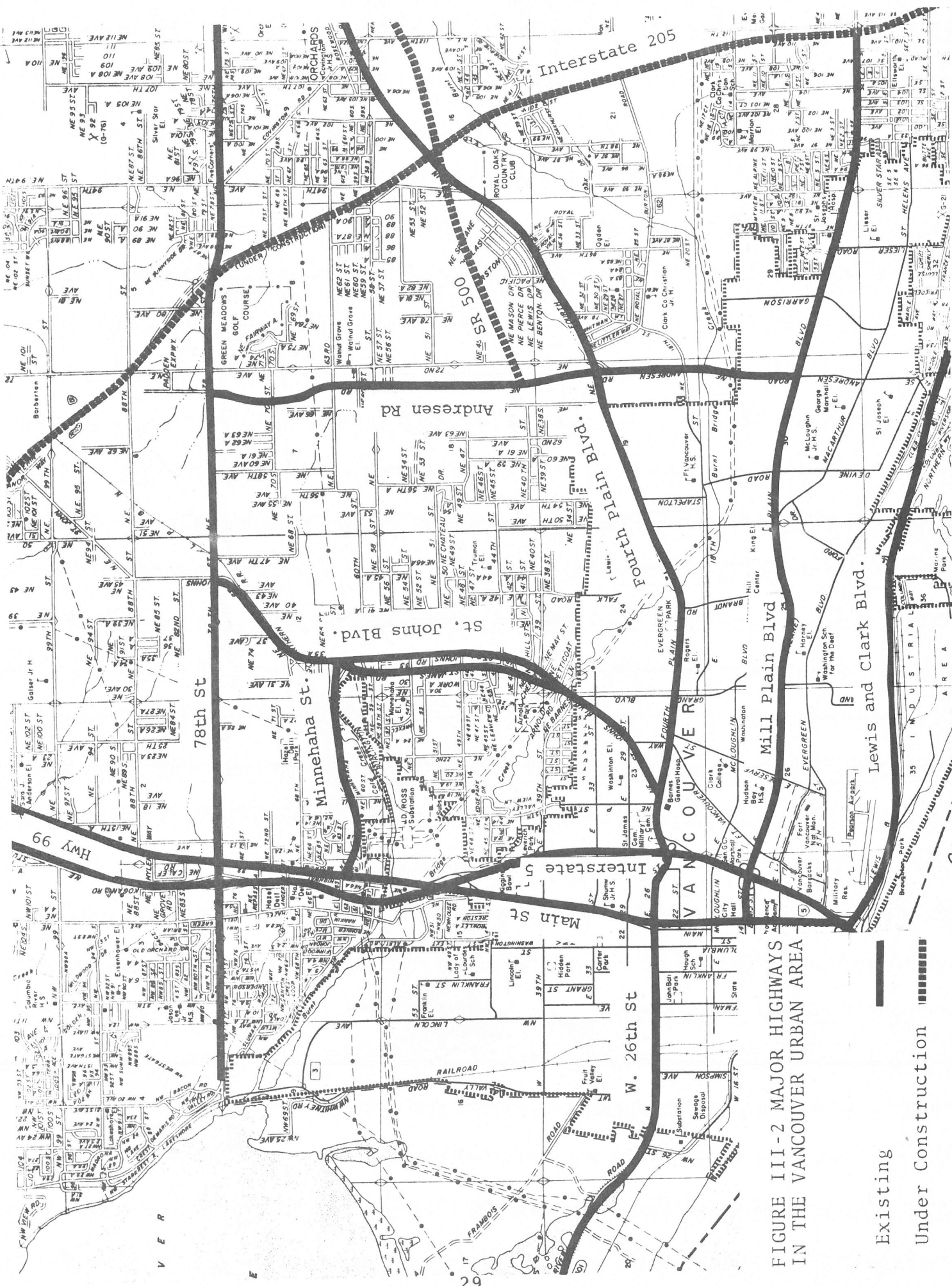


FIGURE III-2 MAJOR HIGHWAYS
IN THE VANCOUVER URBAN AREA

Existing
Under Construction

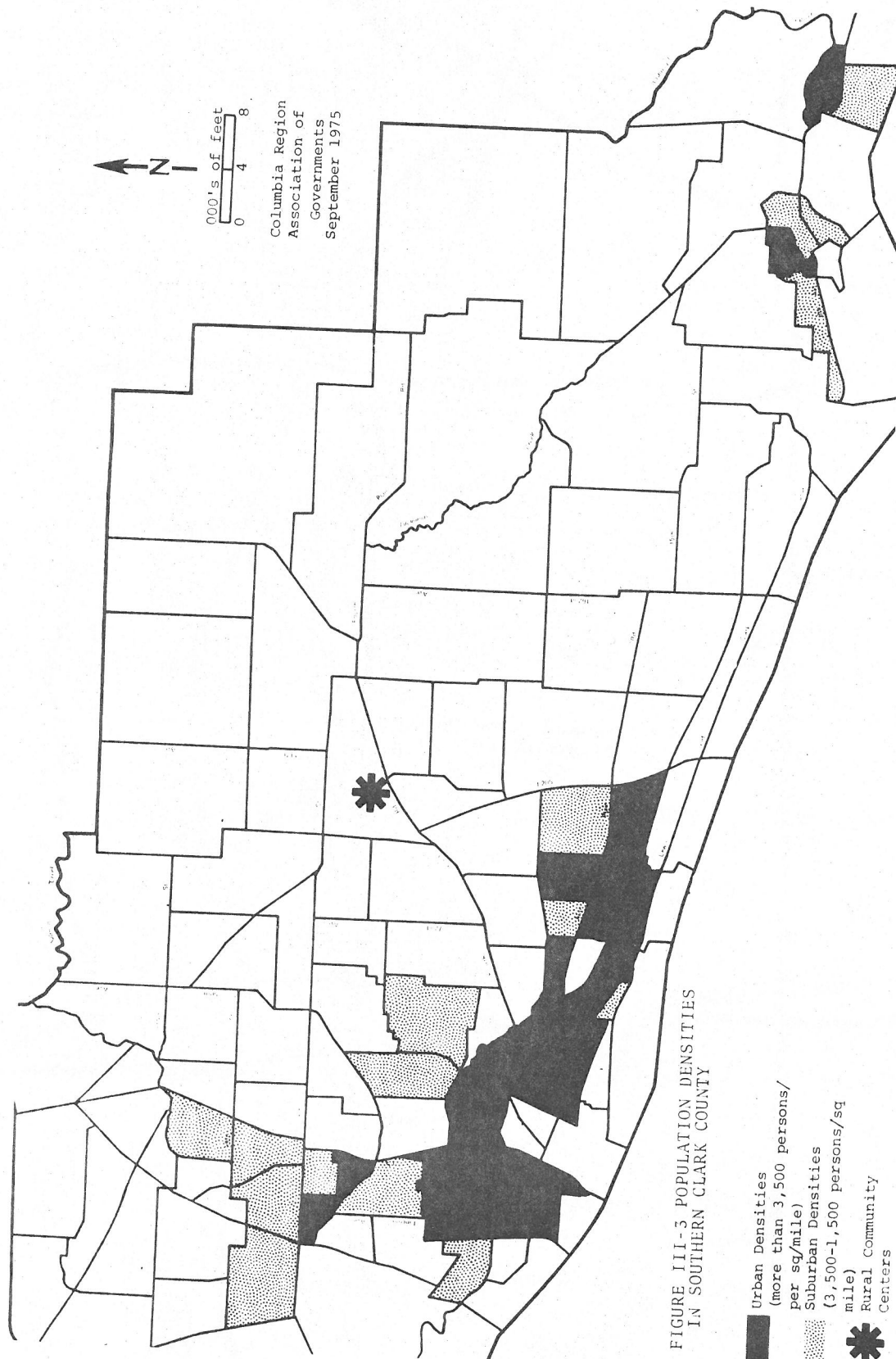


FIGURE III-3 POPULATION DENSITIES
IN SOUTHERN CLARK COUNTY

- Urban Densities
(more than 3,500 persons/
per sq/mile)
- Suburban Densities
(3,500-1,500 persons/sq
mile)
- Rural Community
Centers

operating characteristics of these services are shown in Table III-B.

Radial Service

Radial service is composed of those lines which operate along major arterial highways. The service begins in outlying residential developments or community centers and terminates in Vancouver's central business district.

The purpose of this service is to provide rapid movement of people between their places of residence and the central business district. Buses will operate at selected headways throughout the day. In addition, extra buses will be added during the morning and evening peak periods to fill the demand created by persons commuting to and from work. The system should be designed so that convenient transfers can be made between this service and buses traveling to and from downtown Portland.

Park and ride stations can be useful in improving access to these lines. Also, radial service can be supplemented or "fed" by the local service described below.

Local Service

Local service is designed to provide transportation for persons having no access to private automobiles; and, if local service is provided at sufficiently frequent intervals, it can, in some families, reduce the need for a second car.

To be effective, local service should be available within a short walking distance of the people which it serves. Therefore, transit vehicles providing local service will probably operate a certain portion of the time on local streets. It may be desirable (or even necessary) to use smaller vehicles to provide this service. The presence of large buses on local streets is likely to be objectionable to persons living in areas where the system is operated.

Local service can be provided by any one or a combination of three routing systems including:

- Fixed Routes
- Variable Routes
- Dial-a-Bus

Fixed routing, the system presently used by Vancouver transit, is buses operating only on designated routes and adhering to a schedule. An extended discussion of demand responsive systems such as variable route and dial-a-bus contained in Appendix D.

Corridor Service

Service in the major north-south regional transportation corridor

TABLE III-B CRITERIA FOR TYPES OF TRANSIT SERVICE AREAS

TYPE OF SERVICE AREA	TRANSIT SERVICE CRITERIA			
	DENSITY (PERSONS PER SQUARE MILE)	TYPES OF SERVICE	MINIMUM HEADWAY FREQUENCIES IN MINUTES	DISTANCE FROM SERVICE
URBAN	MORE THAN 3,500	EXPRESS ARTERIAL LOCAL SHUTTLES SPECIAL TRANSPORTATION	PEAK: 10 OFF PEAK: 30	$\frac{1}{4}$ MILE FROM EVERY HOUSEHOLD
SUBURBAN	3,500 - - 1,500	ARTERIAL CORRIDOR SPECIAL TRANSPORTATION	PEAK: 15 OFF PEAK: 60	$\frac{1}{2}$ MILE FROM EVERY HOUSEHOLD
RURAL	LESS THAN 1,500	ARTERIAL INTERCITY	PEAK: AS NEEDED OFF PEAK: AS NEEDED	VARIABLE, SERVICE RURAL COMMUNITIES

(I-5) is the object of this service. The Interstate Bridge Corridor is currently served by a private carrier which is costly to patrons. As previously noted, a commuter traveling from East Vancouver to Swan Island by bus will pay a total one way fare of \$1.40 to ride three transit systems and will be unable to make free, convenient transfers from one system to the other. In addition, transit offers no time or speed advantage to commuters because buses are subject to the same congested traffic conditions that plague auto travel in the corridor.

A publicly operated corridor service linking downtown Vancouver with Portland would alleviate these constraints to travel by reducing fares and providing for free transfers. This service would also utilize the proposed priority lane for high occupancy vehicles. A priority lane would enable transit vehicles to bypass freeway congestion, thereby, obtaining total travel times competitive with automobiles.

Provision of corridor service requires the purchase of the Vancouver-Portland Bus Company (V.P. Bus). This action has been recommended in several previous reports. Tri-Met would be the most logical agency to accomplish this purchase, since it has the capability, established operating staff and equipment to easily take over V.P. Bus. In addition, most of the V.P. Bus routes are located in the Tri-Met service area.

Acquisition of V.P. Bus by Tri-Met also opens up the Regional Bus system to patrons on the Vancouver-Portland line. This is particularly important to Vancouver commuters since over 8,000 residents of Vancouver work in areas outside of downtown Portland. Free transfers make economical bus service available to these persons.

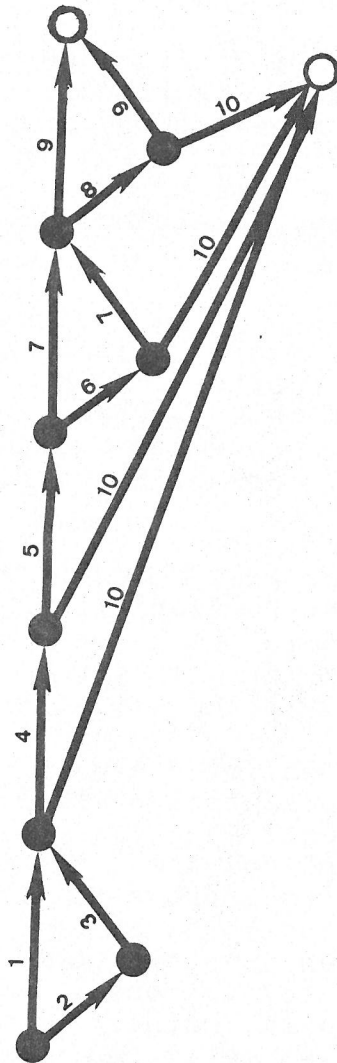
The 1973 Washington State Department of Highways origin and destination survey noted that substantial numbers of Vancouver commuters work in relatively concentrated employment locations in North Portland such as Swan Island and the Lloyd Center. Tri-Met should investigate opportunities to improve the interface between corridor service and routes serving these areas. Improved access to employment locations other than downtown would provide an alternative to automobile travel for Vancouver residents working in these Portland areas resulting in further increases in patronage on the corridor lines. It has been estimated that the Clark County-Vancouver share of the costs for providing this service would be approximately \$21,000 per year. One point which should be made clear is that the Tri-Met purchase of Vancouver-Portland Bus Company may be totally independent of the transit planning activities. This is illustrated on figure III-4.

Interurban Service

There are six small cities in Clark County that may benefit from the provision of public transit service. Currently, the four smallest cities (Battleground, Ridgefield, Yacolt and LaCenter) are without any public transportation service. The cities of

PURCHASE VANCOUVER-PORTLAND BUS COMPANY

1. City/County Request VP Bus Purchase
2. Form Transit Agency
3. Transit Agency Requests VP Bus Purchase
4. Tri-Met Concur
5. Negotiate for Purchase
6. Litigation
7. UMTA Grant for Purchase
8. Other funding for Purchase
9. Purchase
10. Status Quo



○ - Terminal Point
● - Decision Point

FORM TRANSIT AGENCY

10. Status Quo
11. City/County Contract
12. Financing
13. Planning
14. Contract
15. Operations
16. Form Transit Agency
17. Transit Agency Contracts w/City
18. Transit Agency Contracts w/Private Operator
19. Transit Agency provides in-house Operations
20. Transit Agency Contracts w/Tri-Met
21. Contract for all Services
22. Contract for Operations Only
23. Set Policy
24. Hire Staff
25. Set Plan
26. Modify Plan
27. Implementation

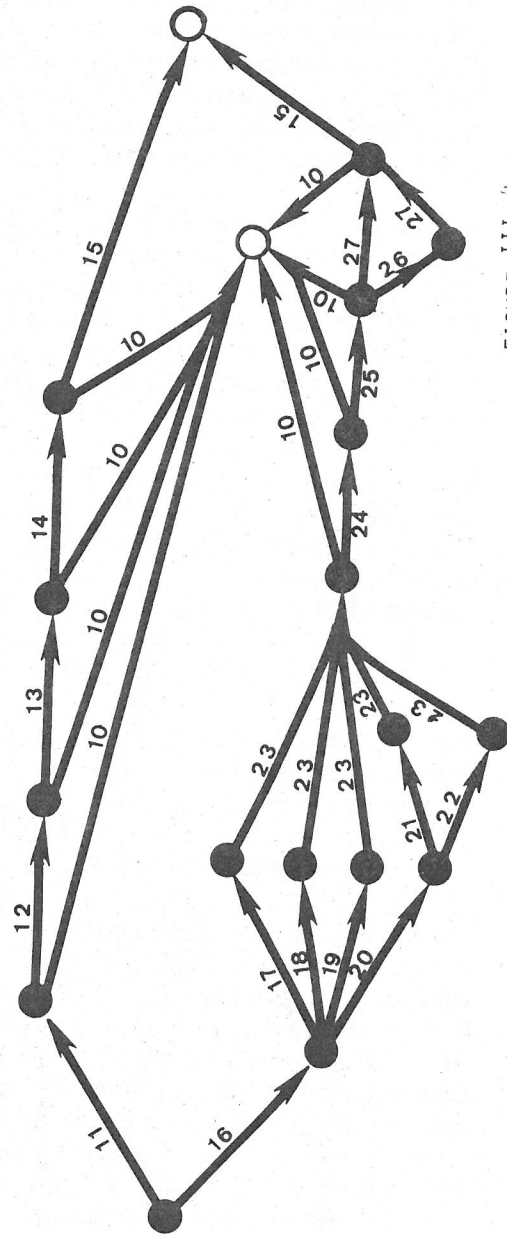


FIGURE III-4 DECISION NETWORK FOR
ESTABLISHMENT OF A TRANSIT AGENCY
IN CLARK COUNTY

Camas and Washougal are served by a private carrier operating three round trips daily between these cities and Portland.

Interurban service would provide regular service to some or all of these cities. It is likely that the size of the Camas-Washougal area justifies reasonably frequent service intervals. The other small cities might be adequately served on a daily or even weekly basis.

The provision of interurban service should be tied to the levying of taxes in the county. Should the transit benefit area include the entire county it would probably be desirable to serve all cities.

Shuttles

Two kinds of shuttle service having possible application in Vancouver have been identified. These include shuttles providing home to work transportation for industrial workers and shuttles operating in and between the city's major activity centers.

The industrial shuttle which would operate only during shift changes at Clark County's major industrial areas. This service could be operated on a subscription basis with routes designated according to origin points of the workers.

The second shuttle service would operate in the CBD area and between major activity centers. The downtown shuttle would provide a people moving service in the CBD and in some of the high density neighborhoods that surround this area. Another shuttle would connect major activity centers such as Clark Community College, Barnes General Hospital, the public library and the County Courthouse.

Since most industrial shift changes occur outside the normal peak period, it may be possible to utilize the equipment that is used for radial commuter service to run the industrial shuttles. This would result in a very low operating cost for the service.

Special Transportation

Federal transportation policies require that the needs of the elderly and handicapped be considered in the provision of public transportation services. (Section 16, UMTA Act 1964.) Legislation provides that 1½% of the federal funding provided for transit shall be used to provide special transportation services.

Special transportation is needed because persons with physical, mental or age disabilities may be unable to board a conventional bus. Some minor improvements such as handles on the outside of the bus, reserved front row seating for the elderly and easy to read bus schedules can make the transit system more accessible to a substantial number of the transit disadvantaged. Demand responsive buses equipped with wheelchair lifts are in use in certain areas.

Federal requirements and CRAG policy requiring provision of special transportation make it imperative that special transportation be considered in the design of any regional transit system.

System Revenues

As noted in Chapter II, Washington State law provides a number of options by which a county can fund transit service. Briefly, the Washington state funding options include:

<u>Option</u>	<u>Rate</u>
General Sales Tax	.1, .2 or .3%
Household Utility Tax	Up to \$1.00 per household per month.
Business and Occupation Tax	Local option

In addition, Washington law permits local jurisdictions to use of the receipts from the motor vehicle excise tax for transit finance. The 1975 legislative session, however, failed to appropriate the necessary funds for this program.

The Urban Mass Transportation Administration has made available, to local transit agencies, funds for providing operating subsidies for service expansions. Table III-C lists the various funding options and the amount of revenue which can be obtained through intergovernmental transfers and taxes for transit. Figures include the amount of revenue which would be raised in the cities of Camas-Washougal.

Revenue would also be obtained through the farebox. Virtually all planning efforts in this area have assumed a 35¢ fare. With fare discounts offered for senior citizens and children, the average fare works out to about 31¢. Farebox revenues, therefore, will depend upon the system patronage.

Patronage, in turn, depends upon the level of service. Tri-Met has computed patron estimates based on existing condition in the urban area. These estimates and the revenue that the various levels of patronage would be expected to generate show shown on Table III-D.

TABLE III-C
FUNDING OPTIONS

	<u>Annual Revenue</u>
SALES TAX (COUNTY WIDE)	
.1%	\$ 500,000
.2%	\$ 990,000
.3%	\$1,490,000
HOUSEHOLD UTILITY TAX (\$1 per month)	
County Wide	\$ 520,000
Vancouver Urban Area	\$ 403,000
Vancouver (City)	\$ 243,000
Camas-Washougal	\$ 45,000
BUSINESS AND OCCUPATION TAX	NA*
STATE MATCH FROM MOTOR VEHICLE EXCISE TAX	NA*
UMTA SECTION 5 OPERATING ASSISTANCE	
1976	\$ 237,000
1977	\$ 308,000
1978	\$ 367,000
1979	\$ 402,000
1980	\$ 426,000

* Estimate not available

TABLE III-D RIDERSHIP AND FAREBOX REVENUE PROJECTIONS IN CLARK COUNTY

Accessibility to Transit

	Annual Ridership	
	Vancouver only	Vancouver Urban Area
As Is	336,000	--
Low	467,000	904,000
Medium	652,000	1,263,000
High	1,065,000	2,066,000

Farebox Revenues (Based on 31¢
Average Fare)

As Is	\$104,000	--
Low	145,000	\$ 280,000
Medium	202,000	391,000
High	330,000	640,000

NOTE:

See Appendix E for definition of service levels

CHAPTER IV
TRANSIT SERVICE

Chapter IV

TRANSIT SERVICE

In January, 1975, a joint meeting of the Vancouver City Council and Clark County Commissioners was held at which goals and objectives were developed to guide the transit planning efforts in Clark County. A summary of these goals and objectives is noted in Table IV-A. In addition, the meeting participants directed the Consolidated Transportation Staff of Clark County (CTS) to devise some scenarios portraying alternative levels of transit service which might be possible in Vancouver and Clark County. The CTS in conjunction with the IBC project staff has developed two scenarios. The scenarios represent what might be considered a moderate and high level of service. The status quo is assumed to be a low level of service. The scenarios were developed on the basis of the funding which is now available for transit operations in the state of Washington. (See Appendix E). It should be noted that there are any number of detailed service possibilities between the two scenarios.

Service options described in the two scenarios are based on the service elements noted in the previous chapter. These options have been combined in a system designed to serve a given area with regular transit service as well as to provide the I-5 Corridor with a feeder system.

In September, 1975, these scenarios, as modified by the staff of the Clark County Regional Planning Agency, were presented to a Public Transportation Improvement Conference held in Clark County. The conference, which under Washington Law, is an official body formed to develop a public transit system in a given county, expressed interest in the scenarios and has agreed to further consider these planning efforts.

Scenario 1

Scenario 1, proposes a system with annual operating expenses of approximately \$1.1 million. System capital costs are estimated at \$2.2 million with the local share totaling \$442 thousand.

System characteristics for Scenario 1 include the following:

1. Base service where population density exceeds five (5) persons per acre. Service is within one quarter mile of each household at no more than one (1) hour headways.
2. Radial (arterial) service in the major arterial corridors to provide transit service to the suburban areas at no more than one (1) hour headways. Park and ride sites will be located along the routes, where opportunities to obtain

- interim sites present themselves.
3. Service is provided to Camas and Washougal cities at one (1) hour headways.
 4. Base and commuter service between Portland and Vancouver will be provided much the same as is presently operated.
 5. Commuter service will also be provided in the major corridors to transport employees to downtown Vancouver.
 6. An industrial shuttle will be provided along the Columbia River to permit industrial employees to transfer in downtown Vancouver and be delivered to their places of work.
 7. Demand response (radio dispatched) transit will be provided in areas where the ridership is low to provide an additional incentive to ride transit with the intent of increasing ridership.
 8. A downtown transit station, with park and ride facilities is constructed to serve as a focal point for the system. The downtown station is also the system's major transfer point.
 9. Shuttle service in the downtown area and between downtown and major activity centers (such as Clark College) is provided.

Cost estimates for the various types of service utilized in Scenario 1 are listed on Table IV-B. A map of the proposed service area is shown on Figure IV-1.

Scenario 2

Scenario 2 proposes a county wide system with service extending to the smaller cities in Northern Clark County. System operating expenses are estimated at \$2.2 million annually. Total capital costs of \$6.6 million are forecast with the local share totaling \$1.3 million.

System characteristics for Scenario 2 include the following:

1. Base service where population density exceeds five (5) persons per acre. Service is within one quarter mile of each household at no more than one-half hour headways.
2. Radial (arterial) service in the major arterial corridors provide transit service to the suburban areas at no more than one-half hour headways. Park and ride locations will be appropriately located along the routes.
3. Service is provided to Camas and Washougal on one-half hour headways. At least four daily trips are provided to Ridgefield-LaCenter and Battleground.
4. Base and commuter service between Portland and Vancouver will be provided much the same as is presently operated.
5. Commuter service will also be provided in the major corridors to transport employees to downtown Vancouver.
6. An industrial shuttle will be provided along the Columbia River to permit industrial employees to transfer in downtown Vancouver and delivered to their places of work.
7. Demand responsive (radio dispatched) transit will be pro-

- vided for handicapped persons.
8. A downtown transit station with park and ride facilities is constructed to serve as a focal point for the system. The downtown station is also the system's major transfer point.
 9. Shuttle service in the downtown area and between downtown and major activity centers (such as Clark College) is provided.

Operating and capital cost estimates are shown in Table IV-C. The proposed service areas are noted on Figure IV-2.

Table IV-A

SUMMARY OF TENTATIVE GOALS AND OBJECTIVES

DEVELOPED ON JANUARY 9, 1975

1. The transportation system should support land use goals.
2. The transportation system should strengthen the CBD.
3. The transportation system must serve the needs of the County while maintaining some reasonable degree of fiscal integrity.
4. The system should provide incentives or disincentives for land use policy statements and political goals.
5. The system should be flexible enough to meet the needs of everyone (multi-modal).
6. The system should be designed to take advantage of future and existing state, Federal and local funding options.
7. The system should be a public system.
8. Expand City of Vancouver's system to the Clark County urban area.
9. The transportation system should recognize the changes in our life style and energy sources.
10. The transportation system should recognize the mobility needs of the citizens or individuals and provide transportation for those needs.
11. Future land use should be developed to such density that population support exists.
12. The system should provide a genuine alternative to the automobile.
13. The transportation system should ultimately be operationally economical.
14. The local system should now (or ultimately) tie into a regional system (CRAG).
15. The system should preserve the integrity of neighborhoods as well as different life styles.
16. The system should be flexible enough to take advantage of the changing state-of-the-art in fuel conservation and

changing Federal and State funding mechanisms.

17. The system should meet not only future needs of the community, but also have current benefits.
18. The system should support or serve current needs and expand to serve future needs as directed by the land use decisions.



TABLE IV-B
ANNUAL OPERATING AND CAPITAL COSTS
Scenario 1

Capital

	Total Cost (000's)	Federal Match (000's)	Local Share (000's)	Annual Cost
Servicing Facility	\$ 250	\$ 200	\$ 50	
9 New Conv. Buses	540	432	108	
7 Demand Resp. Buses	105	84	21	
Downtown Transit Station (1)	1300	1040	260	
Bus Shelters	15	12	3	
Total Costs	2210	1768	442	

ANNUAL CAPITAL COST

(2)

Operations

Type of Service	Area Served	Number of Buses Peak	OFFPeak	Cost (000's)
Corridor	L-5 Corridor(3)	6	1	30
Arterial	Mill Plain	4	2	180
	Fourth Plain	2	1	90
	Minnehaha	1	1	60
	Hazel Dell	4	2	180
Local	Rosemere	1	1	60
	Capitol Hill	1	1	60
	Downtown	1	1	60
	Shuttle			
	Clark Com.	1	1	60
	College Shuttle			
	Industrial Shuttle	2	-	(4)
Demand Responsive	Fruit Valley	1	1	50
	E. Vancouver	1	1	50
	McLoughlin Hgts.	3	3	150
	Camas- Washougal	1	1	50
Intercity	Camas- Washougal	1	1	60
ANNUAL OPERATING COST				1,140,000

(1) A 500 auto capacity park and ride station - Source: 1990 Deleuw Cather Public Transportation Plan.

(2) Annual capital costs may vary depending on the means used to purchase capital equipment.

(3) Service provided by Tri-Met.

(4) Cost included in costs for arterial service.

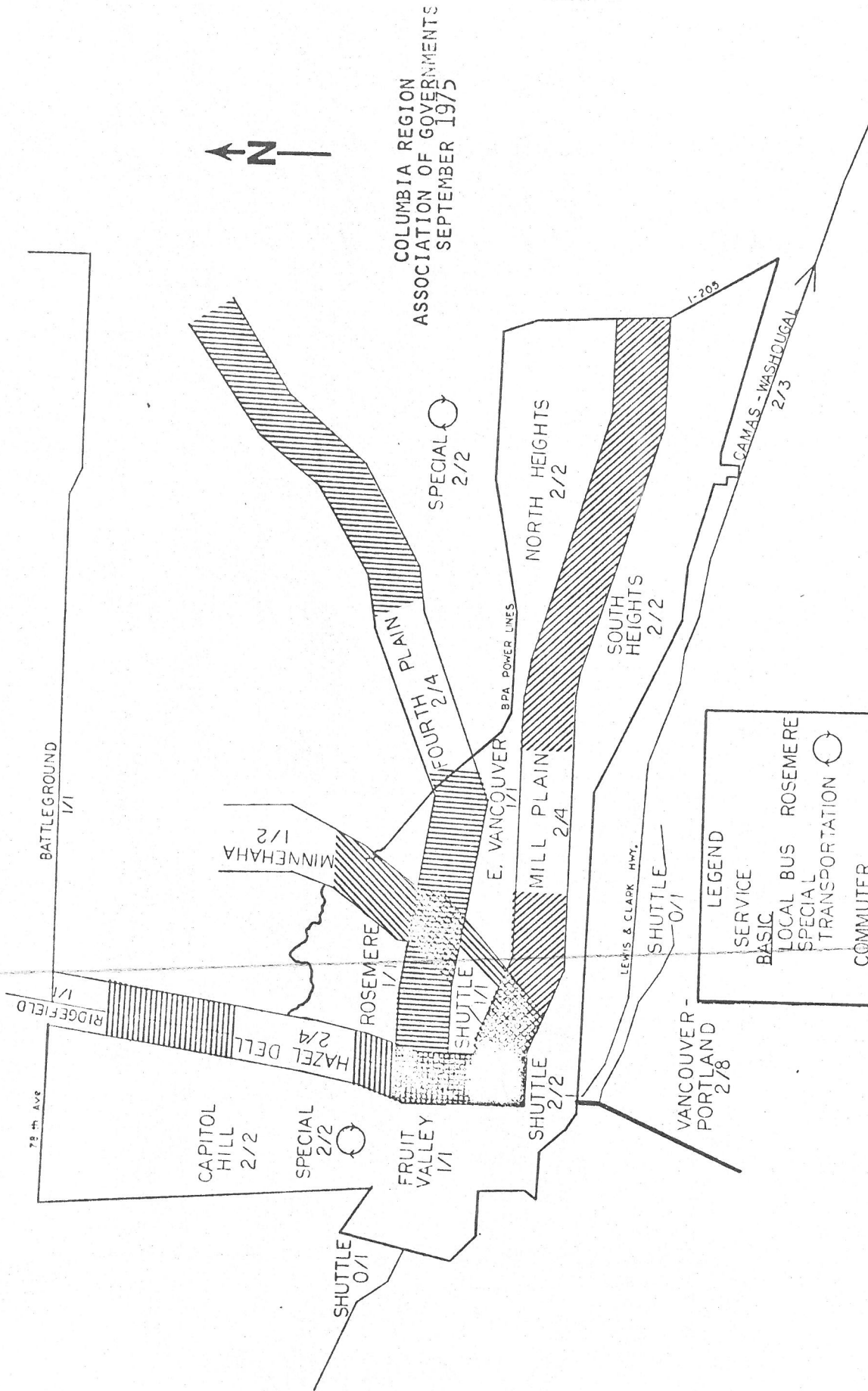


FIGURE IV-2
SCENARIO 2

COLUMBIA REGION
ASSOCIATION OF GOVERNMENTS
SEPTEMBER 1975

TABLE IV-C

ANNUAL OPERATING AND CAPITAL COSTS
FOR
HIGH LEVEL OF SERVICE

Capital

	Total Cost (000's)	Federal Match (000's)	Local Share (000's)	Annual Cost
Servicing Facility	\$ 500	\$ 400	\$100	
New Conv. Buses	1800	1440	360	
4 Spec. Equip Demand Resp. Buses (1)	66	53	13	
Downtown Transit Station (2)	1300	1040	260	
Bus Shelters	140	112	28	
Park & Ride (3)	2826	2260	565	
Total Costs	6632	5306	1326	

ANNUAL CAPITAL COST

(4)

Operations

Type of Service	Area Served	Number of Buses Peak	OffPeak	Cost (000's)
Corridor	I-5 Corridor(5)	8	2	60
Arterial	Mill Plain	4	2	180
	Fourth Plain	4	2	180
	Minnehaha	2	1	90
	Hazel Dell	4	2	180
Local	Rosemere	1	1	60
	Capitol Hill	2	2	120
	Fruit Valley	1	1	60
	E. Vancouver	1	1	60
	Downtown Shuttle	2	2	120
	Clark Com.			
	College Shuttle	1	1	60
	McLoughlin Hgts.	4	4	240
	Camas	1	1	60
	Washougal	1	1	60
	Industrial Shuttle	2	-	(6)
Intercity	Camas- Washougal	3	2	150
	Ridgefield- LaCenter	1	1	60
	Battleground	1	1	60
Spec. Trans.	Urban Area	4	4	200
Evening	Arterial & Local	-	10	80
Sunday	Arterial & Local	-	10	100
ANNUAL OPERATING COST				2,180,000

- (1) Equipped with wheelchair lifts
 (2) 1972 dollars for 500 auto capacity P&R station. Source: DeLeuw
 Cather 1990 Public Transportation Plan
 (3) 1972 dollars - see DeLeuw Cather 1990 Public Transportation Plan
 (4) Annual capital costs may vary depending on the means used to
 purchase capital equipment
 (5) Service provided by Tri-Met
 (6) Cost included in costs for arterial service

CHAPTER V
PRIORITY TREATMENT ANALYSIS

Chapter V

PRIORITY TREATMENT ANALYSIS

This section of the report describes the procedure utilized in the priority treatment analysis. After the prevailing conditions were determined, effort was devoted to how a high occupancy vehicle lane and ramp control measures could improve the conditions with other appropriate improvements also being considered. Some of the improvements mentioned have been identified previously and discussed in the Phase I report. After various improvements were identified, a determination was made on the probable consequences of the improvements on existing conditions. Some attention was given to law enforcement and carpooling issues; in addition, a number of other selected impacts were evaluated subjectively.

Existing Conditions

There are good records for traffic volumes on the I-5 facility at the permanent recorder count station located at the Interstate Bridges and Ainsworth Street. To supplement this data, additional portable recorder counters were set out and manual counts obtained. The manual counts included occupancy samples in peak and off-peak intervals. Travel time-delay studies were accomplished in the peak periods as well as numerous field trips on the part of the project staff. The traffic volumes and field trips were utilized to identify the location and intensity of the congestion problems and the travel time-delay data determined the extent of the queueing caused by the congestion. Congestion occurs when the traffic flow is large and the backup propagates a considerable distance upstream. Congestion caused on Hayden Island has propagated as far south as the Fremont Interchange during the evening peak period. The existing conditions are illustrated on Figures V-1&2. It is apparent that congestion problems occur at Portland Blvd. and between Union Avenue and Hayden Island (Columbia Slough Bridge). The identification of the congestion problems has been supported by work accomplished by ODOT Planning Section in Salem. Figures V-3&4 graphically illustrate current peak-hour congestion problems in terms of level of service. Detailed analysis is contained in Appendix B.

Utilizing existing counts and occupancy rates, the level of service of the freeway and ridership (passengers per hour) of each lane was estimated at Portland Blvd. and the Columbia Slough¹. These sites were selected since congestion normally initiates from them and propagates to other areas.

HOV Lane Analysis

This portion of the work effort dealt specifically with an exclusive lane for HOV and utilized the most recent information². This analysis of the HOV lane analyzed impacts of the lane and on

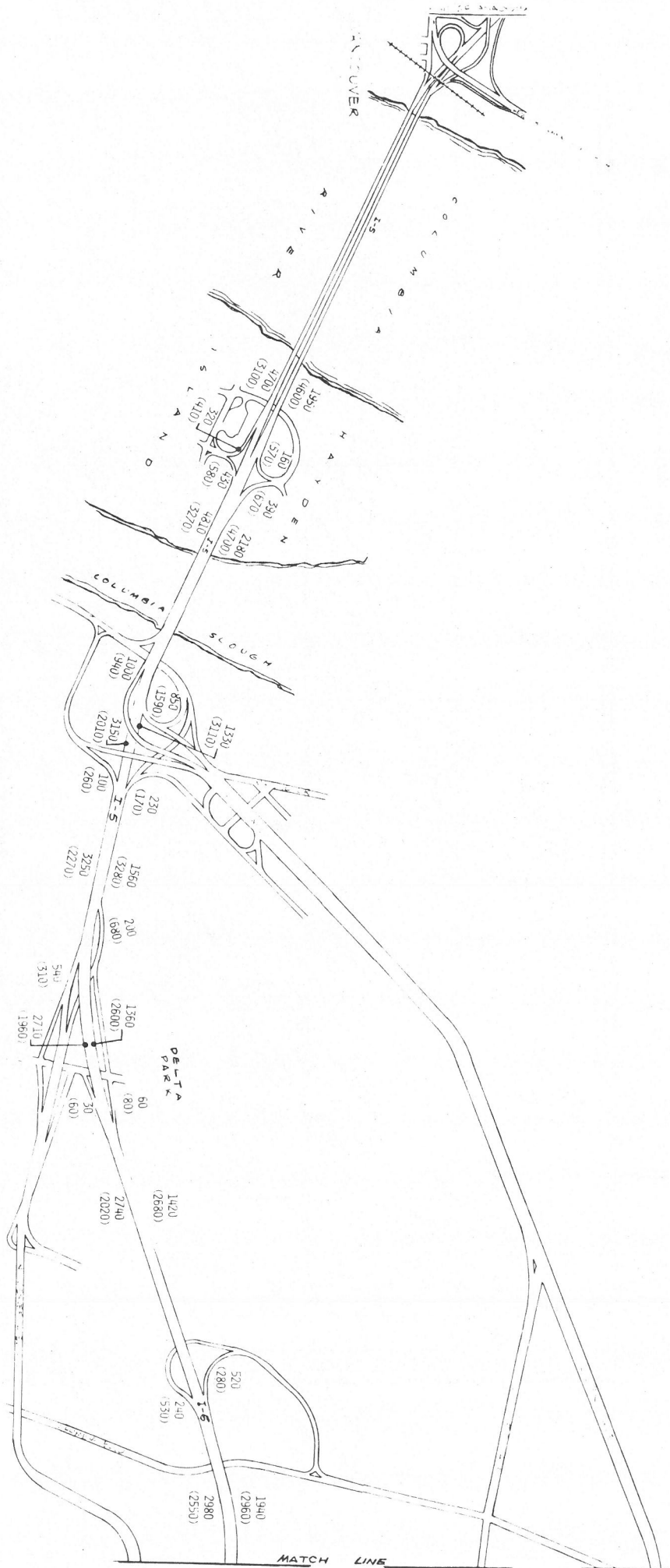
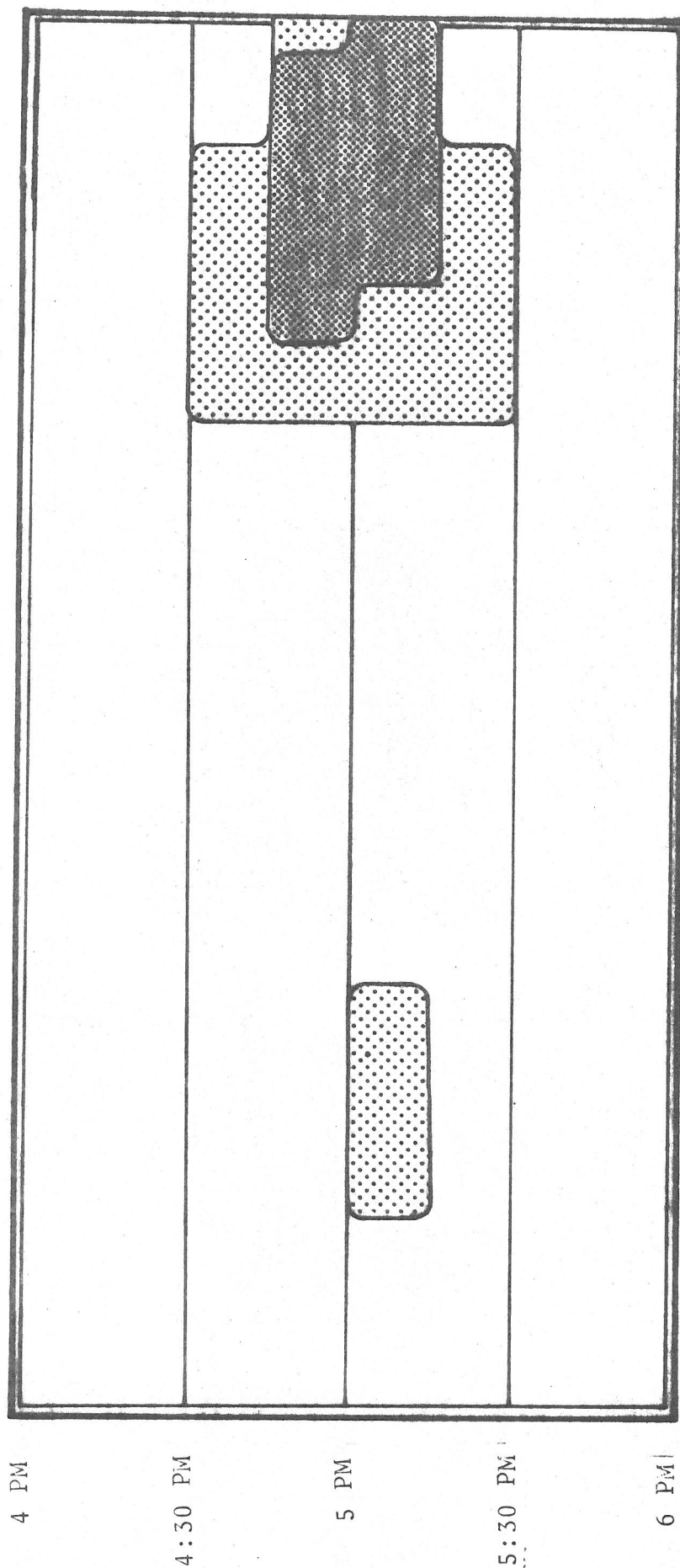


FIGURE V-2
I-5 CORRIDOR
PEAK HOUR TRAFFIC VOLUMES
MARCH, 1974



MILES PER HOUR
30 40



South End of Interstate
Hayden Island
Overcrossing

Marine Dr
Swift St

Denver Ave

Delta Park
Overcrossing

Columbia Blvd

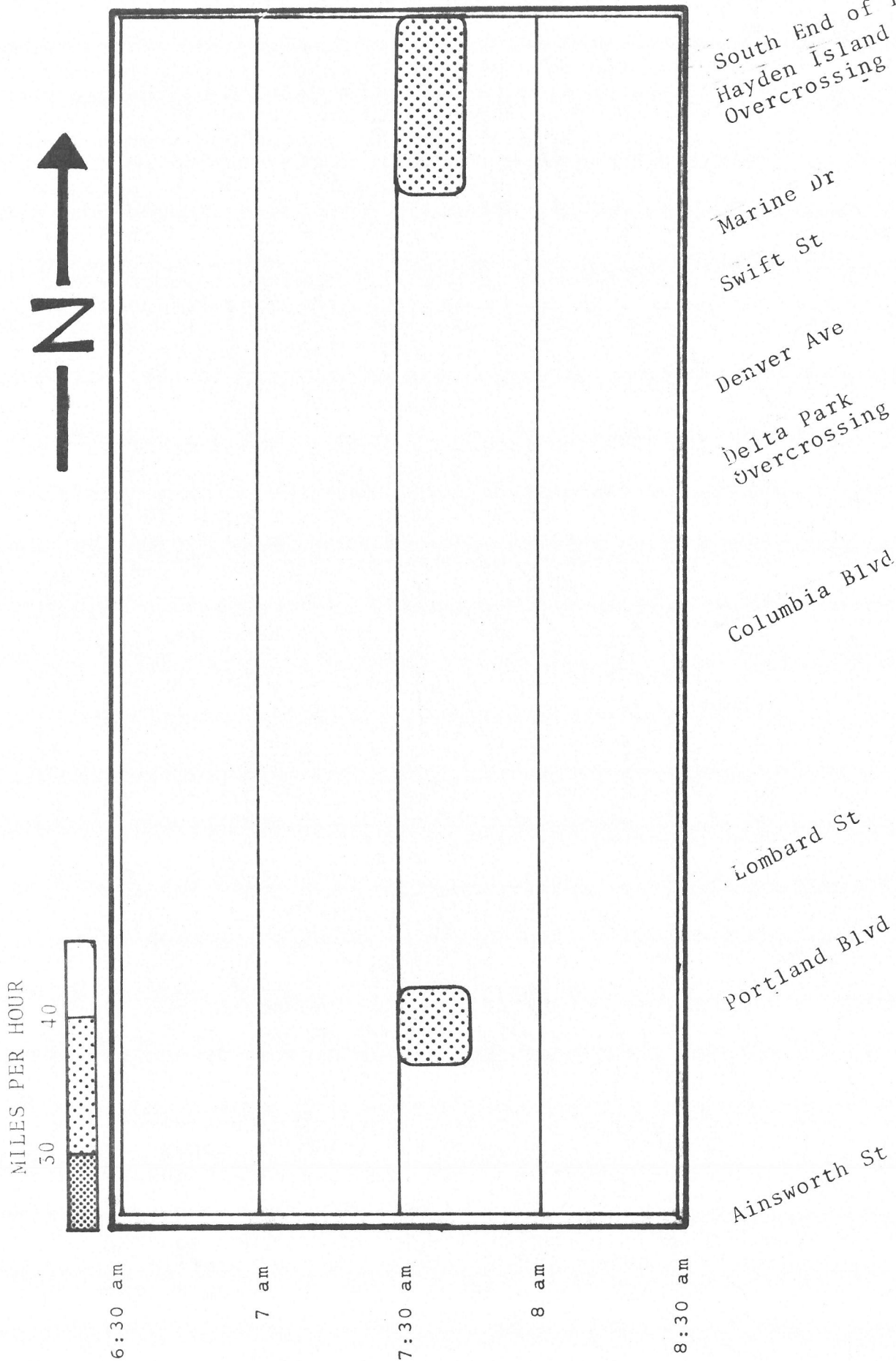
Lombard St

Portland Blvd

Ainsworth St

EXISTING EVENING PEAK TRAFFIC
NORTHBOUND I-5 WITH RECOMMENDED IMPROVEMENTS
SPEEDS ON I-5 BETWEEN AINSWORTH STREET AND HAYDEN ISLAND

FIGURE V-3



EXISTING
SOUTHBOUND MORNING PEAK TRAFFIC
SPEEDS ON I-5 WITH RECOMMENDED IMPROVEMENTS
BETWEEN AINSWORTH STREET AND HAYDEN ISLAND

FIGURE V-4

the remainder of the roadway. Using the same method of assessing existing conditions, the analysis was repeated assuming the installation of a HOV lane of the freeway. The results of these exercises (Table V-A) indicated considerable improvement in the level of service in the non-priority traffic flow during the evening peak hour. There was also some improvement in the morning peak hour but not as much. The HOV lane was assumed to contain buses and carpools with three or more persons. It was also assumed that the number of carpools and transit ridership doubled with the installation of the HOV lane. This assumption was based on the experience of the Oakland-Bay Bridge priority treatment program for carpools and the Tri-Met fare reduction for transit ridership.²

The assumption that the transit ridership would double after the improvements recommended herein is substantiated in the following ways:

1. The ridership on several Tri-Met lines (Forest Grove/Hillsboro/Beaverton, Sherwood/Tigard, and Somerset West) increased about 1.56 times six months after the 35¢ flat fare structure went into effect. These lines are approximately equal in length or in travel time to the lines between Downtown Vancouver and Portland.
2. There will be a city-county transit system in Washington with a free transfer for interstate passengers.
3. Fuel costs will continue to increase for the immediate present.

It was estimated that the northbound HOV lane in the evening peak hour would service approximately 1570 passengers per hour at Portland Blvd. and 2060 at the Columbia Slough Bridge. Respectively, the morning peak hour volumes in the southbound direction were expected to be 840 and 1470.

One conclusion of the capacity analysis, was that the Columbia Slough Bridge needs to be widened to eight lanes. Southbound on Interstate 5 the fourth lane may be added at the Hayden Island Interchange and dropped at Union Avenue while the third may be dropped at Denver or retained through the Portland Blvd. interchange if an HOV lane is installed. Northbound the improvement should be symmetrical. The third lane could begin at Portland Blvd. or be added at Union Avenue and terminated at the Hayden Island interchange.

To ensure safety and smooth traffic flow, shoulders should be provided in the sections having a HOV lane. It appears that this can be accomplished with a minimum of widening and utilization of 11' lanes.

It might be desirable to extend the priority lanes south from Portland Blvd. to the Fremont Bridge to improve traffic operations. This could be accomplished either by using an existing

TABLE 1-A PRIORITY ANALYSIS FOR I-5 BETWEEN PORTLAND BLVD. AND COLUMBIA SLOUGH

Location	Lane	Existing		W/ HOV Lane		W/ Ramp Control		W/ HOV Lane & Ramp Control		W/ Utilizing Shoulder at Portland Blvd.
		vph	pph	vph	pph	vph	pph	vph	pph	vph
Portland Blvd AM	3 (HOV)	---	---	90	840	1800	840	90	840	3 (38%) 1330
	2	2070	2500	2010	2510	1800	2240	1800	2240	2 (41%) 1440
	1 (41%)	1430	1740	1400	1680	1200	1400	1200	1400	1 (21%) 730
			4240		4920		4410			
Level of Service	F			E		D ¹		D ⁵		*C
PM	3 (HOV)	---	---	300	1570	1800	1570	300	1570	
	2	1940	2630	1830	2290	1800	2250	1800	2250	
	1 (41%)	1410	1830 (40%)	1220	1530 (40%)	1200	1506	1200	1506	
			4460		5290		5526			
Level of Service	F			*E		D ²		D ⁶		
Columbia Slough AM	3 (HOV)	---	---	270	1470	1760	1460	270	1460	
	3 (40%)	1920	2330 (39%)	1770	2050 (39%)	1760	2038	1760	2038	
	2 (38%)	1830	2210 (39%)	1770	2050 (39%)	1760	2038	1760	2038	
	1 (22%)	1060	1280 (22%)	1000	1160 (22%)	980	1136	980	1136	
Level of Service	E		5820	E	6620	*D ³	6572	D ⁷		
PM	4 (HOV)	---	---	440	2060	1760	2060	440	2060	
	3 (40%)	1880	2430 (39%)	1660	2010	1760	2010	1660	2010	
	2 (38%)	1790	2300 (40%)	1700	2060	1760	2060	1700	2060	
	1 (22%)	1030	1330 (21%)	900	1090	980	1090	900	1090	
Level of Service	E		6060	*D	7120	D ⁴	7123	D ⁸		

NOTE: vph - Vehicles per hour
 pph - Passengers per hour
 (xx) - Lane distribution of traffic volumes
 * - Recommended Control

DATA AND ASSUMPTIONS: See Appendix A

FOOTNOTES:

1. About 500 vph (of the 650) must be diverted from Lombard St. "On" ramp to Portland Blvd. "On" ramps, etc.
2. About 350 vph (of the possible 440 vph) must be diverted from Williams Ave. and Going St. to other facilities.
3. About 310 vph at Hayden Island or Vancouver must be queued and held until volume reduces.
4. About 200 vph at Delta Park or Union Ave. must be queued and held until volume reduces.
5. About 410 vph must be diverted as in note 1.
6. About 50 vph must be diverted as in note 2.
7. About 40 vph must be queued as in note 3.
8. No ramp control required.

lane in the three and four lane sections of I-5 or by creating four and five lanes respectively in these sections of the freeway. This might be accomplished with a minor amount of widening and utilizing 11' lanes in this section.

Ramp Control

Ramp control and metering systems have been previously treated and the various modes of control identified and described. For this analysis "capacity-demand" mode was considered the most appropriate control for this situation. It was selected because (1) the "on" ramp acceleration lanes were not seriously deficient, (2) it is traffic responsive and will respond to varying flow conditions and (3) it is less expensive than more sophisticated modes. Ramp metering usually is applied to a facility which has a parallel alternative for those who are directed from the freeway (Figure V-5); however, motorists crossing the Slough or Interstate Bridge do not have an alternate route.

Possible northbound ramp control sites include:

	<u>PM Pk. HR.</u>	<u>*</u>
Williams Ave NB "On"	1080	357
Going St NB "On"	260	85
Portland Blvd NB "On"	110	44
Denver Ave NB "On"	680	
		<u>486</u>

Of the northbound peak hour, approximately 486 vehicles are subject to diversion, about 440 vehicles per hour may be diverted to reduce the demand at Portland Blvd. This would reduce traffic demand to approximately 2910 vehicles per hour. The actual diversion was based on level of service "D" (1500 vehicles per hour per lane). The freeway volume in excess of 1500 vehicles per hour per lane was diverted to other arterials up to a maximum diversion of 440 vehicles per hour. Since the PM peak hour volume was 3350 vehicles per hour at Portland Blvd., 350 vehicles per hour were diverted to other facilities.

Southbound ramp control at Lombard Street could improve the level of service at Portland Blvd. which has been shown as deficient on Figure V-1. In fact, the Lombard southbound "on" ramps could be closed since Portland Blvd. is near and has sufficient capacity to accommodate the additional traffic. However, 500 vehicles per hour of the total 650 vehicles per hour is the number which will need to be diverted. There is sufficient capacity on the local arterials (Interstate and Vancouver Avenues) to accommodate this diverted traffic. It would be appropriate, however, to consider the renovation of some of the existing signals and the installation of new ones at the Portland Blvd. interchange and left turn channelization on Interstate Avenue, Lombard Street and Portland Blvd.

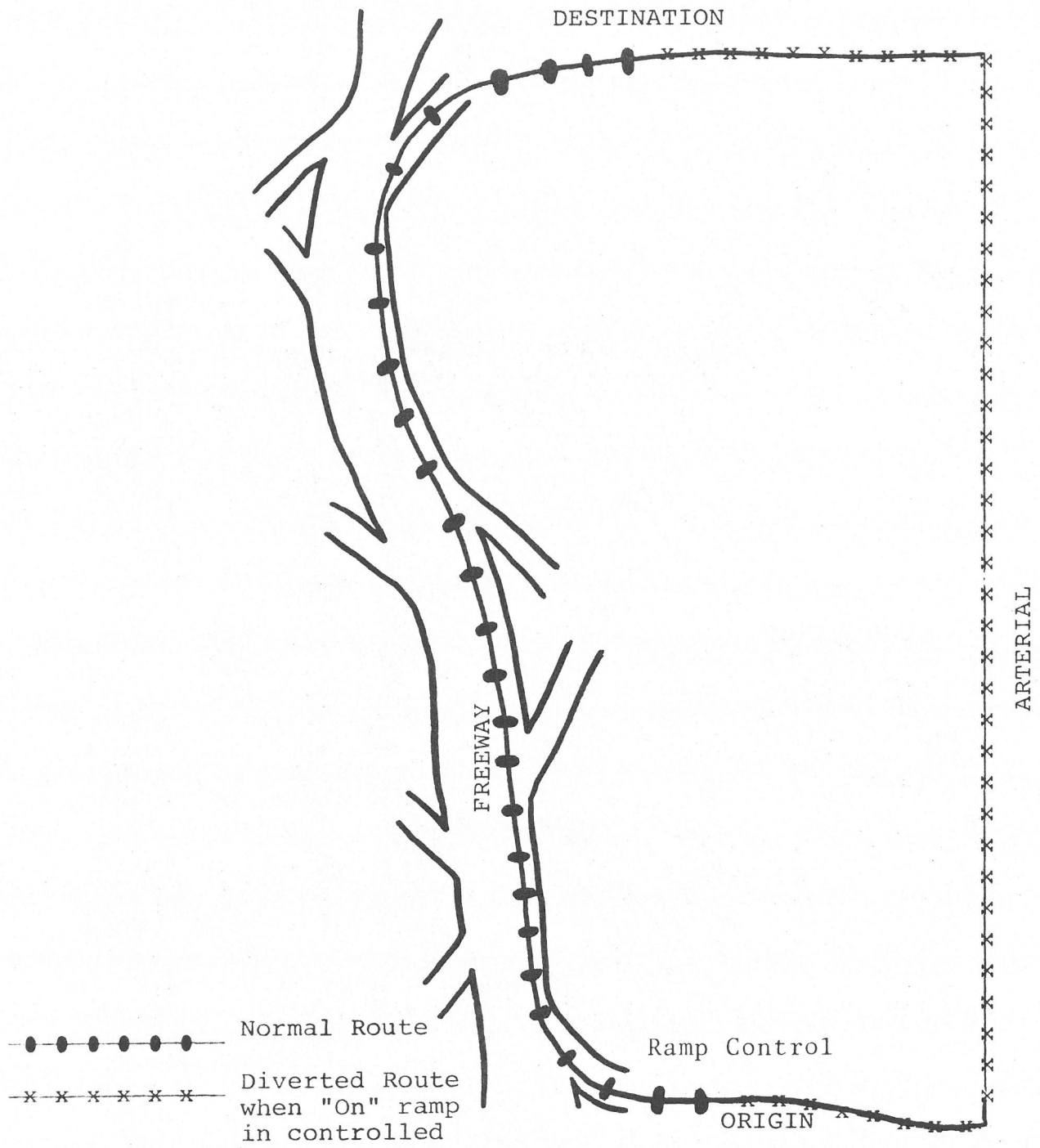


FIGURE V-5 PRINCIPLE OF TRIP DIVERSION RESULTING FROM RAMP CONTROL

Even though the HOV lane northbound and widening southbound will improve the traffic flow, there is reason for concern on Hayden Island. There have been land development proposals which will generate more trips.⁴ Currently, a comprehensive plan for development on the island is being prepared. In view of this interest and the obvious economic and social incentives for additional development, some method to maintain reasonable level of service on Interstate 5 is desirable. Ramp control at the northbound and southbound on-ramps with HOV bypasses would maintain a sufficient level of service. While this application of ramp control would not have an alternate route for motorists, there would exist an alternative: utilization of carpools or transit.

The consequences of not using ramp control are (1) to stop all traffic generating development on the Island, or (2) to tolerate additional congestion on Interstate 5.

Law Enforcement Control System

A very important component of an efficient and effective functional transportation system is that of enforcement. Effective law enforcement measures can improve the efficiency of a transportation system particularly when accidents or other incidents occur which may adversely affect the traffic flow. This section addresses the law enforcement issue by describing lane delineation and signing controls. In addition, the concept of closed circuit television (CCTV) is also discussed.

Whenever preferential treatment is permitted for a portion of the traffic flow, enforcement can be difficult. By designating one lane to be used by buses and carpools there will be a tendency for those motorists who do not qualify for the priority treatment to violate the control. Experience elsewhere indicates that there is a number of violations when any priority treatment is first established. However, through effective law enforcement measures, conformance to this practice can be established.

The utilization of this kind of priority treatment may be referred to as a free access high occupancy vehicle lane and differs from previous applications elsewhere in the country which utilize traffic cones or some other means of physical separation from the normal traffic flow. Such separated application permits access to and from the HOV lane only at selected opportunities. The application recommended in this instance does not provide a physical barrier throughout the length of the HOV lane on Interstate 5. This type of design tends to increase the confusion, weaving, and conflicts which will occur from vehicles entering and leaving the HOV lane. Legally, access to the HOV lane can be restricted or eliminated by the utilization of a double solid white line between the HOV lane and the adjacent lane since

crossing the line is not legal. At frequent locations one of the double white lines can be discontinued, which permits motorists to cross the line with care. This is based on national policy.⁵

In addition to the lane markings, considerable signing would not only be appropriate but necessary to convey information to the motorist about the use of the HOV lane. Since the operation of an HOV lane is not common, special attention to signing would be essential. Extra effort and care is proper whenever the motorist is required to cope with new and/or unusual control measures.

To assist the law enforcement effort, since violators are expected, CCTV surveillance was explored and appeared to have considerable merit. The CCTV could monitor the lane for violators, patrol units could be notified and warnings issued to violators when they leave the HOV lane. Also, dynamic message signs would emphasize the lane control as violators approach the signs. Another benefit, identified and discussed in the Phase I report, is the detection of accidents, disabled vehicles or other incidents which may intensify congestion. If the time of incident detection can be substantially reduced, emergency equipment can arrive at the scene in much less time because the queues will be still relatively small. Currently, in peak hours the queues often extend for miles before the incident is reported to the law enforcement agency. The immediate detection of an accident may be the strongest reason for utilizing CCTV.

The utilization of an HOV lane in one direction only will tend to increase violations because motorists will tend to be confused as to which direction they may use the HOV lane. This lends additional support to the concept of providing an HOV lane in both directions.

Carpooling Considerations

In recent years the practice of carpooling has received considerable attention and emphasis in an attempt to increase the efficiency and passenger capacity of transportation facilities. On a nationwide basis, approximately 30% of all work trips occur in carpools. The definition of a carpool is two or more persons per vehicle. On Interstate 5 during the peak period carpools represent approximately 22% of all work trips. In a report by the U. S. Department of Transportation on carpool incentives and opportunities it was noted that a small increase in vehicle occupancy will result in a significant decrease in vehicle mileage. Subsequently, rather small changes in the automobile occupancy can have substantial improvements in the savings of fuel and at the same time increase the capacity of the transportation system. It has been further determined that carpoolers can save approximately \$200 to \$850 per year depending upon the number of persons participating in the carpool.

Some have been concerned with possible detrimental affects on transit ridership by marketing and emphasizing carpools. How-

ever, actual experience has shown that effective carpool programs have had no significant adverse impacts on transit ridership. Further, the most effective and successful carpooling activities have occurred when employers have provided incentives such as discriminatory parking in favor of carpoolers. The most promising and innovative concept in this area has been that of Vanpooling. This consists of the company providing a 10 to 12 passenger van which is funded by the participants at no cost to the company. The USDOT will participate in financing losses which may result from companies trying this method.

Throughout the nation, in general, it has been reported that too few urbanized areas have systematically pursued priority treatment for HOV's. It appeared that many state and local transportation officials have not given sufficient emphasis to this matter. In fact, in some cases they have even resisted such measures. This action is not new because often new or innovative concepts meet some institutional resistance; institutional momentum changes are required to use new ideas. In the CRAG region it is fortunate that the state and local officials have voiced support for the use of priority treatment for high occupancy vehicles.

Generally, carpooling and vanpooling can develop into a significant component of the transportation system. One of the major difficulties in the development of transportation facilities is the matter of designing for peak period utilization. The actual demand on the transportation facilities during the peak periods is much greater than the off peak. By utilizing a substantial number of carpools and vanpools it is possible to accommodate the peak period demand without having to invest in additional rolling stock for transit service and additional roadway capacity, illustrated in Figure V-6. Much of the cost of public transportation funds the purchase of rolling stock for peak period service: rolling stock that is idle the rest of the day. In addition, and perhaps more important, more drivers are required for the peak period, and with the present labor contracts the work day must extend beyond the peak periods. Carpools and vanpools would reduce the amount of rolling stock and the number of drivers required during the peak period.

Cost Considerations

An important issue in any decision-making process is, of course, the cost. No solution merits serious consideration unless it is within the realm of financial capability of the implementing agency. For this reason the improvements studied in the project work tasks have been compared with other alternatives and appear as follows:

<u>Alternative</u>	<u>Estimate (Millions)</u>
1. Exclusive HOV Roadway and Ramps	\$35
2. Exclusive HOV Lane with Interstate	16

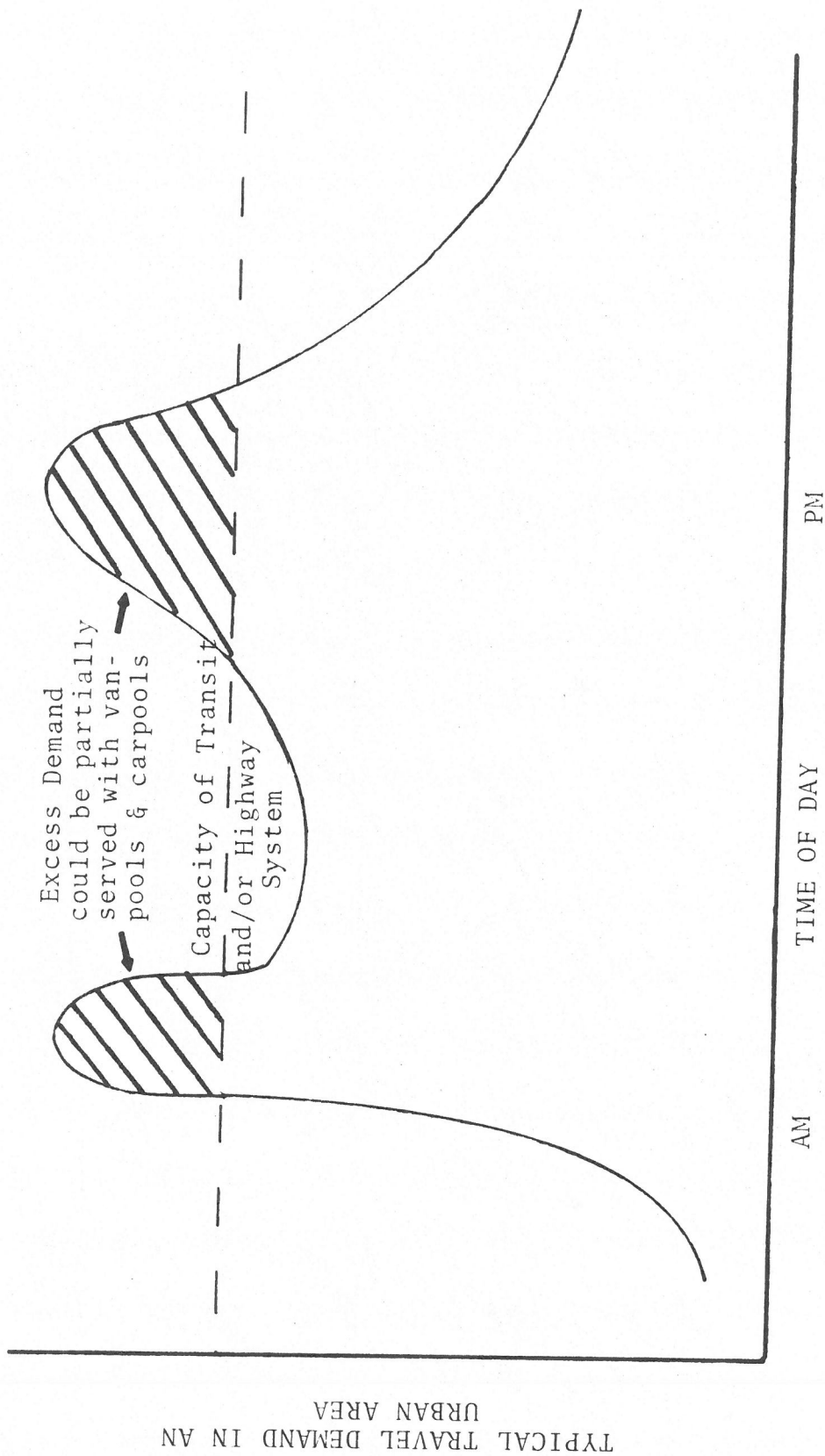


FIGURE V - 6 PROVIDING FOR EXCESS DEMAND ON TRANSPORTATION SYSTEM

3. Roadway Standards
Exclusive HOV Lane with Sub
standard Geometrics

1.3

An apparent conclusion of the cost estimates suggest that the improvements evaluated herein are extremely reasonable when compared with other alternatives which may be considered for Interstate 5 corridor.

Selected Impacts of Improvements

Whenever changes are made in one aspect or component of a system, changes usually occur elsewhere. So likewise the improvement in this section are expected to cause changes in other aspects. A number of the less obvious impacts have been identified and subjectively evaluated. This evaluation is summarized on Table V-B. Travel Time reductions for non HOV's are shown in Appendix A.

TABLE V-B SELECTED IMPACTS OF A PRIORITY LANE FOR HIGH OCCUPANCY VEHICLES IN THE I-5 CORRIDOR

FACTOR IMPACTED	CAUSE OF IMPACT	MEASUREMENT	AREA IMPACTED	ANTICIPATED RESULT
1) Air Quality	Reduce the number of auto's emitting pollutants by providing incentives to increase vehicle occupancy	Amount of gases, particles etc, in the air	Regional and Corridor Airshed	Improvement in region's air
2) Energy Conservation	Reduce consumption of fossil fuels (i.e. gasoline) by encouraging use of more efficient means of transportation	Gasoline Consumption	Corridor and Clark County	Reduction in per capita energy consumption
3) Land Use: Downtown Portland	Encourage additional employment in the Portland CBD by improving commuter transportation access to the CBD	CBD Employment	Portland CBD	Increase employment in Portland CBD
4) Land Use: Downtown Vancouver	Improved transportation access to Vancouver CBD resulting in increased economic activity	Employment Retail Sales	Vancouver CBD	The economic viability of downtown Vancouver will increase
5) Land Use: Vancouver Transit Station	Increased activity around transit station	Land Values	Vancouver CBD	Land values in areas surrounding the transit station will increase
6) Land Use: Clark County	Improved Transportation opportunities to employment centers	Increased Clark Co. Population and work force	Developable land in Clark County	Development in Clark County will increase until land costs are driven up

TABLE V-B (continued)

FACTOR IMPACTED	CAUSE OF IMPACT	MEASUREMENT	AREA IMPACTED	ANTICIPATED RESULT
7) Safety	Reduction in the reliance of autos in the corridor due to encouragement of express bus. Earlier detection of incidents occurring on the freeway shoulder.	Accident Rates: 4 Auto-1.2A/MPM Bus-.14A/MPM (A/MPM-Accidents per million vehicle miles)	I-5 Freeway	Reduction in corridor's accident rate and improved response to incidents. Some adverse affect may result because of elimination of shoulder.
8) Noise Pollution	More buses will be using the corridor increasing noise levels	Decibels	Primary impact along corridor	Increase in noise levels in corridor may result
9) Public Finance	Additional subsidy needed to operate transit buses in corridor	Public Expenditures	Clark County Tri County Metropolitan transit district	Increased taxes in Clark County and in Tri-Met District
10) Employment (short term)	Construction of priority lane	Employment	SMSA Work Force	Slight increase in area employment 2
11) Employment (long term)	Operation and maintenance of buses	Employment	SMSA Work Force	Slight increase in area employment 2
12) Commerce	Slightly lower demand for gasoline and related products	Retail Sales	Clark County	Slight decline in sales relating to motor fuel and related services and projects
13) Parking	Lower demand for parking in Portland CBD: Increased demand in Vancouver CBD	Parking Rates	Vancouver and Portland CBD's	Slight decline in parking spaces in Portland CBD as land is converted to other uses. Increasing demand for parking in and around Vancouver CBD as park and ride increases

TABLE V-B (Continued)

FOOTNOTES:

1. Additional economic impacts (such as #4) likely to result in overall employment increases.
2. Increased employment in Portland CBD plus increased development in Clark County may encourage more downtown workers to live in Clark County, thus further complicating transportation in the I-5 Corridor until property values rise sufficiently to curb development.
3. Care should be taken in the design of the termination of priority lanes to assure that there is adequate opportunity to merge. Since highway design standards encourages merging from the right in contrast to the left, perhaps, it would be advantageous to merge normal traffic into the HOV lane at the terminous on Hayden Island.
4. One of the measures of highway safety is that of traffic accidents. The accident rate on I-5 was found to be 1.2 A/MPM this was determined by converting the 1.8 A/MVM accident rate assuming a daily occupancy rate of 1.5 passengers per vehicle. A similar accident rate for Tri-Met buses were found to be 2.82 A/MPM for all lines. The accident rate for buses operating on lines utilizing freeways and expressways was .14 A/MPM. From this data it is apparent that any incentive to utilize transit-such as a HOV lane-would tend to improve the level of safety.

Long Range Planning Considerations

While the provision of immediate relief is the major focus of the Interstate Bridge Corridor Project, long range considerations have also been studied.

The completion of I-205, shortly after 1980, is expected to provide a degree of relief in the Interstate Bridge Corridor. However, continued development in the Rivergate Industrial Area, as well as, in Clark County will cause continued high traffic volumes on the I-5 freeway. By 1990, the traffic volumes on I-5 are expected to equal or exceed present day counts; congestion in the corridor is expected to be a long term problem. Estimates prepared by the Oregon Department of Transportation (ODOT) show the following traffic projections:

Point of Measurement	1974 ADT (000s)	1990* ADT (000s)	% Increase (Decrease)
Interstate Bridges	83	87	5%
Lombard St to Portland Blvd	73	73	--
Ainsworth to Killingsworth St	81	101	25%

In order to avoid traffic conditions even more congested than those experienced on the freeway at this time, High Occupancy Vehicles will have to play a major role in increasing the people moving capacity of the Interstate Bridge Corridor.

Estimates prepared by the Governor's Task Force on Transportation show that bus lanes operating on the freeway and on Union Avenue could carry approximately 30,000 daily riders.** Transit operating on the freeway would maintain one minute headways during the peak periods, five minute headways during the daytime off peak and thirty minutes for evening and night service.⁵

*NOTE: These estimates are based on assumptions made in the CRAG Interim Transportation Plan which includes completion of I-205 and a busway on I-5.

** The Union Avenue project has recommended that bus lanes not be included in the proposed rebuilding of Union Avenue.

Following the findings of the Governor's Task Force Report, the CRAG Interim Transportation Plan has recommended the provision of an exclusive busway on I-5. The Busway would connect the Portland Downtown Transit Mall with the Vancouver Transit station. The frequent headways noted in the Governor's Task Force Report would be maintained.

Provision of bus lanes within the existing right of way would enable the planning staffs of ODOT, Tri-Met and WSHD to study the impacts of a low capital intensive HOV priority system prior to the development of a more permanent busway. In addition, the bus lanes would provide a means of gradually upgrading transit service in the corridor. Thus, ridership could be increased up to a point where development of the capital intensive busway would be justified.

References

Chapter 1

1. Interstate Bridge Corridor Project Phase I Low Cost Improvements: Analysis and Recommendations Columbia Region Association of Governments September 1974

Chapter II

1. See Tri-Met Service Criteria Appendix A in the Transportation Improvement Program for the Portland Vancouver Metropolitan Area Columbia Region Association of Governments August 1975

Chapter V

1. Highway Capacity Manual - 1965, Transportation Research Board, SR 87, Washington, D.C., 1965
2. Priority Techniques for High Occupancy Vehicles (Working Draft), US Department of Transportation, February 1975
3. Interstate Bridge Corridor Project Phase I Low Cost Improvements: Analysis and Recommendations Columbia Region Association Of Governments September 1974
4. "Traffic Impact of Tomahawk Island Proposed Development", Interstate Bridge Corridor Project Task Force, December 1974
5. (UMTCD) Manual on Uniform Traffic Control Devices U.S. Department of Transportation U.S. Government Printing Office Washington, D.C. 1974
6. (SYDC Report) The Cooperative Transportation Planning Process In the Metropolitan Area System Design Concepts Inc. January 1975

CHAPTER VI
RECOMMENDATIONS

**INTERSTATE BRIDGE CORRIDOR
RECOMMENDATIONS**

FIGURE R-1

FEBRUARY, 1976

 **1"=4000'**

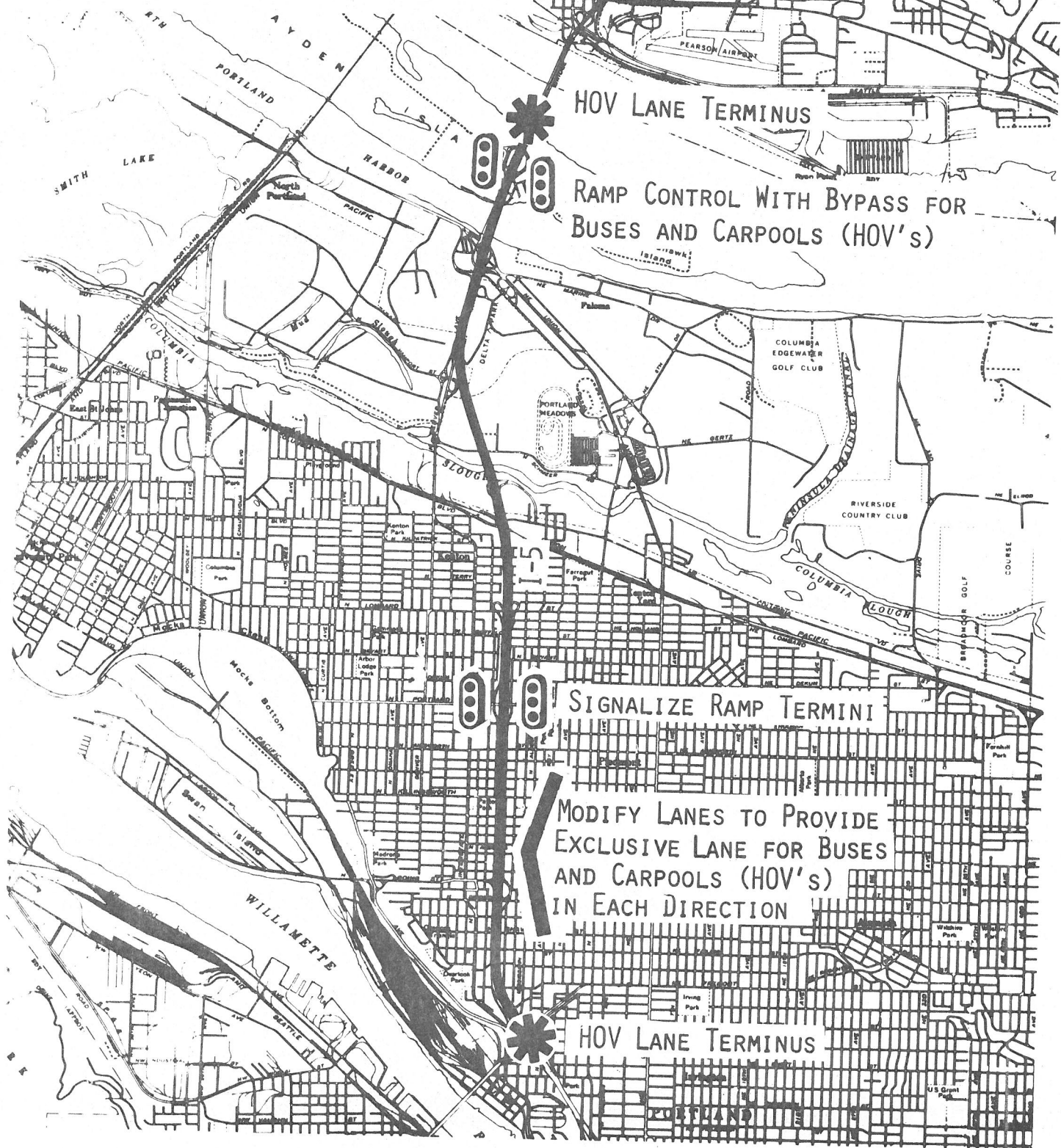
COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

FIGURE R-1

FEBRUARY, 1976


$$1'' = 4000'$$

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS



RECOMMENDATIONS

1. A coordinated public transit system should be developed in the Interstate Bridge Corridor to provide a convenient, inexpensive and attractive transit service between Clark County, Vancouver and Portland.
2. Tri-Met should purchase Vancouver-Portland Bus Company immediately.
3. As the agency responsible for the regional carpool program, Tri-Met should expand aggressive carpool marketing efforts to Clark County.
4. Oregon State Department of Transportation should proceed with priority treatment measures as follows:
 - A. Add a HOV lane on I-5 in both directions between the Fremont Bridge and Hayden Island.
 - B. Ramp control at Hayden Island on-ramps with bypass for HOV.
 - C. In cooperation with the Oregon State Police, review the costs and benefits of installing and operating a closed circuit TV system for surveillance of freeway operations on I-5 north.
5. Oregon State Department of Transportation should proceed with the Columbia Slough Bridge to an eight lane structure.
6. The Oregon Department of Transportation consider installation of traffic signals at the termini of the I-5 ramps at Portland Boulevard.

These recommendations should assist in the attainment of certain regional transportation goals such as conservation of fuel, improved safety, reduction of traffic congestion and improvement of regional air quality. Certain capital and operating costs will be incurred in the implementation of these recommendations.

These costs could be funded as follows:

Transit service in Clark County - Household utility tax, UMTA operating funds and state motor vehicle excise tax matching funds (if available).

Corridor service - UMTA operating funds: priority treatment.

Slough Bridge and signal - Interstate funds.

Carpool marketing - Federal Aid Urban System Funds

Action on some of these recommendations has already been taken. A public transportation improvement conference has been held in

Vancouver. It concluded that transit in the county should be provided through inter-governmental contracts between the City of Vancouver, Clark County and other cities interested in obtaining transit service.

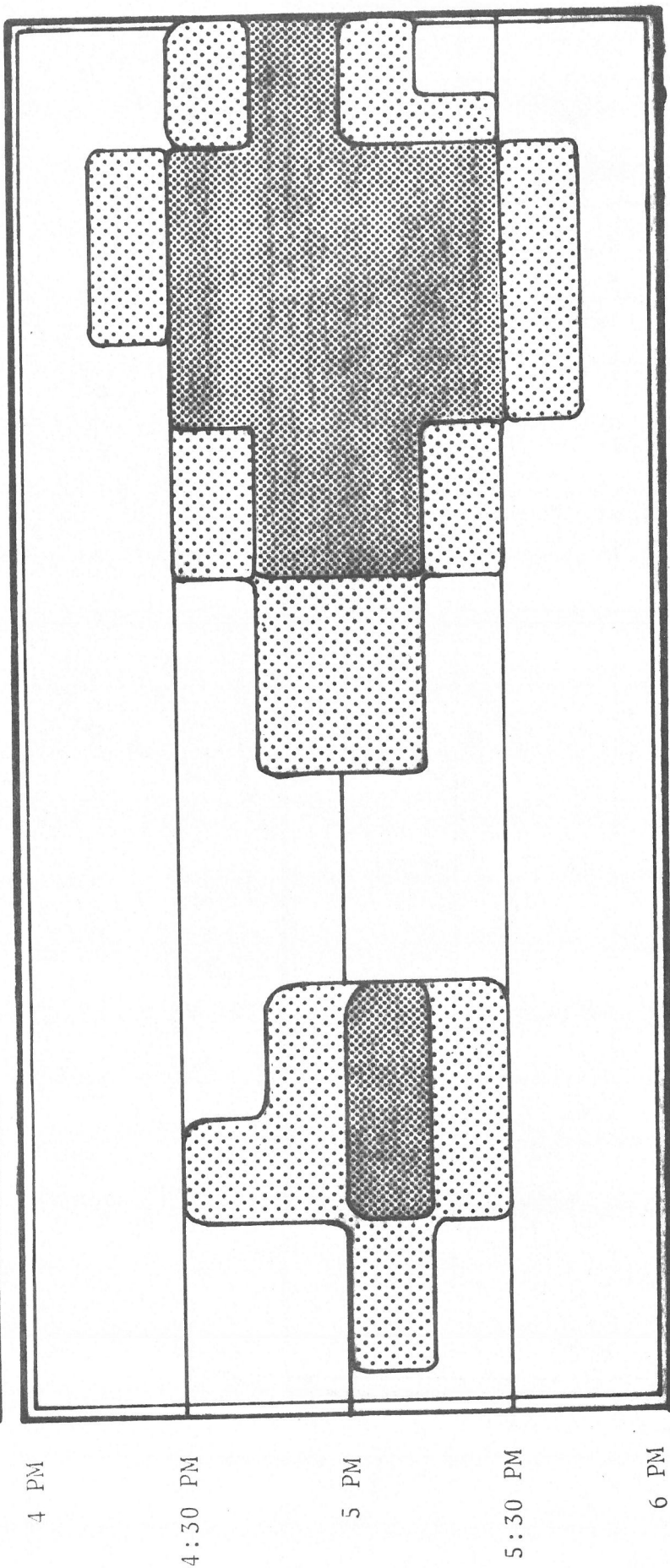
The City of Vancouver and Clark County have approved a joint resolution supporting public acquisition of Vancouver-Portland Bus Company. Tri-Met is currently studying the legal and financial aspects of acquisition and operation of this line.

The City of Vancouver has agreed to purchase ten new diesel buses. The purchase of these buses is essential to the implementation of any city-county agreement to provide transit service outside the city limits of Vancouver.

The estimated benefits from these recommendations in terms of improved level of service are graphically depicted in Figures R2 and 3. These figures indicate the level of improvement over Figures V-3 and 4.

MILES PER HOUR

30 40



South End of Interstate
Hayden Island
Overcrossing

Marine Drive

Swift St

Denver Ave

Delta Park
Overcrossing

Columbia Blvd

Lombard St

Portland Blvd

Ainsworth St

NORTHBOUND EVENING PEAK
TRAFFIC SPEEDS ON I-5 BETWEEN
AINSWORTH STREET AND HAYDEN ISLAND

FIGURE R-2

MILES PER HOUR

40



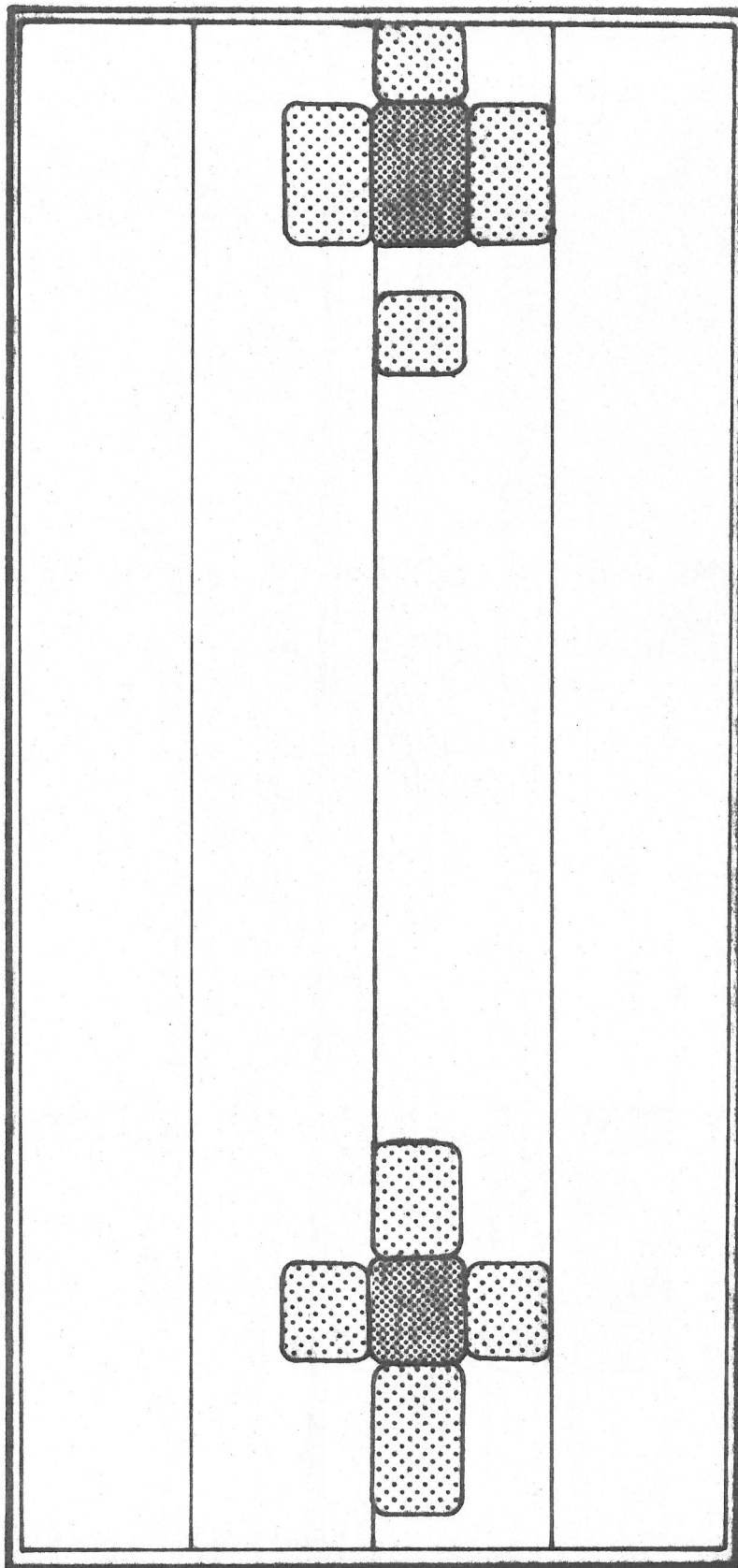
6:30 am

7 am

7:30 am

8 am

8:30 am



South End of Interstate
Hayden Island
Overcrossing

Marine Dr

Swift St

Denver Ave

Delta Park
Overcrossing

Columbia Blvd

Lombard St

Portland Blvd

Ainsworth St

SOUTHBOUND MORNING PEAK
TRAFFIC SPEEDS ON I-5 BETWEEN
AINSWORTH STREET AND HAYDEN ISLAND (1974)

FIGURE R-3

APPENDICES

APPENDIX A

DATA FOR HIGH OCCUPANCY VEHICLE

LANE ANALYSIS

	PORTLAND BLVD		COLUMBIA SLOUGH		
	AM	PM	AM	PM	
Occupancy for all autos ¹ (persons/auto)	1.21	1.33	1.21	1.29	1
Occupancy for autos with more than 3 persons (persons/auto)	3.50	3.50	3.50	3.50	2
Occupancy for autos with less than 3 persons (persons/auto)	1.20	1.25	1.16	1.21	3
Autos with one person	81.9%	75.6%	79.5%	71.8%	4
Autos with two persons	15.3%	19.3%	19.3%	23.7%	5
Carpools (more than 3 persons) without HOV Lane	2.8%	9.0%	5.6%	9.4%	6
Carpools (more than 3 persons) with HOV Lane ²	5.6%	18.0%	11.2%	18.8%	7
Bus Volumes without HOV Lane	4	4	4	4	8
Bus Volumes with HOV Lane ³	10	10	10	10	9
Occupancy of Buses ⁴	52	52	52	52	10

1. The 3 to 5% trucks were treated as autos
2. Carpools were doubled, based on experience on Bay Bridge in California
3. Number of buses are doubled based on 1) Tri-Met fare reduction, 2) Tri-Met operates corridor service 3) There is an urban public transit system in Clark County with free transfer arrangement with Tri-Met, and 4) $\frac{1}{2}$ of Tri-Met peak period service to Hayden Island is routed on to I-5
4. Source of bus occupancy: Vancouver-Portland Bus Company
5. The total number of auto trips remained same, based on experience on the Bay Bridge in California

TRAVEL TIME COMPARISON
For
NON-HOV LANES

<u>Direction of Flow</u>	<u>Travel Time</u>		<u>TIME SAVED</u>
	<u>BEFORE HOV LANES</u>	<u>AFTER HOV LANES</u>	
Northbound PM Peak (5pm)	29 Minutes	17 Minutes	12 Minutes
Southbound AM Peak (7:30am)	15 Minutes	9 Minutes	6 Minutes

NOTE: All automobile travel time estimates are based on the assumption that travel speeds in the most congested areas average 5 mph. Travel time estimates shown are from the east bank of the Fremont Bridge to SR 14 north of the Interstate Bridge.

TRAVEL TIME ESTIMATE
For
HOV LANES

Travel speeds in the HOV lanes are estimated to average 50 to 55 miles per hour. Assuming an unconstrained merging movement at the end of the HOV lane, the travel time on the HOV lane from the Fremont Bridge to SR 14 will be about 7 to 8 minutes.

APPENDIX B

This contains extracts from an analysis conducted by Oregon State Department of Transportation - Planning Section in Salem, Oregon.

DEPARTMENT OF TRANSPORTATION
Planning Section
Plan Analysis Unit

I-5 Corridor
Going Street-Interstate Bridge

Introduction

Pursuing the I-5 Study further, this report focuses more directly on specific improvements to I-5 north of Delta Park Interchange and at the Portland Boulevard Interchange. Several design changes are suggested to improve traffic operations on the subject sections of I-5. Southbound and northbound analyses were separated and the findings are summarized below:

I-5 Southbound

- a) Widen the Oregon Slough Bridge section to four lanes.
- b) Improve the curvature of the existing Swift Road off-ramp or combine the Union-Swift off ramps into a single two-lane off-ramp.
- c) Improve I-5 to three lanes at the Portland Boulevard Interchange.

I-5 Northbound

- a) Widen the Oregon Slough Bridge section to four lanes.
- b) Close the Union-Swift off-ramp to eliminate the short weave section north of the Delta Park Interchange.
- c) Improve I-5 between the Denver Avenue and Union-Swift entrance ramps by providing an extended acceleration lane for Denver Avenue on-ramp traffic.
- d) Improve I-5 to three lanes at the Portland Boulevard Interchange.

Analysis

The emphasis of this analysis is to study today's traffic problems and determine appropriate solutions. The 1974 peak hour volumes were used for this study. Assuming traffic growth will be regulated by the Interstate Bridges, future traffic projections were not used in the analysis. Shortly, an updated version of future projections will be available reflecting I-205 traffic diversion, current land use plans, and higher transit estimates.

Figure I illustrates the peaking characteristics of traffic flow on the Interstate Bridges. The southbound bridge peaks from 7:00 to 8:00 AM while the northbound bridge peaks from 4:00 to 5:00 PM.* Solutions to relieve the peak hour delays and congestion existing today on the Minnesota Freeway will be discussed.

Summary

This analysis assumes the automobile will continue to be the predominant mode of travel in the subject I-5 corridor. With this assumption, emphasis was directed at the highway system's capability to satisfy the demands. Ramp metering systems or busway proposals to modify auto travel demand were not considered in this study.

The completion date of I-205 (1980-1981) is expected to provide considerable relief on I-5. In the meantime, traffic generated from new developments at Hayden Island and Rivergate Industrial Park are anticipated to further strain congested conditions already existing in the study

* Manual counts by the Washington State Department of Highways in 1972 indicated that the evening peak hour on the Interstate Bridge was 4:30 to 5:30 PM.

corridor. Therefore, the "worst case" traffic condition would exist just prior to the completion of I-205.

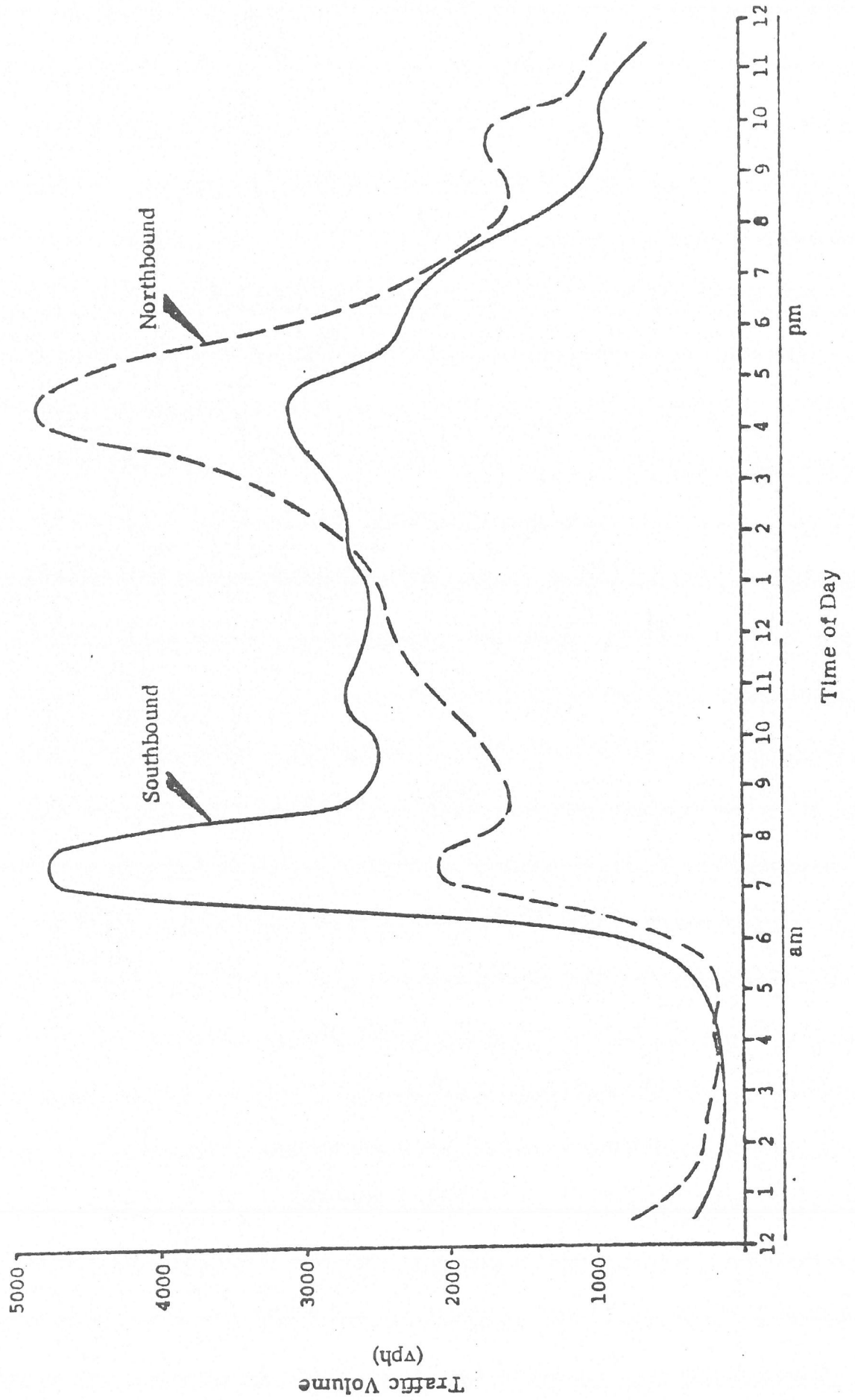
With the proposed improvements, traffic operations during the "worst case" condition should be acceptable. It is estimated that peak hour traffic growth is limited to 300 to 600 vehicles due to the capacity limitations of the Interstate Bridges. The proposed improvements would provide the needed capacity to handle this traffic growth at a tolerable level of service.

Jim Branch
Bob Jurica
6-30-75

Figure I

INTERSTATE BRIDGE

Weekday Traffic Distribution
(Nov. 26, 1974)



APPENDIX C

COSTS FOR CORRIDOR SERVICE

The following is a computation of the estimated costs for corridor service, as well as an estimate of the subsidy needed for Vancouver and Clark County. The service provides 34 daily trips, including extra peak period service, 27 Saturday trips and 12 Sunday trips. This is essentially a continuation of the present level of service provided by Vancouver-Portland Bus Co., with the addition of evening service. The lines operate at ½ hour headways 6:30am-6:00pm, 10 minute headways during the peak and hourly headways after 6pm. All Sunday service runs on hourly headways. Additional assumptions are made as follows:

- Tri-Met operates this service
- Tri-Met's current operating costs are used
- The fare is 35¢ with reduced fares for children and senior citizens. This produces an average fare of 31¢
- Patronage on this line will double over a period of a year as a result of reduced fares and free transfers
- Peak service operates on a self sustaining basis (no subsidy needed)
- Clark County and Vancouver will subsidize the service operated beyond Jantzen Beach

Tri-Met Cost per Bus Hour	\$ 17.20
Tri-Met Cost per Bus Mile	1.21
Average Bus Speed	14.7 mph
Number of Daily Trips	34
Less peak trips	-13
Off peak daily trips	21
Saturday trips	27
Sunday trips	12
Estimated 2 Way Trip Length	15 miles
Estimated 2 Way running time	1 hour
Estimated 2 Way distance from Jantzen Beach to Downtown Vancouver	4 miles
Estimated running time from Jantzen Beach to Downtown Vancouver	16 minutes
Current average Vancouver-Portland off peak patronage (including weekends)	320

COSTS (off peak including weekends)

On hourly basis

Daily Service Hours	Cost/Bus Hour	Weekdays in a Year	Weekend Service Hours	Cost/Bus Hour	Weekends in a Year
---------------------	---------------	--------------------	-----------------------	---------------	--------------------

$$((21 \times \$17.20) 225) + ((39 \times \$17.20) 52) = \$98,000$$

On mileage basis

Daily Service Hours	Cost/ Bus Mile	Weekdays in a Year	Weekend Bus Hours	Cost/ Bus Mile	Weekends in a Year	
((315 x \$1.21)		255	+	((585 x \$1.21)	52	= \$134,000

Average

$\frac{\$98,000 + \$134,000}{2}$	=	\$116,000
----------------------------------	---	-----------

Revenues

Average weekday off peak patronage (at the beginning of Tri-Met service)	320	
Average daily off peak revenues .31 x 320	\$	99.00
Annual revenue at initial patronage level	\$	36,000.00
Average weekday off peak patronage (after 1 year)	640	
Average daily off peak revenues .31 x 640	\$	198.00
Annual revenue after 1 year	\$	71,000.00
Estimated first year revenue	$\frac{71,000 + 36,000}{2}$	\$ 53,500.00

Subsidy

Costs	\$116,000.00
Less Revenues	\$-53,500.00
Subsidy Needed	\$ 62,500.00
Portion of route attributable to Clark County/ Vancouver	
$4 \div 15 = 27\%$	
$16 \text{ min} \div 60 \text{ min} = 27\%$	27%
Subsidy attributable to Clark County (.27 x \$62,500)	\$ 17,000.00
Subsidy attributable to Tri-Met (\$62,500 - \$17,000)	\$ 45,500.00

* This includes 285 weekday passengers
600 Saturday passengers
200 Sunday passengers

Estimates provided by Vancouver-Portland Bus Company

APPENDIX D

DEMAND RESPONSIVE TRANSIT

Variable routing and dial-a-bus represent the two forms of public transportation known as "demand responsive transit". The basic element of this system is communication between the patron and the transit vehicle prior to the time the patron boards the bus. The patron makes his travel desires known to the transit company which in turn responds by routing its vehicles according to the travel demands of its riders.

Route deviation is a system where a bus is deviated from its regular route (within a given service area) to provide "doorstep" service to its patrons. The deviation is generally limited to a few blocks.

"Pure" demand responsive transportation or dial-a-bus, like the route deviation system provides doorstep service. However, no route is adhered to. There are three variations of this type of service which includes:

Many-to-one pattern - providing transport from several origins to a common destination such as a shopping center or bus terminal.

Many-to-few - providing transport from multiple origins to a few destinations, such as major activity centers or points on a downtown loop.

Many-to-many - providing transport between any origin-destination pair in the service area without limitation.

Note: These service patterns may be used, in reverse, or in combination throughout a service area or on a zonal basis depending on the characteristics of the service area. (See Demand Responsive Transit, p.3)

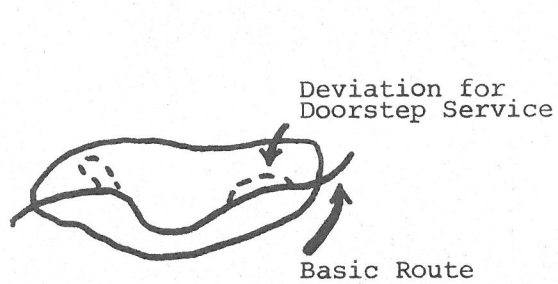
A schematic diagram of these service patterns is provided in figure D.

Demand-responsive transit is usually activated by a patron calling the transit agency and requesting the service at a given place and time. A few demand-responsive systems are operated on a subscription basis. The patron subscribes to the service by requesting the service at a given time on a daily or otherwise basis.

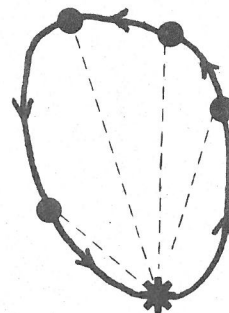
Demand responsive transit has certain advantages over conventional transit. It provides more direct service, thus encouraging ridership. Demand responsive service is more flexible and can better serve the needs of persons unable to use the conventional bus service such as the elderly and the handicapped. Its main disadvantage is cost. A transit system operating both conventional and demand responsive service reported costs 14% higher for its demand responsive service. This is due to additional labor costs. Personnel are needed to receive requests for

service and dispatching buses to meet these requests. In addition, little or no savings can be expected from the use of smaller vehicles. Small vehicles generally require more maintenance than their larger counterparts and are usually fueled by gasoline which is more expensive than diesel fuel.

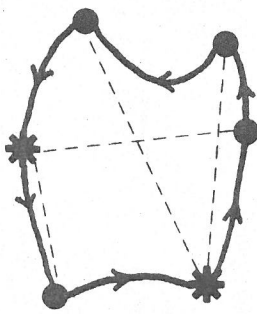
FIGURE D SERVICE PATTERN ALTERNATIVES FOR DEMAND RESPONSIVE TRANSIT



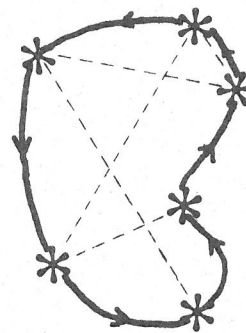
(1) Route Deviation



(2) Many-to-One



(3) Many-to-Few



(4) Many-to-Many

- Origin Point
- * Main Terminal, Transfer Point, Activity Center
- Desire Line
- One possible dynamic routing
- * Origin and destination pairs

APPENDIX E

TRANSIT FUNDING IN THE STATE OF WASHINGTON

The operation of publicly owned transit systems in Washington and Oregon is regulated by state law. In addition, certain federal assistance programs make publicly owned transit systems eligible for federal funds; therefore, a knowledge of restrictions placed upon local transit operating agencies by federal regulations and state law is extremely important in the development of a transit system.

This chapter contains an analysis of the legal requirements governing the establishment of planning and funding transit systems in the State of Washington. In addition, a brief overview of Oregon law relating to contracts between systems and a description of federal regulations governing assistance to transit operators is provided.

In the State of Washington, prior to 1974, only cities and King County (Seattle) had the authority to establish and provide public transit service. Cities are authorized to levy a household utility tax for the support of transit. This tax is to be levied on all households in the city and is limited to a maximum charge of \$1 per household per month. Operations of these transit systems are restricted to service within the city limits. Household utility tax collections are matched with state receipts from the motor vehicle excise tax. The state had originally been authorized to match local collections on a dollar for dollar basis. However, a total statewide limit was placed on the dollar amount which could be used to match local funds for transit service. Thus, the motor vehicle excise tax has, to this point, provided cities with somewhat less than a full possible match.

In 1974, Washington State law was amended to permit counties to operate transit systems which could be financed through a county-wide, 3/10 of one percent general sales and use tax. The activities of such a system were to be directed by a policy board comprised of the county commissioners, the mayor of the largest city, a representative of cities with more than 5,000 population, and a mayor chosen by cities of less than 5,000 population. The transit authority could be formed by a majority vote of the county commissioners. However, funding through the 3/10 of one percent sales tax would be permitted only after its approval by a vote of the people. This legislation was not attractive to the elected officials in Clark County because Oregon (just across the river) does not have a sales tax and increases in the sales tax in Clark County are not popular.

In the 1975 legislative session, substantial modifications were made in this law. These changes modified the manner in which counties form transit agencies, create service areas, and

provide financing for the transit service. The new legislation has given the cities and counties four means of funding transit systems. These include:

1. Imposition of a 1/10, 2/10 or 3/10 percent general sales and use tax;
2. Imposition of a business and occupation tax;
3. Imposition of a household utility tax of up to one dollar per household per month;
4. A combination of 2 and 3.

While the business and occupation (B&O) tax and household utility tax (HUT) may be used in combination, the sales tax must be used alone. Imposition of any of these taxes is, of course, subject to a vote of the people. The B&O tax and the HUT are eligible for a motor vehicle excise tax match; however, the sales tax is not.

Previously, taxes for transit service had to be levied uniformly throughout an entire city or an entire county as noted above. Under the 1975 legislation, a public transit benefit area (PTBA) may be formed to provide transit service in areas larger than a city and smaller than a county. Each county is permitted to establish one PTBA. A single PTBA can be established in two or more counties. The boundaries of the benefit area must be contiguous and may not contain islands of territory not included in the PTBA. For purposes of representation, the PTBA must include or exclude entire cities. Should only a portion of a city be included, the city may not be represented on the PTBA governing body. The means of representation on the governing body is to be determined by the jurisdictions involved in the PTBA. Single county benefit areas are limited to a nine member governing body. Multi-county areas may have up to a 15 member board. Cities not included in the transit benefit area may send a non-voting representative to the governing body to represent their interest.

Prior to the formation of a PTBA, a public transportation improvement conference is to be held. The conference shall be attended by representatives from the county and each of the cities in the county. The conference shall determine the desirability of establishing a public transportation benefit area. After completion of the initial conference, a public hearing shall be held. Prior to the convening of the hearing, the local legislative body shall advise the county governing body of their desire to be included or excluded from transit benefit area.

Following the conclusion of the hearing, PTBA conference shall adopt a resolution fixing the boundaries of the PTBA. The decision of the conference may be reviewed by the county governing body which may modify the boundaries to include areas which will benefit from transit service and exclude areas that will not. If the county does not approve a resolution nullifying or modifying the decision of the conference, the transit benefit area will stand as approved by the conference.

Within 60 days of the establishment of the boundaries of the PTBA, the county commissioners and elected representatives of the cities within the area shall provide for selection of the governing body of the PTBA. Governing bodies shall consist of elected officials selected by and serving at the pleasure of the governing bodies of component cities within the PTBA and county commissioners of each county within the area. Cities are given the option to withdraw from the PTBA if they act to do so by resolution within 60 days of the formation of the benefit area.

The PTBA is required to prepare a transportation plan. This plan shall include but is not limited to the following:

1. The levels of transit service that can be reasonably provided for various portions of the benefit areas;
2. The funding requirements including local tax sources, state and federal funds necessary to provide the various levels of service within the area;
3. The impact of such a transportation program on other transit systems operating within that county or adjacent counties;
4. The future enlargement of the benefit area of the consolidation of such benefit area with other transit systems.

The transit plan as developed by the PTBA shall be reviewed by the planning and community affairs agency of the State of Washington. This agency may approve the transit plan or request that the plan be modified. Plan approval is necessary for the PTBA to become eligible to receive matching funds from the state's motor vehicle excise tax.

The PTBA shall have the normal corporation and governmental powers granted to special purpose districts in the State of Washington. This includes the power to contract with other transit agencies, public or private for the purpose of providing service.

Competition between the PTBA and privately operated transit systems is forbidden by this legislation. The PTBA, however, is authorized to make special arrangements with private carriers to continue operations even after PTBA service has been established. If such arrangements can not be made, PTBA shall purchase by condemnation the private transit operation. City systems which are operating prior to the formation of the PTBA may continue to operate after the PTBA has been formed. The PTBA may acquire such systems. However it may do so only with the permission of the governing body of the city which owns the system.

Territory may be annexed to the PTBA by election of the persons involved in the affected territory. Annexation elections may be requested by: 1. Resolution of a PTBA; 2. By petition calling for such an election, signed by at least 4% of the qualified voters residing within the area to be annexed; 3. By resolution of PTBA authority upon request of any city for annexation.

Counties that have established a county transportation authority or public transportation benefit area that have been established pursuant to this legislation are eligible to receive a one time advanced financial support payment from the state to assist in the development of the initial comprehensive transit plan. The support payment is limited to one dollar per person residing within each county or \$50,000, whichever is the least. Repayment of an advanced financial support payment shall be made to the public transportation account in the general fund. Such repayment shall be waived within two years of the date that the advanced payment was recieved if the voters in the appropriate counties of PTBA areas do not elect to levy and collect taxes provided under this legislation.

In Oregon, special purpose districts for transit service may be formed in those counties comprising a standard metropolitan statistical area. Two such districts are presently operational in Oregon. These are the Lane Transit District in the Eugene-Springfield Metropolitan Area and the Tri-Met District in Portland. Oregon districts are permitted to contract with other jurisdictions to provide service outside of the transit district boundaries. (See ORS 267.560) Therefore, Tri-Met may enter into a contractual arrangement with the Washington agency for purposes of providing transit service. If Tri-Met operates across state lines, however, it is necessary to obtain an operating permit from the Interstate Commerce Commission. In addition, the private carrier now providing service in the corridor must be purchased by Tri-Met. Federal regulations prohibit a public carrier, receiving federal assistance, from competing with a privately owned carrier.

Federal law provides for assistance for both operations and capital expenditures for local transit systems. The Urban Mass Transportation Administration is authorized to allocate funds to urban transit systems to pay operating costs for service improvements or expansions. A total of 1.8 million dollars is expected to be available to the Washington portion of the Portland urban area over a six year period ranging from 1975 through 1980. The City of Vancouver and Tri-Met are presently the designated recipients for this funding. The UMTA money must be matched by locally raised non-fare box revenues. This program is known as UMTA Section 5 Operating Funds. (See Federal Register, January 13, 1975, page 2534).

Assistance is also available from UMTA for purchase of capital equipment or for capital construction. UMTA will pay 80% of the cost of capital acquisition for eligible projects. These projects may include purchase of buses and other rolling stock, as well as construction of terminal facilities, shelters, exclusive rights-of-way, acquisition or private transit companies and construction of maintenance facilities.

APPENDIX F RIDERSHIP ESTIMATES

For a given population and fare, ridership will be determined by:

1. Accessibility which is determined by the extent of feeder coverage, and availability of park and ride facilities;
2. Convenience which is determined by the length of headways, availability of shelters and various operating characteristics;
3. Speed which is measured by the ratio of auto to transit travel time.

These projections are based on a Clark County system whose convenience and speed characteristics are comparable to the Tri-Met system. Ridership will become a function of accessibility. A low, medium, and high level of accessibility will be compared to existing service.

During the early 1970's, Tri-Met averaged 31.5 annual rides per suburban household within $\frac{1}{4}$ mile of each route¹. This ride generation figure will be used for the low accessibility scenario. In 1974, Washington County generated 44 rides per household.² Forty-four rides per household represents a mid-level of accessibility. In 1974, the tri-county metropolitan area averaged 72 originating rides per household³. Vancouver service is currently attracting 18 annual rides per household⁴.

The following chart shows expected ridership for each level of accessibility, based on 1974 housing data⁵:

<u>Annual Ridership</u>					
<u>Service Area:</u>	<u>Access:</u>	<u>As Is</u>	<u>Low</u>	<u>Medium</u>	<u>High</u>
Vancouver (18,911 units)		336,000	467,000	652,000	1,065,000
Vancouver & urbanized (32,804 units)		590,000	904,000	1,263,000	2,066,000

These figures are adjusted for interstate transit trips which do not interface with internal transit trips.⁶

- 1 Information derived from DeLeuw, Cather, PVMATS Study, "Step I".
- 2 1970 Washington County population = 157,920
 1974 Washington County population = 182,500; increase factor = 1.156
 1970 housing units = 52,038
 Derived 1974 housing units = $1.156 \times 52,038 = 60,156$
 1974 Washington County ridership = 2,626,106
 1974 rides per housing unit = $2,626,106 / 60,156 = 43.7 = 44$
- 3 1970 Tri-County population = 878,676
 1974 Tri-County population = 931,200; increase factor = 1.059
 1970 housing units = 316,000
 Derived 1974 housing units = 334,964
 1974 Tri-County ridership = 24,000,000 originating riders
 1974 rides per housing unit = $24,000,000 / 334,964 = 72$
- 4 1970 Vancouver population = 42,493
 1974 Vancouver population = 50,100; increase factor = 1.177
 1970 housing units = 16,067
 Derived 1974 housing units = 18,911
 1974 Vancouver ridership = 335,793
 1974 rides per housing unit = $335,793 / 18,911 = 18$
- 5 Vancouver, as is = 18,911 housing units x 18 rides/housing unit = 340,398 rides
 Vancouver, low access = 18,911 housing units x 31.5 rides/h.u. = 595,697 - adjustment factor
 Vancouver, medium access = 18,911 housing units x 44 rides/h.u. = 832,084 - adjustment factor
 Vancouver, high access = 18,911 housing units x 72 rides/h.u. = 1,361,592 - adjustment factor
 Vancouver and urbanized area, as is = 32,804 housing units x 18 rides/h.u. = 590,472 rides
 Vancouver and urbanized area, low access = 32,804 housing units x 31.5 rides/h.u. = 1,033,326 - adjustment factor
 Vancouver and urbanized area, medium access = 32,804 housing units x 44 rides/h.u. = 1,443,376 - adjustment factor
 Vancouver and urbanized area, high access = 32,804 housing units x 72 rides/h.u. = 2,361,888 - adjustment factor

6 Adjustment Factor

One-third of Clark County labor force works in Oregon. Assume 1/3 of Vancouver originating trips will have an Oregon destination.

Assume 65% of Vancouver-Oregon trips will not rely on internal Vancouver transit.

Therefore, the adjustment factor = $\frac{\text{Vancouver internal trips}}{3} \times .65$

Appreciation is expressed to members of the Tri-Met planning staff for assistance in compiling this information.

APPENDIX G

TRANSIT OPERATIONS

Operations

The largest single aspect of any transit system is the day to day operations effort. This activity is comparable to the production function of an industry with operations being the systems largest expenditure.

Operations can be broken down into four major subcatagories including:

- Operations Administration
- Supervision
- Service and Maintenance
- Vehicle Operation

The operations administrator performs the standard administrative tasks. These may include budgeting, planning, scheduling, contract administration, and supervision of subordinates. In smaller transit companies the operations administrator may be the general manager. In larger operations, the administrator will be a department head working under a general manager.

Supervisors are responsible for insuring that maintenance and servicing tasks are properly assigned and carried out. In addition, they may be responsible for developing and administering the maintenance and service program of the transit company.* Supervisors are also needed to insure that bus operators are adhering to designated routes and schedules. Like the administrative function, the number of supervisors will depend on the size of the operation. In very small companies, this function may be performed by the general manager. As the system gets larger, this function will be assigned to a greater number of persons.

Service and maintenance will be performed by teams of individuals with specialized skills in all but the smallest companies. Buses must be fueled, cleaned and maintained at regular intervals. In addition, mechanical assistance must be on hand to deal with those equipment breakdowns and accidents which invariably occur.

* For a complete description of the elements involved in a maintenance and service program see Mass Transit Management: A Handbook for Smaller Cities, Institute for Urban Transport, February, 1971.

Vehicle operation is performed by the system's drivers. Usually the drivers wages will be the single most costly item in the system's expenditures. Since proper (or improper) operation will go a long way toward influencing patronage and image, it is imperative that drivers be well trained and adequately supervised.

Table G provides a listing of those materials, equipment and labor which are necessary to maintain transit operations. In addition, a list of related costs is also noted.

A transit system must perform other functions, in addition to operations. If the system is publicly owned, it will be necessary to work with a governing body or other public agencies to set system policy. A budget must also be prepared. Personnel policies must be drafted and administered. It is also necessary to monitor and evaluate system performance.

Most transit systems will maintain a planning function which provides eventual service improvement and expansion.

Finally, a marketing program is essential to system development. Marketing has proven its effectiveness in attracting riders to transit systems. The system should anticipate spending about 5% of its revenues for this function.*

Planning and marketing costs are presented in Table III-B.

Capital Improvements

System capital improvements may be broken down into three general catagories including:

- Rolling Stock
- System Maintenance and Storage Facilities
- System Anemities

It is important to keep in mind that the Urban Mass Transportation Administration will fund 80% of the cost of most capital improvements. Cost estimates (where provided) are made on the basis of total cost and are not necessarily the costs that would be incurred by the local transit agency.

Rolling stock includes all transit vehicles which are used in transporting passengers on the system. In this area, all public transit rolling stock is powered by internal combustion engines (gas or diesel). It is likely that this trend will be continued with the Clark County transit system.

* For a discussion of marketing effectiveness see Advertising and Promotion Demonstration Project Final Report, UMTA.

Currently, a full size diesel bus costs about \$65,000. A modified bus, containing a good deal of special equipment will cost up to \$75,000. (See Passenger Transport, May 16, 1975, p.9)

Smaller demand responsive vehicles cost somewhat less. A 15 passenger radio equipped van, modified for transit service can be purchased for about \$15,000. A small radio equipped transit bus will cost up to \$41,000. (Demand Responsive Transportation, p. 39)

The number of buses needed by the system will be determined by the number of routes, frequency of service and route length. In addition, it is generally considered necessary to have a number of spare buses on hand as a contingency against equipment breakdowns. Usually one spare for every 10 buses needed for operations is considered adequate.

Maintenance Facilities

Preventive maintenance is essential to the efficient, safe and economic operation of the transit system. To accomplish a high level of preventive and essential maintenance it is necessary to have an adequate maintenance service and storage facility.

Industry standards suggest that the transit system have facilities available for performing maintenance on about 8% of the fleet. Thus, a system having 25 buses should have two service bays. In addition, room is needed for the following functions:

- * Fueling and Service
- Cleaning
- Greasing
- Body Repair
- Painting
- Machine Shop
- Stocking
- Storage or Parts
- Offices
- Storage of Coaches
- Storage of Fuel
- Storage of Batteries

*Mass Transit Management, p. 155-156

Facility costs will vary depending on the size of the system. It has been estimated that a maintenance facility for 25 buses will cost about \$250,000.

System Amenities

System amenities are those features which improve access to the transit system or make use of the system or make the system more pleasant for the patron. The most common amenities include park and ride sites, bus stations, and bus shelters.

Park and ride facilities may range in design from simple parking lots to elaborate transit stations complete with waiting rooms, comfort stations and ticket offices. In some cases, agreements may be worked out between the transit agency and merchants, churches or civic groups which have under utilized parking facilities. In other cases, the cost of the facilities will depend on size, elaborateness and location.

The unadopted 1990 transit plan for the Portland-Vancouver area describes eight transit stations for Clark County. These stations were to be constructed at a total cost of \$3.6 million. A scaled down version of this plan has been adopted in the Interim Transportation Plan (ITP). The ITP recommends two transit stations for Clark County. The first station would be located in downtown Vancouver. The design and precise siting of this station is under study. Another station would be constructed near I-205 in East Vancouver or in Orchards. Siting of this station is to be studied at a later date.

Bus shelters are also a useful addition to a transit system. Bus shelters not only protect passengers in inclement weather, but also serve to call attention to the system and its routings; system information such as routes, fares and schedules can be posted on the shelters. The cost of shelters averages about \$1,500 per installation.

TABLE G SAMPLE OPERATING COSTS

(Dollars Pre Bus Operating Hour)

OPERATIONS	TRI-MET	VANCOUVER TRANSIT
Driver Labor	6.46	4.54
Maintenance Labor	1.53	1.59
Scheduling	.15	----
Operations Supervision & Administration	.69	1.11
Overtime	1.06	1.05
Fringe Benefits	1.49	1.42
Operations Materials & Supplies	<u>2.19</u>	<u>3.43</u>
TOTAL OPERATIONS	13.57	13.14
ADMINISTRATION, PLANNING & MARKETING		
Executive	.19	(1)
Personnel	.68	(1)
Finance	.20	(1)
Contract Administration	.25	(1)
Marketing	.93	(2)
Planning	.43	(2)
Insurance	.52	.60
Overhead	<u>--</u>	<u>.64</u>
Depreciation	3.20	1.24
	<u>.43</u>	<u>NA</u>
TOTAL COSTS	17.20	14.38 (3)

- (1) Personnel, finance, contract administration and executive functions are performed by the City of Vancouver and funded through overhead expenses
- (2) Vancouver Transit has no marketing or planning program comparable to Tri-Met's
- (3) Excludes depreciation

APPENDIX H

Potential Improvements Considered in PHASE I

Surface

- Bus Transit
- Priority Treatment for High Occupancy Vehicles
- Bicycle
- Public Automobile Service
- Highway Improvements

Rail

- Mono Rail
- Light Rail
- Heavy Rail
- Levitating Vehicles
- Palleted Automatic System
- Horizontal Elevator
- Subway
- Peoplemover

Water

- Hydrofoils
- Ferry (Conventional)

Air

- Hele-Bus/Taxi
- Airship

Socio-Economic

- Staggered Work Hours
- Staggered Work Days
- Communication (Travel Substitutes)
- Carpools

Potential improvements are detailed in Interstate Bridge Corridor
Project Phase I Report
Low Cost Improvements
Analysis and Recommendations
Columbia Region Association of Governments
September 1974