COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

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Memorandum December 26, 1974

To: TRANSPORTATION TECHNICAL ADVISORY COMMITTEE (TTAC)

From: Dick Etherington, Transportation Director

Subject: Revised Work Program for the Interstate Bridge Corridor Project and Restructuring of the Project Management Board

Attached herewith is a copy of subject material for your review. So that the work activities may be completed by June 30, 1975, it is important that committee action be taken on January 3 to approve this revised work program. Please review. If there are any questions or problems, please contact this office so that resolution may be made prior to the meeting if possible.

As a result of the recent restructuring of the CRAG Board of Directors and various committees, it was appropriate to re-evaluate the membership of the project management board. In accordance with the CRAG restructuring, it is recommended that this management board will become the Interstate Bridge Corridor Project Steering Committee of the TTAC. It is further recommended that the new membership of this committee be as follows:

1. Clark County - Commissioner Dick Granger
2. City of Vancouver - Councilman Dick Pokornowski
3. Washington Dept. of Hwys. - Pierre Henrichsen
4. ODOT - Bob ~~Royer~~ BOTHMAN
5. Tri-Met - Bill Hall
6. City of Portland - Ernie Bonner
7. Multnomah County -
8. Vancouver-Portland Bus Company - Jerry Peck
9. I-5 Citizen Advisory Committee - Pat Blackwell
10.

Since some of these people are not members of the TTAC, the suggested membership would need approval of the Board of Directors.

In summary, it is recommended that the TTAC approve the revised work program and new committee membership and forward to the CRAG Board of Directors for appropriate action.

INTERSTATE BRIDGE CORRIDOR PROJECT

Revised Work Program

Columbia Region Association of Governments

December, 1974

OBJECTIVE

The objective of the revised work program is to

1) Bring about the creation of a unified, publicly owned and operated mass transit system in the Interstate Bridge Corridor and Clark County,

2) Provide some means of priority movement on I-5 for transit service and other high occupancy vehicles (HOV) and

3) Initiate medium range planning for and evaluation of corridor transportation alternatives.

PREVIOUS WORK

The Interstate Bridge Corridor Project was initiated in late 1973 as a three-phase project designed to address the existing transportation problems in the Interstate 5 corridor between Vancouver and Portland. The objective of the project was to develop solutions which would move people through the corridor more efficiently with primary emphasis on public transportation including consideration of park and ride facilities.

Phase I of the project recommended a number of improvements that would provide relief in the corridor. The analysis indicated that in order to move people through the corridor more efficiently on existing facilities, a unified transit system would have to be established thereby eliminating the necessity for potential transit riders to use as many as three existing transit systems. Specifically, the purchase of the privately owned Vancouver-Portland Bus Company by the Tri-County Metropolitan Transportation District of Oregon (Tri-Met)

was recommended. This, together with recent legislation in the State of Washington (HB-670) to enable the establishment of a county transit system in Clark County, would provide for publicly operated and financed transit service throughout the corridor. It was further found that some method or providing priority movement in the corridor for high-occupancy vehicles (buses and carpools) would be necessary to move people more efficiently and serve as an incentive to increase vehicle occupancy.

From the Phase I analysis, five primary corridors in Clark County were identified as having potential for commuter transit service to five primary employment areas in Portland. Therefore, an extensive level of service would be required between these areas if public transit is to provide any significant improvement in traffic flow in the corridor. Presently, the city-owned Vancouver Transit System operates only within the city while the Vancouver-Portland Bus Company provides service between Vancouver/Hazel Dell and Portland. The Evergreen Stage Line provides limited service from Camas/Washougal and several other locations in Clark County to Portland. With the exception of Vancouver-Portland Bus Company's operation, only a limited amount of transit service is provided between downtown Vancouver and Portland. It is, therefore, apparent that an extensive unified transit system should be provided in the corridor.

From an assessment of the immediate transit needs in the

corridor and the recommendations of Phase I, it seems that the Phase I recommendations are implemented, the initial objective of the project will be fulfilled. It has also been determined during Phase I that there are insufficient staff resources within the local agencies/jurisdictions to implement the recommendations. This revised work program has, therefore, been prepared to enable the CRAG staff to assist the local agencies/ jurisdictions in implementing the Phase I recommendations, conduct a feasibility analysis of priority treatment for high occupancy vehicles (HOV) on I-5, and initiate an evaluation of longer range improvements for a yet to be determined future year.

METHODOLOGY

A joint effort of affected agency personnel and CRAG staff will be provided to carry out the implementation activities of the Phase I recommendations. CRAG staff will conduct the feasibility analysis of priority treatment in the corridor and provide assistance in determining the level and scope of transit service required in Clark County. The staffs of the local agencies with the assistance of the CRAG Staff will develop the necessary information, determine appropriate procedures and initiate proper applications and agreements which will result in the establishment of a county-wide transit entity and a unified transit system. Upon completion of these activities and determination of a forecast year,

CRAG staff will work with the ODOT planning staff in determining longer range alternatives between Oregon and Washington including the impact of opening I-205 on the I-5 Corridor.

Work Activities

The work activities have been segregated into three principal elements; namely, (A) Unified Transit System, (B) I-5 Priority Analysis for HOV and (C) Initiation of Medium Range Corridor Planning. The costs and funding of these activities may be found in the appendix of this material.

(a) Unified Transit System

The creation of a unified mass transit system in the Corridor and Clark County will be accomplished under the direction of the Consolidated Transportation Staff * (CTS) in three major work tasks. The acquisition of the private transit operations by Tri-Met is the first part and the formulation of a transit plan and creation of a transit district in Clark County consist of the other parts. The subsequent narrative provides some details of the work tasks.

A program for providing publicly-owned and operated transit service in the corridor as recommended in Phase I will be developed through a combined effort of CRAG, CTS, Tri-Met, and other affected jurisdictions.

* The Consolidated Transportation Staff consists of two budget responsible staff members each from Washington State Department of Highways, Clark County, City of Vancouver and Regional Planning Council of Clark County.

(See attached chart - Figure 1 - and description contained in the appendix). This will include determining the type and extent of transit service needed in the corridor, the mechanism for providing the service including preparation of operating and financial agreements, federal applications for purchase of privately owned transit systems operating in the corridor, and a method for financing. The primary effort of CRAG staff activities will be to determine the level of service needed in the corridor and to assist in the preparation of an application(s) for federal funds for purchase of the privately-owned transit systems.

Possible approaches to addressing the transit service element would be for Tri-Met to acquire the Portland-Vancouver Bus Company either through purchase or condemnation. Tri-Met could then contract with the City of Vancouver to provide service between Portland and downtown Vancouver where Vancouver's system would connect. Another alternative would be for Clark County and the cities in the county to form a transit district, acquire the Vancouver system and expand it throughout the county and contract with Tri-Met to provide service to downtown Vancouver. Another possibility would be for Tri-Met to extend service into the county as well as to the city. If it is determined that a transit district should be created, service to such areas as

Camas, Washougal, Battle Ground, etc. will have to be addressed which may require acquisition of the rights of the Evergreen Stage Line which presently serves these areas. Each of these alternatives will be explored as required to ascertain the best mechanism for providing the desired level of service. The final mechanism for providing the service will, of course, be a function of the type and scope of service proposed. In addition to developing service levels, an operating mechanism and financing, it will also be necessary to address such items as equipment, staffing, maintenance and storage facilities, revenue collections and voter approval of the transit program. This will be done through a coordinated effort of CRAG and local agency staff with local agencies taking the lead on such items as voter approval and development of a revenue collection procedure.

B) I-5 Priority Analysis

The priority study on I-5 will include feasibility analyses of both a system of ramp control for traffic with priority being given to HOV (buses and car pools) and the feasibility of establishing special use lanes for HOV on I-5, parallel to the flow of traffic, south of the Interstate Bridge.

The first task of the priority treatment feasibility analysis is to determine a strategy for providing an additional lane in each direction on I-5 between the Portland Blvd. and Union Ave. Interchanges. This might be accomplished by

utilizing the shoulder and/or some of the median clearance or possibly some minor structural widening. These improvements will be tested during the peak periods when one lane (southbound in the morning & northbound in the evening) will be reserved for HOV. In addition, a ramp metering system, with bypass provisions for HOV will be devised for testing against the priority lane alternative. This work activity will produce sufficient detail on the alternatives for effective testing.

The second task will consist of compiling data (traffic counts, roadway characteristics, speed, etc.) already available and determining any additional data which may be needed. The additional information may include such data as aerial photography, ramp origin-destination survey during the peak periods, spot speed studies and transit schedules and routes. Also, base maps will be made for all diagrams which will be produced in the work activities. The data will be analyzed to determine the "before" condition by fifteen minute time slices. Diagrams, tables, and graphs will be prepared to illustrate the location and intensity of the operational problems as they build and dissipate.

The next work item consists of testing the two alternatives so that observations may be made about their respective performances. A computer model (PRIFRE) developed at ITTE

in Berkeley, precisely for this type of analysis, will be utilized for this work item. The program will be loaded onto the State of Oregon IBM 370 in Salem with the assitance of ODOT personnel with a remote terminal available to the CRAG staff so that the computer may be accessed directly. After completion of this study the computer program will be available for utilization on other corridors.

After testing the alternatives, the output will be reduced and organized into the same type of diagrams, tables and graphs to illustrate the system differences between the alternatives. In addition, operational and capital costs will be determined, funding sources identified, and other information obtained as required to conduct a feasibility evaluation on the two alternatives.

Finally, a report will be prepared identifying and discussing the procedures, findings and recommendations of the priority treatment analysis.

C) Initiation of Medium Range Corridor Planning

A final element in this work program will be to initiate an evaluation of major transportation alternatives for the I-5 corridor. This will include an assessment of the I-205 opening on the level of service provided by I-5. This assessment will be based on travel projections for a yet to be determined forecast year, perhaps somewhere between 1980-1985. The assessment will also consider the improvement in travel on

I-5 resulting from increased public transportation use and the establishment of priority treatment on I-5 for high-occupancy vehicles to be developed under this project's earlier effort. Using future year forecasts, an evaluation of a number of alternatives will be tested for the I-5 Corridor. This will include but not be limited to busway facilities on I-5 and Union Avenue, and widening of I-5 to six lanes in the present four lane section. It is anticipated that this will be a joint effort of CRAG and the ODOT planning staff and will involve network evaluation by computer analysis.

Because of the scope of this final activity, it is not expected to be completed by the end of the current project period (June, 1975). Completion of this element of the revised work program can be completed under CRAG's continuing planning program and interfaced with other corridor planning activities.

A P P E N D I X

INTERSTATE BRIDGE CORRIDOR PROJECT

REVISED WORK PROGRAM

WORK ACTIVITIES MANPOWER DISTRIBUTION

Elements	CRAG Manpower Manmonths	Estimated Cost
A. Unified Transit System		
Tri-Met Acquisition of V-P Bus Co. & Evergreen State Line	½	1,000
Transit District Plan	5½	11,000
Citizen Input & Activities	½	1,000
Element Total	6½*	13,000*
B. I-5 Priority Analysis		
In House Activities	8	16,000
Other Activities - CRAG	1	2,000
Others	-	16,000
Element Total	9	34,000
C. Initiation of Medium Range Corridor Planning - CRAG	2½	5,000
ODOT/WSDH	-	8,000
Element Total	2½	13,000
PROJECT TOTAL	18	$ 60,000

* This manpower and cost allocation will be supplemented by 8½ manmonths by the Consolidated Transportation Staffs of agencies in Clark County and Tri-Met. Tri-Met has already developed much useful information.

INTERSTATE BRIDGE CORRIDOR PROJECT

I-5 PRIORITY ANALYSIS

OTHER WORK ACTIVITIES

Activity	Source	Estimated Man Months	Cost Estimate
Traffic Counts	SHD's	.6	$1,000
Spot Speed Data & Reduction (Am & PM)	SHD's	.5	750
Ramp O-D Survey (Evening)	SHD's	.6	1,000
Computer	ODOT		4,500
Computer Programming	ODOT/CRAG	1.3 (1.0)*	2,000
Computer Terminal Access			1,000
Adm., Mgmt & Technical Assistance	ITTE		750
Photogrammetry	CONST.		2,500
Ramp O-D Data Processing	PSU/ODOT	1.0	1,500
Computer Key Punch / Terminal Typing	CRAG/ PSU/ODOT	.6	1,000
Total Estimate			$16,000

* CRAG manpower costs include this amount.

INTERSTATE BRIDGE CORRIDOR PROJECT

REVISED WORK PROGRAM

REVENUE FROM PARTICIPATING AGENCIES

AGENCY	AMOUNT
Washington State Department of Highway	$ 16,300
Oregon State Highway Division	10,900
U.S. Urban Mass Transit Administration	26,200
City of Vancouver	1,100
Clark County	1,100
City of Portland	550
Multnomah County	550
Tri-Met	3,300
Total Revenue	$ 60,000

Note: These funds are the balance of the original commitments to the project and, therefore, do not represent additional financial commitments.

Chart III

WORK PROGRAM DETAIL

FOR THE

FORMATION OF A UNIFIED TRANSIT SYSTEM

In order to supplement the main text of the description of this work program pertaining to the establishment of a unified transit system the following information is provided. It has been organized in such a manner so as to accompany Figure I; namely, acquisition of the private operations by Tri-Met, development of a county wide transit plan and formation of a Transit District.

Acquisition of the Private Operations.

Much of the staff work required for this portion of the work program will require the expertise of trained legal personnel. The legal ramifications of acquisition will first be determined. When all constraints have been identified, an appraisal of Vancouver-Portland Bus Co. (VP Bus) will be conducted. The results of the appraisal will form the basis for negotiations to purchase VP Bus. When an agreement on purchase price and procedure have been reached, staff will prepare and submit to UMTA, a proposal to obtain federal funding to execute the purchase agreement.

In addition to acquiring VP Bus, investigation into the need to acquire Evergreen Stage Lines will be conducted. Should this investigation indicate a need to

acquire Evergreen, an appraisal of the company will be obtained and preliminary work on procurement conducted.

Formulate Transit Plan - In the initial activities, in regard to the development of the transit plan, potential routes for providing service to Clark County will be developed. Existing routes (Vancouver Transit and VP Bus) will be analyzed to determine their effectiveness and modified where necessary. Other routes to serve populous, unincorporated areas and outlying communities will be identified. Operational costs for the routes will be determined for each of the levels of service which can be feasibly implemented throughout the transit district. Other service possibilities such as special transit for handicapped, dial-a-bus, etc. and system amenities will be identified. Related considerations such as administrative structure, a marketing program, and legal constraints will also be analyzed during the initial phase of the project.

As a next step, staff will determine patronage estimates, identify funding sources and estimate system revenues for the various levels of service. Costs will be attached to levels of service and the amount of required subsidy determined. With this information staff will be able to weigh the economic,

social, environmental and political consequences of the various levels of service so that the decision makers may select the most desirable level of service.

Opportunities for interagency agreements between the transit authority and Tri-Met will be determined, analyzed, and evaluated. Those opportunities which can be implemented will be identified and draft agreements prepared and distributed to appropriate agencies.

Staff will utilize available information on level of service, routes, organizational structure, costs and marketing program to develop an operations plan. Interim arrangements needed to continue providing transit service during the transition period should also be investigated and a procedure for such developed. The capital needs of the system will be identified and costed. A preliminary estimate of operating costs (including administrative, planning & other incidental costs) will also be made. As a final step, a means of financing the system which is compatible with the goals and objectives of the system and is in harmony with the countie's capability to finance the system will be recommended. All pertinent findings and conclusions will be published by the staff.

Formation of a Transit District - The first step in forming the Transit District will be the development of a

Citizen Participation task force. This group will work with local political leaders to develop goals and policies under which the planning process will proceed. Throughout the planning process, this group will provide input to the planning staff and assist elected officials in decision-making at various points as to the selection of a level of service, the development of an operations plan and the selection of revenue sources. Experiences that other jurisdictions have had in developing transit districts will be documented for the purpose of recognizing possible opportunities and pitfalls. Political leaders and involved citizens will conduct public relations and marketing efforts to obtain community support for the plan.

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum December 26, 1974

To: Transportation Technical Advisory Committee (TTAC)

From: Dick Etherington, Transportation Director

Subject: Interstate Bridge Corridor Project Staff Report on Proposed Development Tomahawk Island

In response to a request from Multnomah County for information on the impact of traffic generated by the proposed developments on Hayden and Tomahawk Islands on the operation of I-5. Enclosed is a report prepared by the Interstate Bridge Corridor Project Staff on the Tomahawk Island proposal.

Sufficient information on the Hayden Island proposal was lacking; therefore, it was not possible to quantify that impact. However, based on the findings of the Tomahawk Island proposal it is apparent that the Hayden Island development proposal would result in substantial adverse consequences on I-5.

This report is being sent to you for TTAC review, approval and transmittal to the CRAG Board of Directors. The transmittal to the Board is for adoption of the finding that the proposed Tomahawk Island development causes undesirable impacts on I-5 and approval of the development should be considered in the light of the need for an acceptable alternative for transportation access to the proposed development.

INTERSTATE ROUTE 5 TRAFFIC IMPACT

OF

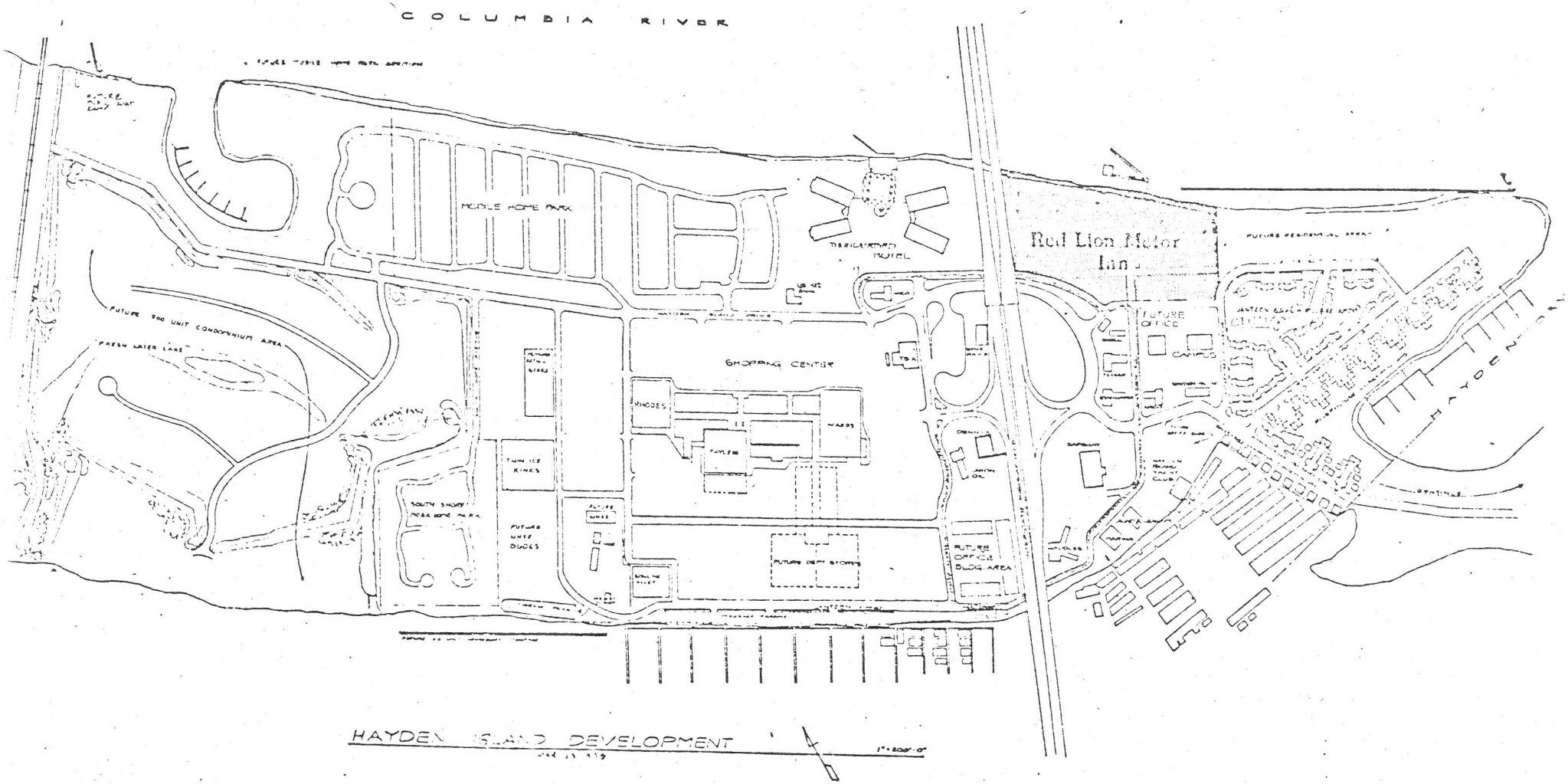
TOMAHAWK ISLAND PROPOSED DEVELOPMENT

Prepared by the Project Staff under
the direction of the Project Management
Board for the Interstate Bridge Corridor
Project.

November, 1974

Columbia Region Association of Governments

Portland, Oregon



HAYDEN ISLAND DEVELOPMENT

SUMMARY AND FINDINGS

At the October 18, 1974 Project Management Board Meeting, the project staff was instructed to determine the impact on Interstate Route 5, resulting from the traffic generated by the proposed Tomahawk Island Development. Using the data obtained from Multnomah County, the number of generated trips were estimated, distributed and superimposed on the existing I-5 and Hayden Island Interchange (I.C) traffic. A weave analysis was conducted between the Union Avenue I.C. and the Hayden Island I.C. "before" and "after" the marginal trips from the proposed development were added. It was conducted for southbound traffic in the morning and northbound in the evening. It was found that the additional trips generated from the proposal had serious adverse impacts on the operation of the freeway during the morning and evening peak hours. A critique of Hayden Island Incorporated's analysis of traffic impacts of the new development was also conducted. This traffic analysis was found to be lacking in many respects. It would be entirely appropriate for a more detailed traffic analysis to be conducted by a professional traffic/ transportation engineer.

INTRODUCTION

In late 1973 several public agencies in Oregon and Washington established the Interstate Bridge Corridor Project. The purpose of this project is to address and resolve some of the traffic operational problems which exist in the corridor due to the excessive demands placed on the Interstate Route 5 facility. The project is directed by a project management board which was set up by the CRAG Board of Directors. Members of the Project Management Board include representatives of the Oregon State Highway Division, Washington State Department of Highways, the Cities of Portland, and Vancouver, Multnomah and Clark Counties, and the Tri-County Metropolitan Transit District of Oregon (Tri-Met).

Interstate Route 5 is the only existing highway facility between Clark County and Multnomah County. More than 16,000 workers use the I-5 Freeway to commute between their homes and places of work. In addition, the highway is a major interstate route connecting the Portland metropolitan area to Seattle, Vancouver, B.C. and other points north. The Interstate Bridges provide the only Columbia River crossing for approximately 45 miles in either direction. The bridges are of significant regional importance because (1) they are a major link between two segments of a metropolitan region, (2) the freeway is a major link of commerce on the interstate system, and (3) the freeway

is presently congested during the peak periods. Therefore, it is desirable that the project management board comment on any proposed major residential, commercial and/or industrial development that will significantly increase traffic volumes in the corridor thus increasing the congestion on the freeway. Since Interstate Route 5 is the only highway connecting Hayden and Tomahawk Islands with the mainland, the traffic generated by any new development on these islands must use the I-5 facility to reach any destination not located on the Islands. Also much local island traffic must use one or the other intersection at the freeway ramp terminals in order to cross the freeway. Therefore, it is anticipated that significant new development on Hayden and/or Tomahawk Islands will seriously impact the already overcrowded Interstate Route 5 facility.

GENERATED TRIPS

Traffic congestion in the I-5 Corridor is most critical during the morning and evening peaks periods when most of the region's labor force is traveling to and from their places of work. For this reason, analysis of the traffic generated by new development on Hayden and/or Tomahawk Islands will focus on work and commercial trips originating or terminating at the island during the morning or evening peak hours. It is acknowledged that the commercial and recreational generators obtain peak generation during the transportation off peak. However, the impacts should be explored during the transportation peaks because small increases can cause serious problems. For this study, only work and commercial trips were considered (recreational trips are assumed to be minimal during peak hours).

The 1970 census data indicates that average dwelling unit occupancy on Hayden and Tomahawk Islands is 2.2 persons per unit. Average auto ownership rate on the islands is about 1.4 autos per dwelling unit. Assuming that these figures will reflect future conditions, the 601 units proposed for the Tomahawk Island development will house about 1,320 persons who will own 840 autos. With this information, the number of work trips made by island residents on any given day can be determined by the following PVMTS * trip generation equation:

$$HW=(-.135 + .210\ (NOPR/Du) + .703\ (NOAU/Du)\ \ Du$$

Where:

HW - Auto Person Work Trips
NOPR - Number of Persons
Du - Dwelling Units
NOAU - Number of Autos

$$HW = (-.135+.210\ (1320/601) +.703\ (840/601))\ \ 601= 790$$

*Portland-Vancouver Metropolitan Area Transportation Study

Since 790 represents total daily person trips, it is necessary to convert this figure to the number of autos that 790 persons would use to commute to work. This is done by dividing 790 by the average auto work trip occupancy factor (1.23). To isolate the number of autos moving in the peak hour, the number of autos are multiplied by the AM work trip peak hour factor (.385), which is taken from the Interstate Bridge Corridor Project demand modeling process. The number of Auto work trips in the AM peak hour was approximately 250. The distribution of these trips is discussed later in this analysis.

Using a figure of 300 square feet per employee (Environmental Impact statement - Clackamas Town Center), the commercial area of the Tomahawk Development would employ about 550 workers, since there is a 165,000 square feet of commercial area planned. From the average trip generation rates, used by the Puget Sound Governmental Conference (13 trips/employee) for sub-regional shopping areas, the 550 employees were found to represent 7150 person trips attracted to the commercial complex, or 4660 auto trips (based on a PVMTS occupancy rate of 1.5 persons per auto for shopping trips). Based on an estimated 7% of shopping trips moving in the evening peak hour (NCHRP Report #24), 320 auto shopping trips will be made to Hayden/ Tomahawk Islands in the PM Peak Hours. Assuming the return of the AM Peak Hour 250 auto work trips during the PM peak hour, the total increase (shopping trips & work trips) is estimated at 575 vph (vehicles per hour).

Applying the distribution principles used by the Interstate Bridge Corridor Project staff, it was found that 34% of Hayden Island trips are destined for Washington. On this basis, 80 vph originating at Tomahawk Island in the AM peak period were assigned northbound on I-5 while 170 vph were assigned in the southbound direction. In the evening peak hour, 190 vph were attracted to Hayden Island from the north and 380 vph were attracted from the south. These trips were added to the existing network (see Figure I). These attracted trips are in the direction of Tomahawk Island, therefore, these trips must be coupled with the produced trips in the opposite direction of flow which were computed and also added to the network. To obtain this opposing flow, directional splits of 75/25 for the AM period and a 60/40 split for the PM period were used. This amounted to 30 vph from Washington and 60 vph from the south during the AM peak hour. Similarly, in the PM peak hour, 130 auto trips are expected to travel north and 250 south from Hayden Island.

CAPACITY ANALYSIS

In order to evaluate the impact of the Tomahawk Island proposed development on the I-5 facility, a weave analysis was conducted with and without the traffic generated from the development. The location of the study was between Union Avenue I.C. and Hayden Island I.C. This does not imply that there will not be impacts elsewhere but the analysis revealed detrimental effects of a serious nature. Further roadway capacity analysis at Portland Blvd. I.C. for example would be redundant because congestion on Hayden Island during the peak hours will cause the traffic flow breakdown to propagate upstream for miles.

A Weave Analysis was conducted to determine the level of service (LOS), using the methods of the 1965 Highway Capacity Manual, which prevailed in March, 1974. The analysis determined the LOS for the AM peak hour in the southbound direction, using the multiple weave procedure and the simple weave procedure for the PM peak hour in the northbound direction. A conclusion was derived from this analysis.

The AM peak hour southbound traffic flow operates at the maximum LOS "E" nearly LOS "F" and the PM peak hour northbound also operates at LOS "E". The LOS "E" means that traffic flow travels at 30 to 35 mph, is unstable, and can easily break down to forced flow (stop and go movement). Forced flow is LOS "F" which does not improve until the demand is substantially reduced (until the peak period is over).

The apparent concern is simply that the additional traffic growth will intensify or compound the existing operational problem on Interstate Route 5 and result in forced flow (LOS"F"). This conclusion, however, does not imply that additional demand growth is undesirable. Additional growth can be accommodated provided the vehicle occupancy is increased to serve the marginal travel demand.

Indeed the concern is justified because the weave analysis with the Tomahawk Island generated traffic added to the existing traffic resulted in a LOS "F" during both peaks through the weaving sections. Clearly, additional facilities, highway and/or transit, are needed to accommodate trips generated from this proposed development. The following table summarizes the results.

TABLE I

Interstate Route 5
Union Ave. to Hayden Island
Weave Analysis

	Southbound AM Peak Hour	Northbound P.M. Peak Hour
Lanes Available	3.0	3.0
W/O Development		
Lanes Required LOS "D" [1]	3.8	3.3
Lanes Required LOS "E" [2]	3.0	2.6
Prevailing LOS	"E"	"E"
W/Development		
Lanes Required LOS "D"	4.4	4.1
Lanes Required LOS "E"	3.6	3.
Prevailing LOS	"F" [3]	"F"

1. Operating speeds of about 40 mph. Traffic is approaching flow unstable.
2. Operating speeds of about 30-35 mph. Traffic is approaching flow unstable
3. Operating speeds of 0-30 mph. Forced flow - stop and go.

CRITIQUE OF TOMAHAWK ISLAND TRAFFIC AND TOTAL INTERCHANGE TRAFFIC ANALYSIS

Hayden Island Inc. conducted a traffic analysis to evaluate the impact of the proposed development of Tomahawk Island on the transportation facilities on Hayden Island. In determining the traffic impact on I-5, a critique of this traffic analysis was performed by I-5 project staff and revealed limitations and inadequacies.
An important aspect of any traffic analysis to define the study area, including the transportation facilities, which is the area of significant influence. This analysis completely ignored any impact on I-5 and did not include all of the affected facilities on Hayden Island.

The trip generation for commercial and recreation areas was based solely on the number of parking spaces available and an undocumented assumed usage time. It did not consider the probable multi-use of parking areas (i.e. using office parking for evening

commercial or recreational purposes.) Trip generation usually results from multiple linear regression analysis and the factors or variables affecting the generation are determined within levels of statistical significance. In many studies, three or four variables are used. Parking availability, in most cases, is not one of them (PVMTS, PSRTS & BATS). The "Tomahawk Island Traffic Analysis" correctly points out that the peak hours at the commercial and recreational complexes do not occur during the peak hour on I-5. However, this analysis does not estimate the commercial generation during the I-5 traffic peaks. It has been reported that 60% (NCHRP Report #24) of the shopping center peak trips occur during the PM peak hour of the street network near the shopping center.

The analysis also indicated the alternative paths to I-5 for the trips generated on Tomahawk Island, but did not address how the interaction of this traffic and other traffic is expected to occur. It may be that secondary route alternatives will be congested.

Assumptions on trip distribution were not documented and found to differ considerably from the demand modelling results of the I-5 Project work.

The capacity of 1,555 vph for the northbound off-ramp should be questioned. While it may be true that 1555 vph may exit the freeway, those vehicles must be accommodated on local facilities. One must also consider the capacity of the intersection which will soon be signalized at the ramp terminal. The capacity will more closely approximate 1,000 vph, considering the signalized intersection, two lane approach from the off-ramp, alignment and the grade of the intersection. Volumes such as 1555 vph on two lane arterials need tangent, non grade alignment with substantial storage at signals. Such a volume in this case would cause queuing backups on the freeway.

The approach to the total interchange capacity used in this analysis could not be found in any publication available to the project staff including:

1) Highway Capacity Manual 1965
2) Highway Capacity Manual 1950
3) ITE Handbook
4) AASHO Rural 1965
5) Pignataro - Traffic Engineering
6) Oglesby & Hewes - Highway Engineering
7) Miscellaneous Transportation Research Board reports on capacity

This analysis divided the sum of the parking 5920 spaces on Hayden Island into the total interchange volume (26,000 vph) for an unspecified hour and declares "each parking space

generates 4.39 movements per day." First, it has been implied previously that parking availability did not sufficiently correlate with trip generation. There are more reliable factors or variables to consider. Second, the generation rate on a daily basis was made from an hourly volume which is mathematically inconsistent. In addition, the assumption was made that the Tomahawk Island development would be the only additional development on the islands. It should be pointed out that a proposal has already been made to construct a large hotel-restaurant complex on the island. The environmental impact statement on the Red Lion Motor Inn,by the developers,indicates that daily traffic in the corridor would be increased about 1.5% by this development though much of the increase would occur outside of the peak period (EIS Red Lion Motor Inn). Other developments which would increase travel demand in the corridor includes the further expansion of the Jantzen Beach Shopping Center, and the development of secondary and tertiary stores and services that generally follows residential and commercial growth.

In conclusion it may be stated that the "Tomahawk Island Traffic Analysis" is lacking in several areas and should <u>not</u> be considered a reliable basis for decision-making. The analysis tends to be misleading and incorrectly implies little or no impact will occur by the proposed development on I-5 during the peak periods.

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum January 3, 1975

To: TRANSPORTATION TECHNICAL ADVISORY COMMITTEE (TTAC)

From: Dick Etherington, Transportation Director

Subject: TOMAHAWK ISLAND REPORT and INTERSTATE BRIDGE REVISED WORK PROGRAM ADDITIONS AND/OR CORRECTIONS

Reference is made to these materials transmitted to you for this meeting. The first document should be changed as follows: Table I (page 5) under "northbound PM peak hour" for "lanes required LOS "E" w/ development" should read 3.4, footnote 2 (second statement) of the same table should read "Traffic flow is unstable" and line 9 of paragraph 4 on page 6 should read "four lane arterials" rather than "two lane arterials". The revised I-5 Work Program had two pages inverted - page 8 and Chart II. The new name of the project management board should be the Interstate Bridge Corridor Project Task Force rather than Steering Committee as indicated on the cover memo. The tenth member of the Project Task Force will be from the City of Camas and will represent the smaller cities in Clark County. The name of the individual has not yet been determined. Chart I-A and Figure 2 has been included to supplement the information you have already received.

ELEMENT B: I-5 PRIORITY ANALYSIS

	ACTIVITY	RESPONSIBLE AGENCY	ESTIMATED MANMONTHS
1.	Defining & determining system alternatives	CRAG	.4
2.	Data Collection Speed & Counts	ODOT/WSDH	1.1
	Ramp O-D Survey	ODOT/WSDH	.6
	Transit Data	CRAG	.3
	Aerial Photo	ODOT (CONSUL)	--
3.	Data Analysis	CRAG	2.8
	Ramp O-D Data Processing	ODOT/PSU	1.6
4.	Computer Modeling Preparation of Data & Testing Systems	CRAG	2.1
		ODOT	1.0
5.	Analysis of Output	CRAG	.8
		ODOT	.3
6.	Feasibility Determination	CRAG	1.0
7.	Preparation of Report	CRAG	.7

CHART I-A

THE CITY OF
PORTLAND
OREGON

OFFICE OF
PLANNING AND DEVELOPMENT
GARY E. STOUT
ADMINISTRATOR

1220 S.W. FIFTH AVE.
PORTLAND, OR. 97204

13 December 1974

MEMORANDUM

TO: Commissioner Grainger

FROM: Bill Dirker, City Transportation Coordinator

SUBJECT: I-5 Corridor Project

I attended a meeting of the Multnomah County Division of Land Use Planning staff on December 11th regarding the development on Tomahawk Island. This was in response to the material forwarded to the Project Management Board by Hurvie Davis. The staff was accumulating the concerns of various interest groups to be presented in their staff report to the Planning Commission in the near future. This will lead to a formal public hearing now scheduled for February 4th by the Planning Commission. Apparently two major actions are required and the first in sequence is a change to the County Comprehensive Plan. If this change is approved at a later time the zone change must be approved.

I express the concerns of the Project Management Board as outlined in the draft resolution which the staff has prepared. I stressed that this is a matter of broad regional concern due to the uniqueness of this corridor, with no other route for 45 miles in either direction and also due to the peculiar traffic operational problems at this location with the weaving and interchange merging. I stress that it was not the Project Management Board's view that it had a responsibility for Land Use Planning, that it did feel that the responsible bodies, ultimately the Multnomah County Commission, should be fully informed of these regional concerns.

We now understand that there is an additional and larger development contemplated by the Hayden Island Corporation to the west of the present development on Hayden Island. Obviously this would more than compound an already difficult situation. It may well

be that the Project Management Board would like to make a recommendation through the Transportation Committee to the CRAG Board of Directors that these projects be reviewed for compliance with the Interim Development Policy. Both of these areas have limited or no public services and clearly exceed the transportation capacity of the area. I am not sure what actual authority exists in this matter. I don't believe Multnomah County has adopted the Interim Development Policy. However, a good posture for CRAG to take may be one of responsible persuasion.

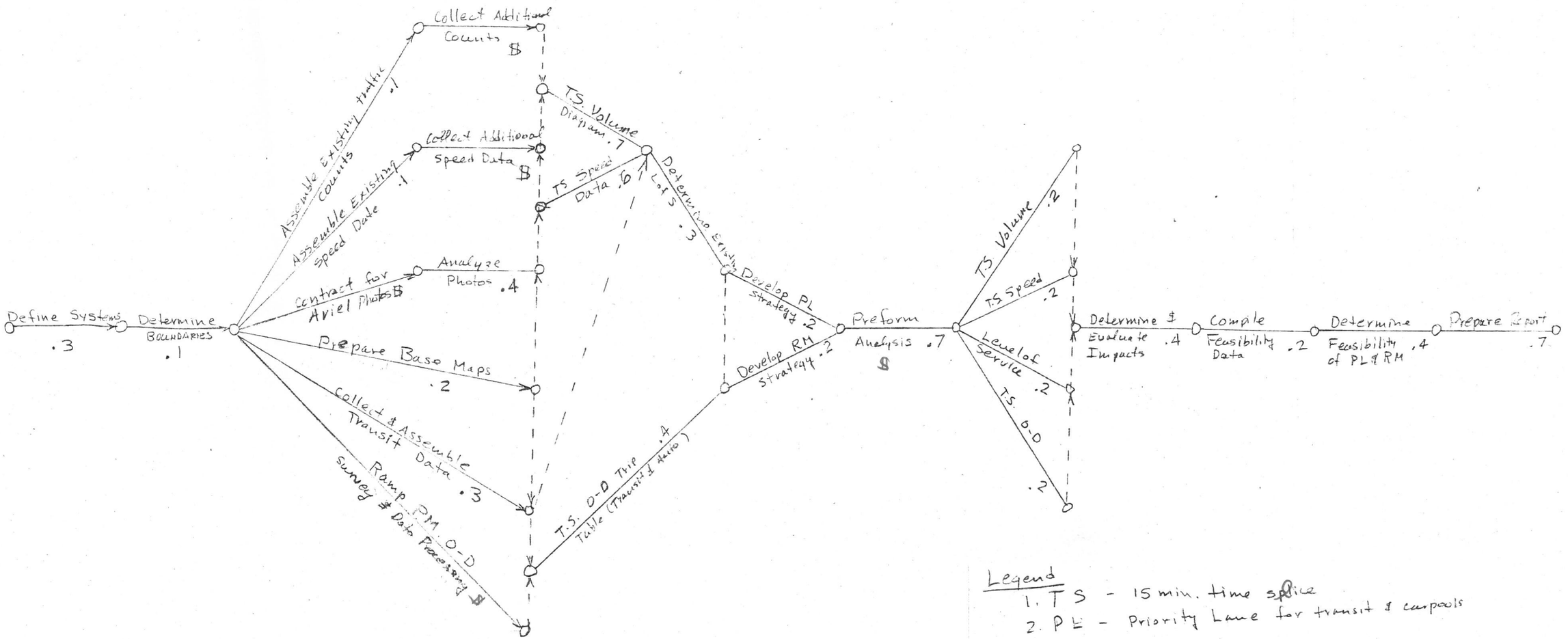
BD:bn
cc Ernie Bonner
Gary Stout
Hurvie Davis

INTERSTATE BRIDGE CORRIDOR PROJECT

I-5 PRIORITY ANALYSIS

PRIORITY LANE
&
RAMP METERING

"PERT DIAGRAM"



Legend

1. TS - 15 min. time slice
2. PL - Priority Lane for transit & carpools
3. RM - Ramp metering
4. $ - Work to be done by Others

FIGURE 2

12/6/1

I-5 Corridor Work Program
Pr Hearing Date

Transit Program
acquisition of Private Carrier — Tri Met

Transit Plan - Lead by Jenis — CRAG + Tri Met + Clark Co. Trans.

Transit District — Craig

Priority ~~Lane~~ Treatment / H.O.V.
Feasibility — CRAG

Corridor Impact / I-205 + Transit

Tomahawk Island Project

I
a. IS Consider Project
b. Consider Study by CMAL
c. OSHD Improvement
d. Tri-Net operations
e. ISS Study

II

Major Regional Concern
Hayden Island Key Executive Point

10/15

I 5 Corridor Project

1. Is there any prospect that Phase II will recommend actions to increase capacity or decrease demand that will not be large scale in cost and time?

2. How much money is committed to complete the project from local and UMTA Technical Studies grant?

3. What steps can be taken now to restructure the study to incorporate it into the CRAG Corridor Development program and Tri-Met STS?

Ferry Operation

15 minutes to load, load + turnaround
a 100 car ferry + ticketing
10 hour week

The boundary for the modeling process geographically (Figure 1) consisted of the CRAG region. The traffic zone composition is treated in Appendix A and illustrated in Figure II. In terms of variables the boundary included 1973 and 1980 population and employment, work force factors and travel times. This is discussed in Appendix B. Since this model was static in nature, time was not a variable; however, it does possess a time domain of seven years. The selection process of the actual mathematical equation was based upon the review of several. The conventional gravity model was considered as well as the opportunity intervening model. However, for this process the electro-static model was selected inasmuch as it was simpler and cheaper. After a computer program flow chart was prepared a program was written. This information together with additional detail of the model is contained in Appendix C.

Model Output

The output of the model was in the form of trip tables which were combined (Table I) for easy comparison. To further illustrate the results and calibration figures III and IV were prepared. In addition, a generalized overall impact of the model may be obtained merely by viewing the trips using the Interstate Bridge southbound in the morning.

Condition or Policy	Auto Trips in AM Peak Hour
1973 Count (During O-D Survey)	4440
1973 Model Estimate (Calibrated)	4310
1980 Model Estimates	
Continuation of Existing Trends (CET)	5040
Suburban Employment Center (SEC)	4850
Staggered Work Schedules	4510

This output of the bridge traffic suggests that staggered work schedule policy should probably receive more immediate attention than either of the other two.

Findings and Recommendations

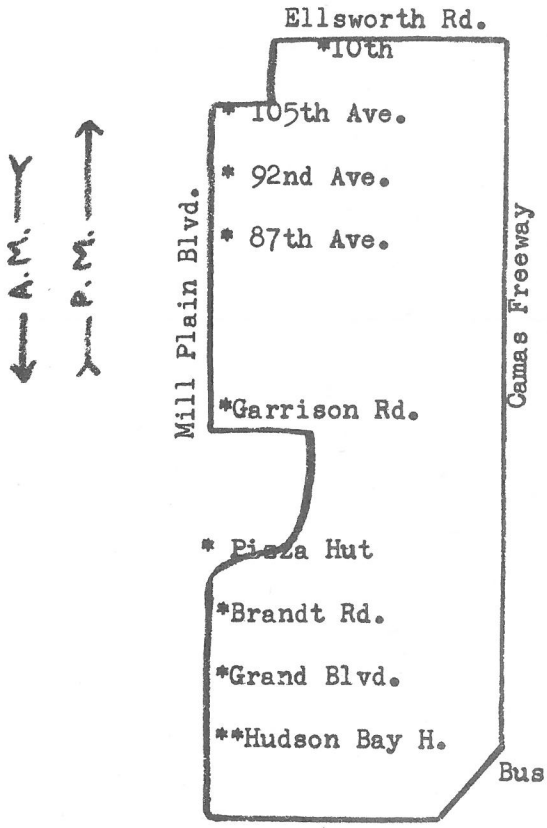
A review of the traditional or contemporary transportation models (and planning process) has led to a list of problems:

1. The models consume too much money, manpower and time.
2. The evaluations of alternatives is often too costly.
3. The modeling process is generally insensitive to policy.
4. The models require too much data.
5. The models are not well understood by decison-makers and sometimes by the modelers themselves.

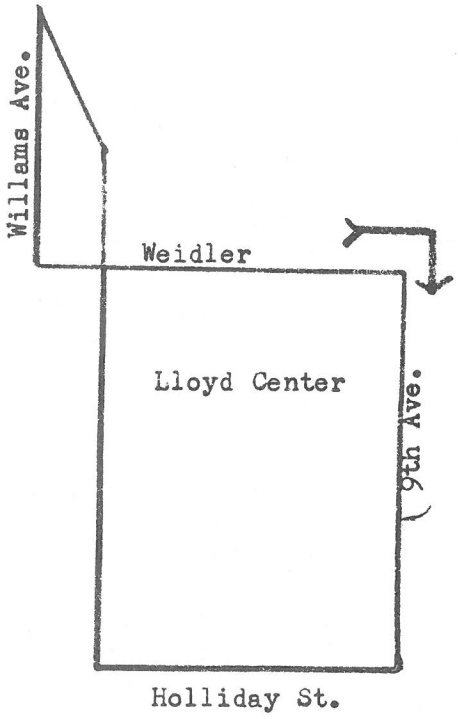
Now Running....

Mill Plain to Portland Buses

Leaves Ellsworth and 10th
at 6:35 a.m. and 7 a.m.



Leaves 9th and Holliday (Lloyd Center)
4:25 p.m. and 5:15 p.m.



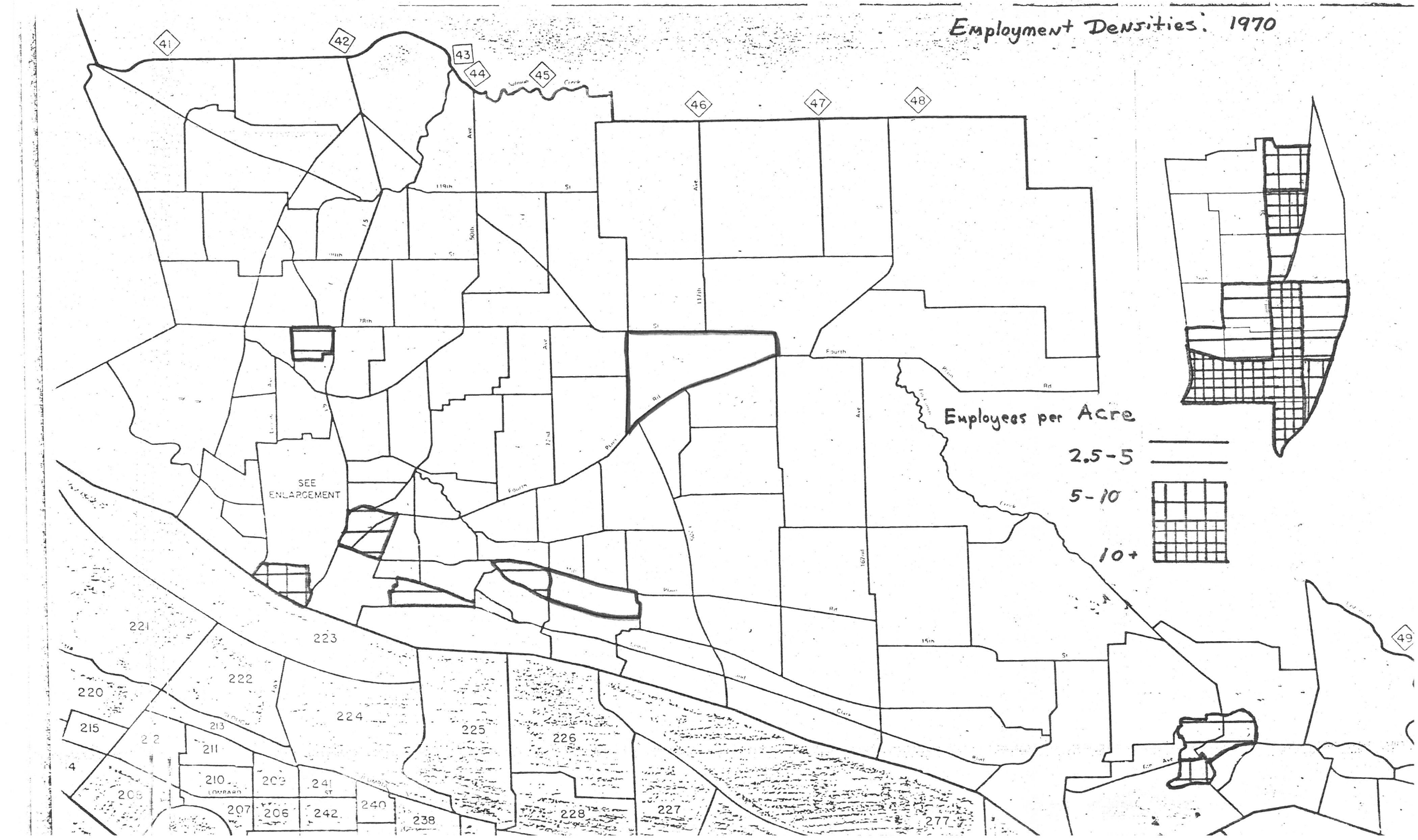
Now you can commute directly to Lloyd Center from Mill Plain or make a quick transfer in downtown Vancouver to downtown Portland. All at these low fares:

25 ride commuter books	$15.00
10 ride commuter books	$ 6.50
Cash per ride	75¢

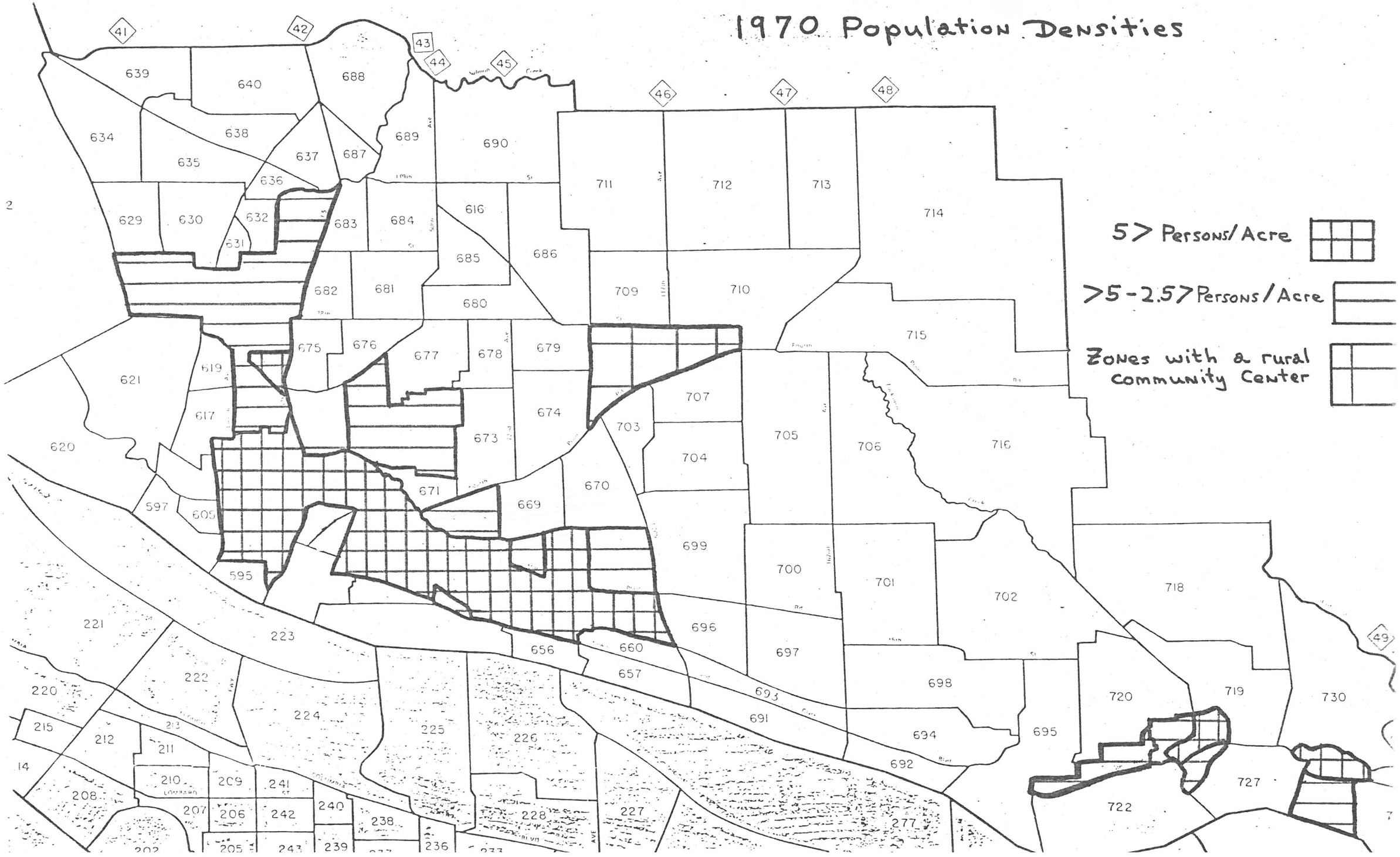
NO WAITING FOR CHANGES AS SCHEDULES ARE PLANNED FOR QUICK TRANSFERS.

VANCOUVER TRANSIT
OPTIONAL ROUTE FOR VP
FIRST OPPORTUNITY FOR VP STOP
POOR LOCATION FOR V-P STOP.
V-P TRANSIT
INGALLS ST.
HARNEY
GRANT STREET
FRANKLIN
ESTHER
DANIELS
COLUMBIA
WASHINGTON
MAIN
BROADWAY
VANCOUVER FREEWAY

Employment Densities: 1970



1970 Population Densities



SCENARIO IV. County Wide Transit Service

Route	Mileage (One Way)	Cost/ run	Daily Rnd Trips (Weekdays)	Headways	Cost/Day	Weekend Service (Trips)	Weekend Cost/ Weekend	Total Op Cost/ Yr.	Required Buses
Hazel Dell-9th Ave.	5.7	11.40- - 14.25	17	60' 30pk	$193- $242	11	$125- -$157	$55,939- 69,924	
Hazel Dell-Anderson Ave.	5.5	11.00- 13.75	17	60'	$187- -234	11	$121- -151	53,977- 67,471	
Rosemere-Minnehaha	4.1	8.20 -10.25	30	30'	$246- -$307	26	$213- $267	73,816- 92,270	
Walnut Grove	9.8	$19.60- -24.50	13	60'	$254- 319	11	$216- -$270	76,185- 95,231	
Fourth Plain	8.4	$16.80 $21.00	47	30' 15'pk	$790 987	47	$790- -987	242,407- 303,009	
Battleground Express	9.8	19.60- -24.50	6	120'	117- 147	6	117 147	36,103- -45,129	
Burton	8.6	17.20- -21.50	13	60'	224- -280	11	189- -237	66,856- -83,571	
Mill Plain *	7.6	15.20 19.00	43	30' 15'	653- -817	43	653 817	200,655- 250,819	
Evergreen-Heights	6.6	13.20- 16.50	13	60'	172- -215	11	145- 182	51,308- -64,136	
Evergreen-South	6.9	13.80- -17.25	13	60'	179- -224	11	152 190	53,641- 67,050	
Camas-Washougal Express *	16.5	33- 41.25	13	60'	429 536	17	561- 701	138,567- -173,208	

SCENARIO IV. County Wide Transit Service

Route	Mileage (One Way)	Cost/ run	Daily Rnd Trips (Weekdays)	Headways	Cost/Day	Weekend Service (Trips)	Weekend Cost/ Weekend	Total Op Cost/ Yr.	Required Buses
Fruit Valley	4.1	$ 8.20- $10.25	13	60'	$106 133	11	$ 90- 113	$31,873- 39,842	
Industrial Shuttle	6.2	$12.40- 15.50	6	-	$ 74.- 93.	-	0	$18,972- - 23,715	
Cap Hill	3.7	$ 7.40- 9.25	26	30'	$192- $251	22	$163- 203	$57,527- 71,910	
Dial-a-Bus (2 routes)	--	--	-- (Operates 15 hrs/ day)	--	? $539 @(17.97	0	0	? - $137,445	
TOTALS	113.5		289			217		$1,295,271 1,584,730	

SCENARIO III: Transit Service For The Urban Area

Route	Mileage	WEEK			WEEKEND		TOTALS	
		Cost/run	Daily Rnd Trips (Weekdays)	Headways	Cost/Day	Weekend Service (Trips)	Weekend Cost/ Weekend	Total Op. Cost/ Year	Buses Required
Vancouver-Portland **	8.8								
Hazel Dell Express **	3.3								
Hazel Dell Local	5.7	$11.40--$14.25	13	60'	$148--$185	11	$125--$157	$ 44,312--$ 55,389	
Fruit Valley-29 St.	7.3	$14.60--$18.25	13	60'	$190--$237	11	$161--$201	$ 56,750--$ 70,937	
Capitol Hill	3.7	$ 7.40--$ 9.25	26	30'	-$192--$241	23	$170--$212	$ 57,912--$ 72,391	
Minnehaha-Rosemere	4.1	$ 8.20--$10.25	27	30'	$221--$277	27	$221--$276	$ 67,969--$ 84,962	
Fourth Plain	8.3	$16.60--$20.75	24	60' 30'pk	$398--$498	24	$398--$498	$122,308--$152,886	
Mill Plain *	7.6	$15.20 $19.00	43	30' 15'pk	$653--$817	43	$653--$817	$200,655--$250,819	

SCENARIO III.

Route	Mileage	Cost/run	Daily Rnd Trips (Weekdays)	Headways	Cost/Day	Weekend Service (Trips)	Weekend Cost/ Weekend	Total Op. Cost/ Year	Buses Required
Evergreen--Heights	6.6	$13.20 $16.50	13	60'	$171- $215	11	$145- -$182	$ 51,308 $ 64,136	
Evergreen South	6.9	$13.80 $17.25	13	60'	$179- -$224	11	$151- -$190	$ 53,641 $ 67,051	
TOTALS	62.3							$654,828*** $818,571***	

*Includes Sunday Service. All other weekend service is Saturday only.

**Costs presently being computed by Tri-Met.

***Totals are incomplete pending receipt of additional data.

SCENARIO II: De Leuw Cather 1975 Plan

Route	Mileage (One Way)	System Cost/run (1975 $s)	Daily Rnd Trips (Weekdays)	Headways	Gross Cost/Day	Weekend Service (Trips)	Weekend Cost	Total Op.Cost/ Yr.	Buses Required
Vancouver-Portland *	8.8								
Hazel Dell *	6.2	$ 6.20 $-7.75	19	60' 30 pk	$118- -$147	19	$118- -$147	$36,226- -$45,206	1 2 pk
Rosemere	3.8	$ 7.60 -$ 9.50	27	30'	$205 -$257	27	$205- -$257	$62,935 $78,899	
Kaufman	4.2	$ 8.40 -$10.50	26	30'	$218- -$273	21	$176- -$221	$64,742- - 81,107	
Fourth Plain North	6.6	$13.20 -$16.50	13	60'	$172- -$215	11	$145- -$182	$51,400 $64,289	
Fourth Plain South	6.5	$13.00 -$16.25	13 13	60'	$169 -$211	11	$143 -$179	$50,531- -$63,113	
Washington-McLoughlin	6.8	$13.60 -$17.00	13	60'	$177- - 221	11	$150- -$187	$52,935 $66,079	
Fruit Valley-E. Vancouver	6.6	$13.20 -$16.50	13	60'	$172 -$215	11	$145 -$181	$51,400- $64,237	
TOTALS	49.5							$ 431,436** $ 515,217**	

*Includes Sunday Service. All other weekend service is Saturday only.

**Totals are incomplete pending receipt of additional data.

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

D 1 R K 12 A

Memorandum December 3, 1974

To: Members of the Project Management Board

From: Myrna Parish

Subject: Project Management Board Meeting

Please include the enclosed report ("Interstate Route 5 Traffic Impact of Tomahawk Island Proposed Development") with the other material recently mailed for your review for the next Project Management Board meeting.

INTERSTATE ROUTE 5 TRAFFIC IMPACT

OF

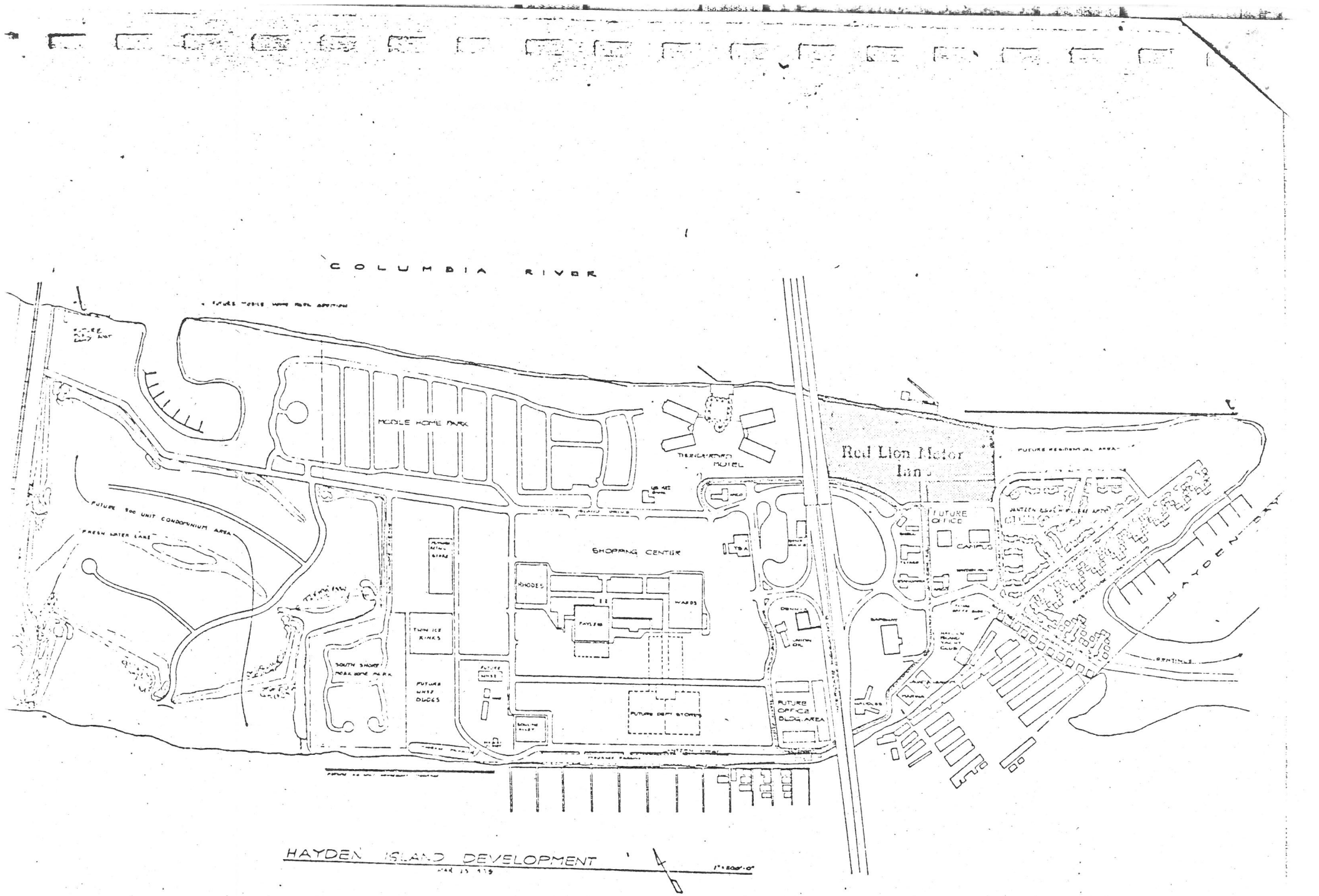
TOMAHAWK ISLAND PROPOSED DEVELOPMENT

Prepared by the Project Staff under
the direction of the Project Management
Board for the Interstate Bridge Corridor
Project.

November, 1974

Columbia Region Association of Governments

Portland, Oregon



HAYDEN ISLAND DEVELOPMENT

SUMMARY AND FINDINGS

At the October 18, 1974 Project Management Board Meeting, the project staff was instructed to determine the impact on Interstate Route 5, resulting from the traffic generated by the proposed Tomahawk Island Development. Using the data obtained from Multnomah County, the number of generated trips were estimated, distributed and superimposed on the existing I-5 and Hayden Island Interchange (I.C.) traffic. A weave analysis was conducted between the Union Avenue I.C. and the Hayden Island I.C. "before" and "after" the marginal trips from the proposed development were added. It was conducted for southbound traffic in the morning and northbound in the evening. It was found that the additional trips generated from the proposal had serious adverse impacts on the operation of the freeway during the morning and evening peak hours. A critique of Hayden Island Incorporated's analysis of traffic impacts of the new development was also conducted. This traffic analysis was found to be lacking in many respects. It would be entirely appropriate for a more detailed traffic analysis to be conducted by a professional traffic/ transportation engineer.

INTRODUCTION

In late 1973 several public agencies in Oregon and Washington established the Interstate Bridge Corridor Project. The purpose of this project is to address and resolve some of the traffic operational problems which exist in the corridor due to the excessive demands placed on the Interstate Route 5 facility. The project is directed by a project management board which was set up by the CRAG Board of Directors. Members of the Project Management Board include representatives of the Oregon State Highway Division, Washington State Department of Highways, the Cities of Portland, and Vancouver, Multnomah and Clark Counties, and the Tri-County Metropolitan Transit District of Oregon (Tri-Met).

Interstate Route 5 is the only existing highway facility between Clark County and Multnomah County. More than 16,000 workers use the I-5 Freeway to commute between their homes and places of work. In addition, the highway is a major interstate route connecting the Portland metropolitan area to Seattle, Vancouver, B.C. and other points north. The Interstate Bridges provide the only Columbia River crossing for approximately 45 miles in either direction. The bridges are of significant regional importance because (1) they are a major link between two segments of a metropolitan region, (2) the freeway is a major link of commerce on the interstate system, and (3) the freeway

is presently congested during the peak periods. Therefore, it is desirable that the project management board comment on any proposed major residential, commercial and/or industrial development that will significantly increase traffic volumes in the corridor thus increasing the congestion on the freeway. Since Interstate Route 5 is the only highway connecting Hayden and Tomahawk Islands with the mainland, the traffic generated by any new development on these islands must use the I-5 facility to reach any destination not located on the Islands. Also much local island traffic must use one or the other intersection at the freeway ramp terminals in order to cross the freeway. Therefore, it is anticipated that significant new development on Hayden and/or Tomahawk Islands will seriously impact the already overcrowded Interstate Route 5 facility.

GENERATED TRIPS

Traffic congestion in the I-5 Corridor is most critical during the morning and evening peaks periods when most of the region's labor force is traveling to and from their places of work. For this reason, analysis of the traffic generated by new development on Hayden and/or Tomahawk Islands will focus on work and commercial trips originating or terminating at the island during the morning or evening peak hours. It is acknowledged that the commercial and recreational generators obtain peak generation during the transportation off peak. However, the impacts should be explored during the transportation peaks because small increases can cause serious problems. For this study, only work and commercial trips were considered (recreational trips are assumed to be minimal during peak hours).

The 1970 census data indicates that average dwelling unit occupancy on Hayden and Tomahawk Islands is 2.2 persons per unit. Average auto ownership rate on the islands is about 1.4 autos per dwelling unit. Assuming that these figures will reflect future conditions, the 601 units proposed for the Tomahawk Island development will house about 1,320 persons who will own 840 autos. With this information, the number of work trips made by island residents on any given day can be determined by the following PVMTS * trip generation equation:

$$HW=(-.135 + .210\ (NOPR/Du) + .703\ (NOAU/Du)\ \ Du$$

Where:

- HW - Auto Person Work Trips
- NOPR - Number of Persons
- Du - Dwelling Units
- NOAU - Number of Autos

$$HW = (-.135+.210\ (1320/601) +.703\ (840/601))\ \ 601= 790$$

*Portland-Vancouver Metropolitan Area Transportation Study

Since 790 represents total daily person trips, it is necessary to convert this figure to the number of autos that 790 persons would use to commute to work. This is done by dividing 790 by the average auto work trip occupancy factor (1.23). To isolate the number of autos moving in the peak hour, the number of autos are multiplied by the AM work trip peak hour factor (.385), which is taken from the Interstate Bridge Corridor Project demand modeling process. The number of Auto work trips in the AM peak hour was approximately 250. The distribution of these trips is discussed later in this analysis.

Using a figure of 300 square feet per employee (Environmental Impact statement - Clackamas Town Center), the commercial area of the Tomahawk Development would employ about 550 workers, since there is a 165,000 square feet of commercial area planned. From the average trip generation rates, used by the Puget Sound Governmental Conference (13 trips/employee) for sub-regional shopping areas, the 550 employees were found to represent 7150 person trips attracted to the commercial complex, or 4660 auto trips (based on a PVMTS occupancy rate of 1.5 persons per auto for shopping trips). Based on an estimated 7% of shopping trips moving in the evening peak hour (NCHRP Report #24), 320 auto shopping trips will be made to Hayden/ Tomahawk Islands in the PM Peak Hours. Assuming the return of the AM Peak Hour 250 auto work trips during the PM peak hour, the total increase (shopping trips & work trips) is estimated at 575 vph (vehicles per hour).

Applying the distribution principles used by the Interstate Bridge Corridor Project staff, it was found that 34% of Hayden Island trips are destined for Washington. On this basis, 80 vph originating at Tomahawk Island in the AM peak period were assigned northbound on I-5 while 170 vph were assigned in the southbound direction. In the evening peak hour, 190 vph were attracted to Hayden Island from the north and 380 vph were attracted from the south. These trips were added to the existing network (see Figure I). These attracted trips are in the direction of Tomahawk Island, therefore, these trips must be coupled with the produced trips in the opposite direction of flow which were computed and also added to the network. To obtain this opposing flow, directional splits of 75/25 for the AM period and a 60/40 split for the PM period were used. This amounted to 30 vph from Washington and 60 vph from the south during the AM peak hour. Similarly, in the PM peak hour, 130 auto trips are expected to travel north and 250 south from Hayden Island.

CAPACITY ANALYSIS

In order to evaluate the impact of the Tomahawk Island proposed development on the I-5 facility, a weave analysis was conducted with and without the traffic generated from the development. The location of the study was between Union Avenue I.C. and Hayden Island I.C. This does not imply that there will not be impacts elsewhere but the analysis revealed detrimental effects of a serious nature. Further roadway capacity analysis at Portland Blvd. I.C. for example would be redundant because congestion on Hayden Island during the peak hours will cause the traffic flow breakdown to propagate upstream for miles.

A Weave Analysis was conducted to determine the level of service (LOS), using the methods of the 1965 Highway Capacity Manual, which prevailed in March, 1974. The analysis determined the LOS for the AM peak hour in the southbound direction, using the multiple weave procedure and the simple weave procedure for the PM peak hour in the northbound direction. A conclusion was derived from this analysis.

The AM peak hour southbound traffic flow operates at the maximum LOS "E" nearly LOS "F" and the PM peak hour northbound also operates at LOS "E". The LOS "E" means that traffic flow travels at 30 to 35 mph, is unstable, and can easily break down to forced flow (stop and go movement). Forced flow is LOS "F" which does not improve until the demand is substantially reduced (until the peak period is over).

The apparent concern is simply that the additional traffic growth will intensify or compound the existing operational problem on Interstate Route 5 and result in forced flow (LOS"F"). This conclusion, however, does not imply that additional demand growth is undesirable. Additional growth can be accommodated provided the vehicle occupancy is increased to serve the marginal travel demand.

Indeed the concern is justified because the weave analysis with the Tomahawk Island generated traffic added to the existing traffic resulted in a LOS "F" during both peaks through the weaving sections. Clearly, additional facilities, highway and/or transit, are needed to accommodate trips generated from this proposed development. The following table summarizes the results.

TABLE I

Interstate Route 5
Union Ave. to Hayden Island
Weave Analysis

	Southbound AM Peak Hour	Northbound P.M. Peak Hour
Lanes Available	3.0	3.0
W/O Development		
Lanes Required LOS "D" [1]	3.8	3.3
Lanes Required LOS "E" [2]	3.0	2.6
Prevailing LOS	"E"	"E"
W/Development		
Lanes Reauired LOS "D"	4.4	4.1
Lanes Required LOS "E"	3.6	3.6
Prevailing LOS	"F" [3]	"F"

1. Operating speeds of about 40 mph. Traffic is approaching flow unstable.
2. Operating speeds of about 30-35 mph. Traffic is approaching flow unstable
3. Operating speeds of 0-30 mph. Forced flow - stop and go.

CRITIQUE OF TOMAHAWK ISLAND TRAFFIC AND TOTAL INTERCHANGE TRAFFIC ANALYSIS

Hayden Island Inc. conducted a traffic analysis to evaluate the impact of the proposed development of Tomahawk Island on the transportation facilities on Hayden Island. In determining the traffic impact on I-5, a critique of this traffic analysis was performed and revealed limitations and inadequacies.

An important aspect of any traffic analysis to define the study area, including the transportation facilities, which is the area of significant influence. This analysis completely ignored any impact on I-5 and did not include all of the affected facilities on Hayden Island.

The trip generation for commercial and recreation areas was based solely on the number of parking spaces available and an undocumented assumed usage time. It did not consider the probable multi-use of parking areas (i.e. using office parking for evening

commercial or recreational purposes.) Trip generation usually results from multi-linear regression analysis and the factors or variables affecting the generation are determined within levels of statistical significance. In many studies, three or four variables are used. Parking availability, in most cases, is not one of them (PVMTS, PSRTS & BATS). The "Tomahawk Island Traffic Analysis" correctly points out that the peak hours at the commercial and recreational complexes do not occur during the peak hour on I-5. However, this analysis does not estimate the commercial generation during the I-5 traffic peaks. It has been reported that 60% (NCHRP Report #24) of the shopping center peak trips occur during the PM peak hour of the street network near the shopping center.

The analysis also indicated the alternative paths to I-5 for the trips generated on Tomahawk Island, but did not address how the interaction of this traffic and other traffic is expected to occur. It may be that secondary route alternatives will be congested.

Assumptions on trip distribution were not documented and found to differ considerably from the demand modelling results of the I-5 Project work.

The capacity of 1,555 vph for the northbound off-ramp should be questioned. While it may be true that 1555 vph may exit the freeway, those vehicles must be accommodated on local facilities. One must also consider the capacity of the intersection which will soon be signalized at the ramp terminal. The capacity will more closely approximate 1,000 vph, considering the signalized intersection, two lane approach from the off-ramp, alignment and the grade of the intersection. Volumes such as 1555 vph on two lane arterials need tangent, non grade alignment with substantial storage at signals. Such a volume in this case would cause queuing backups on the freeway.

The approach to the total interchange capacity used in this analysis could not be found in any publication available to the project staff including:

1) Highway Capacity Manual 1965
2) Highway Capacity Manual 1950
3) ITE Handbook
4) AASHO Rural 1965
5) Pignataro - Traffic Engineering
6) Oglesby & Hewes - Highway Engineering
7) Miscellaneous Transportation Research Board reports on capacity

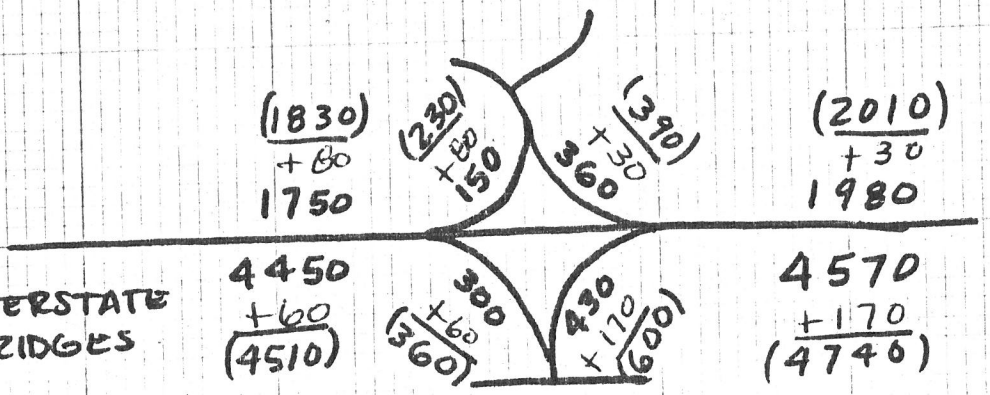
This analysis divided the sum of the parking 5920 spaces on Hayden Island into the total interchange volume (26,000 vph) for an unspecified hour and declares "each parking space

generates 4.39 movements per day." First, it has been indicated previously that parking availability did not sufficiently correlate with trip generation. There are more reliable factors or variables to consider. Second, the generation rate on a daily basis was made from an hourly volume which is mathematically inconsistent. In addition, the assumption was made that the Tomahawk Island development would be the only additional development on the islands. It should be pointed out that a proposal has already been made to construct a large hotel-restaurant complex on the island. The environmental impact statement on the Red Lion Motor Inn,by the developers,indicates that daily traffic in the corridor would be increased about 1.5% by this development though much of the increase would occur outside of the peak period (EIS Red Lion Motor Inn). Other developments which would increase travel demand in the corridor includes the further expansion of the Jantzen Beach Shopping Center, and the development of secondary and tertiary stores and services that generally follows residential and commercial growth.

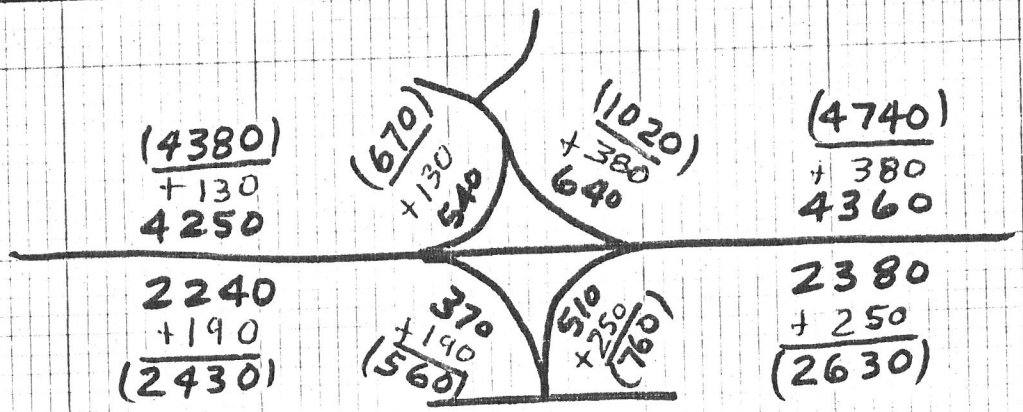
In conclusion it may be stated that the "Tomahawk Island Traffic Analysis" is lacking in several areas and should not be considered a reliable basis for decision-making. The analysis tends to be misleading and incorrectly implies little or no impact will occur by the proposed development on I-5 during the peak periods.

I-5
HAYDEN ISLAND INTERCHANGE
TRAFFIC VOLUMES
MARCH 1974

AM PEAK HOUR



PM PEAK HOUR



LEGEND

XXX - Traffic Volumes March 1974

+XX - Traffic Volumes Generated by Tomahawk Development

(XXX) - Sum of Both

Figure I

DRAFT RESOLUTION ON THE

PROPOSED TOMAHAWK ISLAND DEVELOPMENT

WHEREAS, the Project Management Board (PMB) of the Interstate Bridge Corridor Project has been designated by the CRAG Board of Directors to direct an effort to develop transportation improvements in the I-5 Corridor;

WHEREAS, the PMB consists of representatives of the affected jurisdictions in the corridor; namely, Oregon State Highway Division, Clark County, City of Portland, City of Vancouver, Tri-Met, the Washington State Department of Highways, and Multnomah County;

WHEREAS, a proposal for Tomahawk Island development is now pending before the Multnomah County Planning Commission;

WHEREAS, the intensity and scale of the proposed development will increase the demand on transportation facilities in the corridor which is of major concern;

WHEREAS, the capacity of Interstate Route 5 on Hayden Island and the access ramps to and from the freeway is presently being exceeded during the peak periods;

WHEREAS, the excessive demand on transportation capacity causes delays, accidents, air pollution, inefficient use of fuel and other undesirable impacts;

THEREFORE, BE IT RESOLVED that the Project Management Board advises

the Multnomah County Planning Commission of the transportation impact anticipated from the proposed development on Tomahawk Island. The Board hereby requests that the impact of the proposed development on transportation facilities in the corridor be properly, thoroughly, and adequately addressed including solutions, funding and implementation schedules prior to any action on this matter.

DIRKEN

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum

December 2, 1974

To: Project Management Board

From: Hurvie Davis, Project Coordinator

Subject: Project Management Board Meeting

Enclosed are some materials relevant to the next Project Management Board meeting and the minutes of the previous meeting for your review.

You will be notified of the next meeting within a few days.

DRAFT

INTERSTATE BRIDGE CORRIDOR PROJECT

Revised Work Program

Columbia Region Association of Governments

November, 1974

Discussion of this -
9AM Dec 10th at CRAG
Conference Room "D"

OBJECTIVE

The objective of the revised work program is to carry out the implementation of the recommendations developed under Phase I of the Interstate Bridge Corridor Project.

PREVIOUS WORK

The Interstate Bridge Corridor Project was initiated in late 1973 as a three-phase project designed to address the existing transportation problems in the Interstate 5 corridor between Vancouver and Portland. The objective of the project was to develop solutions which would move people through the corridor more efficiently with primary emphasis on public transportation and including consideration of park and ride facilities.

Phase I of the project recommended a number of improvements that would provide relief in the corridor. The analysis indicated that in order to move people through the corridor more efficiently on existing facilities, a unified transit system would have to be established thereby eliminating the necessity for potential transit riders to use as many as three existing transit systems. Specifically, the purchase of the privately owned Vancouver-Portland Bus Company by the Tri-County Metropolitan Transportation District of Oregon (Tri-Met) was recommended. This, together with recent legislation in the State of Washington (HB-670) to enable the establishment of a

county transit system in Clark County would provide for publicly operated and financed transit service throughout the corridor. It was further found that some method of providing priority movement in the corridor for high-occupancy vehicles (buses and carpools) would be necessary to move people more efficiently and serve as an incentive to increase vehicle occupancy.

From the Phase I analysis, five primary corridors in Clark County were identified as having potential for commuter transit service to five primary employment areas in Portland. Therefore an extensive level of service should be provided between these areas if public transit is to provide any significant improvement in traffic flow in the corridor. Presently, the city-owned Vancouver Transit System operates only within the city while the Vancouver-Portland Bus Company provides service between Vancouver/Hazel Dell and Portland. The Evergreen Stage Line provides limited service from Camas/Washougal and several other locations in Clark County to Portland. With the exception of Vancouver-Portland Bus Company's operation, only a limited amount of transit service is provided between downtown Vancouver and Portland. It is therefore apparent that an extensive unified transit system should be provided in the corridor.

From an assessment of the immediate transit needs in the

corridor and the recommendations of Phase I, it seems that if the Phase I recommendations are implemented, the initial objective of the project will be fulfilled. It has also been determined during Phase I that there are insufficient staff resources to implement the recommendations within the local agencies/jurisdictions. This revised work program has, therefore, been prepared to enable the CRAG staff to assist the local agencies/ jurisdictions in implementing the Phase I recommendations, conducting a feasibility analysis of priority treatment on I-5, and initiating an evaluation of longer range improvements for a yet to be determined future year.

METHODOLOGY

A joint effort of affected personnel and CRAG staff will be provided to carry out the implementation activities of the Phase I recommendations. CRAG staff will conduct the feasibility analysis of priority treatment in the corridor and provide assistance in determining the level and scope of transit service required in the corridor. Upon completion of these activities and determination of a future year, CRAG staff will work with the ODOT planning staff in determining longer range alternatives between Oregon and Washington including the impact of I-205 on the I-5 Corridor

WORK ACTIVITIES

A method of providing priority treatment for high-occupancy

vehicles on Interstate Route 5 will be undertaken as part of the revised work program. This will include feasibility analyses of both a system of ramp control for traffic with priority being given to high-occupancy vehicles (buses and car pools) and the feasibility of establishing special use lanes for high-occupancy vehicles on I-5, parellel to the flow of traffic, south of the Interstate Bridge.

The first task of the priority treatment feasibility analysis is to determine a strategy for providing an additional lane in each direction on I-5 between the Portland Blvd. and Union Ave. Interchanges. This might be accomplished by utilizing the shoulder and/or some of the median clearance or possibly some minor structural widening. These improvements will be tested during the peak periods when one lane (SB in the AM & NB in the PM) will be reserved for high occupancy vehicles (HOV). In addition, a ramp metering system, with bypass provisions for HOV will be devised for testing against the priority lane alternative. This work activity will produce sufficient detail on the alternatives for effective testing.

The second task will consist of compiling data (traffic counts, roadway characteristics, speed, etc.) already available and determining any additional data which may be needed. The additional information may include aerial photography and ramp origin-destination survey data, etc. during the peak periods.

The data will be analyzed to determine the "before" condition by fifteen minute time slices. Diagrams, tables and graphs will be prepared to illustrate the location and intensity of the operational problems as they build and dissipate.

The next work item consists of testing the two alternatives so that observations may be made about their respective performances. Consideration will be given to the utilization of a computer model (PRIFRE) developed at ITTE in Berkeley, precisely for this type of analysis.

After testing the alternatives, the output will be reduced and organized into the same type of diagrams, tables and graphs to illustrate the system differences between the alternatives. In addition, operational and capital costs will be determined, funding sources identified, and other information as required to conduct a feasibility evaluation on the two alternatives.

Finally, a report will be prepared identifying and disucssing the procedures, findings and recommendations of the priority treatment analysis. A program for providing publicly-owned and operated transit service in the corridor as recommended in Phase I will be developed through a combined effort of CRAG, Clark County, Vancouver, Tri-Met and other affected jurisdictions. This will include determining the type and extend of transit service needed in the corridor, the mechanism for providing the service including preparation of operating and financial agreements, federal applications for purchase of privately

owned transit systems operating in the corridor, and a method for financing. The primary effort of CRAG staff activities will be to determine the level of service needed in the corridor and to assist in the preparation of an application (s) for federal funds for purchase of the privately-owned transit systems. Possible approaches to addressing the transit service element would be for Tri-Met to acquire the Portland-Vancouver Bus Company either through purchase or condemnation. Tri-Met could then contract with the City of Vancouver to provide service between Portland and downtown Vancouver where Vancouver's system would connect. Another alternative would be for Clark County and the cities in the county to form a transit district, acquire the Vancouver system and expand it throughout the county and contract with Tri-Met to provide service to downtown Vancouver. Another possibility would be for Tri-Met to extend serfice into the county as well as to the city. If it is determined that a transit district should be created, service to such areas as Camas, Washougal, Battle Ground, etc. will have to be addressed which may require acquisition of the rights of the Evergreen Stage Line which presently serves these areas. Each of these alternatives will be explored as required to ascertain the best mechanism for providing the desired level of service. The final mechanism for providing the service will, of course, be a function of the type and scope of service proposed.

In addition to developing service levels, an operating mechanism and financing, it will also be necessary to address such items as equipment, staffing, maintenance and storage facilities, revenue collections and voter approval of the transit program. This will be done through a coordinated effort of CRAG and local agency staff with local agencies taking the lead on such items as voter approval and development of a revenue collection procedure.

A final element in this work program will be to initiate an evaluation of major transportation alternatives for the I-5 corridor. This will include an assessment of the I-205 opening on the level of service for I-5. This assessment will be based on travel projections for a yet to be determined forecast year, perhaps somewhere between 1980-1985. The assessment will also consider the improvement in travel on I-5 resulting from increased public transportation use and the establishment of priority treatment on I-5 for high-occupancy vehicles to be developed under this project's earlier effort. Using future year forecasts, an evaluation of a number of alternatives will be tested for the I-5 corridor. This will include but not be limited to a busway facility in I-5 and Union Avenue, widening of I-5 to six lanes in the present four lane section and perhaps a water transportation link. It is anticipated that this will be a joint effort of CRAG and ODOT planning staff and will involve

network evaluation by computer analysis.

Because of the scope of this final activity, it will not be completed by the end of the project period. Completion of this element of the revised work program can be completed under CRAG's continuing planning program and be interfaced with other corridor planning activities.

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum November 29, 1974

To: Project Management Board

From: Hurvie E. Davis, Project Coordinator HED

Subject: Traffic Control During I-5 Reconstruction

Attached is a statement on the control of traffic flow during reconstruction of I-5. This is transmitted to you for review and comment and especially for input from the state highway agencies who have considerable interest in this matter. Of particular interest for the staff would be any other "special traffic control measures" not identified in this statement. It would be appreciated if this review could be completed and comments submitted to staff by mid-December.

We believe that the I-5 project can serve as an excellent coordinating mechanism during the initial construction and that the Board may choose to continue in existence for the duration of the construction period.

ROUGH
DRAFT

TRAFFIC CONTROL DURING I-5 RECONSTRUCTION

Introduction

The Interstate Bridge Corridor Project was initiated to address transportation problems in the corridor. During the next five years the Washington State Department of Highways will execute several major contracts resulting in the improvement of Interstate 5 to a six-lane facility. Interchange ingress and egress ramps will be reconstructed or modified, auxiliary lanes utilized where appropriate and acceleration and deceleration lanes improved to provide a freeway facility constructed to modern standards. In Oregon safety improvements will be performed on this facility in the vicinity of the Union Avenue Interchange. The Oregon State Highway Division will make improvements in roadway design to eliminate some of the operational problems which presently exist. Although the anticipated operational and safety improvements will provide relief, with approximately 80,000 vehicles per day in the construction zones, it is apparent that a tremendous impact on traffic flow may be expected during the construction work. To minimize the adverse, but necessary, impacts of construction on safety and traffic flow, a national policy has been developed and adopted as a guide for traffic control during periods of construction. Part VI of the Manual on Uniform Traffic Control Devices 1971 (MUTCD) containing the national policy has been adopted for use in Washington and Oregon. It should be emphasized that this policy is considered

as "minimum desirable standards" applying to typical situations and that for application to "special complexities and hazards" may require additional or special protection. This article will briefly describe some of the major complexities, the standard control measures in the MUTCD and some additional measures which can be used. It will be an approach to policy or philosophy rather than an actual traffic control plan which will, of course, be left to the implementing agencies and their contractors.

The construction work on I-5 will affect two states, Washington and Oregon, two counties - Multnomah and Clark, two cities - Vancouver and Portland, four transit operators - Tri-Met (public), Vancouver Transit System (public) Vancouver-Portland Bus Co. (private) and Evergreen Stage Line (private) - and in in excess of 100,000 person trips each weekday. Such a multi-agency problem can be effectively addressed by a multi-agency organization which is, of course, the role of the Project Management Board (PMB) and the Columbia Region Association of Governments (CRAG) Board of Directors to whom the PMB reports. The essential purpose of this element in the Interstate Bridge Corridor Project is to ~~address~~ treat the issue of traffic control during construction on a multi-agency basis.

Construction Work

In Washington the construction ~~can~~ is best ~~understood~~ described by statements of the Washington State Highway Commission.

> "The portion of SR-5 considered for improvement in this report begins at the north end of the Interstate Bridge and runs northerly through the City of Vancouver for a

distance of approximately two and one-half miles to the Burnt Bridge Creek vicinity. The existing 4-lane route was constructed in 1955 and has the distinction of being the first freeway constructed in the State of Washington. As this major traffic artery enters the State it crosses the Columbia River on two 3-lane bridges. Immediately upon leaving the bridge the highway constricts to 4 lanes and continues as a 4-lane facility through the city. The 1972 average daily traffic crossing the Interstate bridges was 77,800 vehicles, with peak counts as high as 100,000 in August.

To accomplish this improvement it will be necessary to reconstruct the interchanges at SR-14, Mill Plain, Fourth Plain, and 39th Street. Reconstruction of the 39th Street interchange will include a connection with the proposed new route of SR-500 (Vancouver to Orchards), which is now in the design stage. Work will also include the removal and replacement of the existing structures at Evergreen and McLoughlin Blvd., 29th Street, 33rd Street, and the relocation of the Visitors' Information Center."

The work will rebuild ten existing structures and construct four additional structures to provide a facility with present design standards. The construction effort is scheduled to begin in April of 1975 and terminate in 1979. Additional schedule details are contained in Table I.

The work in Oregon by the Oregon State Highway Division will widen the Portland Slough (North Portland Harbor) Bridge to provide

standard shoulders, concrete median barrier, standard acceleration and deceleration lanes, and improve the roadway curvature at the south end of that bridge.

In addition, the City of Vancouver and Clark County are planning roadway improvements on North Main Street (Old US 99). Caution should be used to assure that, if possible, work on these improvements do not occur concurrently with I-5 construction because any operational problem on arterials will create adverse effects on the freeway.

Table I. SCHEDULE FOR I-5 RECONSTRUCTION BY STATE HIGHWAY AGENCIES.

Location	Beginning Time	Agencies
33rd St. Structure	April 1975	WSDH
29th St. Structure to Main St. IC (Burnt Bridge Creek)	April 1976	WSDH
Mill Plain Blvd. I.C.	August 1976	WSDH
Fourth Plain Blvd. I.C.	Spring 1977	WSDH
SR 14 (Lewis & Clark Highway) I.C.	Spring 1978	WSDH
Union Ave.I.C.	Spring 1975	OSHD
North Main Street	1975	Vancouver
Old US 99	1975(?)	Clark County

Typical Control Measures for Construction Activities

The MUTCD permits the use of various types of control measures to permit the safe flow of traffic through construction zones. These measures include as possibilities, pavement markings, traffic

cones, signs, traffic signals, barricades, drums, lane closures, detours, flagmen, warning flashers, illumination (street lighting), lanterns and pilot cars. The specific use of any of these measures depend upon the particular situations which arise and each situation tends to be unique. As such, each case must be carefully examined to maximize the protection to motorist and workers without imposing unreasonable demands on either.

SPECIAL CONTROL MEASURES

There are several control measures over and above the MUTCD which the highway agencies may wish to consider because of the complex situations on I-5. Essentially, these measures have already been useful to one or the other highway agencies or both. The special control measures include:

1. Reducing traffic volumes by utilizing transit and carpools.
2. Manual ramp metering.
3. Off-peak work schedules.
4. Night time work schedules
5. Accommodating queues (backups).
6. Extensive public relations and information.
7. Signal systems to increase capacity on parallel arterials.
8. Flashing arrow trailers.
9. Detailed project schedule coordination ~~between~~ among the highway agencies and local jurisdictions.

Some of these merit further comment to appreciate their value. During the construction of the Seattle Freeway the WSDH operated a manually controlled ramp metering system to maintain better

traffic flow. Both state agencies have supervised construction projects restricting the work to off peak periods. The WSDH restricted the work on the Vancouver Freeway concrete median barrier contract to night time and this measure was very successful. Adjustments in the location of control devices have been made by WSDH to accommodate queues when a lane or roadway closure was necessary. A graph (Figure I) developed by the district office in Vancouver is included which establishes the design criteria for this measure. In Washington there are local arterials which could accommodate additional traffic if there was a traffic responsive signal system installed to control the signals on these arterials. Public relations and information can not be over-emphasized in conveying the other control measures to the public before they are "trapped" in the construction zone.

RECOMMENDED CONTROL STRATEGY

Synthesizing all the information which may be applicable to the upcoming construction projects led to several statements concerning strategy which may be utilized by the implementing agencies. The comments are intended to offer possibilities which have merit but, of course, the legal responsibilities rest with the highway agencies and their contractor; subsequently, the detailed plans are left to them. The following comments are expected to provide sound direction for the highway agencies in addition to that contained in the MUTCD:

1. Increase transit service to areas effected by the construction

work.

2. Utilization of temporary ramp metering.

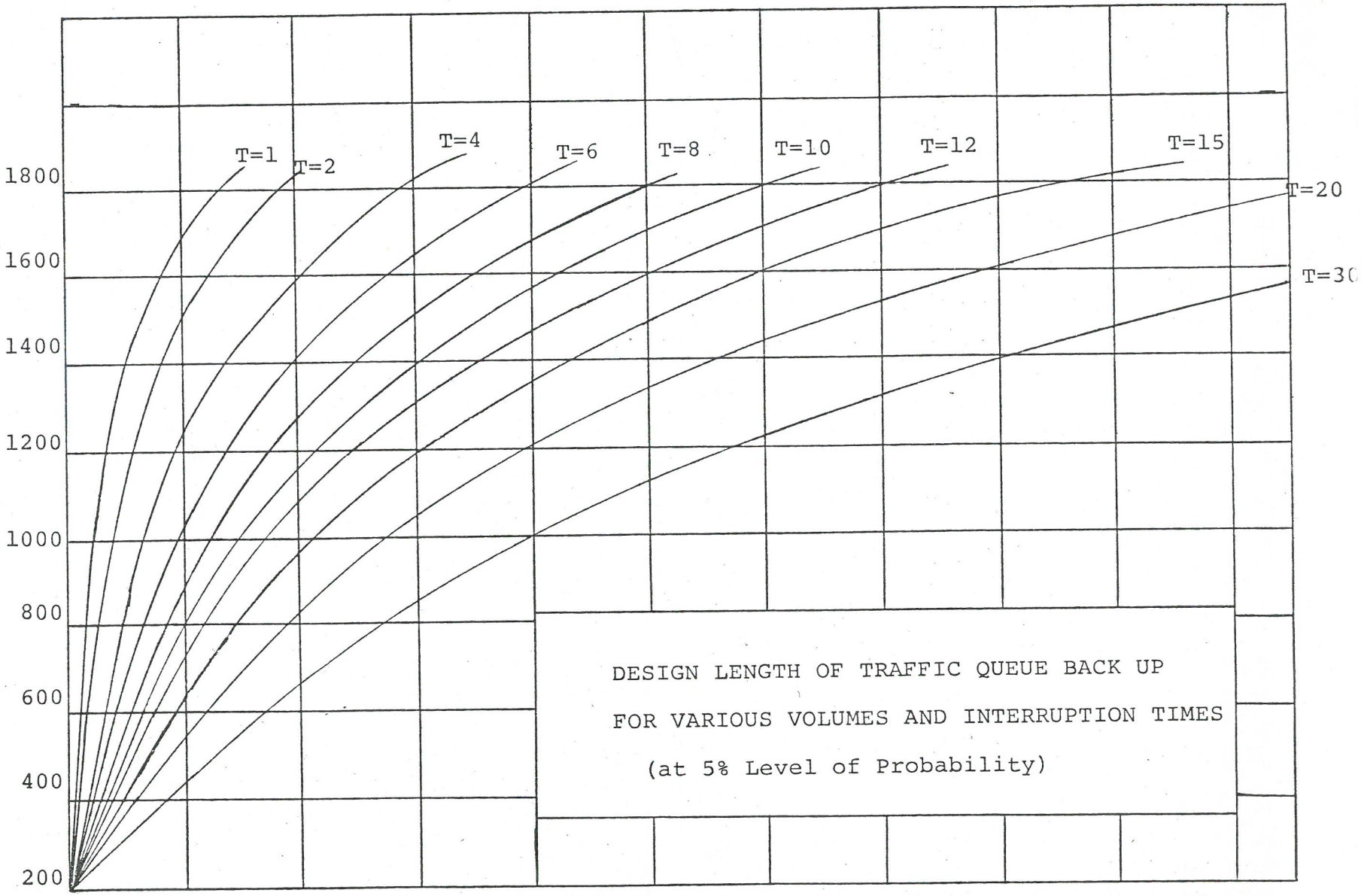
3. Restricting the construction week to four ten-hour nights. (This may preclude the necessity of ramp metering or other measures.)

4. Use the queuing back up criteria if roadways are to be blocked to assure motorists that they will have advanced warning of the blocked condition.

5. Extensive public relations and information. Perhaps the Citizens' Advisory Committee could provide some assistance in this area.

6. Installation of a signal system in Vancouver to increase the capacity of 1) Broadway-Washington (Main) Street couplet and ~~Couplet~~ Main Street to 39th Street and 2) Columbia Street.

7. Considerable coordination between the highway agencies as well as with the local jurisdictions. Perhaps the PMB could provide the mechanism for this coordination through the duration of the I-5 Corridor Project.



* 6% TRUCKS

FIGURE 1.

Multnomah County Oregon

DIVISION OF LAND USE PLANNING

(503) 248-3043 ▪ 1107 S.W. 4th AVENUE ▪ PORTLAND, OREGON 97204

Re: C 23-74 - Tomahawk Island

Gentlemen:

As you are probably aware, there is a development proposal for Tomahawk Island which is being presented to the Multnomah County Planning Commission for approval. The area proposed for development is indicated on the Comprehensive Land Use Plan as suitable for waterfront commercial-recreation use. This land use designation does not reflect a specific zone, but rather a combination of zones which will meet certain criteria. These criteria, which are now being reviewed and evaluated by the Planning Commission, will serve as a definition of waterfront commercial-recreation development.

Attached is the statement adopted by the Planning Commission as a definition of waterfront commercial-recreation. Also attached is material presented to us by the applicant, describing the proposed project. Due to the unique combination of potential problems associated with the area, the Planning Commission is concerned with the possible impacts of the proposed project. We are, therefore, requesting that you review and comment on this proposal.

A meeting with all concerned agencies and groups has been scheduled for December 11th, at 2:00 p.m. at our office. At this time we would like to obtain a formal statement of your concerns, including what potential benefits or detriments are observed, possible alternatives or modifications which would realize greater public benefit, and any additional information which you feel should be furnished in order to make an adequate evaluation.

We can provide further information and meet with you individually if desired. Contact either Mr. Bill Horning or Mr. Duncan Brown at 248-3043 to arrange a time.

Very truly yours,

DIVISION OF LAND USE PLANNING

Duncan Brown, Urban Planner
DB/jb - Attachments

Those lousy traffic jams! Why can't someone. . .

Traffic slowed to a crawl: a scene that greets many Vancouver residents returning home from work.

By LARRY LANGE
Columbian Staff Writer

You're a Vancouver motorist who drives to work in Portland every weekday on Interstate 5, across the Interstate Bridge through the ever-growing jam of traffic.

Things aren't getting any easier for you. You buzz along nicely each morning, southbound, until you get about to the Vancouver city limits. Then traffic thickens and slows to a crawl.

The 15-mile-an-hour stop-and-go routine starts. Cars like yours, carrying one or two people each, are bumper-to-bumper, and the time creeps ever closer to 8 o'clock, when you're supposed to be at work.

Every morning you go through the routine, drumming your fingers on the steering wheel as traffic inches along and your radio blares. You think the same things every day about thattime: Is the bridge up? An accident dovn the line? What's the holdup?

Then you swear to yoursef and wonder, perhaps out loud, "Why doesn't somebody DO somethin about this blankety-blank freeway?"

For almost a year now, somebody was supposed to, but the specil study organized the the Columbia Region Association of Governments (CRAG) has, at times, moved almost a slowly in figurative terms as the trffic you drive in does, literally, every orning.

The study, the Interstate Bridge Corridor Project, was stared last winter, determined to study ways to alleviate congestion on the freway and bridge and improve its efficiency. It was armed with support from the federal government and seven local agencies — and $150,000 in funding.

The study was set up with the equivalent of almost three fulltime CRAG staffers running it and a 10-member project board advising it along the way. Vancouver and Clark County have had representatives on the board; each agency contributes $4,500 toward the total operating amount.

The project's goals and objectives embodied many a motorist's ideals: get the freway operating more efficiently through the Vancouver-Portland corridor through increased mass-transit use, park-and-ride stations and, possibly, other modes.

The push for the project was more practical than that. Dick Granger, Clark County commissioner and chairman of the project board, recalls it came during last winter's gas crisis — and at a point when officials began realizing that soon the Washington Highways Department would begin ripping up pavement to rebuild three miles of the freeway through Vancouver — and needed to figure out some way of moving traffic around the work.

Dick Baum, former Clark County planner who helped organize the project, recalls that the widening, which will begin before the study project ends, "was what really galvanized the project."

The study portion of the project is moving along, but another major part of its goals — an actual, on-the-ground traffic-relief demonstration project — is nearly five months behind schedule.

Driving conditions, essentially, are no different now at the end of the project's first year than they were when it started. With all the expense and study — why?

From observation of the project's board meetings and talks with board and staff, two reasons emerge:

— Highway and mass-transit interests on the board have disagreed over methods to cure the bridge traffic bottleneck. A result was a delay in the most notable of the project's achievements so far — attempt to get grant money for a special reversible lane on the bridge to help handle rush hour traffic.

— The project shifted in scope over the months as the staff tried to respond to even the most far-out transit mode ideas for the corridor. The initial idea was to study bus improvements, car pools, and park-and-ride facilities, but much time was spent on more exotic options such as gravity-vacuum tubes, levitating vehicle systems, and bicycle wind-tunnels.

Most people involved in the project concede those ideas are a long way off, if they're ever used in the corridor. Some, like board member Bill Dirker, Portland's transportation coordinator, are openly critical of time spent on far-out ideas.

"It got pretty complicated for what we were trying to do," Granger concedes. "It was hard to keep it in context."

See stories on Page 23, also

Bridge traffic jams: can they be solved?

Dick Granger, board chairman: A classic struggle.

Continued from Page 19

By LARRY LANGE
Columbian Staff Writer

Solving traffic jams on the Interstate Bridge, to some, is as simple as improving bus service across the river. To others, it means setting up special priority lanes for buses and car pools. To others, it may mean a mix of bus, car, and water transportation.

To some, the freeway itself can be used to handle traffic between Vancouver and Portland. To others, traffic may have to use other routes beyond I-5.

The Interestate Bridge Corridor Project assembled by the Columbia Region

The Washington Department reacted sharply to the idea of cutting through the expensive concrete median barrier it had recently built, in order to install a cross-over connection for a contra-flow system.

"We just spent hundreds of thousands of dollars to put that in, to keep people from running into each other head-on," says Dick Carroll, Vancouver district engineer for the Washington department.

Pierre Henrichsen, Carroll's second-in-command and a member of the project board, says priority lanes are out of the question until freeway

study metering systems for access control to the freeway during construction. The application revamping simply reflected that.

As it turned out, the big push for NTECAP money and the contra-flow lane resulted from a misconception of what NTECAP funding really is. Hurvie Davis, head of the project's staff, says it was originally thought NTECAP programs carried money with them. They don't. The program merely places fuel-conservation projects on a higher priority than others vying for Federal Highway Administration money.

"The feds just wanted to cut red tape," Davis says.

The board and staff also became mired in studies of such exotic transit mode options as gravity-vacuum tubes, levitating vehicle systems, and bicycle wind-tunnels, and ferries.

Some of those ideas are experimental, and most people in the project concede they're a long way off for I-5 — if they're ever used. Some board members, like Bill Dirker, Portland's transportation coordinator, are openly critical of time spent on such far-out ideas.

Staffers say they were pressed to studying those options by interested board members, but Dirker believes the staff "wanted to cover their tails so nobody could criticize them for not covering somebody's pet idea. I think I'd've dismissed some of those things with a sentence."

Granger concedes the study got into many areas where "it didn't need to be," that it "got pretty complicated for what we were trying to do."

Granger called the arguing over the application part of "the classic struggle of highways versus transit" and says the project "could have been gunnysacked right then" had not the compromise been reached.

But recent discussions about where the project is heading have also dragged it out further than some expected. Dave Hupp, Multnomah County's environmental analyst, recently questioned why the project had not considered use of Union and Interstate Avenues as alternate transit routes to the freeway.

Hupp noted that an initially-stated project objective was "an implementation program for a Vancouver-Portland mass transit system" to be set up by next July — and a demonstration project to be ready last summer.

Hupp, a mass-transit advocate responsible in large part for his county's stand against the I-205 freeway last summer, was almost immediately accused by highway representatives of injecting mass-transit ideas into the project goals.

Highway interests on the board, such as Henrichsen and Bob Bothman of the Oregon Highway Division, say they believe traffic relief will come through a mix of modes — buses with more car pools — rather than through transit alone.

Hupp has been critical of the study for its lack of strong auto disincentives for the corridor. Several Phase I recommendations, such as unification of bus systems, expansion of regional car pool programs, express bus service, and free intersystem bus transfers amount to just that, but Hupp argued unsuccessfully for stronger suggestions than that.

Hupp disagrees that he injected the transit emphasis. "It's already there," he says.

Both Henrichsen and Bothman agree with transit incentives but say they don't believe transit buses will relieve only a portion of the bridge traffic. Bothman puts the portion at about 30 per cent.

"There aren't that many buses available," he says.

Henrichsen, at one point, said building the controversial I-205 bridge crossing will do as much to relieve I-5 corridor traffic as anything.

That opens up a major question the study group has been reluctant to deal with: What would completion of I-205 do to transit or car pool incentives the study comes up with now?

Edgar Waehrer, who represents Portland's Tri-Met bus line on the board, says it's "probably not appropriate to assume I-205 (as the study so far has) in terms of meeting the general transit needs of Clark County and the Portland metrop-metropolitan area."

But Waehrer says "in terms of political commitments, it probably would be" appropriate to assume the bridge would be built.

Waehrer concedes that transit development would do better without the new bridge crossing, since lack of the second crossing would do more to pry commuters out of their cars and into buses as traffic worsened.

But Waehrer and other transit interests on the board have never raised that point at board meetings.

Garth Anderson, Vancouver public works director who has occasionally attended board sessions, says the I-205 issue involves land-use questions such as possible dispersion of residences and work-destinations.

Those questions, Anderson says, involve "major growth and policy decisions...I don't think the (project) group was asked to look at that."

The highway departments, looming large with grant review power and heavy money commitments to the project, are also interested in finishing I-205. Millions of dollars and much time has already been committed to it.

There may be court action over Multnomah County's stand.

With that background, Waehrer concedes there's been a reluctance on the project board's part "to get into the I-205 controversy. It's probably a dead-end..."

Pierre Henrichsen, highwayman: Mix transit modes.

Corridor study just one of several

has done that — and, in the project board chairman's view, almost scuttled the project in what he called "the classic struggle of highways versus mass transit."

The project reached a peak last spring when staff convinced the board to approve application for a National Transportation Energy Conservation Action Plan (NTECAP) grant to finance a study of a high-occupancy vehicle lane.

The idea was to set up a lane for use by buses and car pools in morning rush-hour periods. The proposal included the option of setting up a reversible "contra-flow" lane to switch one northbound bridge lane to southbound traffic.

Oregon and Washington highway department representatives on the board opposed the "contra-flow" idea. They argued it would be unsafe, and said there wasn't enough difference in north and southbound traffic volumes to make a reversible lane practical.

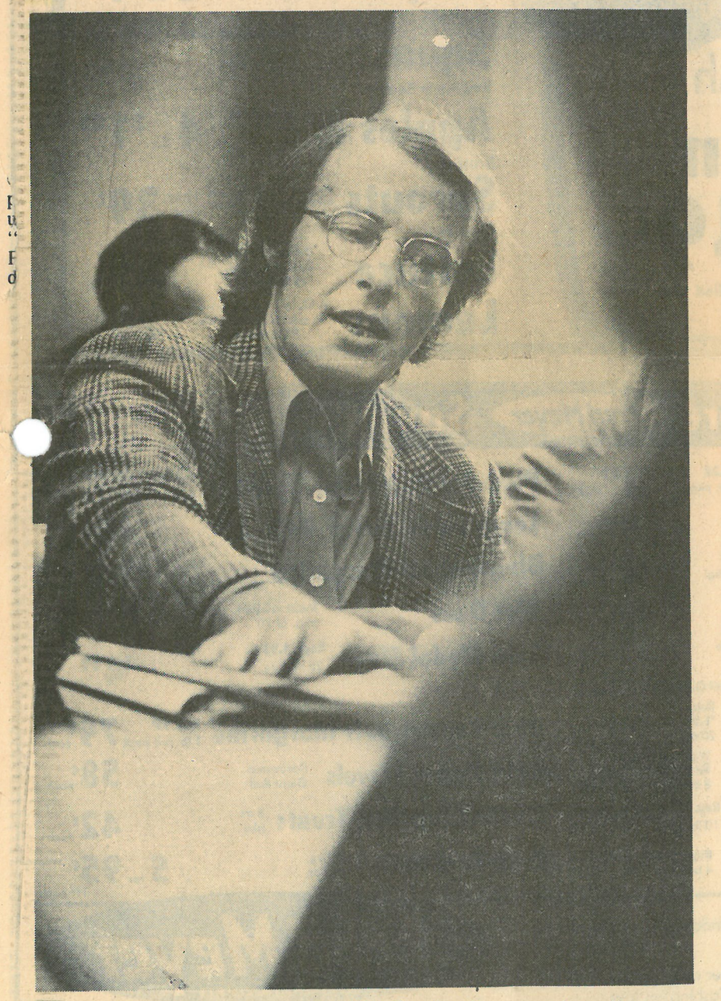
project funding, each must approve the NTECAP funding applications before they go to the Federal Highway Administration. Thus, the agencies exercise a lower-level veto power.

So arguments continued, despite the application being in the mill. A special subcommittee was formed to resolve the differences. It suggested modifying the application — cut out the "contra-flow" idea but keep the suggested priority lane idea, add ramp-metering studies.

Soon after that, the staff resubmitted the amended application, purportedly to meet a state deadline. The board wasn't told until later, when, somewhat embarassed, it went through the exercise of approving the resubmittal after the fact.

Granger, normally calm in public, was openly rankled.

The outcome was no more than an exercise of the highway departments' power, since the Washington department had already planned to



Dave Hupp, environmentalist: Emphasize mass transit.

By LARRY LANGE
Columbian Staff Writer

Can the Interstate Bridge Corridor Study have any value, or will it be just another study or provide just another place to talk about transportation problems?

Project management board members are wrestling with that question now. The project, which most members say has been a valuable discussion forum, is no longer unique. It is now just one of several major transportation studies going on in metropolitan Portland.

Those include:

— The suburban transit station study initiated by Portland's Tri-Met bus line. It is financed with a $500,000 federal grant from the Urban Mass Transit Administration (UMTA). Part of that study will be on the feasibility of a station in Vancouver, and will tie in with a downtown revitalization study being done by the City of Vancouver.

— The Union Avenue Corridor Project being run by Portland. That program, paid for b with that city's own budget money, is studying ways to improve Union Avenue as a transit route and undertake some urban renewal along the strip. Decisions made by that project could affect the CRAG bridge study, particularly if Portland decides to use Union as a transit route.

Portland also is studying the Swan Island corridor, a major rush hour traffic bottleneck, with an eye to some possible improvements there.

CRAG's unified work program includes studies on several major traffic corridors (Phase II of the bridge project includes some traffic "model" projections through 1980).

At a recent meeting, one board member, Bill Dirker, suggested various studies might be combined to come up with one large-scale traffic project, so the studies didn't end up going different directions.

The situation, as CRAG also notes, is that there are several times more projects than funding for them. "Common sense," says Dirker, "tells me the only way you're going to improve the (I-5) corridor is with a large-scale project."

Dirker says he views the I-5 corridor as related to the other major traffic routes, including Union and Going (to Swan Island).

Another Oregon official, Bob Bothman of the state's highway division, also has complained about being confused about which project is doing what kind of work. "We get it from three angles," he says.

Bothman says lack of coordination between studies could mean his agency will look to one study for help on a project "and it's not going to be there." He argues, too, that much of the traffic-modeling work CRAG is doing for the bridge project could be done by his agency.

Dick Granger, the board chairman, admits there have been problems coordinating various jurisdictions' efforts because representatives from different agencies don't keep in continual contact.

"One problem," he says, "is everybody's (other) work."

That, Granger also admits, results in less supervision of the project staff than is needed — one reason for the board's embarassment over a fund application submitted without the board's knowledge.

A citizen member of the board, Pat Blackwell, also notes that each agency comes to the project with different predjudices.

"Each person comes to the meetings with his own point of view," she says. "Coming to a middle ground is difficult."

Most board members agree the project has had one redeeming value—getting the agencies together talking about the problems.

One of the project's suggestions was unification of bus systems and transit fares to make mass transit more appealing.

That suggestion, says Vancouver Public Works Director Garth Anderson, "got Vancouver and Tri-Met off their duffs and talking about bus service in Clark County."

Since the suggestion was made public, negotiations have been conducted between Tri-Met and Vancouver-Portland Bus Co. about possible Tri-Met takeover of the Vancouver-based line.

Ultimately, though, that major decision will have to be made by officials who aren't on the project board.

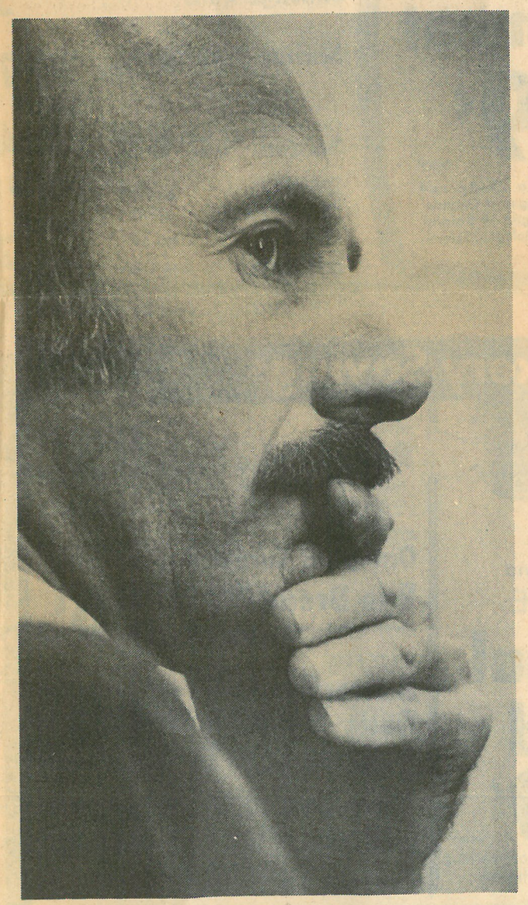
Another recommendation, express bus service from Mill Plain Boulevard and Hazel Dell to Portland, will be tried on an experimental basis later this year.

Jerry Peck, owner of the Vancouver-Portland line, says discussion of the Tri-Met takeover wasn't just CRAG's thinking. It was a natural occurrence, he says, since Tri-Met bought out the other small bus lines in the region when it was formed.

Peck says he had a "little bit of a feeling" the study recommendation was pressure on him, and says he doubts the study will really have much impact on transit improvements.

So long as such projects are run by agency staffers, that will probably be true. This project, Granger says, needs more elected officials running it, to increase its effectiveness.

Granger also wants more representation from Vancouver, on the board, because the city is in a key political position. Without Vancouver's support, Granger says, coordinated transit development in Clark County may not happen.



Bob Bothman: Should highway departments do the study work?

Bill Dirker: Do we really need more than one project?

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum October 28, 1974

To: Members of the Project Management Board

From: Pat Blackwell

Subject: Transportation to Portland International Airport

The Citizen's Advisory Committee is very much interested in the problem of transportation access to the Portland International Airport from Clark County and North Portland. Due to the traffic congestion existing on the Interstate Bridges and other transportation difficulties created by the reconstruction of the Airport, residents of Clark County and North Portland are finding it increasingly difficult to travel to the airport. A planned reconstruction of Interstate Route 5 in Vancouver, beginning in early 1975, will further increase congestion on this freeway. Employees of the airport living in these areas are faced with similar transportation problems.

To provide a degree of relief to these problems, the Interstate Bridge Corridor Project Citizen's Advisory Committee recommends that the following transportation improvements be considered by the Project Management Board.

1) In conjunction with Tri-Met, the Port should assist in developing a north Portland crosstown bus route. The route, utilizing one of several East-West arterials, would begin in St. Johns, connect with bus service from Vancouver at Interstate Avenue, Union Avenue, or I-5 and proceed to the airport. This service would be primarily oriented toward serving airport employees and is justified by the large number of persons who are employed at the airport or it's immediate vicinity.

2) The Port should sponsor or encourage the development of a limousine or shuttle bus service from downtown Vancouver or Hayden Island to the airport. No such service exists at this time, therefore the 135,000 residents of Clark County are left to "fight" the congestion. This service could also provide airport transportation to the residents of North Portland.

It appears that these improvements would serve the desirable purposes of encouraging the use of high occupancy vehicles, slightly reducing traffic on Interstate Route 5, providing alternative transportation for those without automobiles, and reducing congestion at the airport.

The Citizen's Advisory Committee recommends that the Project Management Board direct a letter to the Port of Portland and Tri-Met to encourage further study and development of these proposals.

Your prompt action on these matters will be appreciated.

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum October 18, 1974

To: I-5 Project Management Board

From: Hurvie E. Davis

Subject: Minutes of October 18, 1974 Meeting

The meeting was called to order by the Chairman, Commissioner Granger. After the minutes were approved with minor corrections, the guests were introduced: Messrs. J.E. Sullivan, Washington State Ferries,&Cpl. Garland, Oregon State Police.

The status of Phase II was given. The demand forecasting has been delayed because of modeling problems which have recently been solved and results are expected in mid-November. Staff is developing guidelines pertaining to construction work on I-5 for the highway agencies and effort on socio-economic improvements is continuing.

Preliminary engineering monies for the NTECAP Demonstration Project - Priority Treatment on I-5 have been authorized.Concern was expressed in coordinating this analysis with other studies and project within the corridor. Staff was instructed to address this issue and report to the P.M.B. at the next meeting.

The status of the State Bond Projects was presented. The City of Portland is incorporating the Interstate Ave. & Going St. signal into the Going Street Project. Multnomah County reported that the signal at Union Avenue and Marine Drive is being incorporated into the agency's State Bond Application to Crag.

The enforcement problems associated with providing preferential treatment for busses at the northbound Delta Park off-ramp was discussed. A motion passed instructing staff to submit a request to the highway division to consider the installation of bus preferential signing for a three month trial period.

Mr. Sullivan gave a presentation on ferry service in the state of Washington, (Puget Sound Region). After being informed of the proposed application locally, he questioned the use of ferry service for the I-5 Corridor.

A proposed residential and commercial development on Tomahawk Island was reported by Multnomah County. Since it would cause

a significant impact on transportation in the corridor, a motion was made to advise the Multnomah Planning Commission of concerns of the PMB. Staff is to prepare an initial letter to the Commission advising them of the Board's concern and that more detailed information would be forthcoming. The Staff is to prepare a resolution and a detailed statement of impact, on the matter for the next meeting.

Since there was no further business, the meeting was adjourned.

THOSE PRESENT	REPRESENTING
Bill Dirker	City of Portland
J.E. Sullivan	Washington State Ferries
Pierre Henrichsen	W.S.H.D.
Robert Bothman	O.S.H.D.
Tim Kilduff	Carpool
Cpl. D.K. Garland	Oregon State Police
Dick Granger	Clark County, Wn.
John Perry	Tri-Met
Dave Hupp	Multnomah County
Richard Etherington	CRAG
H.E. Davis	CRAG
Leonard Bacon	The Oregonian
Larry Lange	The Columbian
John Krawczyk	CRAG
Jerry Peck	Vancouver-Portland Bus Co.
A. Reed Gibby	CRAG
Glenn Davis	Vancouver

COLUMBIA REGION ASSOCIATION of GOVERNMENTS

6400 S.W. CANYON COURT

PORTLAND, OREGON 97221

(503) 297-3726

AGENDA

I-5 PROJECT MANAGEMENT BOARD MEETING

Friday, October 18, 1974 - 9 A.M.

Clark County Courthouse - Vancouver

I. Approval of Minutes

II. Status Report

III. Enforcement Problems - Bus Priority at Delta Park Ramps.

IV. Status of State Bond Applications - City of Portland & Multnomah County

V. Presentation by Washington State Ferries Staff

VI. Presentation on Tomahawk Island Development (Dave Hupp, Multnomah County)

VII. Other Business

VIII. Next Meeting Date

DAVIS

OREGON STATE HIGHWAY DIVISION

METROPOLITAN SECTION • 5821 N.E. GLISAN • PORTLAND, OREGON 97213

TOM McCALL
GOVERNOR

F. B. KLABOE
Administrator of Highways

October 8, 1974

SUBJECT: Signing Proposal At Delta Park Interchange

Hurbie Davis
Assistant Director of Transportation
CRAG
6400 SW Canyon Ct.
Portland, Ore. 97221

I am responding to your memorandum directed to Don Bergstrom, requesting consideration to revise the lane-use control sign at the Delta Park interchange, to allow a through-movement from the off-ramp to the on-ramp for busses.

Due to the irritation caused to the motorists staying on I-5, by those motorists using the off-ramp and on-ramp at Delta Park as a by-pass to the congestion, the Highway Division prohibited through-movements in May 1974. A count of violations noted September 16 indicated 146 violations during the peak hour, 4:30 to 5:30 p.m. Made aware of this situation, the State Police were contacted and due to their surveillance for a week, violations noted September 26 total 29 during the peak hour.

It is my opinion, with concurrance from the Highway Administration staff, that the advantage of routing busses as suggested does not equate sufficiently to the disadvantages to motorists and traffic handling of the interchange to warrent proceeding at this time.

R.N. BOTHMAN
METROPOLITAN ENGINEER

cc Klaboe
Coulter
Spence
Bergstrom

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum October 4, 1974

To: I-5 Project Management Board

From: Hurvie E. Davis

Subject: Minutes of October 4, 1974 Meeting

The meeting was called to order and presided over by Pat Blackwell, Vice Chairperson, in the absence of Chairman Granger. The minutes of the September 20th meeting were approved. A new PMB member, Mr. Herman Brame representing the Union Avenue Project, was introduced. Mr. Brame is from the City of Portland Office of Planning and Development. Mr. Tim Kilduff, the new manager of Carpool, was also introduced.

The progress on bus priority treatment at the Delta Park Interchange was discussed. ODOT indicated a letter responding to the recommendation that buses be permitted to exit northbound, procede through the intersection and re-enter the freeway - would be forthcoming soon. The present coordinator was instructed to make this letter available to board members.

Bob Bothman stated that the proposal did not appear feasible particularly from an enforcement standpoint. Subsequently, it was agreed that the Oregon State Police should be invited to discuss the enforcement problems at the next meeting on October 18th.

The phase I report was discussed and the following course of action was approved with one negative vote: The report is approved and shall be transmitted to the CRAG Executive Board with the recommendation that it be adopted as a planning document for the implementing agency members of CRAG and that these agencies incorporate the report recommendations into thsir planning priorities.

With respect to the NTECAP application for priority treatment for high occupancy vehicles on I-5, ODOT reported that preliminary engineering funds have been authorized and will soon be initiated.

Since Dave Hupp, representative of Multnomah County, was unable to attend the meeting, the agenda item "Tomahawk Island Development" was held over for the next meeting.

Under the item of other business the staff presented the results of a survey conducted at the Transpo '74 Fair held on September 28th. It was reported that Carpool was receiving a substantial number of inquiries from Clark County, and WSDH reported that authorization has been given that their work crews may now sign the carpool parking lots.

In addition, the PMB passed a resolution that Vancouver-Portland Bus Company be granted Intrastate transit rights within the Vancouver Urban Area incidental to the proposed interstate express service in the corridor.

THOSE PRESENT	REPRESENTING
Reed Gibby	CRAG staff
Herman L. Brame	Office of Planning &Dev.(City)
Edgar Waehrer	Tri-Met
Tim Kilduff	Carpool
John Perry	Tri-Met
Pierre Henrichsen	WSHD
John Krawczyk	CRAG
Chuck Neumayer	WSHD
Patricia Blackwell	League of Women Voters
Hurvie E. Davis	CRAG
Glenn Davis	Vancouver
Bill Dirker	Portland
Wally Hibbard	OSHD
Bob Bothman	OSHD
Larry Lange	The Columbian

COLUMBIA REGION ASSOCIATION of GOVERNMENTS

6400 S.W. CANYON COURT

PORTLAND, OREGON 97221

(503) 297-3726

I-5 Project Management Board Meeting

October 4, 1974
Clark County Courthouse

9a.m.
Judge McMullen's Jury
Room - Third Floor

AGENDA

I. INTRODUCTION OF MR. HERMAN BRAME - New Board Member

II. PROGRESS ON BUS PRIORITY TREATMENT ON DELTA PARK RAMPS

III. DELIBERATION OF PHASE I REPORT AND RECOMMENDATIONS

IV. DISCUSSION OF ECAP APPLICATION AND CORRIDOR PRIORITY TREATMENT

V. TOMAHAWK ISLAND DEVELOPMENT - Presentation by Multnomah County's Dave Hupp

VI. OTHER BUSINESS

VII. ADJOURNMENT

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum October 2, 1974

To: Dick Etherington

From: John Krawczyk

Subject: Responses to Transpo Questionnaire

I was somewhat impressed by the responses recieved to our questionnaire. Most people took a good deal of time to answer and many of the responses showed a good deal of thought and understanding of the transportation issues facing the Portland-Vancouver Metropolitan area.

The first question inquired as to what was seen as the primary transportation problems or issues in this area. The responses are broken down as follows:

Need improved Transit	6
Improve transportation to Portland	6
Complete I-205	3
Reduce the number of autos using highway facilities	2
Poor road systems	1
Congestion	1
Decision makers too Highway oriented	1
Pollution	1
Land use-transportation relationship not sufficently explored	1
Total	22

Question I a inquired as to what the respondent felt was the most important transportation problem in Clark County. The responses to this question are listed below:

Improve public transit in Clark County	9
Reduce I-5 congestion	2
Improvement of I-5	2
Completion of 205	2
Need for local employment centers	1
Poor road systems	1
Improve highways	1
Reduce congestion (in general)	1
Improve transportation for working people	1
Land use-transportation relationship	1
No response	3
Total	24*

*Includes those respondents that listed two or more concerns

Opinions on the question concerning additional freeway construction were about evenly split. Slightly less than half (10 respondents) felt no additional freeways should be constructed. Six persons felt that additional facilities

should be constructed where needed. Completion of the I-205 bridge only was recommended by three respondents and two respondents felt that only I-205 should be completed. One person did not respond to the question.

Most respondents felt that their costs per mile for operating their autos were greater then 15¢ per mile. The breakdown of responses to this question are listed below:

Cost per mile	responses
0-5¢	1
6-10¢	1
11-15¢	2
16-20¢	9
21-25¢	2
26¢+	1
No response	6
Total	22

Improvement of transit service to outlying areas was the most frequent means by which persons felt that public transit could be improved. A second major concern was frequency of service as noted below:

Concern	Responses
More service to outlying areas	7
More frequent service	4
Longer service hours	2
Improved information avalibility	2
Comfort	1
More direct routings	1
Reduce travel time	1
Reduce travel costs	1
Reduce pollution from buses	1
Provide shleters	1
Provide courteous drivers	1
No response	4
Total	26*

* Includes those respondents listing two or more concerns.

Safety was seen as the most important transportation issue with energy conservation following as a close second. The total results of this section of the questionnaire are noted on the next page.

	Very Important	Important	No Opinion	Not Very Important	Not at All Important
Energy Conservation	14	8			
Safety	15	7			
Travel Comfort	3	12	3	6	
Economy	5	14	2	1	
Pollution Control	12	8	1	1	
Increased Mobility	5	6	5	4	
Reduce Need for Travel	3	10	4	3	2
Speed	4	10	5	3	
Noise Control	7	14	1		
Convenience	9	8	5		
Improve Transportation for the aged, poor, handicapped	7	12	2	1	
Improve highway maintenance	2	9	3	7	
Better Traffic Control i.e. signals, signs	4	11	2	5	

In response to a question on carpools, two of the twenty two respondents mentioned that they were members of carpools. Two others indicated that they were interested in joining or forming a carpool while sixteen others indicated no interest.

A number of persons responded to the open-ended question asking for comments on transportation in this area. These comments (in condensed form) are listed below:

Need shuttle service from Jantzen Beach to the Airport
Improve traffic signing
Push for two person carpools
Reduce cost of bus service
Provide tax incentives for those living close to work
Make better use of rail transport (2 responses)
Use less land for transportation purposes
Establish a work trip oriented transit systems in Clark County and connect the system to Portland
Establish a progressive tax to favor small over large autos
Provide a park and ride facility on Mill Plain Blvd
Coordinate transportation planning with land use planning
Stop high density subdivisions on Mt. Hood
Tie transportation modes with historical sites
Improve Transit
Provide transit service to shopping centers
Do something: Any non-highway improvement would be appreciated

COLUMBIA REGION ASSOCIATION of GOVERNMENTS

6400 S.W. CANYON COURT
PORTLAND, OREGON 97221

(503) 297-3726

October 1, 1974

Mr. William Dirker
Transportation Coordinator
City Hall
Portland, Oregon 97204

Re: Traffic Signal at Interstate Avenue and Going Street

Dear Mr.Dirker:

In response to a PMB directive given to the I-5 Corridor Project staff in the September 20, 1974 meeting, the attached State Bond Application is transmitted to you. It is suggested that it be processed through appropriate departments and modified in accordance with Capital Improvement Program and/or procedures of your agency. After completion of the application, it should be transmitted together with a resolution, indicating official agency support and commitment, to Mr. Richard Etherington, Director of Transportation, at CRAG for forwarding to ODOT.

The State Bond funding was selected because it provides for quick approval and will expedite the implementation of the project. Any urging you can provide in the procedures would be advantageous.

Sincerely,

Hurvie

Hurvie E. Davis,
Project Coordinator

HD/rb

STATE BOND APPLICATION

TITLE — Traffic Signal

LOCATION — Intersection of Interstate Avenue (SPH 9)

DESCRIPTION — The project consists of the removal of the existing traffic signal and the installation of a new signal with full actuation interconnect capability, and queue detection near the ramp with queue control logic. The full actuation provides a signal that responds to traffic flow demand while the queue detection will sense traffic as backups near the northbound Going Street off-ramp from I-5 and the queue control logic will lengthen the green time to clear the traffic waiting on the ramp. The interconnect capability will enable this intersection to be connected to a signal system.

JUSTIFICATION — Fixed time traffic signals controller can accommodate large variations in traffic demand. The timing is usually insufficient in the peak periods while excessive in the off-peak periods. In addition to these general aspects, a traffic backup on the east approach to the existing traffic signal in the AM peak period often occurs severe enough to block the I-5 northbound off-ramp and even the right lane of the freeway mainline. This, of course, results in a safety hazard as well as congestion on the freeway and considerable delay to those vehicles using the off-ramp.

ESTIMATED COST — $30,000 (Does not consider the salvage value of the existing signal equipment.)

IMPACT — The implementation of this project will result in the reduction of delay, air pollution and fuel consumption caused by congestion on the off-ramp during the AM peak. In addition, a hazard which often occurs on the I-5 mainline between the Fremont Bridge and Going Street will be eliminated.

STATE BOND APPLICATION

TRAFFIC SIGNAL

VICINITY MAP

INTERSTATE AVE - GOING ST.

CITY OF PORTLAND

SEPT '74

COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum September 26, 1974

To: Project Management Board

From: Hurvie E. Davis, Project Coordinator

Subject: Phase I Implementation - Traffic signals at Union Avenue & Marine Drive and at Going Street & Interstate Avenue .

In order to expedite the implementation of a portion of the Phase I recommendation 7 (b&c) the PMB during the September 20 meeting instructed staff to provide the City of Portland and Multnomah County with sufficient information to fill a request for State Bond funding of one project in each jurisdiction. The cost of each project is expected to be about $30,000.

The first is the remodeling of the Going Street and Interstate Avenue traffic signal which should consider full-actuation, ramp queue detection and queue control logic, and interconnect capability.

The second is a traffic signal in Multnomah County at the intersection of Union Ave and Marine Drive. The controller should be fully-actuated and possibly include transit pre-emption. Transit vehicles should also be permitted to turn left on to the on-ramp from the right lane in order to avoid long queues in peak periods.

To support this action it is further suggested that Tri-Met consider installation of signal pre-emption devices on the transit vehicles which are most likely to use these intersections. It may be appropriate to apply to UMTA for a capital grant to equip buses with the pre-emption devices.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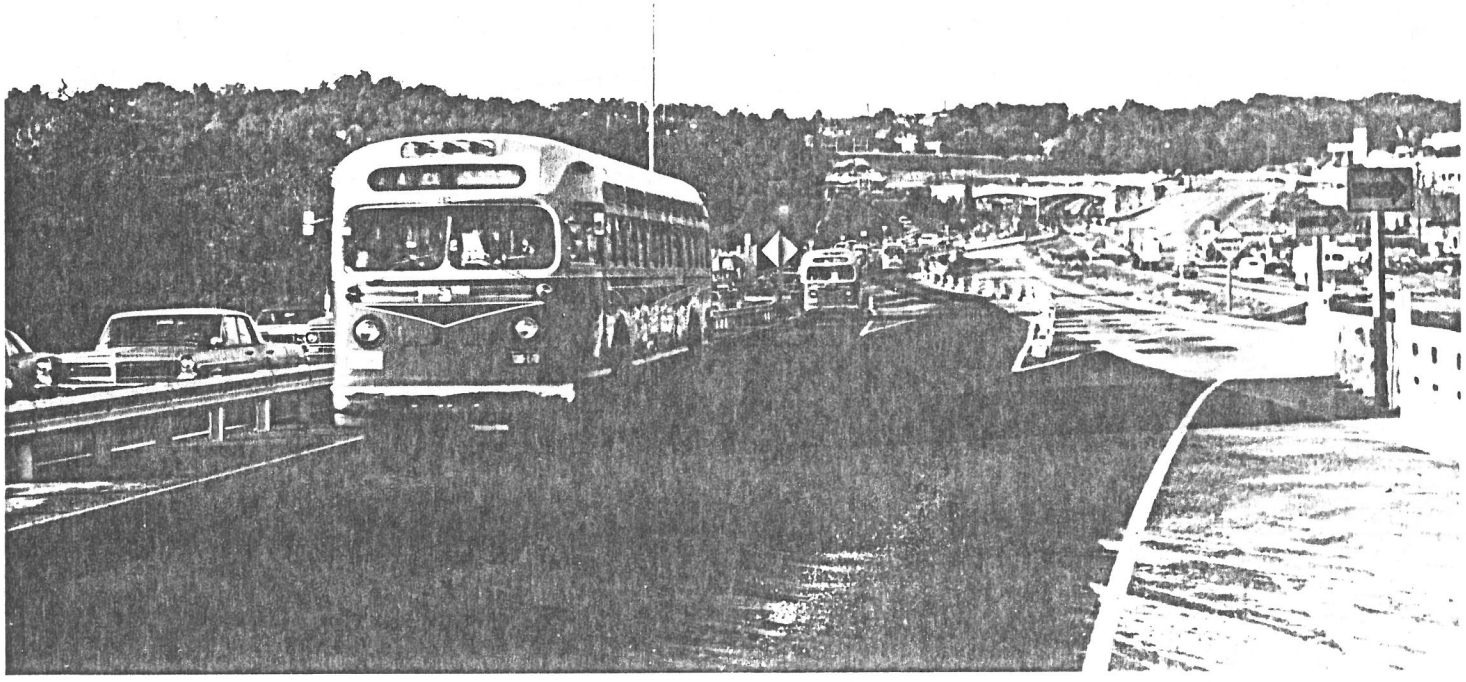

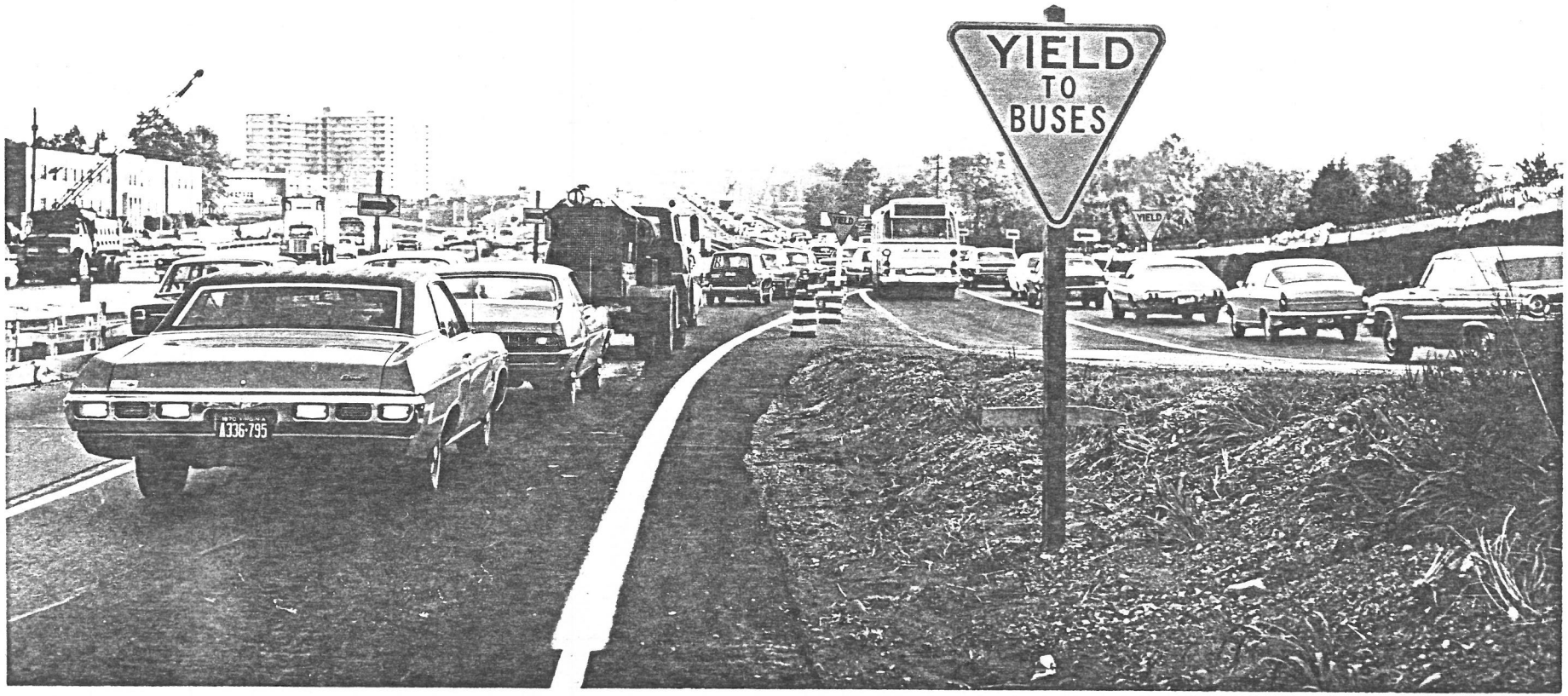
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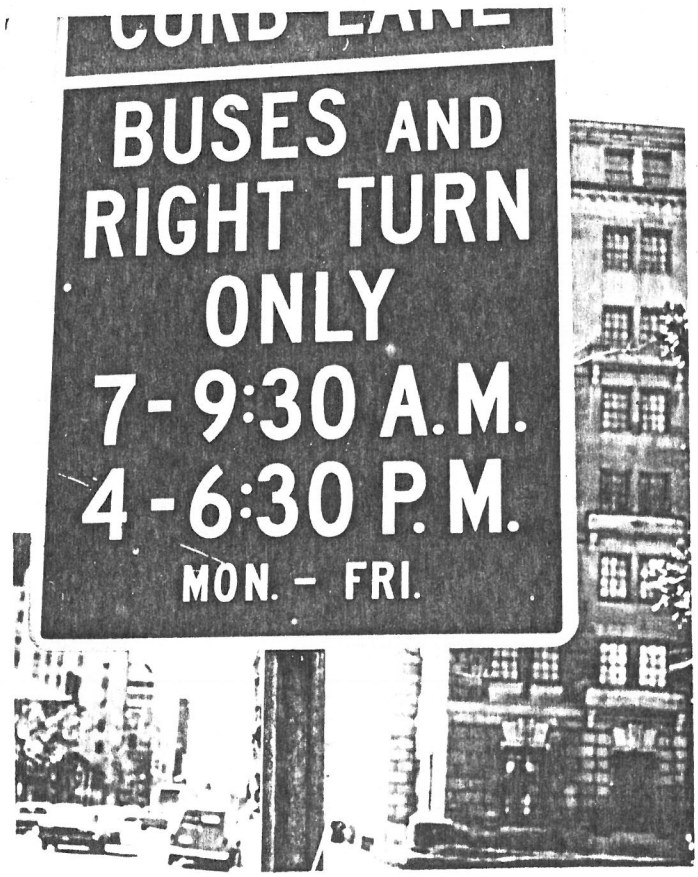
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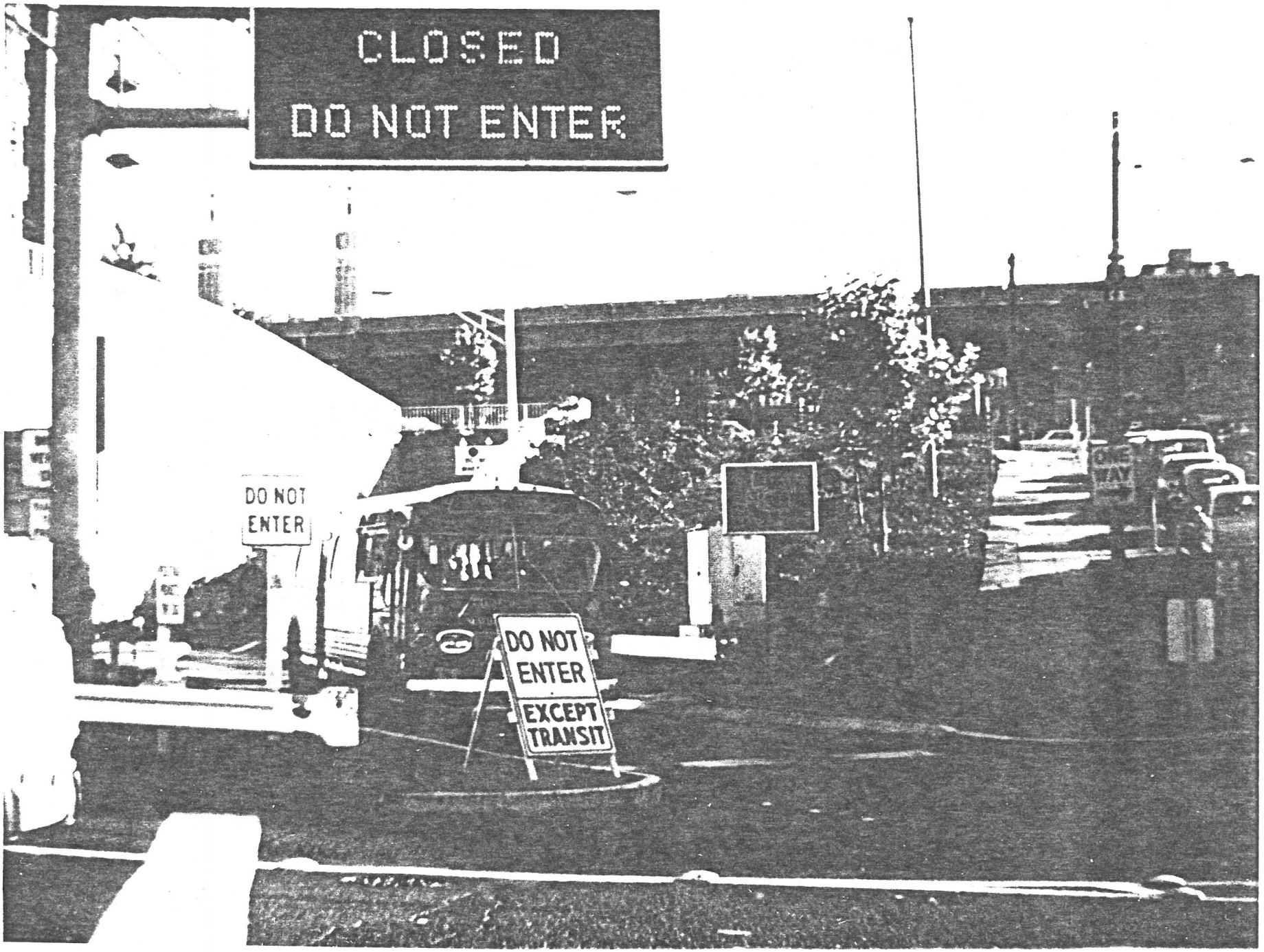
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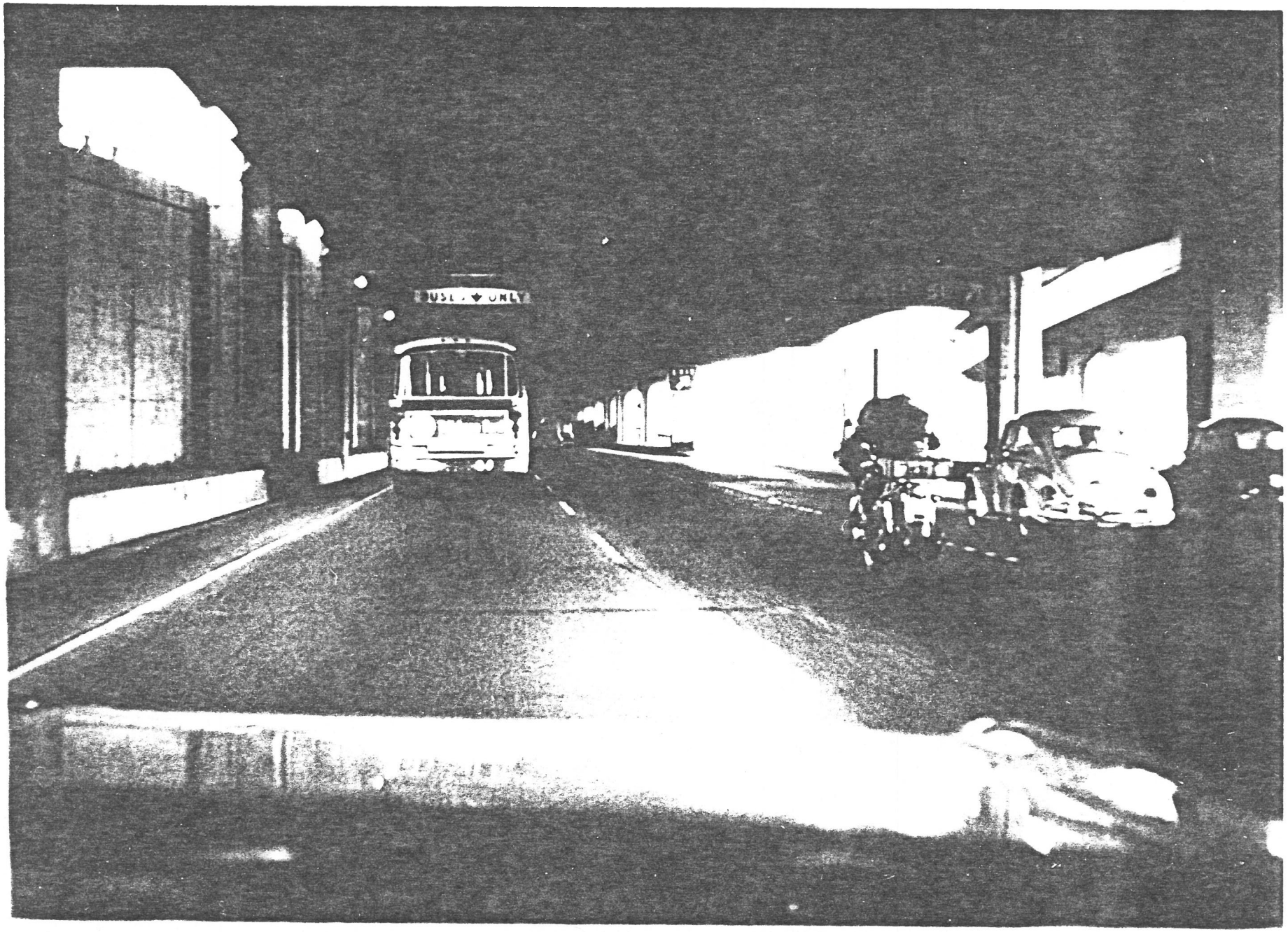
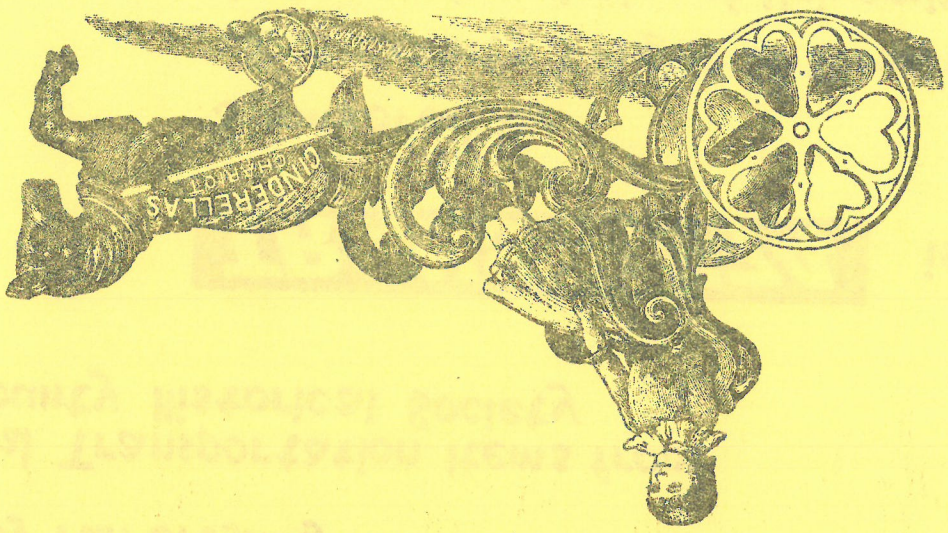




TRANSPO '74

regional options

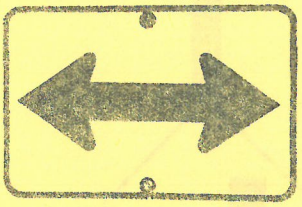
TRANSPO '74 is a challenging event planned to connect ideas and people concerned with transportation.

September 28, 1974
Fort Vancouver Regional Library
10am to 5pm

TRANSPORTATION FAIR

SEPTEMBER 28, 1974
Fort Vancouver Regional Library
1007 East Mill Plain Blvd.
Vancouver, Washington

695-9928 Coordinator



EVENTS

10:00	Booths Open	Main Floor
10:30	AAUW September Meeting	Library Hall
11:00	Slide Show	Alcove-Main Floor
11:45	Design for Clark County Annual Meeting	Library Hall
12:00	David Stevens*	Library Hall
12:20	Panel Discussion on 1990 Scenario**	Library Hall
2:00	Slide Show	Alcove-Main Floor
5:00	Booths Close	

*GUEST SPEAKER

David Stevens from the Office of the Governor
will speak on forming a State Department of Transportation

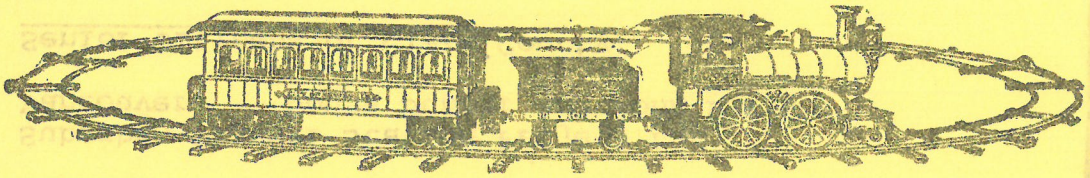
- Vancouver Students' Drawings
  "Fantasy Fun Crossing the Columbia River"
- Historical Transportation Items from
  Clark County Historical Society

TRANSPO '74 is.....

Sponsored by:
Clark County League of Women Voters
American Association of University Women
Design for Clark County
Fort Vancouver Regional Library

SPECIAL DISPLAYS

- Transportation Models - George Burres
- Large Model Airplanes - Allan Halleck

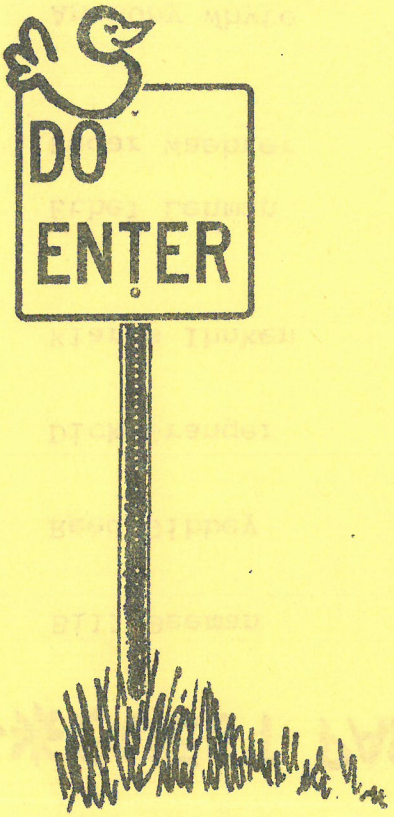


- Camas Students - Transportation items made from recyclable materials
- Transportation Stamp Collection - Clarence Davis

**GUEST PANELISTS

Bill Beeman	Washington State Highway Department
Reed Gibbey	Traffic Engineer with CRAG
Dick Granger	Clark County Commissioner
Klaris Ihnken	AAUW President and citizen advocate of mass transit
Ethel Lehman	Vancouver City Councilwoman
Edgar Waehrer	Project Coordinator of Tri-Met STS Study and Project Management Board of the I-5 Corridor
Anthony Whyte	Columbian writer and ex-Planning Commissioner for Camas, advocate for mass transit

INFORMATIONAL BOOTHS - LIBRARY MAIN FLOOR



1. Air Transportation in Clark County

   Bev Fogle and Pearson Airport

2. Bicycle Path Master Plan

   Bill Dygert and Clark County Parks

3. Burlington Northern Railroad

   James Hagle

4. CARPOOL

   Jack Graham, Director

5. Clark County League of Women Voters

   Alice Bryant on the formation of a state Department of Transportation

6. CRAG

   Richard Etherington, transportation director

7. Discovery Trails

8. Fort Vancouver Historical Society

   "From Bunker Hill to Clark County--1775--1792"; also history of transportation in Clark County

9. Tri Met

   Suburban Transit Station Project for Vancouver; Donna Dunbar and John Perry

10. Senior Citizens of Clark County

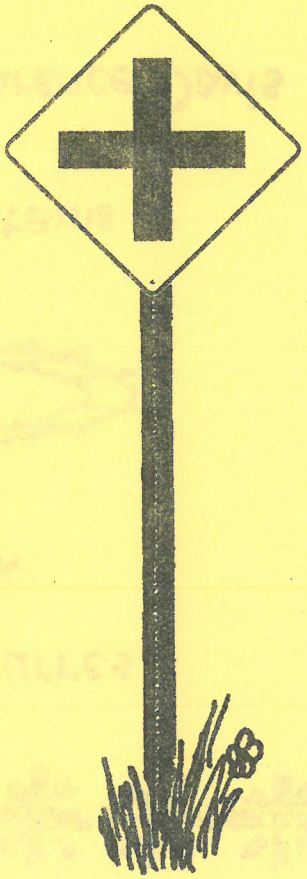
    George Hutton

11. Vancouver-Portland Bus Company

    Jerry Peck

12. Women's Highway Safety Leaders

    The National Safety Council's Defensive Driving Course



COLUMBIA REGION ASSOCIATION OF GOVERNMENTS

Memorandum September 26, 1974

To: I-5 Project Management Board

From: Hurvie E. Davis

Subject: Minutes of September 20, 1974 Meeting

After the minutes of the PMB meeting of July 19,1974, and the Subcommittee to the PMB meeting of July 26, 1974, were approved, the first item, the subcommittee report, was presented. The report pertained to the subcommittee's findings on the I-5 Priority treatment and NTECAP application for Federal funds. It was recommended that the application be revised to include only two possibilities for priority treatment for high occupancy vehicles (HOV); namely, an exclusive lane for HOV and ramp metering with HOV by pass at the metered ramps. ODOT is to respond within 10 days of the meeting as to whether or not the revised application needs to be directed through the CRAG Board of Directors. A motion to approve the subcommittee's recommendation and forward it through the Board if required was approved. The PMB instructed staff to provide additional information on the revised application to the members. The Multnomah County representative stated that this application was in no way to exclude Union Avenue or other facilities from consideration for the longer range improvements of Phase II and III. A discussion on the ECAP application and corridor projects was requested for the next meeting.

Information from Washington State Ferries system was discussed. Staff reported that ferry service in the corridor did not appear feasible. WSHD agreed to contact the ferry agency in Washington and arrange a presentation at the next regular PMB meeting (18 October, 1974).

The Interstate Bikeway plan was reviewed briefly and the PMB approved a resolution of support and instructed staff to prepare an implementation summary (see attachments).

Staff distributed the final draft report of Phase I activities and the PMB set a meeting in two weeks (Oct. 4) to discuss the report in detail.

Since the PMB Vice-Chairperson, Dick Barnum has relocated to another area and will no longer be serving on the Board, Pat Blackwell was selected to serve as Vice Chairperson. In addition, Mr. Herman Brame of the Union Avenue Project in Portland was appointed to serve on the Project Management Board.

The implementation of several Phase I recommendations was discussed which included: express bus service, Tri-Met information numbers, traffic signals, etc. V-P Bus Co.

is awaiting approval for intra-state service in Clark County urban area to improve the feasibility of the express bus service which is expected to be a deficit without the intra-state riders. Clark County and the City of Vancouver indicated that action on the V-P Bus Company request is forthcoming. Staff was instructed to pursue the State Bond Funding of two of the traffic signal projects recommended in Phase I. Subsequently, staff will be contacting, through the PMB representatives, the responsible agencies for these projects. State bond funding is expected to reduce the time for implementation in contrast to some other sources.

Staff distributed some Phase II technical notes on trip generation, distribution, network assignment, modal split and zone composition. The PMB is to review material and submit comments to staff at an early date.

The next regular meeting was set for October 18, 1974, and the meeting was adjourned.

Attachments:

NTECAP Application
State Bond Project Description

THOSE PRESENT	REPRESENTING
Reed Gibby	CRAG
Chuch Neumayer	WSHD
Dick Granger	Clark County
Hurvie Davis	CRAG
Bill Dirker	Portland
Donna Dunbar	Tri-Met
Dave Hupp	Multnomah County
John Perry	Tri-Met
Edgar Waehrer	Tri-Met
Patricia Blackwell	L.W. Voters
Pierre Henrichsen	WSHD
Jerry Peck	Vancouver Portland Bus Co.
Steve Oppenheim	
John Krawczyk	CRAG
Larry Lange	Columbian
Robert Bothman	OSHD
R.O. Cunningham	OSHD
Garth Anderson	City of Vancouver

COLUMBIA REGION ASSOCIATION of GOVERNMENTS

6400 S.W. CANYON COURT
PORTLAND, OREGON 97221
(503) 297-3726

I-5 Project Management Board Meeting

September 20, 1974
Clark County Courthouse

9 a.m.
Judge McMullun's Courtroom
3rd Floor

A G E N D A

I. APPROVAL OF MINUTES
July 19, 1974 Board Meeting
July 26, 1974 Board Subcommittee Minutes

II. REPORT BY SUBCOMMITTEE
I-5 Priority Treatment and Disposition of the NTECAP Application for Federal Funds

III. INFORMATION
Letter from Washington State Ferries re: Ferry Service costs and equipment.

IV. ACTION ON BIKEWAY RESOLUTION

V. STATUS REPORT ON IMPLEMENTATION OF CORRIDOR IMPROVEMENTS

VI. COURSE OF ACTION ON PHASE I REPORT
Copies of the final report are expected to be available.

VII. OTHER BUSINESS

VIII. ADJOURNMENT

INTERSTATE BRIDGE CORRIDOR PROJECT

PHASE I

LOW COST IMPROVEMENTS

ANALYSIS AND RECOMMENDATIONS

Columbia Region Association of Governments

In Cooperation With

Oregon State Highway Division
Washington State Department of Highways
City of Vancouver
Clark County
City of Portland
Multnomah County
Tri-Met

INTERSTATE BRIDGE CORRIDOR PROJECT

PHASE I

LOW COST IMPROVEMENTS

ANALYSIS AND RECOMMENDATIONS

Columbia Region Association of Governments

In Cooperation With

Oregon State Highway Division
Washington State Department of Highways
City of Vancouver
Clark County
City of Portland
Multnomah County
Tri-Met

PROJECT MANAGEMENT BOARD

Dick Granger, Chairman	Commissioner of Clark County
Garth Anderson	City of Vancouver
Pat Blackwell	Citizen Advisory Committee Chairperson
Robert Bothman	Oregon State Highway Division
William Dirker	City of Portland
Pierre Henrichsen	Washington State Department of Highways
Clifford Howlett	Citizen Advisory Committee - Vice Chairman
David Hupp	Multnomah County
Jerry Peck	Vancouver - Portland Bus Company
Ed Wagner	Tri-Met

CITIZEN ADVISORY COMMITTEE

F.S. Barlow	Burlington Northern Railroad	Portland
Pat Blackwell, Chairperson	League of Woman Voters	Vancouver
Ray Brewer	Model Cities Union Avenue	Portland
Julius Gaussoin	Citizen at Large	Vancouver
Carol Hanson	American Association of University Women	Vancouver
Clifford Howlett	Western Environmental Trade Association	Portland
Jim Howell	Sensible Transportation Options for People	Portland
Jim Lafferty	Rose City Marine Brokers	Portland
Ethel Lehman	Design for Clark County	Vancouver
Lee Ann MacColl	League of Woman Voters	Portland
Howard Martin	Camas-Washougal	Camas
Chuck Mulligan	City Center Forum	Vancouver
Corporal Garland	Oregon State Police	Portland
Vern Rifer	Oregon Environmental Council	Portland
Jim Shull	American Pacific Industrial Leasing	Portland
Betsy Strong	Womens Highway Safety Leaders	Vancouver
T.R. Swennes	Trucking Industry	Portland
Larry Wilson	Bicycle Advocates	Vancouver

CONTENTS

The tables and figures for each chapter are located at the end of the respective chapters.

I SUMMARY OF RECOMMENDATIONS

Late in 1973, several public agencies in Oregon and Washington established a project in the Interstate Route 5 corridor to address and resolve some of the traffic operational problems due to excessive demands of the existing major facility, Interstate Route 5. The project was divided into three phases and this chapter describes the recommendations developed in the first phase.

Phase I was directed to low-cost improvements which were generally operational in nature. The recommendations for improvements were directed to transit operators and highway agencies in order to increase the capacity of person trips within the corridor. Included in this section is an impovement program which identifies the recommendations together with the responsible agencies, estimated cost, estimated time of implementation or duration of the recommendaton, and the expected results. A brief summary of Phase I project recommendations is listed below and on tables 1a and 1b; furthermore, a detailed description appears in chapter VIII on page 51.

EXPRESS BUS SERVICE:

Express bus service consists of providing additional service for commuters during the morning and evening peak periods in the Mill Plain and the Hazel Dell areas to downtown Portland and Lloyd Center. The expected result will be increased patronage to public transit; thereby, reducing the number of autos using highway facilities in the Interstate corridor.

FREE INTERSYSTEM TRANSFER:

This simply is a provision by which transit riders can use more than one system for a trip at no additional cost. This is expected to encourage riders to use transit in the corridor. At the present time, the cost of transit from Vancouver to certain destinations by use of multiple carriers is prohibitive.

CUSTOMER INFORMATION SERVICE:

This is a series of relatively minor improvements providing such service as toll free telephone information, a route map in the Vancouver telephone directory, location of bus shelters, public information, and other relatively minor improvements that facilitate the use of public transit. This is expected to encourage the use of transit by informing the public as to what areas area served by transit, the costs of the service and when the service is available.

REGIONAL CAR POOL PROGRAM:

This recommendation has already been implemented. With the assistance of the Washington State Highway Division and other agencies, the regional carpool program presently operating in the Portland Metropolitan area has been expanded to include Clark County.

PRIORITY TREATMENT FOR HIGH OCCUPANCY VEHICLES:

An evaluation is being conducted by Oregon State Highway Division, Washington State Highway Division, and Tri-Met relating to the establishment of an exclusive transit lone or system ramp metering in this corridor. This potential improvement will be addressed in more detail in Phase II. This is expected to improve the relative operational characteristics of transit.

FREEWAY TRAFFIC OPERATIONS IMPROVEMENT:

This consists of a number of highway operational improvements including signals, pavement markings, ramp metering at selected locations and eliminating some off and on ramps.

UNIFIED TRANSIT SYSTEM:

This recommendation provides for a unified transit system for the entire Portland-Vancouver region in which line transfers, fares, schedules, etc. can be better coordinated within the I-5 corridor.

BIKEWAY FACILITY:

The recommendation of adoption and implementation of the portion of the regional bikeways plan in the I-5 corridor will provide another mode of travel extending from Vancouver to downtown Portland. The plan calls for bike facilities on both interstate bridges and the North Portland Harbor bridge, with bike routes and lanes elsewhere in the corridor.

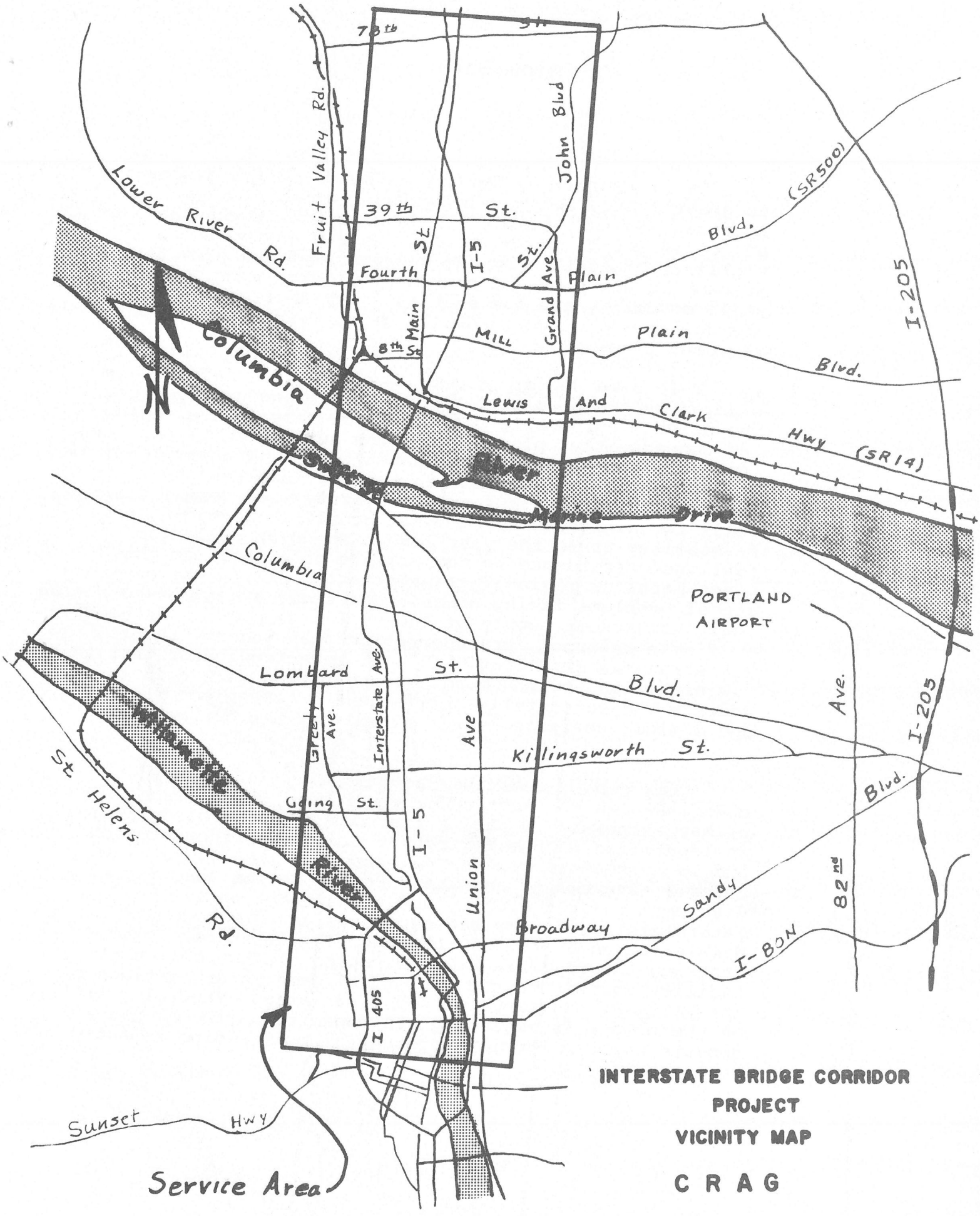
Other recommendations were not a part of the implementation program and consisted of a list of various potential improvements which merit further detailing in Phase II. These improvements include the following: Exclusive transit roadway, work scheduling revision (staggered work hours), employment suburban centers, ramp control systems with transit by-passes and dynamic warning signs, emergency service procedure and system. System alternatives for consideration include express bus, automatic busway, light rail transit, waterway ferries and trolley buses.

TABLE I- 1a I-5 BRIDGE CORRIDOR
PHASE I-TRANSPORTATION IMPROVEMENT PROGRAM

ACTION	AGENCY RESPONSIBLE	ESTIMATED COST	TIME	RESULT
Express Bus Station Operation	V-P Bus	$13,300/year (deficit)	Oct. (Continuous)	Reduce Auto Travel By 1.17 Million Miles Annually
Signing Manufacturing Installation/striping for routes & parking lots	Clark Co/Vanc	$ 1,000		
Promotion	V-P Bus	$ 500/year		
Bus Shelters	Clark Co/Vanc	$ 1,500/shelter		
Free Intersystem Transfers	V-P Bus Tri-Met Vanc. Transit	N/C $ 1,000/year $ 6,000/year	Oct 74 (Continuous)	Encourage Intersystems Trips
Customer Information Service				Encourage Intersystem Trips
Toll Free Line (Vanc. to T.M.)	Tri-Met	$ 72/year $ +.30/call	Sept 74	
Route Map in Phone Books	Tri-Met Vanc. Transit V-P Bus	N/C N/C	April 75	
No. Portland Bus Shelters	Tri-Met	N/C	Sept 74	
Service Promotion	Tri-Met Vanc. Transit V-P Bus Evergn. Stage Lines		Sept 74 (Continuous)	Encourage the Use of Transit

TABLE I- 1b I-5 BRIDGE CORRIDOR
PHASE I- TRANSPORTATION IMPROVEMENT PROGRAM

ACTION	AGENCY RESPONSIBLE	ESTIMATED COST	TIME	RESULT
Carpool			Aug 74 (Continuous)	Increase Auto Occupancy
Public Information	WSHD/Citizens Advisory Committee			
Toll Free Line to Washington	ODOT			
Evaluation of Priority Treatment for High Occupancy Vehicles	ODOT/WSHD Tri-Met	$ 50,000	Aug 74	Feasibility & Determination of Best Concept
Freeway Traffic Operational Improvement	ODOT/WSHD	$500,000	Aug 74 Jan 75	Reduce Congestion
Unified Transit System				Reduce Scheduling Coordination & Transfer Problem of Several Carriers
Clark Co. Transit Dist.	Clark Co/Vanc	N/A	Aug 74- Jan 75	
Tri-Met & V-P Bus Co.	Tri-Met V-P Bus	N/A	Aug 74- Jul 75	
Tri-Met & Evergreen Stage Line	Tri-Met & ESL	N/A	N/A	
Bikeway Facility	ODOT/WHSD/Portland/Vanc	$105,000	Sept 74- Apr 75	Encourage the Use of Bicycles in the Corridor



INTERSTATE BRIDGE CORRIDOR PROJECT

VICINITY MAP

C R A G

JULY 1974 FIGURE I-1

II INTRODUCTION

The life style of today, as many Americans know it, is greatly affected by our transportation system. Americans enjoy a higher degree of mobility than perhaps any other people in the world. This high degree of mobility, brought on by the emergence of the private automobile has provided convenient, quick and comfortable movement, and has enabled many Americans to reside in single family dwellings on large lots outside the central cities.

This same degree of mobility and life style is also enjoyed by the people of the Portland-Vancouver region. The private automobile plays a major role in the region and consequently, planning for the automobile to continue this role in the future has taken place. The result of this planning is described in the Portland-Vancouver Metropolitan Area Transportation Study Plan (PVMATS) which calls for a highway system that provides the mid-60's level of mobility up to the year 1990. The plan calls for continued dependence on the private automobile as the major means of regional transportation. With the environmental problems facing urban areas today and the recognition that our present supply of energy for the private automobile is a finite resource, transportation planning for the region has taken new direction. It must be acknowledged that this new direction towards mass transportation will need to address and sucessfully challenge the convenient, fast and comfort characteristics of the private automobile.

This report describes additional planning being undertaken in one section of the region which places primary emphasis on public transportation. This planning is identified as the Interstate Bridge Corridor Project and is a special cooperative effort of local, state and Federal governments and the Columbia Region Association of Governments (CRAG) to improve transportation in the Interstate 5 corridor between Vancouver/Clark County, Washington, and Portland, Oregon. The Interstate Bridge crossing the Columbia River is currently the only highway facility connecting the Oregon and Washington portions of the Portland-Vancouver metropolitan area. Vehicular traffic on the bridge is exceeding its capacity during AM and PM commute periods and is approaching or exceeding capacity

during heavy weekend and summer months travel periods resulting in serious traffic congestion.

The Portland-Vancouver Metropolitan Area Transportation Study Plan calls for the construction of two additional bridges across the Columbia River within the metropolitan area. One of these, the Rivergate crossing is not committed and will be subject to review in the region's continuing transportation planning process. The other crossing, the I-205 bridge, is committed but the completion date is still some years from construction and may be delayed. Approval of the I-205 design in Multnomah County has recently been withdrawn by the Multnomah County Board of Commissioners. In addition to the existing congestion in the corridor and forecasts which show that the bridge will become increasingly congested, there exists an interim problem of handling traffic during forthcoming reconstruction of Interstate 5 on both the Oregon and Washington approaches to the bridge.

The Interstate Bridge Corridor Project is a three-phase project over an eighteen-month time frame. Primary emphasis is on public transportation with both interim and long-range park and ride facilities contemplated. Phase I of the project is to develop preliminary findings about the problem and its causes and to develop early non-capital intensive type of solutions which can be implemented as demonstration projects. Completion of Phase I was scheduled for June 30, 1974. Phases II and III are to identify more permanent capital intensive public transportation improvements, to prepare an implementation program and to assess the environmental impacts of such improvements. Completion of the entire project is scheduled for June 30, 1975. Even though this project was not designed to address and resolve the problems related to commodity flow, one should not overlook the possibility of integrating commodity flow with passenger flow.

The project is not designed to address the merits of the Rivergate or I-205 river crossings but is to optimize the capacity of the existing and planned reconstructed Interstate 5 facility. In developing more capital intensive improvements for Phases II and III of the project, the I-205 crossing will be considered as a given unless official action is taken in the region which would dictate otherwise. The need for additional transportation facilities dictate otherwise. The need for additional transportation facilities across the Columbia River will be addressed by the Governor's (Oregon) Task Force on

Transportation and as part of CRAG's continuing planning process.

There are other transportation planning activities being conducted in the region and work under this project will be coordinated with these activities. These are:

1. CRAG's new land use and transportation planning activities.
2. Governor's Task Force on Transportation.
3. Tri-County Metropolitan Transportation District of Oregon (Tri-Met) Suburban Transit Station Program
4. Portland Model Cities Union Avenue Project, and
5. Land use and transportation planning efforts of local and state agencies.

Some of these activities can be coordinated on an "in house" basis. Since the project coordinator also serves as assistant transportation director, close coordination of the project activities with other CRAG Transportation and Land Use planning is provided. In addition, the activities of the Governor's Task Force have now been transfered to CRAG. These activities can now be easily coordinated with the project.

Coordination must also be established with related planning activities taking place outside of CRAG such as Tri-Met's Suburban Transit Study and the Union Avenue Model Cities Project. Meetings held at regular intervals between the staffs of these projects would insure that the staff keep abreast of developments which affect the Interstate 5 project. In addition, those members of the project management board, whose agencies are engaged in related planning activities, should reuglarly report on the progress of these activities.

In addition to coordination with other on-going planning in the region, it is imperative that this project incorporate as much citizen participation as is possible within the scope of the project. To accomplish this, a citizen committee was formed to provide input and direction to the project. This committee was subdivided as follows to address three basic issues:

1. Public Awareness
2. Operational Improvements and New Systems
3. Environmental Impact

Each sub-committee has a certain issue to address and serves in an advisory capacity to the Project Management Board. It is essential that the needs and desires of the citizens affected by the project be fully identified and addressed if the project is to be successful.

The project is directed by a Project Management Board comprised of representatives from local and state agencies/ jurisdictions participating in the specially funded project. These participants are as follows:

1. Washington State Department of Highways
2. Oregon State Highway Division
3. Clark County, Washington
4. Vancouver, Washington
5. Tri-County Metropolitan Transportation District of Oregon (Tri-Met)
6. Multnomah County, Oregon
7. Portland, Oregon

In addition, the owner/operator of the Vancouver-Portland Bus Company and the chairperson and vice chairperson of the Citizen Advisory Committee have been appointed as members of the Project Management Board.

Phase I of the project is funded entirely at the local and state level. The Urban Mass Transportation Administration of the Federal Department of Transportation is participating in the funding of Phase II and III. Work on the project is being accomplished by the Columbia Region Association of Governments staff with certain activities being performed by participating agencies.

III PROJECT OBJECTIVES

The Interstate Bridge Corridor Project Phase I objectives have been established to provide for transportation improvement within the corridor. The objectives are oriented to physical action and actual improvement rather than a study with recommendations. Subsequently, this project not only analyzed problems and proposed solutions but addressed, emphasized and assisted in the task of implementation.

In order to update the previous surveys of this type conducted in 1960 and 1970 (Portland Central Business District transit only), an origin-destination survey for highway and transit users was conducted to determine the travel patterns for those using the interstate bridges in the morning peak hours period.

Determine through study and field review the major causes of congestion and low cost (non-capital intensive) solutions to reduce the impact of the existing problems. The solutions are to emphasize federal demonstration type improvements and grants for such demonstrations.

Increase the corridor capacity without major construction through transit and highway operations and social-economic improvements but with due consideration to the desirability of reducing the consumption of fossil fuels.

Develop an action plan or implementation program for the various recommendations setting forth some general criteria for measuring the effectiveness of the recommendations, indicating the implementing organizations and costs.

Conduct a search of contemporary literature to evaluate potential improvements both the short range, non-capital intensive and long range, capital intensive, improvements and set forth in improvements for Phase I and for further considerations in Phase II.

IV DATA BASE

A good data base is an important component of any study or project. Data concerning the social and economic conditions of an area, the travel patterns of an area's residents and the attitudes of an area's residents concerning their transportation problems, must be viewed in setting up a program of improvements to deal with these local problems. In the first phase of the I-5 Corridor Project, the staff has focused on three types of data: the 1970 Census, the Interstate Bridge Origin-Destination (O-D) Survey which was conducted by the Washington State Highway Department, and transit and highway traffic data. Each type of datum supplied a partial description of the problem and issues, and the integration of the various types provided a more complete total picture of the corridor and its problems. Caution was used in the collection and assembling of the data to reduce bias and faulty implications; furthermore, conclusions were carefully established from the data.

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 limited it's definition of a Central Business District to an area somewhat smaller then the Central Business District is 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 the region and particularly in Clark County, and a very high rate of inflation which has substantially effected economic conditions over the past three years.

ORIGIN AND DESTINATION SURVEY

In December 1973, between the hours of 6:00 and 9:00 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 operate in 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 questionaire, and
2. Distributing questionaires 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 questionaire contained 15 questions and provided information on the following subjects in addition to the trip origin and destination (see figure IV-I).

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 questionaires were distributed to motorists from which approximately 3400 responses were received. The sample return was about 36% exceeding the value of 20% which is considered the minimum sample size to obtain representative data. The origin-destination study provided a very detailed break down of the trip origins and 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 study demonstrates that there is a fairly uniform distribution of person trips to destination in the Portland area because no single employment zone recieved 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% figure. 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
5.	Portland north of Columbia Boulevard	722

Note: Trips are expanded and include transit trips. (A complete summary of auto destinations is included in table IV-I)

Six transportation corridors were identified which appear to contain most of the points of origin for 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
I-5 Corridor	2,056

78th Avenue Corridor	1,864
Hazel Dell and Vicinity	1,712
Lewis and Clark Highway 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 destinations, auto occupancy tends to be higher in those areas where employment is relatively concentrated and lower where places of employment are scattered which is only logical. 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. The auto occupancy data is shown in figure IV-2.

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. A complete breakdown of trips (by destination) is shown in table IV-2.

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 interperting these results because such surveys may not represent the behavior of the sampled population. Analysis of observed behavior and conditions are obviously a more accurate indicator of individual and group activities.

A 50¢ fare was the most popular charge for transit as indicated by respondents to the question on this subject. A complete breakdown of what those surveyed feel is a reasonable charge for transit is illustrated in figure IV-3.

It is interesting to note that most respondents selected a fare that was a multiple of a quarter as what they considered a reasonable charge for transit. This suggests that people think in terms of a quarter or multiples thereof as a charge of such services. Response for these fare rates were significantly greater than the 35¢ fare which is used as the base fare by Tri-Met and the Vancouver Transit System indicating that people sense fairness and convenience in paying more for longer trips. These factors should be kept in mind in setting a fare structure for service from the Vancouver area.

Socio-Economic Characteristics:

From the demographic data obtained from the Origin-Destination survey, it can be said that the "typical" Vancouver commuter to Portland is male, between 25 and 35 years old, has access to two or more cars, and an annual income of between $10,000 and $14,000. While the so called "typical" person is usually more of a fiction than a reality, the personal characteristics expressed by this profile does provide a concept of persons who make the daily work trip from Vancouver to Portland.

The age distribution of the respondents are illustrated on figure IV-4. It is interesting to note the relatively young age at which the table peaks, rising rapidly from the 15-19 bracket, gradually dropping to

the 55-59 age group and falling rapidly in the 60 plus age group. This heavily represented segment of the population is indicitive of the fact that ages 20-60 represent the ages most frequently involved in the work force. This is to be expected due to the large amount of work oriented trips. While the number of younger workers (ages 20-29) appear to be rather substantial, statistical analysis indicates that the age distribution of Portland bound commuters is not unrepresentative of the total Clark County population.

Figure IV-5 noted the availability of automobiles to I-5 commuters. The presence of two or more autos in so many households may tend to decrease the receptivity of commuters toward public transit. In fact, a statistical analysis indicated that 1973 vehicle registration in Clark COunty was significantly lower than the autos available to the commuters using I-5.

Income levels of respondents are shown in Figure IV-6. It appears that Portland bound commuters have higher income levels than Clark County residents as a whole.* It is important to note that historically higher income workers tend to be less receptive to transit than low income workers.

Carpools

Only 12% of the respondents indicated they were presently a member of a carpool. About 31% indicated they would be interested in joining a carpool and 49% indicated that they were not interested in a carpool program.

TRANSIT DATA

To supplement the transit Origin-Destination data pertaining to transit ridership, revenues, fare structures, routes, schedules and equipment a search of published and unpublished material was made. Sources of information included the Oregon State Department of Transportation, the four public carriers operating within the corridor and the CRAG libraries. This data aided in the development of the existing situation of transit operations and trends within the corridor and is treated in Chapter VI. Information was also obtained

* Statistical analysis was based on the chi-square test at the 5% level of significance.

pertaining to many transportation systems which may have beneficial application for this corridor.

HIGHWAY TRAFFIC DATA

From the Oregon State Highway Division and Washington State Highway Department data relating to traffic volumes, accident experience, roadway geometics, speed, vehicle occupancy and other information relating to operational characteristics and recent roadway improvements was obtained for I-5, Union and Interstate Avenues. Much of the data was available in reports and files, however, some field studies were conducted specifically for this project. This traffic data provided the basis for evaluating the existing operations and establishing trends in the Interstate Bridge Corridor as described in Chapter V.

SUMMARY

An examination of various types of data from many sources provide much valuable information which was utilized in this project.

According to the 1970 Census information, a considerable portion of the work force in Clark County are employed in the State of Oregon and are oriented to Downtown Portland and the northerly industrial areas. Population projections suggest an obvious need to accommodate considerably more trips in the future which will test the imagination and creativity of problem solvers. The Origin-Destination survey was conducted to more precisely determine the point of trip origins and destinations. The data from it indicated a rather scattered distribution of destinations except for a few locations i.e., Portland Central Business District and Lloyd Center. The responses relating to transit service, occupancy, income, ownership, etc., was indicitive of a low propensity to use transit. Carpooling received some degree of support with about 43% of the respondents indicating they were involved or interested in a carpool arrangement.

Information on transit and traffic characteristics was either readily available from the transit operators in the region and the two state highway agencies or obtainable from the field.

TABLE IV-1 PEAK PERIOD PERSON TRIPS FROM CLARK COUNTY (by Auto) FOR WORK PURPOSES TO OREGON DESTINATIONS

Destination	Trips
Downtown Portland	2,020
North Portland*	1,936
Lloyd Center	1,362
Northwest Industrial Area	1,213
Southeast Portland	948
Swan Island	818
Industrial Areas North of Columbia Blvd.	717
East Multnomah County	692
Washington County	469
Southwest Portland (Excluding Downtown)	446
St. Johns - Rivergate	410
Clackamas County	281
External Stations	173
Total	11,485

*Excludes Lloyd Center, Swan Island, Rivergate, and Industrial Areas north of Columbia Blvd.

TABLE IV-2 TRANSIT RIDERSHIP FOR WORK PURPOSES DURING THE MORNING PEAK PERIOD

Destination	Trips
Downtown Portland	293
Lloyd Center	22
Southwest Portland	6
Portland North of Columbia Blvd.	4
Southeast Portland	4
Other	7

FIGURE IV-I O-D QUESTIONNAIRE FOR INTERSTATE BRIDGE CORRIDOR PROJECT

I-5 INTERSTATE BRIDGE CORRIDOR STUDY

PLEASE DO NOT WRITE IN BOXES

1. Type of Vehicle (check one):
   _____ Passenger car, Pickup or Panel _____ Truck _____ Other — 13 ☐
2. How many people were in the vehicle, including the driver? _____ — 14 ☐
3. Origin of trip (Exact address, nearest intersection or name of well known place where this trip began).
   Address _____ — 15 ☐☐☐☐
   City _____ State _____ Zip _____
4. Destination of trip (Exact address, nearest intersection or name of well known place where this trip ended).
   Address _____ — 19 ☐☐☐☐
   City _____ State _____ Zip _____
5. What was the cost of parking at your destination?
   $ _____ . _____ per _____ Day / _____ Week / _____ Month _____ Free — 23 ☐☐☐☐
6. What was the purpose of this trip?
   _____ Work _____ Personal Business _____ Other (Specify)
   _____ School _____ Pickup or deliver passenger _____ — 27 ☐
7. Which Interchange did you use to leave the Interstate 5 Freeway?
   _____ — 28 ☐☐
8. 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 making this same trip?
   _____ Yes _____ No _____ Uncertain — 30 ☐
9. Considering the cost by auto, what do you feel would be a reasonable charge for this trip by transit? $ _____ . _____ — 31 ☐☐☐
10. Are you presently a member of a car pool? _____ Yes _____ No — 34 ☐
    If you are not now a member of a car pool, would you be interested in joining one? _____ Yes _____ No — 35 ☐
11. You are: _____ Male. _____ Female. — 36 ☐
12. How many persons reside in your household? _____ — 37 ☐☐
13. How many licensed vehicles are available at your household? _____ — 39 ☐☐
14. What is your age? _____ — 41 ☐☐
15. What is your yearly family income? ___ less than $3,999 ___ 4,000-9,999 ___ 10,000-14,999 ___ 15,000-19,999 ___ more than $20,000 — 43 ☐

COMMENTS: _____ — 44 ☐☐

Dir. 1 [2] Time 4 ☐☐☐☐

Station 2 ☐☐

NBR. 8 № 10528

FIGURE IV-2

ORIGIN DESTINATION SURVEY DATA: VEHICLE OCCUPANCY OF SOUTHBOUND A.M. PEAK PERIOD PERSON TRIPS, VANCOUVER, WASH.

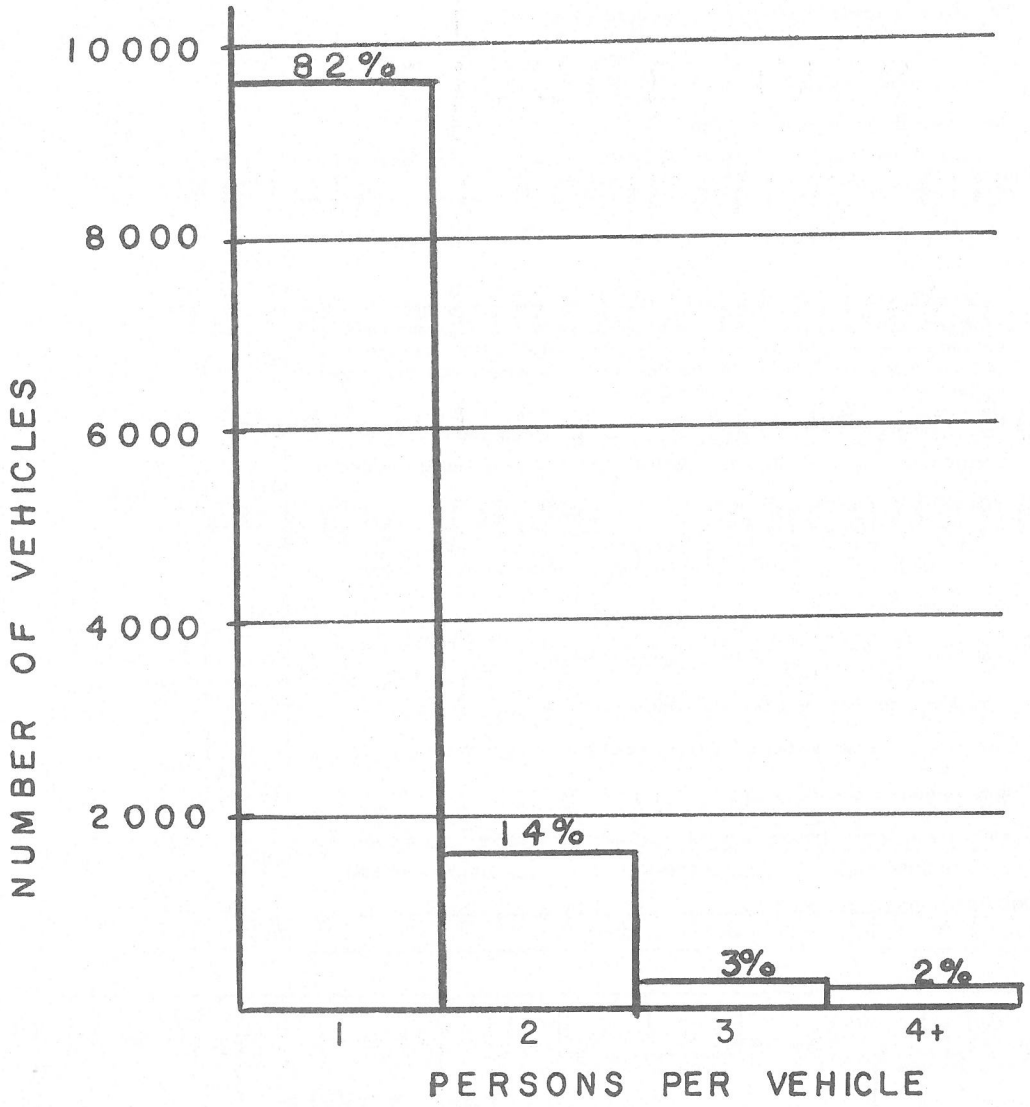


FIGURE IV-3

REASONABLE TRANSIT FARE: SURVEY OF SOUTHBOUND A.M. PEAK PERIOD PERSON TRIPS VANCOUVER, WASH.

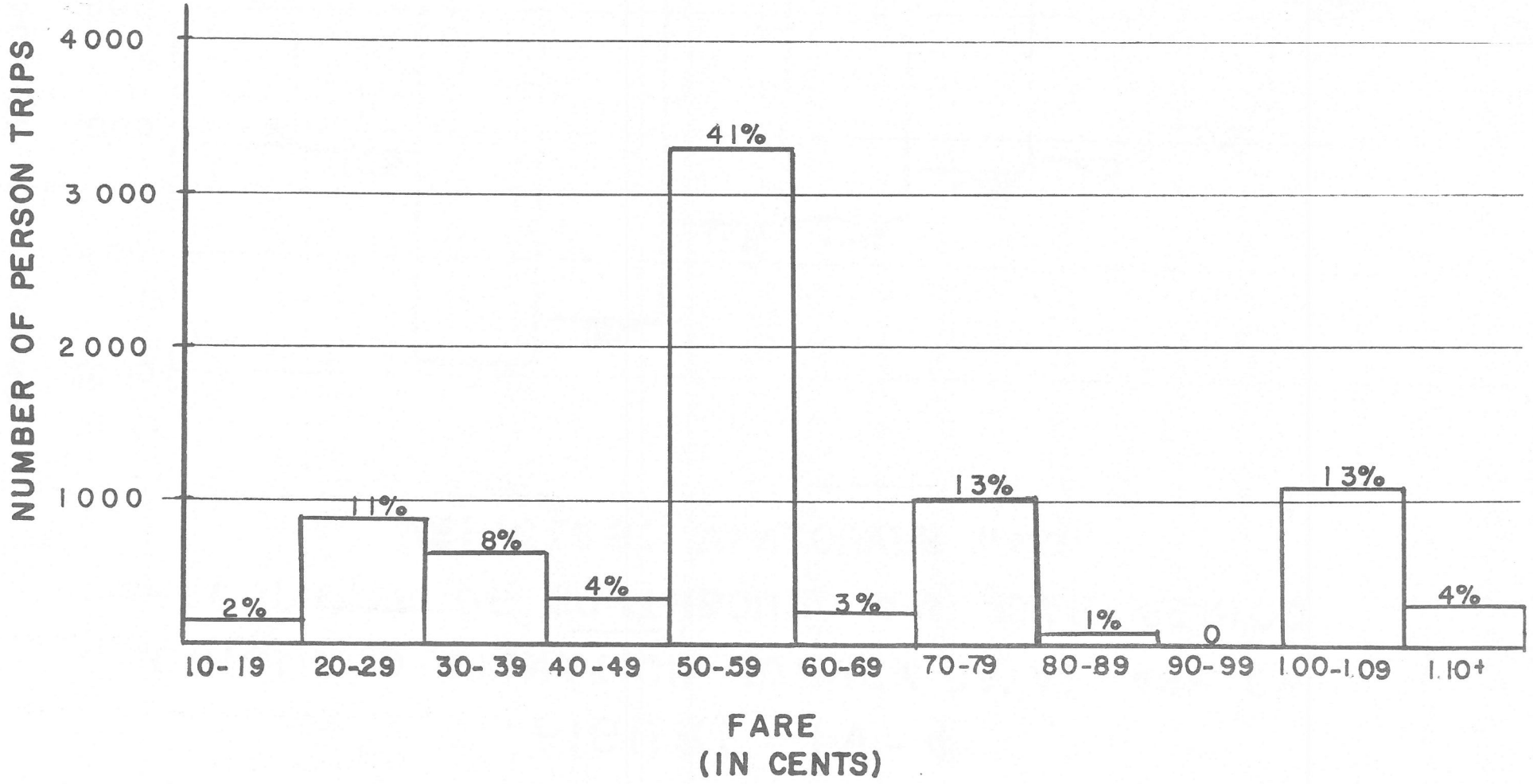


FIGURE IV-4

ORIGIN-DESTINATION SURVEY DATA: AGE OF OCCUPANTS OF SOUTHBOUND A.M. PEAK PERIOD VEHICLES: VANCOUVER WASH.

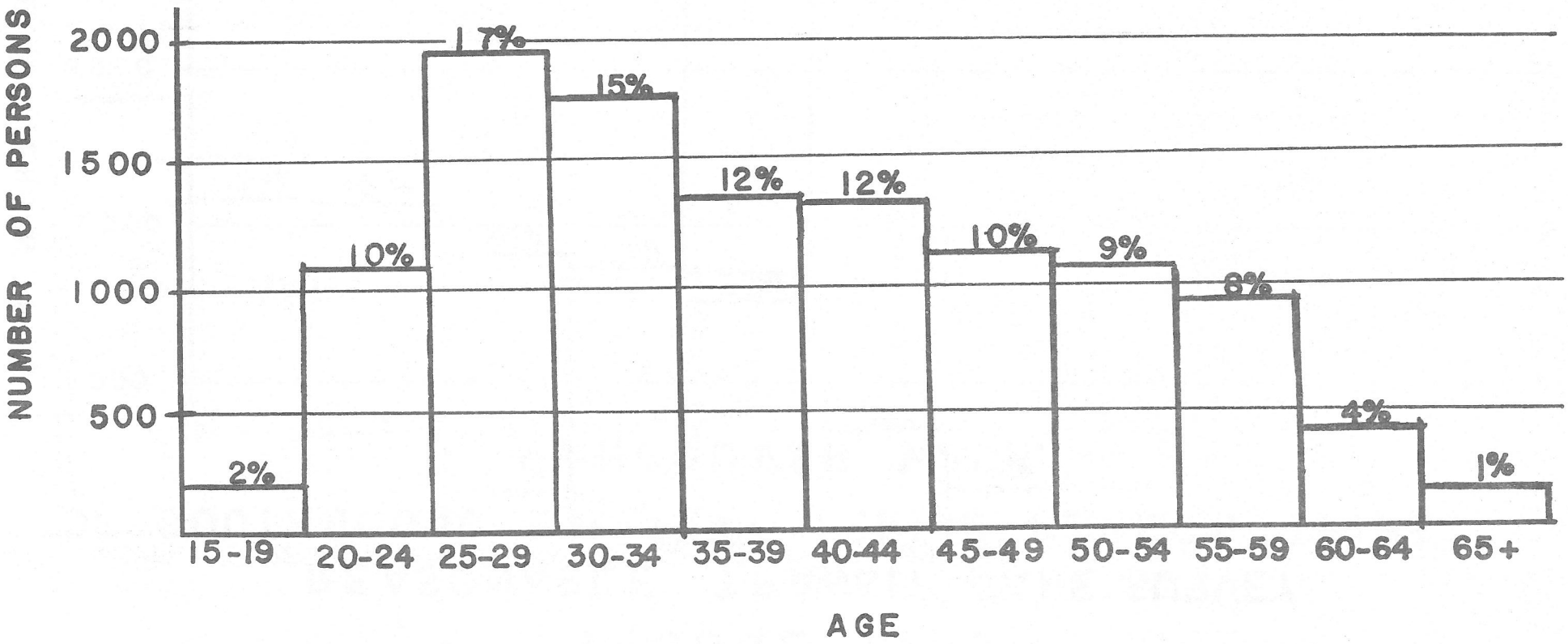


FIGURE IV-5

ORIGIN DESTINATION SURVEY DATA: VEHICLES AVAILABLE TO OCCUPANTS OF SOUTHBOUND A.M. PEAK PERIOD VEHICLES: VANCOUVER, WASH.

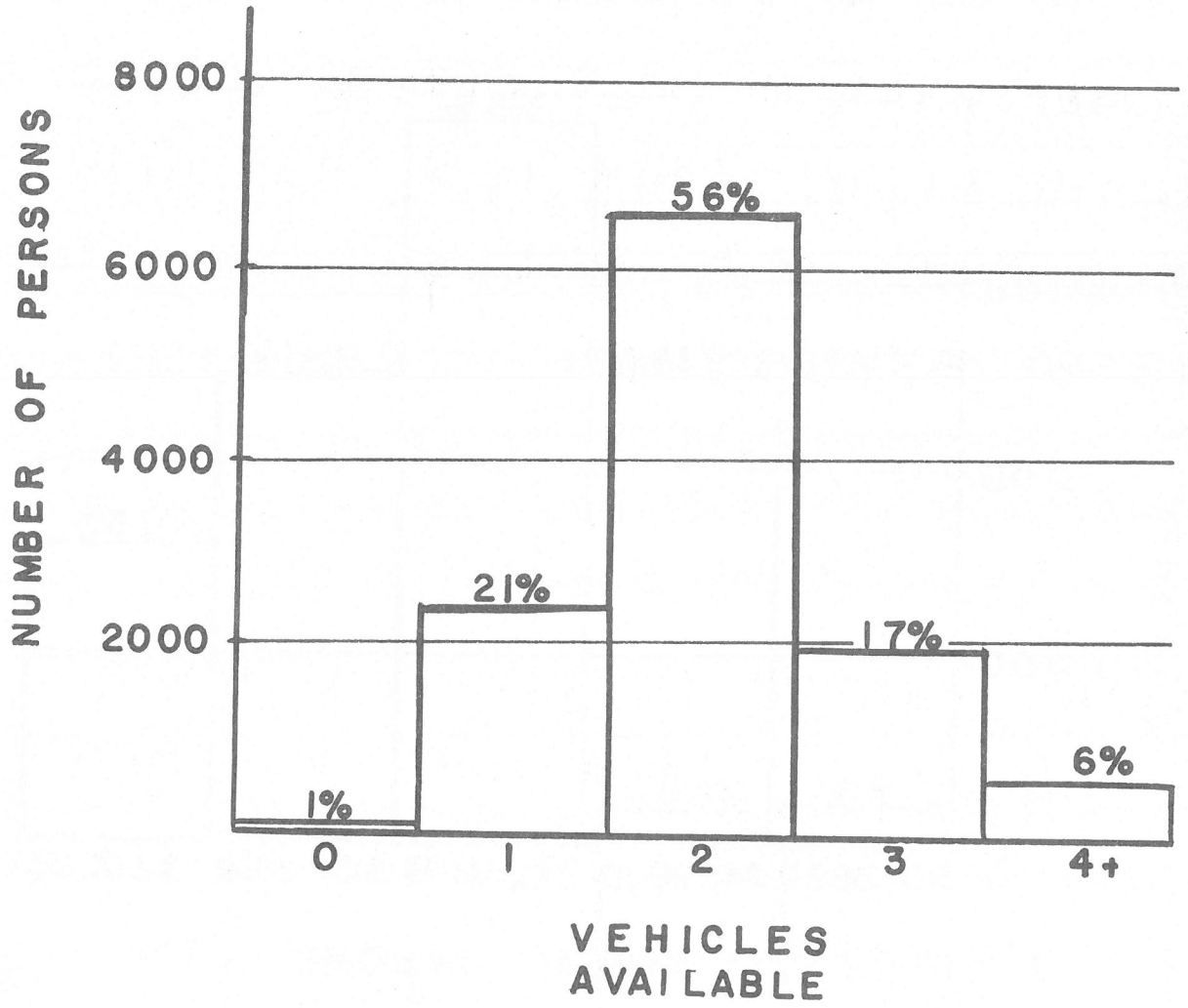
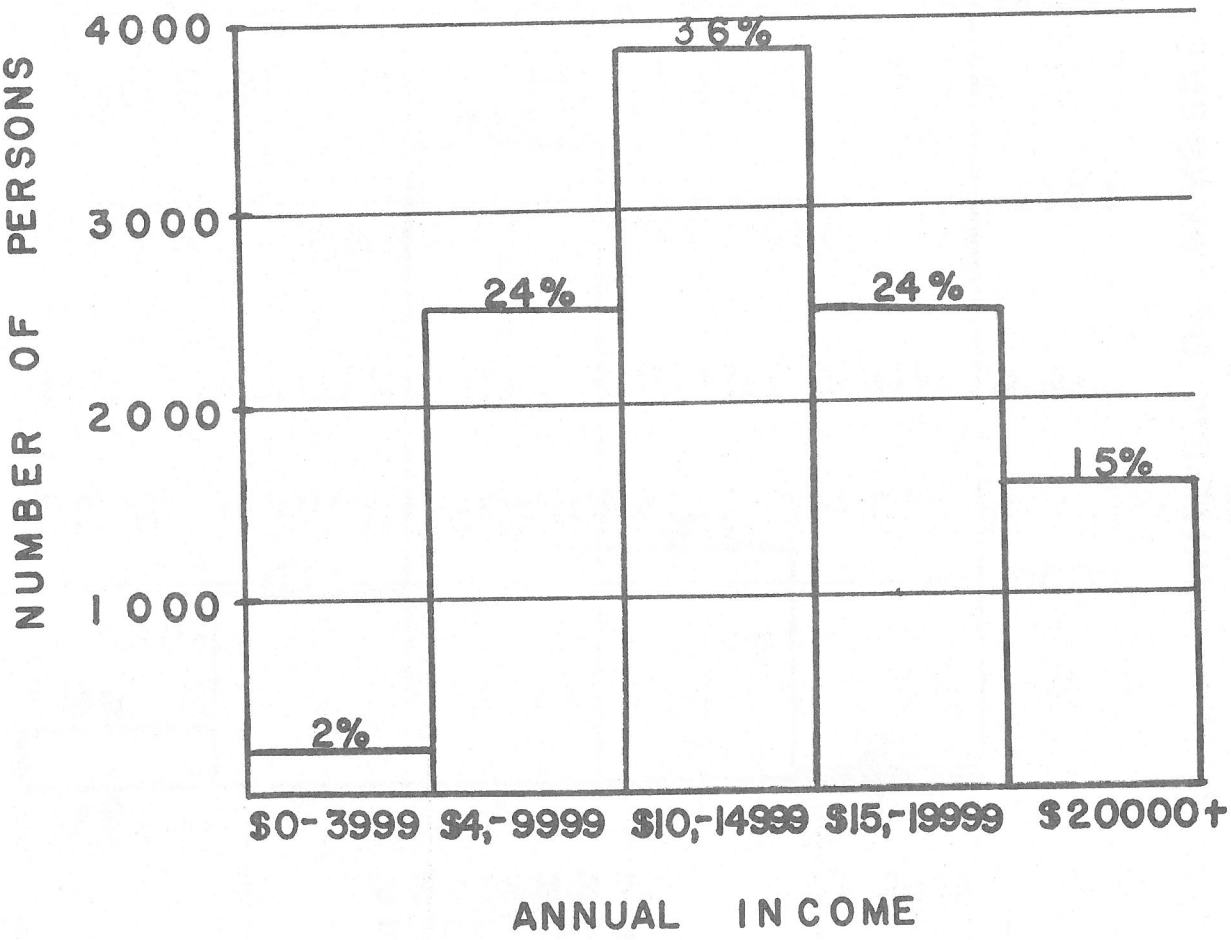


FIGURE IV-6

ORIGIN DESTINATION SURVEY

DATA: ANNUAL INCOME OF OCCUPANTS OF SOUTHBOUND A.M. PEAK PERIOD VEHICLES, VANCOUVER, WASH.



V EXISTING CONDITIONS AND TRENDS

GENERAL

Presently, transportation in the Portland-Vancouver Region is accomplished by highway, marine rail, and air systems. Nearly all passengers are served by one of three modes - auto, bus or air. Rail systems provide the balance, though small, in passenger service but produce a major movement in goods. Truck and marine systems deal exclusively in goods movement while air also provides a portion of this service. The relative passenger service of auto, truck and bus is illustrated on figure V-1.

Within the corridor there are four network types available for consideration of expansion: namely, highways, rail, marine, and air (helicopter charter). The highway facilities within the corridor consist of Interstate Route 5, Interstate Avenue and Union Avenue. The rail lines in the corridor are used jointly by Burlington Northern, Union Pacific, Amtrak and others. Marine service is provided on the Columbia and Willamette Rivers, and air service is a possibility through the use of charter helicopter aircraft. This section evaluates the present conditions of these modes and networks. It also explores the trends of the existing conditions.

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 limites 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 86,700 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.

In order to study the operational problems, a traffic flow diagram (figure V-2) was developed indicating the AM and PM peak hour volumes. From this diagram the locations of maximum volumes

and the level of service may be determined with capacity analysis procedures. Such an analysis 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. The demand volume-capacity (level of service D) relationship is illustrated on figure V-3 and table V-1. 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 improved safety conditions is illustrated on figure V-4 by the reduction in the accident rate which had decreased to 1.8 A/MVM (accidents/million vehicle miles) in 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 50.0 A/MV (accidents per million vehicles) in 1970 while other similiar 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. Although it is apparent that Interstate 5 in Washington needs and is programed for improvement, Phase I of this study did not address this issue because reconstruction was considered a capital intensive improvement. Phase II of this project will address this reconstruction issue in more detail.

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 drawspans yielding the right of way to marine traffic is the only highway link

across the Columbia River within 40 miles in either direction. The high traffic volumes cause queuing problems when the drawspans are open or an accident occurs when traffic flow is heavy. At times the queues have extended for miles on the freeway as indicated in table V-2 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 draw span during peak hours. This bridge has been of considerable interest and concern for sometime; 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 draw bridge controls for the same purpose. The problem with the draw bridge could also be reduced if the river vehicles could be modified so more of them could pass under the higher mid-span section of the bridges. This would reduce the number of interruptions imposed on highway traffic by the waterway traffic.

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 North Portland

Harbor 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 ADT 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 exists 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-existant and each carrier maintains separate fares with no provision for free or reduced fare transfer between systems. (Note: Tri-Met and Vancouver-Portland Bus 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 $2.40 for 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.

Marine passenger service is available only on a charter basis. At present, there is not adequate bus transit service to areas which may be used as marine passenger terminals; therefore, this mode would have a small service area without being supplemented by feeder service. Other limitations on marine systems include an indirect route requiring nearly twice the travel distance from downtown Vancouver to Portland although it may be a feasible alternative.

Generally, air service is not available but helicopter vehicles may be leased and have been used for

special services such as hoists or crane substitutes. Some other regions do have helicopter passenger service operating but with high operational costs and relatively short distances in this region, the high speed and direct route has little advantage. Therefore, this possibility does not appear to be feasible.

MOVEMENT OF GOODS

The major modes for freight movement within this corridor consist of truck, rail, marine with some by private bus. In fact, the first three concentrate on this service. The trucks use the interstate and highway facilities, the trains of several companies utilize the same rail line while marine, of course, uses the rivers which have been dredged to accommodate sea going vessels. Deep water ports have been provided at Portland, Swan Island, and Vancouver. The marine and rail vehicles have a much greater terminal time in contrast with trucks; therefore, the relatively short commodity trips between Portland and Vancouver are predominately provided by the truck mode. The trips of commerce outside the region are, obviously, more likely to be made by rail and marine.

TRENDS

Existing trends are best treated by comparing passenger service by auto, bus and rail since these are the only transportation modes which have varied significantly in relation to each other. During the decades of the 50's and 60's the Portland transit service lost 2/3 of the ridership during which time highway traffic was increasing as shown on figure V-5. The rail passenger ridership declined to insignificant levels almost a half century ago. There are a number of reasons contributing to this trend of reduced ridership:

1. Dispersal of urban development (residential and employment).
2. Low cost and mass production of passenger cars.
3. The advent of the urban commuter.
4. Extensive highway network construction connecting essentially all cities and towns.
5. Availability of inexpensive fuel for autos.
6. The construction of urban freeways.
7. Established transit institutions unable to respond to changes in technology and life styles.

8. Deterioration of mass transit equipment and facilities.
9. Lack of route and schedule flexibility.
10. Increased operating cost, particularly unionized wages.
11. Insufficient sources of revenues.

Generally, low apparent costs for automobiles and travel, increased transit operating capital costs have resulted in the increase of fares which make automobile travel more attractive. Transit systems, therefore, lost non-captive riders which in turn reduced revenues. As revenues declined the unprofitable service was eliminated which further reduced the patronage and also the revenues. This cycle continued until existing agencies or specially created public transit agencies purchased the transit system and supplemented the declining farebox revenues with tax revenues. This movement has also resulted in higher operational cost because of providing service with low ridership but the declining trend in ridership reversed. The present condition of obtaining fuel has provided the biggest inflation of transit ridership in recent history. Tri-Met records include an increase of 30% for February, 1974, over February figures of the previous year; Vancouver-Portland Bus Company experienced a similar increase. Present publications suggest that fuel availability will be reduced, thereby, reducing or at least moderating consumption as compared with the past.

In recent years several land use, network and transportation characteristics have been evaluated to determine which characteristics effect the transit modal split (ratio of transit trips to total trips) and the manner in which they affect it. Among these relationships are residential density, income, auto ownership, available fuel and accessibility (expressed in travel time). These relationships have been illustrated on figures V-6, 7, 8, & 9. Briefly, they may be explained as follows:

1. Transit trips increase with residential (and employment) density.
2. Transit trips decrease as income increases.
3. Transit trips decrease as auto ownership increases.
4. Transit trips decrease with transit travel time.
5. In addition to the above, transit trips increase with reduction in auto fuel availability.

An examination of these trends can provide possibilities for modifying the urban system in such a

manner that the transit modal split will increase. The policies or action, not directly related to transportation, may have considerable impact on transportation. As an example, a considerable reduction in purchasing power may reduce auto ownership and could, thereby, result in an increase in the transit ridership.

Along with the heretofore mentioned are other trends and issues which need consideration and treatment. While carpooling does not directly aid transit, in fact it may reduce potential or existing transit usage, it is desirable because it reduces highway congestion, pollution, etc. Tri-Met has even provided financial support to a regional carpooling effort. The availability of transit equipment is becoming a serious problem because of recent emphasis on transit systems. Equipment costs are expected to increase substantially as the demand continues to increase. The recent interest in cycling has led to the development of bikeway plans both in Washington and Oregon as well as a regional plan by Columbia Region Association of Governments. This regional plan recommended a bikeway in this corridor. Therefore, it is advisable to consider the construction of bike facilities with any other new construction in the corridor.

SUMMARY

Evaluating the present conditions of the transportation systems within the Interstate Bridge Corridor suggested that there is nearly an exclusive reliance on the highway mode of travel which has resulted in problems of congestion - noise, air pollution, and delay, etc. This is true even though there is unused capacity on Interstate and Union Avenues because 1) insufficient motorist information of freeway conditions, 2) geometric deficiences of the facilities 3) all traffic must use the two interstate bridges and 4) the decline in public transportation in the corridor is expected to continue for a few years. The immediate improvements will most likely be centered on automobile and bus modes of transportation since those systems are already in service.

TABLE V-1 HIGHWAY VOLUME -CAPACITY RELATIONSHIPS IN THE INTERSTATE BRIDGE CORRIDOR

FACILITY	NUMBER OF LANES	1972 DEMAND	APPROXIMATE CAPACITY
I-5			
FREMONT	8	86,700	100,000
KILLINGSWORTH	6	73,300	75,000
* COLUMBIA	4	54,700	50,000
* INTERSTATE BRIDGES	6	77,800	75,000
MCLOUGHLIN (Vancouver)	4	53,600	50,000
INTERSTATE			
FREMONT	4	16,700	20,000
KILLINGSWORTH	4	9,300	20,000
COLUMBIA	4	7,400	20,000
UNION			
FREMONT	6-8	19,100	30,000
KILLINGSWORTH	4	15,800	20,000
COLUMBIA	4	12,800	20,000
SCREENLINE			
FREMONT	18-20	122,500	150,000
KILLINGSWORTH	14	98,400	115,000
COLUMBIA	16	74,900	90,000
* INTERSTATE BRIDGES	6	77,800	75,000

* Demand exceeded capacity. This capacity is approximately level of Service "D".

TABLE V-2 ESTIMATED QUEUE LENGTH AND TIME TO CLEAR CONGESTION ON INTERSTATE 5 IN THE VICINITY OF THE INTERSTATE BRIDGES

Hour Ending	Direction & Queue Length (miles)	Clear Time (Minutes)
7:00 A.M.	.8 North	12.3
8:00 A.M.	2.8 North	47.3
9:00 A.M.	1.0 North	13.4
4:00 P.M.	1.0 South	14.3
5:00 P.M.	2.8 South	47.3
6:00 P.M.	2.1 South	28.8
7:00 P.M.	.8 South	12.3

I-5 TRAFFIC VOLUMES

MARCH 1974

XXX AM PEAK HOUR
(XXX) PM PEAK HOUR

FIGURE V-2

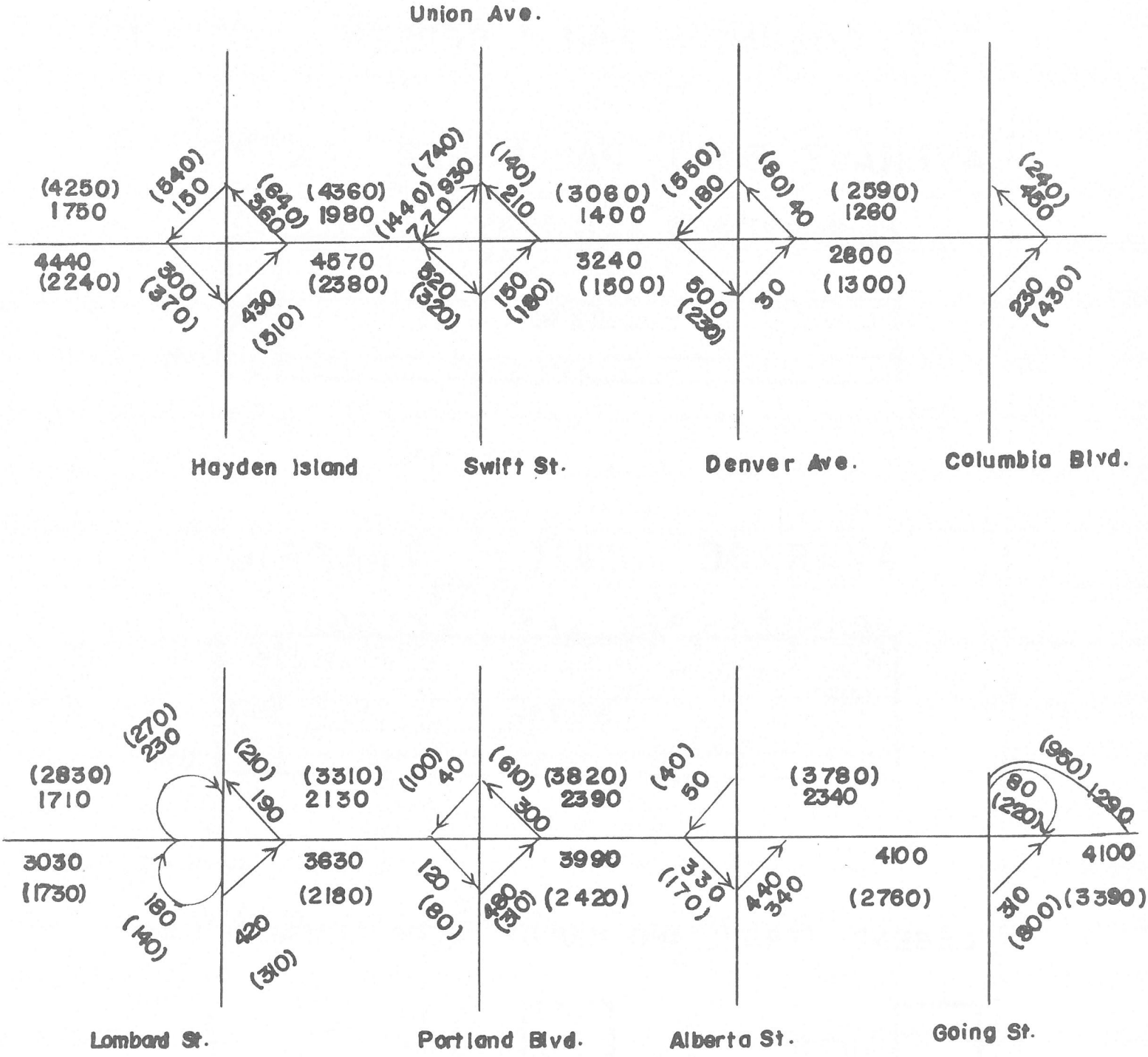
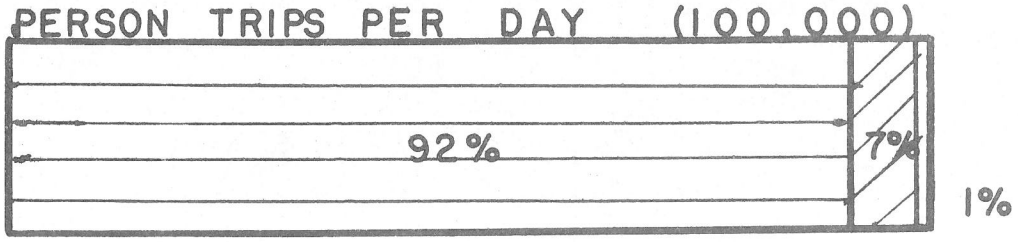


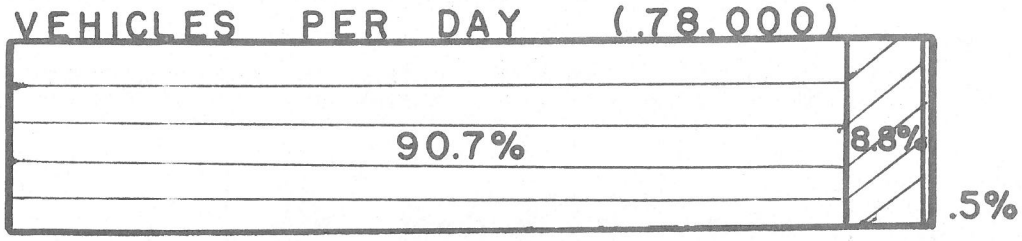
FIGURE V-1

MODAL SPLIT CHARACTERISTICS OF THE COLUMBIA RIVER SCREEN LINE (1972)

AVERAGE DAILY PASSENGER TRIPS



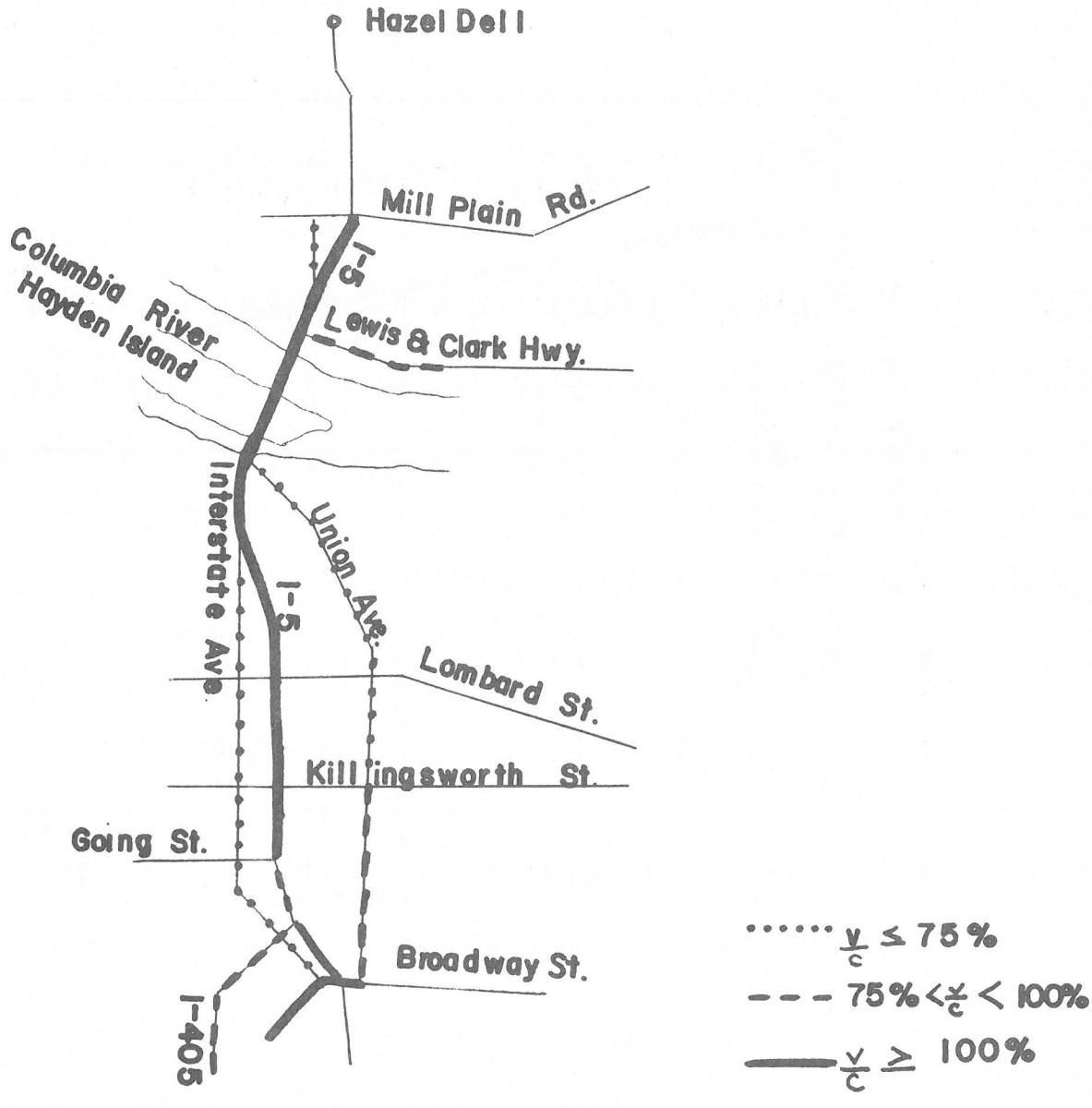
AVERAGE DAILY TRAFFIC



LEGEND: (TRAIN AND MARINE WERE INSIGNIFICANT)

FIGURE V-3

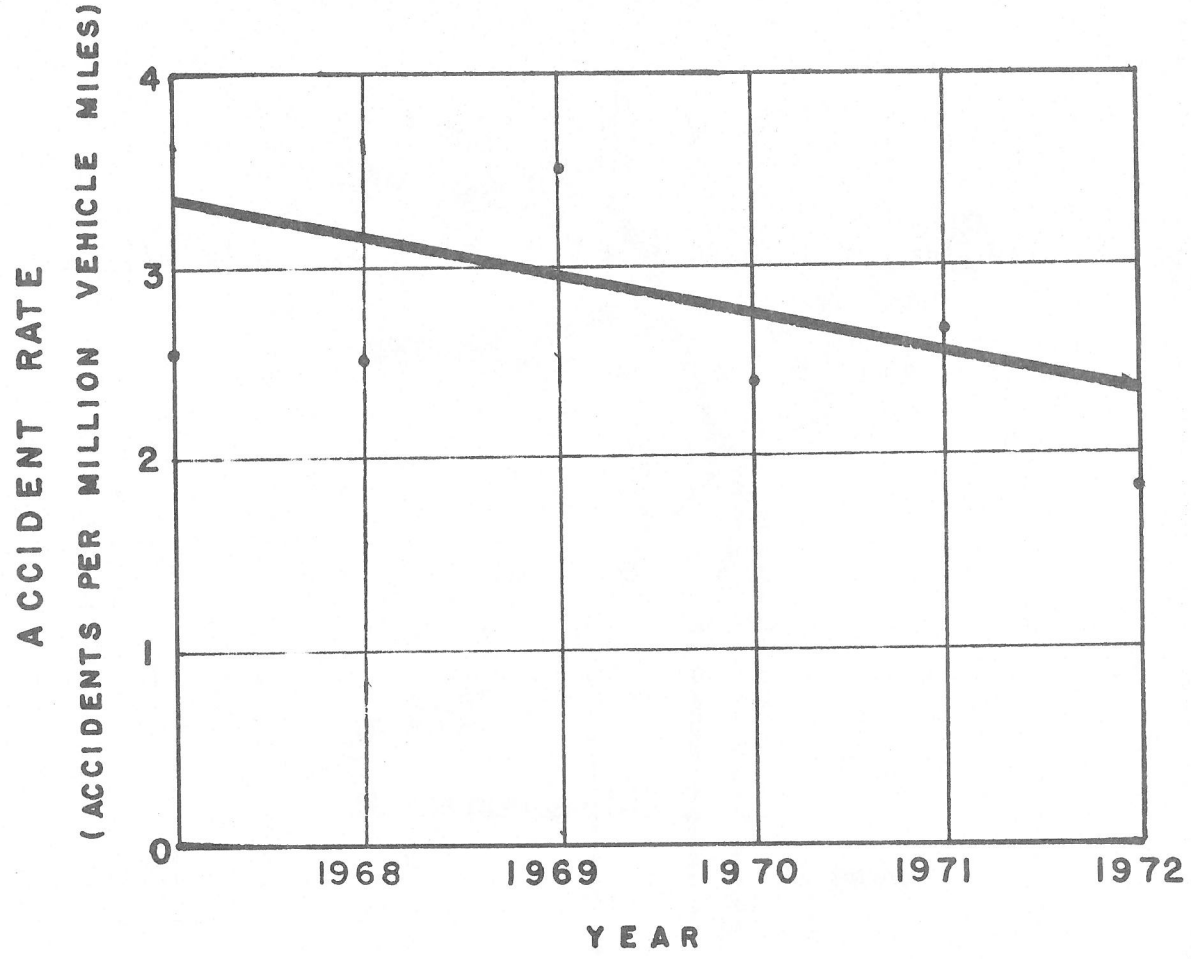
DEMAND CAPACITY OF HIGHWAYS IN THE INTERSTATE BRIDGE CORRIDOR



v/c - Peak Period Auto Trips Compared To Design Capacity

FIGURE V-4

ACCIDENT RATE TREND WITHIN THE CITY OF PORTLAND



I-5 - ACCIDENT RATE TREND WITHIN THE CITY OF PORTLAND

FIGURE V-5

AUTO AND TRANSIT TRIP TRENDS IN THE PORTLAND AREA

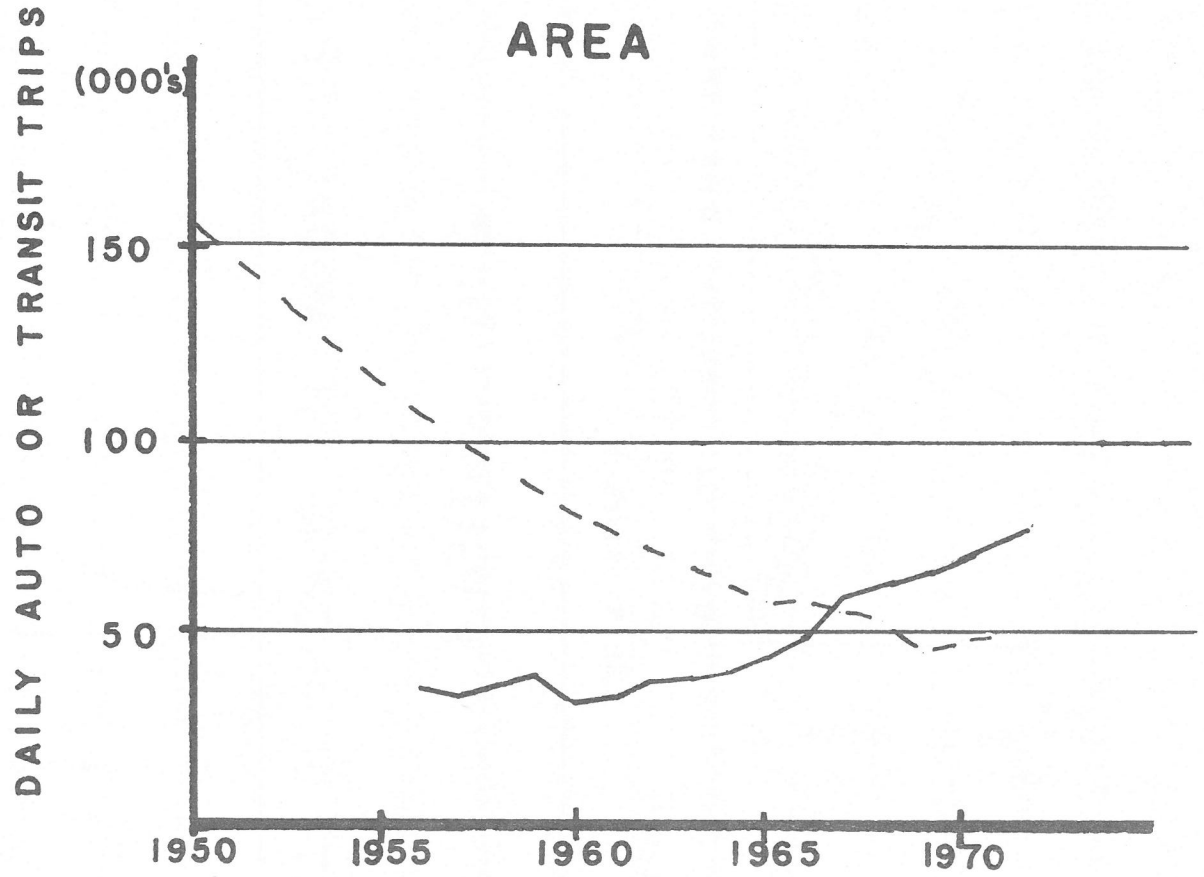
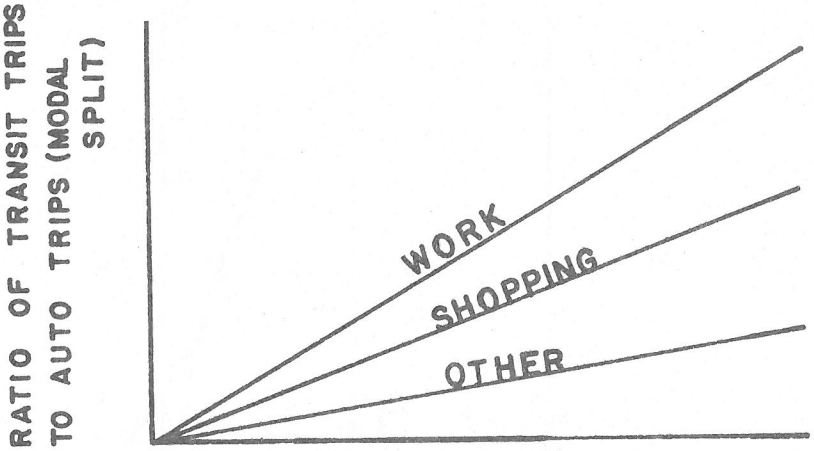


FIGURE V-6

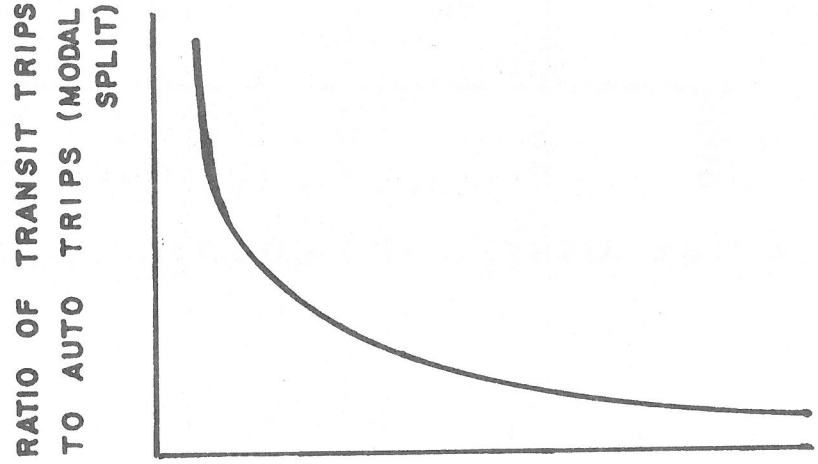
EFFECT OF DENSITY ON MODAL SPLIT



BASIS: TABLE VI REF. 2

FIGURE V-7

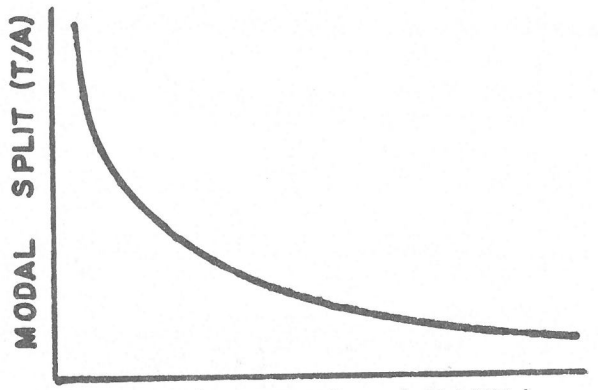
EFFECT OF INCOME ON MODAL SPLIT



BASIS: TABLE VII REF 2

FIGURE V-8

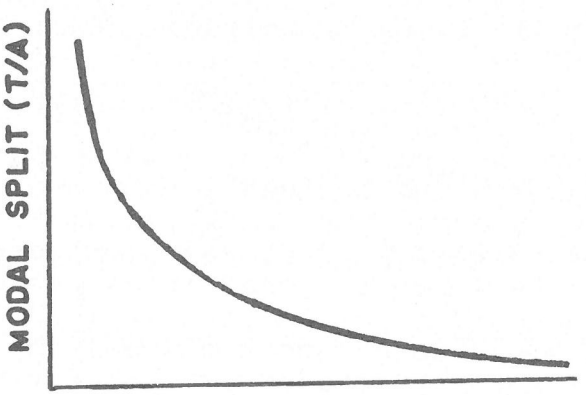
AUTO OWNERSHIP vs. MODAL SPLIT



BASIS: TABLE VII REF. 2

FIGURE V-9

ACCESSIBILITY vs. MODAL SPLIT



BASIS: TABLE X REF 2

VI LEGAL AND LEGISLATIVE ISSUES

Major public transportation (mass transit) service in the Interstate Bridge Corridor is presently provided by a combination of publicly and privately owned transit systems. These systems include:

1. Tri-County Metropolitan Transportation District of Oregon (Tri-Met) - Public
2. Vancouver Transit System - Public
3. Vancouver-Portland Bus Company - Private
4. Evergreen Stage Line - Private

This section of the report describes the existing Oregon and Washington enabling legislation regarding the establishment and operation of publicly-owned mass transit systems. It also describes the authority under which the private carriers operate in the project area as granted by the Interstate Commerce Commission, the Washington Utilities and Transportation Commission and the Public Utility Commissioner of Oregon. Regulatory restraints to service improvements will also be identified.

OREGON EXISTING ENABLING LEGISLATION

Chapter 267 of Oregon Revised Statutes authorizes the creation of a mass transit district encompassing every Oregon county in any standard metropolitan statistical area for the purpose of providing a mass transit system for the people of the district. Mass transit districts established under this authority are governed by a seven member board of directors appointed by the Governor. A district has full power to carry out its purpose and may:

> Have and use a seal, have perpetual succession, and sue and be sued in its own name. Acquire by condemnation, purchase, lease, devise, gift, or voluntary grant real and personal property or any interest therein, located inside the boundaries of the district and take, hold possess and dispose of real and personal property purchased or leased from, or donated by, the United States, or any state, territory, county, city or other public body, nonprofit corporation or person for the purpose of providing or operating a mass transit system in the district and aiding in the objects of that district.

Contract with the United States or with any county, city, state or public body, or any of their departments or agencies, or a non-profit corporation, for the construction, acquisition, purchase, lease, preservation, improvement, operation or maintenance of any mass transit system.

Build, construct, purchase, lease, improve, operate and maintain, subject to other applicable provisions of law, all improvments, facilities or equipment necessary or desirable for the mass transit system of the district.

Enter into contracts and employ agents, engineers, attorneys and other persons and fix their compensation.

Fix and collect charges for the use of the transit system and other district facilities.

Construct, acquire, maintain and operate passenger terminal facilities and motor vehicle parking facilities and motor vehicle parking facilities in connection with the mass transit system within the district.

Perform such other function or acts or things as may be necessary or convenient for the proper exercise of the powers granted to a district by Chapter 267-ORS.

Transit districts are thereby authorized to finance the construction acquisition, purchase, lease, operation and maintenance of a mass transit system. Financing of the system may be accompanied by one or any combination of the following methods:

1. Ad valorem (Property) taxes
2. User charges
3. General obligation bonds
4. Business license fees
5. Income tax
6. Retail sales tax
7. Employer payroll tax

Tri-Met currently employs two of the available financing methods; namely, user charges (fares) and the employer payroll tax. The present service area of Tri-Met consists of the three Oregon counties within

the standard metropolitan statistical area which includes Clackamas, Multnomah, and Washington Counties. Tri-Met does not provide service within the project area which significantly affects interstate traffic on the Interstate 5 facility. However, effective April 1, 1974, Tri-Met extended its Union Avenue Line, Route 6, from its furthermost point on Union Avenue at Lombard Street north to the Jantzen Beach shopping complex on Hayden Island. This extension of service is expected to serve part of a large number of trips made between the Portland area and Jantzen Beach. In addition, on April 1, 1974, Tri-Met and the privately owned Vancouver-Portland Bus Company began exchanging transfers for trips destined to or originating from Jantzen Beach on the Vancouver-Portland Bus Company line. This agreement opens up a larger service area for public transportation to Jantzen Beach and is expected to slightly impact private automobile travel in the corridor.

House Bill 2170 of the 1973 Oregon Legislative Assembly amended Chapter 276 ORS authorizing transit districts established under that chapter to enter into contracts for mass transit services with local governments in Oregon, inside or outside the district, or with the State of Washington or public agencies of the State. Specifically, this legislation authorized Oregon mass transit districts to: "Enter into contracts under ORS Chapter 190 with units of local government of the State of Oregon, whether within or without the district, or the State of Washington or with public agencies of the State of Washington, to act jointly or in cooperation with them or to provide mass transit services to areas under their jurisdictions, provided that the party contracting to receive the services shall pay to the mass transit district not less than the proportionate share of the cost of the services that the benefits to the contracting party bear to the total benefits from the service."

WASHINGTON EXISTING ENABLING LEGISLATION

At the commencement of the project there was no enabling legislation in Washington which would allow Oregon mass transit districts to enter into contract to provide service between Oregon and Clark County, Washington. In April 1974, the Washington Legislature enacted a law to permit Clark County to establish a transit district and levy taxes for its support. In addition, this district may contract with agencies outside the state.

The City of Vancouver is authorized to operate a transit system within the city limits under Revised Code of Washington (R.C.W.) 35.92 and 35.95. It is also authorized, by adoption of a city ordinance, to levy a utility tax to finance the system. Clark County, however, is not authorized to operate transit systems under this legislation. The county may, however, enter into an agreement with the City of Vancouver to operate bus service in the county under Revised Code of Washington 39.34. Such service may not duplicate nor conflict with service authorized by the Washington Utilities and transportation Commission under certificates of public convenience and necessity.

Revised Code of Washington 35.58 authorizes the formation of a Municipal Metropolitan Corporation (Metro) in areas of the state of Washington containing two or more cities, one of which must be a first class city. Mass transit service is but one of the functions which can be provided by a Metro. The City of Vancouver and Clark County alone could not form a Metro, but it could be accomplished by including another city. A Metro established under R.C.W. 35.58 could not include any territory in Oregon and can only be created by a vote of the qualified electors in the proposed service area.

The City of Vancouver and mass transit districts in Oregon may enter into contracts to provide transit service under R.C.W. 35.95 and the 1973 amendment to Chapter 267-ORS. However, this authority does not enable Clark County to enter into a contract for transit service with Oregon mass transit districts. Under R.C.W. 35.95 and 39.34 Vancouver could contract with Clark County and other cities in the county to provide transit service in and between those jurisdictions. This still does not provide a mechanism for providing interstate transit service between Washington and Oregon.

INTERSTATE COMMERCE COMMISSION (ICC)

There are two privately owned and operated transit companies which provide interstate mass transit service in the Portland-Vancouver Metropolitan area. These are the Vancouver-Portland Bus Company and the Evergreen Stage Line. Both carriers hold Certificates of Public Convenience and Necessity issued by the ICC to provide interstate passenger service.

The Vancouver-Portland Bus Company is authorized to provide interstate transportation of passengers

over regular routes between Portland, Oregon and Vancouver, Washington. It cannot provide service from the Camas-Washougal area or unincorporated areas of Clark County beyond four miles of the Vancouver city limits (ICC Commerical Zone ruling). Interstate service to and from intermediate points is also authorized. The Vancouver-Portland Bus Company currently provides the majority of interstate mass transit service between Portland and Vancouver.

The Evergreen Stage Line provides regular route passenger service between Portland and such cities in Clark County as Battle Ground, Camas, Washougal and Vancouver and is authorized to serve intermediate points in between these areas. It does not hold any authority to provide intrastate service within Oregon. This carrier, however, provides only a limited amount of service in the Interstate Bridge Corridor and this is not oriented towards peak hour commute trips.

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION (WUTC)

The Vancouver-Portland Bus Company does not hold any intrastate regular route authority from the WUTC to conduct intrastate regular route operations. Therefore, this carrier is limited to interstate regular route passenger service from the Vancouver area to Portland and intrastate service in Oregon as described later in this chapter.

The Evergreen Stage Line holds operating authority from the WUTC to provide intrastate passenger service in the Vancouver-Clark County area. Service is authorized between Vancouver and areas such as Battle Ground, Camas, Washougla, Lake Heisson and Yacolt including intermediate points. This authority together with ICC interstate authority provides the greatest areal coverage of Clark County with intrastate and interstate operations.

PUBLIC UTILITY COMMISSIONER OF OREGON (PUC)

Intrastate public transportation service in Oregon as authorized by the PUC of the State of Oregon is provided by the Vancouver-Portland Bus Company. The Evergreen Stage Line, although it provides interstate and intra Washington service in the corridor, holds no authority from the Public Utility Commissioner of Oregon to conduct intrastate operations. The Vancouver-Portland Bus Company conducts intrastate

operations from points north of Denver Avenue including Jantzen Beach, to points on its regular routes to downtown Portland.

Until April 1, 1974, this carrier provided the only mass transit service to Jantzen Beach. As a result of many requests from citizens, Tri-Met extended its Union Avenue Line, Route 6, from its previous terminal at Union Avenue and Lombard Street to the Jantzen Beach Shopping Center on April 1, 1974.

SUMMARY

A preliminary review of state enabling legislation in Oregon and Washington and an analysis or regulatory restraints to public transportation indicate several deficiencies hindering transportation improvements in the I-5 corridor. While four individual transit systems presently serve some portion of the travel demand in the corridor, there exists no single system or even a combination of systems which could efficiently serve both the intrastate and interstate travel demand. If public transportation is to attract a larger portion of the travel demand in the corridor, there must be a unified and coordinated system which will enable Washington and Oregon residents to use the system freely, conveniently, and at a low cost. Many economies can be realized and more attractive service can be provided by transporting both intrastate and interstate passengers on the same vehicle within a single system. In addition, many operational problems involving coordination of schedules, routes, fares, transfers, etc. can be eliminated by having a single system serving a given area. Some coordination of separate systems can be accomplished, however, but sufficient energies and resources must be committed to accomplish this task.

Experience in this country has shown that while coordination between systems is possible, this arrangement never achieves the same degree of success as a single unified system. The public interest can best be served by providing a transit system which eliminates all possible barriers which deter use of the system.

Following is a list of issues which should be pursued to address both temporary and permanent solutions to public transportation in the corridor.

1. The City of Vancouver and Clark County could enter into a contractual arrangement to pro-

vide service between the city and county. Passengers would be transported to the Vancouver transit station where an inexpensive transfer could be made to the Vancouver-Portland Bus Company for interstate travel to areas in Portland.

2. Additional operating authority (temporary or permanent) could be granted to the Vancouver-Portland Bus Company to provide both intrastate and interstate service to Vancouver and Clark County residents within the Vancouver commercial zone.

3. Recent legislation approved by the State of Washington (April, 1974) enabling Vancouver and Clark County to establish a county-wide transit system should be expiditously applied and implemented in Clark County. This legislation provided for financing and also authorized county-wide systems to contract with public or private systems inside and outside of the State of Washington for providing service between the county and the Portland,Oregon area.

4. The States of Oregon and Washington could pass joint legislation calling for the creation of a bi-state mass transit district to provide mass transit service within the counties of Clackamas, Multnomah and Washington in the State of Oregon and Clark County in the State of Washington. The district would have such powers as generally held by the Tri-County Metropolitan Transportation District of Oregon. The Legislation should, however, authorize the district's governing body, consisting of representatives throughout the four county area, to define a service area that is benefited by mass transit service beyond the general benefit of all territory within the district. A uniform method(s) of financing the mass transit system throughout the district should be provided.

In terms of providing attractive, convenient and uniform service to all residents throughout the Portland-Vancouver metropolitan area, a bi-state transit district as identified in item four can best serve

the transportation needs in the region, as well as in the corridor. However, since Clark County is establishing a transit district, it is recommended that a decision on the establishment of such an interstate district await the results of Phase II of the Interstate Bridge Corridor Project during which this proposal will be further detailed.

VII POTENTIAL IMPROVEMENTS

An extensive literature search was made in order to consider all reasonable possibilities for transportation improvement within the Interstate Bridge Corridor Project. Possible improvements included measures from low to high cost and minor to major in scope. For convenience and clarity these potential improvements have been catagorized into five types: Transit operation, socio-economic, highway operations, innovative systems and Columbia River bridge structures.

TRANSIT OPERATIONS

To provide a systematic method of presentation, potential transit improvements were grouped into these five catagories - improved local bus service, exclusive transit roadway, expanded express bus service, interface facilities for parking and transferring and rail passenger service. These potential improvements are explained below. The catagories are not completely independent as the express buses often operate on exclusive lanes; therefore, any improvements should pass through a system integration process.

Improved Local Bus Service

Existing bus service could be improved by regional coordination of lines, schedules, fares and free transfers among the carriers presently operating within the corridor. Coordination will enable passengers to conveniently and economically transfer between carriers and can be accomplished in part by expanding intersystem transfers between Tri-Met and Vancouver-Portland Bus Company and Vancouver Transit. Consideration should be given to the private carrier so that is will not receive any reduction in passenger revenue as a result of this procedure because the private carrier, unlike the public carriers, receives no subsidy to assure a continuation of service. This would result in a trip cost of 45¢ to 70¢. It should be noted that Tri-Met has recently approved a 35¢ fare for travel within its service area. The cost of this improvement is estimated at $6,000/year for Vancouver Transit System and less than$1,000/year for Tri-Met. In addition, a similar arrangement may also be used for the private carrier serving the Camas-Washougal area. Another service improvement would be the location of bus shelters planned by Tri-Met

at Interstate and (1) Killingsworth Street and (2) Portland Boulevard. The shelters should be placed such that passengers waiting in shelters for buses of either carrier may see buses approaching so that they can move to the proper bus stop to board their bus.

Exclusive Transit Roadway

Roadway improvements relating to bus transit operations may consist of an exclusive contra-flow lane, concurrent-flow on shoulders, concurrent-flow on exclusive lanes and priority "on" ramps for high occupancy vehicles which include buses and carpools. The following narrative describes these types of exlusive lanes:

1. Contra-flow Lane - This type exploits the fact that one direction of traffic flow is reasonably light during the peak period in contrast to the opposite direction; therefore, the inside lane on the lightly traveled roadway is used for buses and carpools which opposes the direction of the lighter traffic flow.

2. Concurrent-flow on shoulder - This type makes use of the shoulders, during peak periods, so that buses and/or carpools, traveling in the same direction as adjacent lanes, are not impeded by the traffic congestion.

3. Concurrent-flow on exclusive lane - This idea simply utilizes one lane, usually the inside one for the exclusive use of high occupancy vehicles.

4. Priority "on" ramp - Permitting high occupancy vehicles to enter the freeway without delay while "metering" the other traffic is the essence of this type. This method is more effective when used as a part of a freeway control system since such a system will maintain higher operating speeds which provides an advantage for transit vehicles using the facility.

Express Bus Service

An express bus system (EBS) is a form of rapid transit because it provides quick point to point

service with few stops (see figure VII-2). In order to provide an adequate system the following elements should be considered an incorporated where feasible:

1. Adequate fringe interfacing (parking) areas with free parking.
2. Adequate feeder systems at both ends of the trip.
3. Terminals and vehicles designed for quick loading and unloading.
4. Exclusive ramps and roadways on those highways where delay will occur for transit vehicles.
5. Single fare which includes parking cost.
6. High speed non-stop service.

In relation to the Interstate Bridge Corridor project, an EBS was considered with six service areas in Vancouver and Clark County to five destination areas in Portland and Multnomah County. These possible express bus routes resulted from the analysis of the Origin-Destination survey discussed in Chapter III. The express buses were assumed to operate as a feeder on the local arterial and become truly express upon entering the freeway. Depending upon demand, it may be necessary to have the buses stop at the terminal in downtown Vancouver.

The six possible service areas considered in Washington consisted of the following corridors:

1. Lewis and Clark Highway (State Route 14) Corridor would serve neighborhoods near this route between Washougal on the east and I-5 on the west.
2. Mill Plain Boulevard Corridor would provide service to the east Vancouver heights and other neighborhoods between Ellsworth Road and I-5.
3. Fourth Plain Boulevard Corridor would serve developed areas along this route between Sifton and I-5.
4. 78th Street Corridor was conceived as a means of servicing a strip bounded by Sifton on the east and Fruit Valley on the west.
5. Interstate 5 Corridor was designed to service the Hazel Dell area in the vicinity

of 78th Street and Main Street inter changes.
6. The Hazel Dell Corridor would serve the area to the north of Vancouver known as the Hazel Dell Community.

The destinations which were selected for consideration are described as follows:

1. Portland Central Business District - an area bounded by the Willamette River and I-405.
2. Lloyd Center complex - a section of east Portland generally encompassed by I-5, Morrison Avenue, Thompson Avenue and 20th Street.
3. Swan Island Industrial Park
4. Northwest Industrial area - a district surrounded by the Willamette River and U.S. 30.
5. North Portland - an area bounded by Columbia Boulevard, Portland Road, the Columbia River, and the Portland International Airport.

Table VII-I summarizes the total person trips and expected transit passengers from the selected corridors and destinations. Along with this data, field trips and aerial photographs were examined on each corridor to subjectively evaluate the location of development within the various corridors for route selection.

In addition to this information trip origin densities by traffic zones were determined and it was discovered that the Mill Plain Boulevard and the Hazel Dell Corridors contained several zones which produced in excess of 500 trips per square mile. In other corridors, the trip densities were less than 250 per square mile. Trip destination densities of 500 per square mile were exceeded for destination zones in the Portland Central Business District and the Lloyd Center complex.

Interface Facilities for Parking and Transferring

The interface facilities between modes, systems and lines may be placed in one of three classes. The first class, park and ride stops, contain a parking area (autos and cycles), possible feeder service, an information board and a shelter. The second class, park and ride station, includes the facilities of a

stop except it has a larger parking area, a more extensive feeder service, concessions and comfort facilities. The third and final class, a terminal, adds ticket and information offices and also provides interfacing (transferring) between predominate modes, systems of the same mode and/or lines of the same system.

The major emphasis of this study is for Park and Ride stops which may be located in or near residential neighborhoods or the intersection of major arterials. Several corridors have been examined for possible sites for transit stops and it appears that many sites on public and private property have considerable merit. The location of these are summarized on Table VII-2.

Rail Passenger Service

Improvement of passenger rail service in the I-5 corridor may be obtained by providing commuter rail service in the morning peak period. Incidental service is presently provided in the evening and a feeder bus system in Vancouver would be required. This service may be provided in one of two ways: 1) Amtrak could reschedule its service to match the morning peak or 2) other rail users add passenger cars to freight trains which leave Vancouver during this peak period. It has already been established that heavy freight demand precludes the use of this rail line for significant commuter service. Some parking is available at the rail depot. However, some design and installation work would be necessary for it to become adequate. It should also be noted that this rail depot does not have good access with local arterials in Vancouver, is not served by Vancouver Transit System, and is not located near any dense residential areas. Should Amtrak service increase it may be desirable to the public for Vancouver Transit System to serve this rail depot.

SOCIO-ECONOMIC

The socio-economic improvements often address the more fundamental or basic issues of mobility. For instance, rather than designing for additional transportation capacities perhaps some changes in the socio-economic system may reduce the mobility needs or fulfill that need without travel or more

efficiently utilize existing systems. This realm of improvements considers attitude, education, acceptance of an existing transportation system in contrast to changes in that system. Improvements of this type have been divided into five catagories: Work schedules, marketing programs, carpooling, incentives and reducing travel need.

Work Schedule

This catagory is primarly directed to reducing the peak period demand on transportation facilities of all types - highway, rail, air, etc. There are three types of work schedule revisions which will tend to reduce the peak period demand; namely, staggered work hours, staggered work day and the four-day work week. Staggering work hours is merely distributing the starting and ending times of the work day such that there is no pronounced peak in the transportation system. If the work day is staggered so that the work force reports six or seven days each week one can easily see that 100% of the work force is distributed through a time period that encompasses 120% or 140% of the regular five-day work week. The final possibility eliminates one weekly trip to and from work since only four trips occur each week for the four work days.

These three improvements may be combined to simultaneously obtain benefit from all of them. That is, the work force may be divided among six or seven days, each employee works four days and may start work between six and ten AM (nominal) while initiating departures for home from 4:30 to 8:30 or 9:00 PM (depending upon the length of the lunch periods). It is apparent that changes in weekday activities and life-style may be required but with an effective program for changing schedules a substantial reduction in peak period travel demand can be expected. Whether it be rail, bus or auto travel such an effective improvement will reduce the capital costs for the transportation system or conversly will increase optimal utilization of existing facilities in the Interstate Bridge Corridor. Figure VII-1 illustrates the pronounced peak period traffic volumes that occur on the interstate bridges.

Marketing Program

Increased usage of a service or product of any kind may be obtained through the use of an effective

marketing program. Good public relations, advertising and information dessemination will inform the public of a service or product and accent its strong points, thereby encouraging its usage. This is an area where transit operators have placed insufficient emphasis because as one source indicated, large transit operators spent less than 1% of their operating revenues on marketing activities.

An Urban Mass Transit Administration study conducted in Pittsburg in 1968 demonstrated that certain promotional techniques are effective in obtaining increased transit ridership. The study noted that information on transit service which included easy to read time tables and service maps was the most effective promotional device. Advertising was generally considered less effective but did show some promise when the advertising was related directly to service improvements.

Expansions for transit service and other high occupancy vehicle programs in the Interstate 5 corridor will undoubtedly enjoy more success if the service expansion is accompanied by an aggressive, multi-faceted marketing program. Such a program should include advertising, press coverage and distribution of information concerning the service expansions. In addition, governmental units and local health, environmental and community service groups can assist by coordinating and expanding existing efforts which are aimed at encouraging transit usage and increasing vehicle occupancy.

Improving Information Sources

There are several immediate improvements which can be made to make information on bus service in the corridor more readily available and more attractive to the general public. These improvements include the following:

1. Tri-Met could install toll free telephone service from Vancouver to it's information office for a nominal cost of approximately $6 per month plus 30¢ per call, thereby providing Clark County resident with free information relating to Tri-Met lines for trips into the Vancouver area.

2. A route map may be placed in the Vancouver telephone directory illustrating Tri-Met,

Vancouver-Portland Bus Company, and Vancouver Transit System routes and points of transfer. Similarly, the same map should be placed in the Portland phone directory. The map should also contain the information telephone numbers for all three carriers.

3. Information displays can be placed at shopping centers, banks and other public places. Such displays could be more effective if they were the result of a combined effort of all four carriers. Information available at such displays could include maps, schedules and route descriptions.

4. Informational devices could be market tested to determine whether or not such materials are easy to read and understand. Particular attention should be paid to increasing the size of the print on timetables to make them easier for senior citizens to read.

5. Route maps and service information can be placed at all bus stops and park and ride stations. This information should be placed on signs which can be attached to exisiting sign posts at the bus stops. Costs could be shared by providing information on more than one carrier on each sign.

6. Service improvements might be promoted through the use of radio, television and newspaper advertising. Employers and merchants could be induced to distribute brochures advertising the improvements to their employees and customers. Finally, volunteers and service groups might assist in distributing information to households in neighborhoods in which the service improvement is scheduled to take place.

Carpooling

Since the occupancy rate of autos in the am peak period in the corridor was only 1.24, there is considerable unused passenger capacity. In terms of user cost and energy efficiency a fully loaded auto is very competitive with many other modes as evaluated in another section herein, however, with this occupancy

rate the establishment of a carpool depends upon several elements of a trip:

1. The arrival and departure times of both the initial and return trip are nearly the same and are consistent.
2. The routes are nearly coincidental and consistent.
3. Interested trip makers know of others making the same trip.
4. Reasonable social compatibility among users.

There existed in this region two carpooling programs based on the Federal Highway Adminstration's computer matching system. One was designed to operate in Clark County, which was funded by Washington State Highway Department and the City of Vancouver, and the other in Oregon by Federal highway funds and Tri-Met. Logically the separate efforts should be combined to improve the probability of matching potential poolers.

An effective carpooling program enables persons in the region to be notified of others of similar trip characteristic through four phases:

1. Public Information to inform the public of advantages of reduced congestion, out-of-pocket costs, air pollution, energy usage and increased conveniences.
2. Incentives such as prime parking spaces, outlying parking facilities for carpools and exclusive ramps and/or lanes for carpools.
3. Data Processing to match and inform perspective poolers to each other.
4. Continuing Service to accommodate personnel turnover and changing commuting patterns.

The carpool efforts contain these characteristics but have only had limited success in the region and this corridor. Since the two separate efforts have been merged and if persistence is maintained, a significant increase in the automobile occupancy rate may be expected. It appears that contacting the potential carpooler through his place of work provides the greatest likelihood of success in encouraging the formation of carpools.

Reducing Travel Need

While it is acknowledged that mobility is basic and necessary for human existance one may address this issue of transportation by modifying the socio-economic system to fulfill a trip purpose or need for a person wihtout him making the trip. There are two basic types of possible improvements that approach this concept. The first consists of circulating goods/services in mobile vehicles in areas requiring its products, thereby eliminating the need for some trips. A specific example of this would be a mile run operation that would also sell other groceries. The other possibility is a suburban employment facility which would enable some employees to perform their work at an office building within walking or cycling distance of their homes. It has been determined that approximately 22% of the work force may work in these types of facilities if located in Vancouver. This proposal might reduce the travel demand during the peak periods by about 2,000 person trips on the interstate bridges. The office facilities could contain basic office equipment and services - copy machines, typing, receptionist, lunch room, telephone- television, etc. This concept would not only reduce the demand on the regional transportation network but would improve health through exercise and reduce the travel time to and from work. Such office facilities could be located at or near commercial areas to encourage multi-purpose trips.

Incentives

The philosophy of incentives consists of instituting indirect changes which will bring about a direct overall benefit. Incentives may be positive or negative and to provide a comprehensive approach to the transportation problem will most likely involve both types as follows: Central Business District traffic zones, auto exclusion areas, toll fees, special fees, insurance rates and selective enforcement. The twelve possibilities each have potential but the consequences should be carefully examined to prevent adverse socio-economic impacts from occurring. The following information describes the possibilities.

1. Central Business District traffic zones which prohibit movement of auto traffic between zones but permit unrestricted movement of transit vehicles.

2. Auto exclusion areas including such measures as exclusive transit lanes and ramps, transit and pedestrian malls, exclusive bikeways, etc.
3. Discriminatory toll fees on facilities for autos while others such as transit would not pay user fees.
4. Special fees for autos may include a special license to operate in selected areas or progressive license fees on second, third, etc., autos.
5. Insurance rate differences between individuals who used their auto to commute to work and those who ride transit.
6. Selective enforcement could permit transit vehicles to operate in excess of the speed limit while strictly enforcing speed limits for non-transit vehicles.
7. Special parking privileges for carpools.
8. Public and private organizations to provide bicycle racks in shopping and employment areas.
9. Increase fuel costs or reduce fuel availability.
10. Reduce license fees for carpools.
11. Guaranteed parking availibility for carpools at employment sites.
12. Restricting single occupant vehicles during peak periods in specified areas.

HIGHWAY OPERATIONS

There are several classes of improvements which are operational and consist of traffic control systems, emergency service, reversible lane operations, dynamic warning signs, narrow lanes to accommodate an additional land and traffic surveillance. These improvements, generally are not costly in contrast to the cost of constructing new facilities or reconstructing old ones. A discussion of these improvements follow.

Traffic Control Systems

The proper application of traffic control devices has provided considerable improvement in many traffic problems in urban areas at a very nominal capital cost. There are three types of control systems applicable to this corridor, namely, ramp control and metering. systems, signal interconnect systems and transit vehicle signal pre-emption systems.

A. Ramp control and metering systems have been developed to monitor freeway and ramp traffic

so as to reduce the demand on the freeway, thereby maintaining reasonable operational speeds (about 40 miles per hour) and eliminating congestion. One of the basic system needs is one or more parallel routes for shorter trips when the freeway is metered. Interstate and Union Avenues in Oregon, and Main - Washington Streets, in Vancouver provide this feature. The ramp system generally is designed to operate in one of several modes, all of which are operational as briefly described herein, and illustrated on Figures VII-3,4,5,6, and 7.

1. Manual Mode - This is accomplished by the installation of a traffic signal which is operated by an observer at the on ramp location observing traffic conditions and controlling the signal on subjective judgement.

2. Fix Time Mode - This method uses surveillance data to determine the excessive volumes and the time periods of occurance. A time clock is set to anticipate the excessive demand and meter the traffic the predetermined amount.

3. Capacity Demand Mode - The lane occupancy (probability of a detector being occupied by a vehicle) is normally used to determine the ramp volume which should be permitted to enter the freeway mainline. Unlike the previous two modes this requires detection as illustrated below and a logic controller to receive and analyze data and make decisions. This method is most popular except where there are sub-standard acceleration lanes.

4. Gap Acceptance Mode - This system searches for a gap in the right lane of the freeway and releases ramp vehicles such that it will arrive at the merge area simultaneously with the gap. This mode is particularly useful where the freeway and ramps have poor geometrics. This may be applicable on Interstate 5 in Vancouver where there are substandard acceleration lanes.

5. Merging (Pacing) Mode - The merging mode is similar to gap acceptance but it "paces" the ramp vehicle to the merge area. To accomp-

lish this, a computer is required and is, therefore, relatively expensive. This mode also requires good geometrics on the freeway.

B. Signals interconnect systems have been installed on parallel arterials providing an alternate to the freeway. At the same time, signal systems on perpendicular streets which interchange with a freeway may be programmed so as to reduce the operational speed and, thereby, reduce the access to the freeway. In relation to Interstate Route 5, immediate improvement may be provided by the installation of a signal system at the intersection of the northbound off-ramp at Portland Boulevard with queue detection on the ramp and logic to extend the green time and prevent a traffic back-up onto the freeway. Similar strategy may be applied to Going Street off-ramp.

C. Transit signal pre-emption systems as successfully tested consist of electronic devices constructed such that a transit operator can send a pulse (message) to the local traffic signal controller as the bus approaches the intersection. This pulse causes the pre-emption of the signal operation to assure that the transit vehicle will have a green indication when it reaches the intersection.

Emergency Service

One of the most critical conditions within the corridor develops when traffic accidents occur on or near one of the two bridges or on Hayden Island during the peak periods. Congestion is extreme and emergency vehicles arrive at the scene only after considerable delay. If the accident investigation could be completed more quickly and victims and involved vehicles removed in less time than at present, the delay and probability of other collisions will be reduced. There are four possible operational improvements of this nature applicable in this corridor. The first is the practice of emergency vehicles entering off-ramps the wrong way and traveling in the reverse direction to the scene of the accident. This, of course, requires very special traffic control but would improve the present conditions. The second possibility is that of an ambulance helicopter picking up an injured person. This type of evaction has been evaluated through simulation and appears to be feasible,

particularly, if reserve military training, police patrol or other similar units, already in service, could be diverted for medical care emergencies. Such a system may require evaluation to apply on a regional basis rather than only one corridor. The third possibility is the closed circut television observation on the freeway for instant detection of problems, thus emergency services could be more quickly dispatched. The final possibility is the installation of emergency call telephones at frequent intervals which permit the quick reporting of accidents or other problems by motorists.

Reversible Lane Operation

Arterials and highways have been modified for reversible land operation to take advantage of the imbalance in directional traffic flow occurring during the peak periods of traffic flow. An illustration of such operation would be a six lane facility operating with four lane inbound and two lanes outbound in the morning peak period while in the evening the opposite configuration would be in effect. In considering this idea for Interstate Route 5, a major disadvantage is that Interstate Route 5 is only four lanes betwen Union Avenue and Portland Boulevard and would require one lane offlow in the minor direction. This would prohibit vehicles from changing lanes and, thereby, reduce the quality of flow. Also the remaining lane capacity is insufficient, however, additional capacity is available on parallel arterials.

Dynamic Warning System

Motorists can often avoid congested areas if there is sufficient warning so that other routes may be selected and used. Typical applications may be used to advise motorists of congestion on freeways so they may exit and those approaching freeways may use an alternate route to clear blocked lanes, or other appropriate warning information. Systems that provide this service, generally consist of four major components: surveillance, interconnect logic controller and changeable message signs. Dynamic sign systems are often used with ramp control systems to advise motorists when metering is in effect.

Narrow Lanes

The final potential highway operational improvement is rather simple and merely consists of modifying

pavement markings such that the roadway accommodates an additional lane in each direction. This measure would substantially increase the capacity at minimal cost and is applicable to Interstate 5, particularly in the vicinity of Portland Boulevard. This measure coupled with a contra-flow or concurrent flow priority lane may have merit. Caution should be exercised with this measure, particularly if there is a significant reduction in shoulder width. It may be advisable to improve the emergency service during the peak periods if the shoulders are removed.

Traffic Surveillance

Traffic surveillance programs include the collection and reduction of various types of data in order to develop and implement operational improvements. The data collected for such a program should include accidents, volumes, speed, density, delay, ground level and aerial photography, vidio-tape, closed circut television and field observation. The reduction consists of the preparation and analysis of diagrams, charts, graphs and evaluation of visual data. Traffic surveillance usually supplements ramp metering and control systems and/or emergency service.

INNOVATIVE (NEW) SYSTEMS

These potential improvements tend to be more cost intensive than the other improvements discussed previously and are either existing, newly developed, or in the research and development or conceptual stages. This list is comprehensive so as to address all possible solutions.

There were three types or group of innovative systems identified for application in this corridor; namely, marine, air and ground systems. The characteristics of various innovative systems are depicted on Table VII-3 and briefly described herein. Additional detail may be obtained from Appendix A.

Marine

Because of the rivers near the Interstate Bridge Corridor, marine systems are a natural possibility; therefore, four were considered for possible application: superferry, hydrofoil, air cushion marine vehicles, and conventional small ferry. Superferry vessels can transport up to 200 autos and 2,000 passengers, depending upon size, at speeds near 20 knots. Successful

ferry operation normally results where the ferry has no viable alternative from the land or air modes; therefore, with the relatively low operating speeds, substantial terminal times and land modes, it appears that superferries have questionable potential in this corridor, except at the eastern end of the CRAG region until the construction of the Interstate 205. The next possibility is the hydrofoil vehicle which has essentially the same characteristics except for the speed and capacity. The foil devices permit the vehicle to "lift up" and travel on "fins" and thus reduces the drag force. These vehicles operating in excess of 40 knots and transporting up to 70 passengers could provide reasonable service in this corridor. All marine systems to downtown Portland will have the disadvantage of a longer route than other modes because of the river route from Vancouver Central Business District to downtown Portland is about 16 miles in contrast to about 8 miles for those using a ground system.

Low intensity systems such as a small ferry, may service social, recreation and shopping trips by providing service between Vancouver and Hayden Island. Such a marine system should also interface with the ground transit systems operating in Vancouver and on Hayden Island. In addition, ferry service between eastern Clark County and Multnomah County may be feasible.

Air Systems

Another possibility which may have merit is that of the airship or dirigible. This type of vehicle can provide direct point to point service but because of the maneuverability aspects and landing procedures required, it appears that airships would best be suited for inter-urban travel.

Ground Systems

There are numerous distinct ground transportation systems which, for purposes of this analysis, have been divided into sixteen systems and three systems groups classified by type of roadway; namely, rail, pavement and levitation. Rail roadways consist of either steel rail, concrete beams, or steel and concrete guideways while paved roadways are constructed of cement or asphalt concrete. Levitating sytems

suspend vehicles above a concrete or metal roadway by using compressed air or magnetic flux. The energy delivery to the vehicles of various systems may be one of two methods; namely, dynamic and static. The dynamic methods include electrification through overhead wiring or a third rail and the static method consists of fuel storageunits (tanks and batteries) and refueling stations. The line or lane capacity of these systems (plus their feeders) varied from a few thousand to approximately 60,000 passengers per hour. However, in considering capacity, one should keep in mind that as the demand on a particular system increases sufficiently, a higher capacity (and costlier) system may become feasible before the capacity of the system in question is reached. Subsequently, capacity on rail and bus, especially, tend to be a function of demand. In addition, the capacity of rail systems is a function of the station length which determines the number of cars in the train.

One should understand that travel demand growth is gradual and, therefore, it may be advantageous to consider in system evolution, in contrast to system revolution. An illustration of this may be the progressive step from auto to bus to light rail to heavy rail in contrast to the strategy from auto to heavy rail. The later may result in tremendous local and regional impact on existing conditions.

Innovative improvements for highway include the Electronic Route Guidance System (ERGS) and the Induction Conductor Control System (ICCS). The ERGS consists of several parts, namely, roadway detectors, subsystem data process unit, a central system data process unit, a display panel and a coder in the vehicle. The driver of the vehicle selects the disired destination by code identification as illustrated in figure VII-8. The selected information is transmitted to a subsystem controller which sends basic onstructions to the dash board panel for the driver to follow. This could be useful in directing motorists to non-congested routes within the Interstate Bridge Corridor but is only in the early stages of development. The ICCS is another system consisting of guidance devices in vehicles and buried cable which may be adapted to an existing highway network. Such a system would be similar to the innovative Personal Rapid Transit system except this concept could make use of present vehicles which have been modified to operate on highways either "guided" or "unguided". This system is in a similar state of development as

the ERGS in that both are years from any significant demonstrations.

COLUMBIA RIVER BRIDGE STRUCTURES

In consideration of providing additional capacity across the Columbia River there were two possible methods. The first method was the modification of existing bridges while the second consisted of the construction of new structures.

There were three means of modifying existing structures: 1) widening, 2) outrigging and 3) double decking. The practice of widening bridges has been done successfully so long as the bridge initially did not have superstructure as the cost to widen the superstructure is generally prohibitive. The outrigging possibility consists of attaching an additional lane on either or both sides of an existing structure which must have sufficient structural and foundation strength and the drawspans must remain balanced to function properly.

Doubledecking is simply constructing another roadway above or below an existing one, but sufficient clearance (16.5 feet) must be provided between the roadway and the overhead structure. Doubledecking is not possible for the interstate bridges without considerable remodeling of the superstructure. Subsequently, excessive costs would be expected.

In studying a new structure there were three types which include 1) high level bridge, 2) a floating bridge and 3) an under-river tube. The first potential improvement would be high enough to permit gound transportation systems to operate without interruption by river traffic which presently interrupts highway and transit traffic. The second improvement would be interruptable by river traffic but would still provide additional capacity and lower cost for a floating bridge while the third possibility, a tube, would most likely be a part of an underground system in the corridor and would not be subjected to river traffic interference.

There has been previous work on this issue by Oregon State Highway Division in which three proposals were considered; namely 1) construction of a roadway between and attached to the existing bridges 2) construction of a new and separate bridge between

existing bridges and 3) construction of a new structure upstream or downsteam of the existing structures. The cost estimates revealed the following:

Proposal	Cost (Millions)	
1	$ 6.0	(without any pier construction)
2	$14.5	
3 (bridge)	$11.6	
3 (tube)	$42.0	

None of the costs include roadway or ramps to the new bridge in the proposal. It would be helpful to know the full cost of the first proposal including the pier construction.

SUMMARY

Substantial transportation system improvements are not simple. It is true that any one improvment may increase transportation service. However, such over-all individual increases are often only marginal and benefits only a portion of the users or environment, sometimes at the expense of others, or other portions of the environment. An example to consider is ramp metering which generally provides greater benefit to the longer trips, usually to the disadvantage of shorter trips. However, the overall benefit is positive. Naturally, the better method for improvement is comprehensive is nature containing several elements addressing many issues. Consequently, more than forty types of improvements and systems were considered as potential to increase transportation services in the Interstate Bridge Corridor. From this exhaustive list of possibilities many potential improvements may be gathered and assembled into a total balanced and comprehensive solution. Short-range low cost potential improvements provided the project with several types of improvements for immediate implementation (some of which were implemented before publication of this report). The potential long-range improvements enabled direction to be given for Phase II which is to detail more intensive solutions to the transportation problem in this corridor.

TABLE VII-1 INTERSTATE BRIDGE CORRIDOR TRIP TABLE FOR EXPRESS BUS SERVICE

ORIGINS (CORRIDORS)	DESTINATIONS		
	Portland City Center	Lloyd Center Complex	Total
Lewis & Clark	264 (12) (53)	150 (2) (30)	414 (14) (83)
Mill Plain *	577 (54) (115)	342 (8) (68)	919 (62) (183)
Fourth Plain	375 (53) (75)	274 (11) (55)	649 (64) (130)
78th ST.	402 (52) (80)	238 (1) (48)	640 (53) (128)
I-5	285 (29) (57)	265 (9) (53)	550 (38) (110)
Hazel Dell*	361 (54) (72)	257 (1) (51)	618 (55) (123)

* RECOMMENDED FOR A DEMONSTRATION PROJECT

NOTE: 1. Some of the corridors are not mutually exclusive in area coverage.
2. The expected transit ridership is based on frequent and reliable service. (m/s=.2) (See Appendix B.)
3. xxx represents the total person trips from 6 am to 9 am.
4. (xx) the top figure is the existing number of person trips (xx) by transit and the bottom figure is the expected transit usage after improving the service.

TABLE VII-2 POSSIBLE PARK AND RIDE LOCATIONS BY CORRIDORS

LEWIS & CLARK	MILL PLAIN	FOURTH PLAIN	78th STREET	I-5 (HAZEL DELL)
Industrial Complex Grand Ave.	Tower Mall 5411 E. Mill Pln.	Fred Meyer 4th Plain & Grand Ave	Col. River High Sch. 800 N.W. 99th St.	Fred Meyer 7700 Hwy 99
Vanc. Ship Yard	Evng. Free Church 5602 E. Mill Pln.	Keils Food Store 4th Plain & 72nd Ave	Messia Luth. Church 9306 N.W. 9th Ave.	Keils Food Store 303 N.E. 78th St.
WSHD R/W Ellsworth Rd.	Emm. Luth. Church 8310 MacArthur		Hazel Dell Free Evng. 8802 N.E. 9th Ave.	Hazel Dell Drive-In I-5 & 78th St. (SW)
WSHD R/W S.E. 164th Ave.	Vanc. Fire Dept. 8309 MacArthur		Eisenhower Elem. 9201 N.W. 9th Ave.	Totem Pole Shpg Cntr. 7800 Hwy 99
WSHD R/W West Camas I. C.	Trin. Bapt. Church 6700 MacArthur		Jason Lee Jr. High 8500 N.E. 9th Ave.	
WSHD R/W I-5 W/SR500	Grace Luth. Church 9900 E. Mill Pln.			
	Dis. Decorate. Center 2909 E. Mill Plain			
	Vanc. School District Mill Pln & Ft. Vanc.			

FIGURE VII-1

HOURLY TRAFFIC VOLUMES (VPD)

INTERSTATE BRIDGE

OCTOBER 24, 1973 (WED)

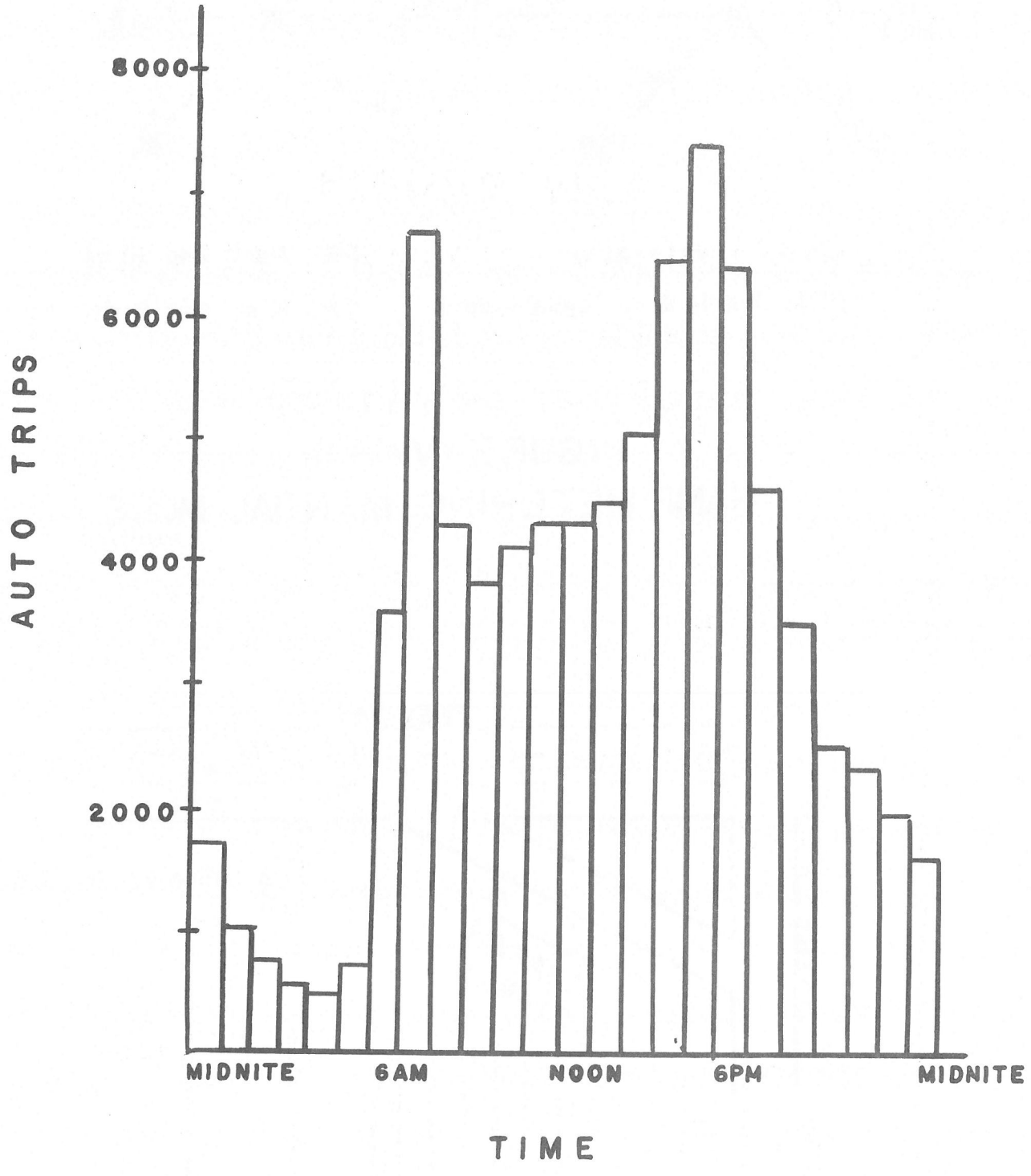
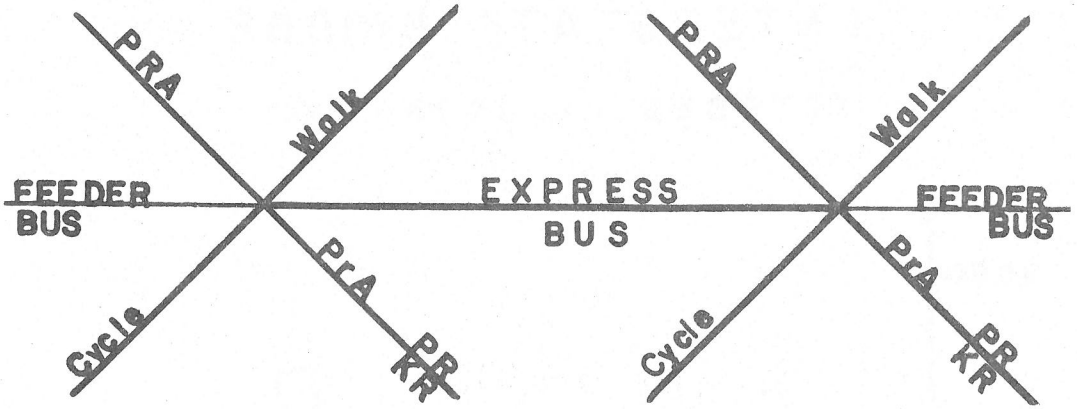


FIGURE VII-2
THE EXPRESS BUS SYSTEM IN CONCEPT



PrA: Private Auto
PRA: Public Auto (cycle) Rental
PR: Park and Ride
KR: Kiss and Ride

FIGURE VII-3
RAMP METERING: MANUAL MODE

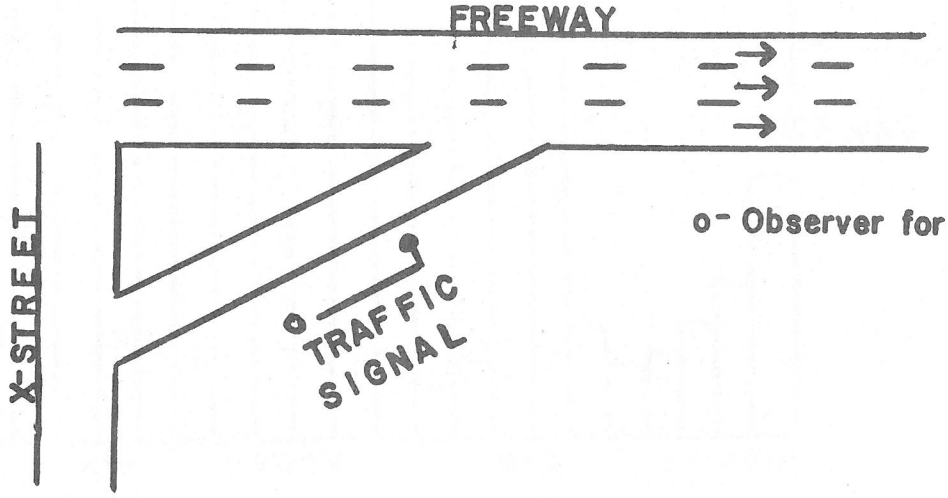


FIGURE VII-4

Ramp Metering Fixed Time Mode

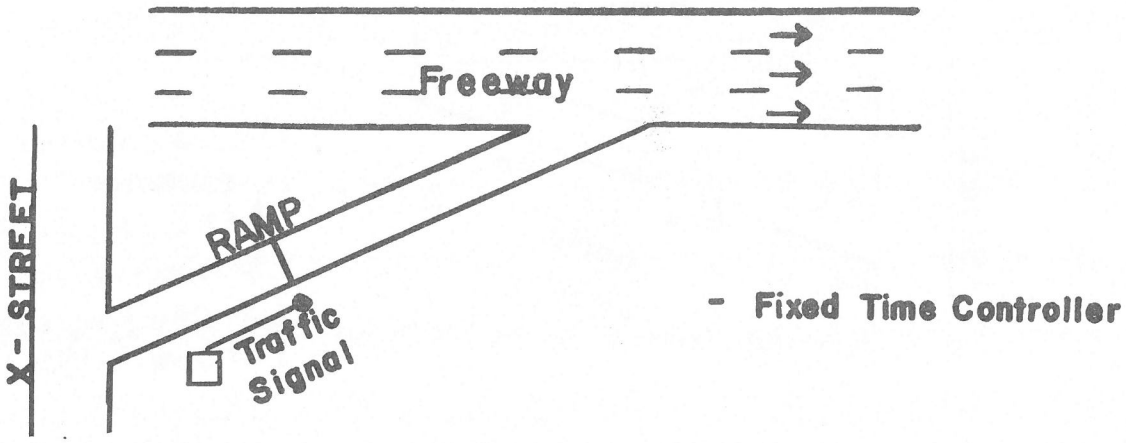


FIGURE VII-5

Ramp Meter-Capacity/Demand Mode

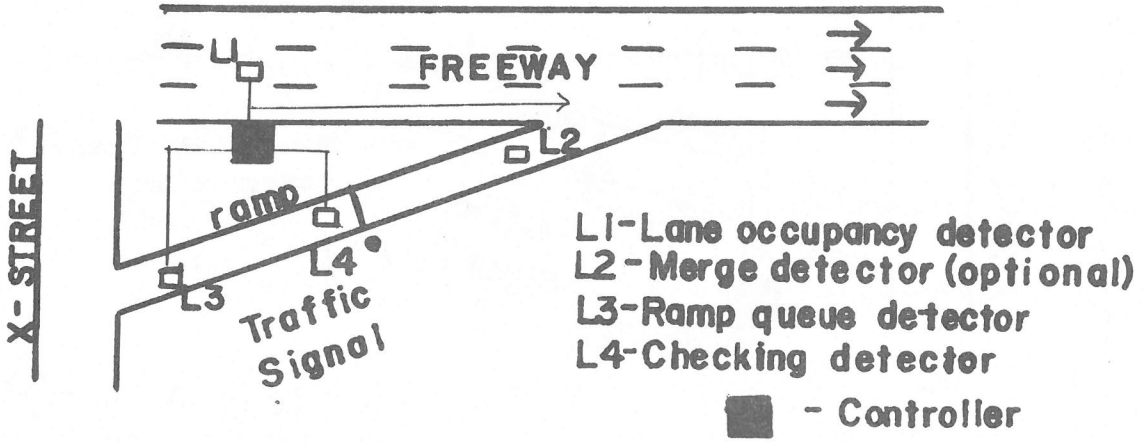


FIGURE VII-6
Ramp Metering - Gap Acceptance Mode

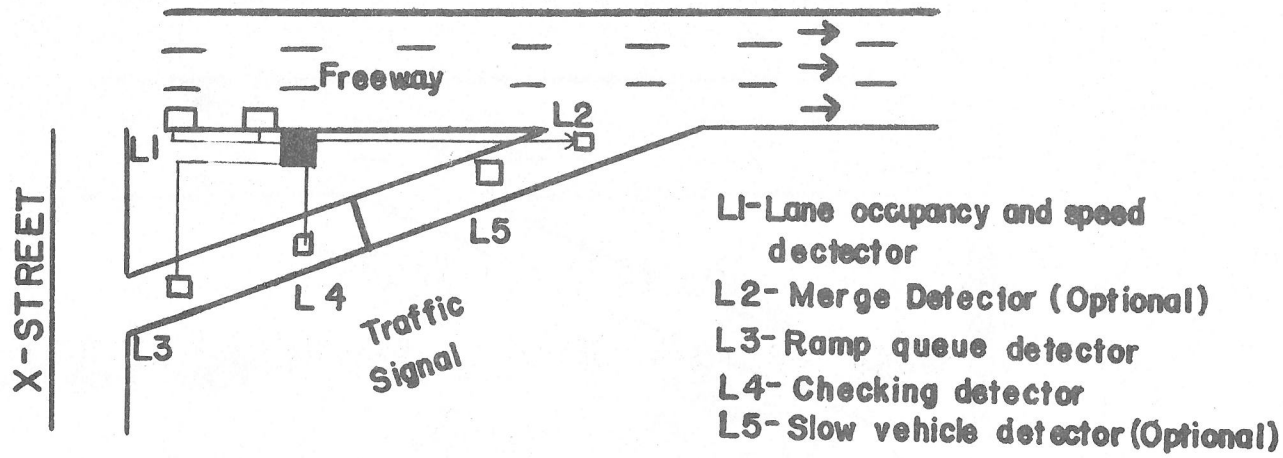


FIGURE VII-7
Ramp Metering - Merging Mode

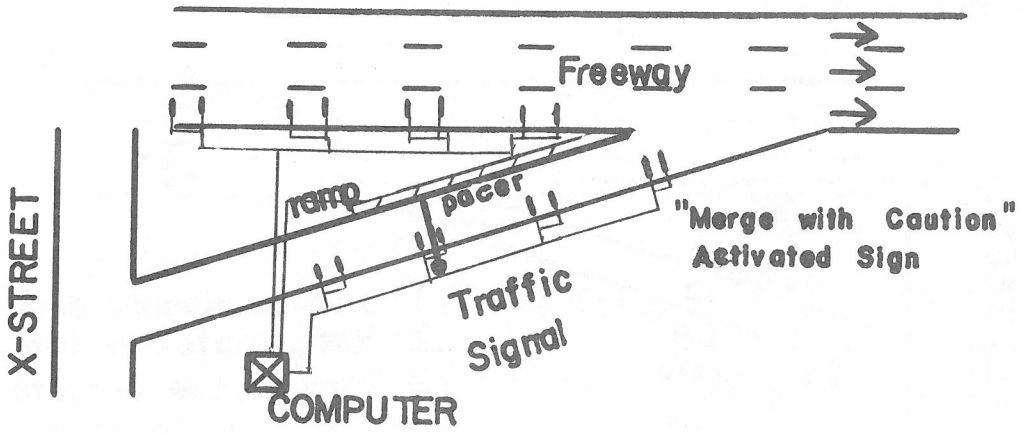
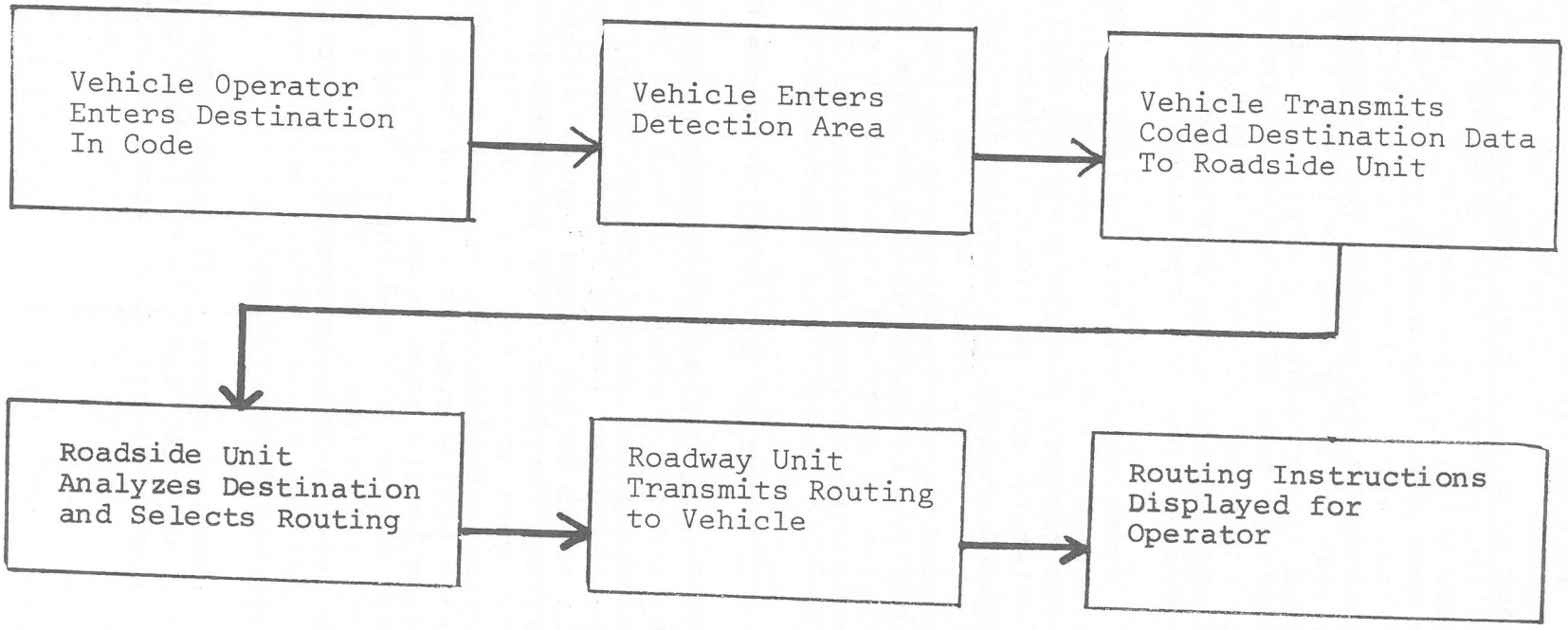


FIGURE VII-8

ELECTRONIC ROUTE GUIDANCE SYSTEM (ERGS) OPERATIONAL FLOW DIAGRAM



VIII RECOMMENDATIONS AND ACCOMPLISHMENTS

This analysis of transportation problems in the Interstate Bridge Corridor has resulted in the development of a number of immediate to short-range, low-cost improvements in the existing transportation system which are recommended for implementation in the corridor. Since this project is oriented towards physical action, the project staff and agency representatives on the Project Management Board have been actively pursuing implementation of some of the needed improvements as they were identified earlier. Therefore, some of the proposed improvements have been acted on, others are in the process of being implemented and still others are listed here as recommendations for implementation.

These improvements include express bus service (between Clark County/Vancouver and Portland consisting of two routes, interim park and ride facilities and use of existing rolling stock), intersystem transfers, customer information service (including toll free telephone line, route maps and identification of bus transfer points in telephone directories), region wide carpooling program, exclusive lane for high occupancy vehicles, a proposed interstate bikeway, highway operations and new legislation in the State of Washington. A description of these improvements follows:

1. Express Bus Service in the Corridor

An analysis of existing travel during the A.M. and P.M. commute periods for work trips indicated a need for the establishment of direct express bus service betwen the Mill Plain Boulevard and Hazel Dell areas to the Lloyd Center office complex and downtown Portland. The proposed service would primarily serve work trips and would operate only during the morning and afternoon commute periods. Both the Lloyd Center office complex and downtown Portland will be served by the same route. The buses would first serve Lloyd Center area and then proceed to downtown via the Steel Bridge. The routes in downtown would use the 5th-6th Avenues couplet to a terminal point in the College Street area. During the afternoon the route would be reversed.

Morning buses will serve commuters with work times at 7:30, 8:00, A.M. in downtown. Evening buses will begin departing downtown shortly after 4 P.M. with

service every half hour to 5:30 P.M. for a total of four P.M. trips. Care should be taken to insure that the bus departing the downtown area at 4 P.M. arrives at the Lloyd Center at a time convenient to serve the large number of Federal office workers released at 4:15 P.M. Other buses would be similarly scheduled.

Route No.1 (Service for the Mill Plain area) should begin at the intersection of Mill Plain Boulevard and Ellsworth Road. Buses will proceed west on Mill Plain Boulevard to Andresen Road, turn south to MacArthur Boulevard, then west to Mill Plain Boulevard thereon to the Interstate Route 5 freeway, exiting at Fourth Street for a stop at the Vancouver-Portland Bus Terminal to permit alighting, transfers and boarding of additional passengers. From that terminal buses will proceed via Interstate Route 5 on an express route to the Lloyd Center area, stopping as necessary in that area, and then proceeding to the downtown Portland area via the Steel Bridge.

Route No. 2 (Service to the Hazel Dell area) should begin at a Kiss and Ride facility in the vicinity of Columbia River High School. Buses will then proceed south on N.W. Ninth Avenue to N.W. 78th Street and turn east to Old U.S. 99, turn south to Interstate Route 5 and utilize the freeway to Fourth Street and continue in the same manner as route 1.

It is also recommended that several interim Park and Ride facilities be established in existing parking lots, subject to property owner's approval, along these two routes. In the Mill Plain route park and ride lots should be located at the Tower Mall and Hudson's Bay High School. For the Hazel Dell route, park and ride sites should be located at Hazel Dell Evangelical Church, Messiah Lutheran Church and possibly the Hazel Dell Fred Meyer shopping center.

These park and ride facilities should be adequately identified through the use of informational signs. In addition, signs noting the location of the larger sites should be placed along those main streets leadto the site. Some Federal aid funds may be used for these facilities.

It is recommended that Vancouver-Portland Bus Company provide this service. This carrier presently

provides service from the Hazel Dell area and several locations within the city of Vancouver to both the Lloyd Center area and downtown Portland. In addition, the Origin-Destination survey revealed that a number of persons who reside in the Mill Plain Boulevard corridor presently travel via this carrier by use of the park and ride and kiss and ride options.

This carrier, in instituting this express commuter service, should be given authority by both the Washington Utilities and Transportation Commission and the City of Vancouver to transport intrastate passengers between the Hazel Dell and Mill Plain Boulevard corridors and downtown Vancouver. This would make the service more viable and would provide service to Clark County/Vancouver residents where none presently exists and would provide additional and improved service in the Mill Plain Boulevard area. Since the Vancouver-Portland Bus Company is a private operator which receives no operating subsidy, the cost of the service must be borne through the farebox. Therefore, a demonstration period of three months is recommended for this service if provided by the private carrier. At the end of three months, if the patronage is not meeting the cost of the operation, a subsidy would be necessary to enable the operator to continue providing the service.

Frequently, traffic congestion on the Interstate Route 5 freeway may hinder operation of this demonstration project. Therefore, it is recommended that the city of Portland and Oregon State Highway Division cooperate with the private carrier to review existing traffic regulations and make necessary modifications to authorize and establish desirable alternate routes when congestion occurs.

Discussions between the project staff and the owner of the Vancouver-Portland Bus Company indicate that he is willing and able to provide the proposed service for a three month trial period under the above conditions.

Other options are:

a. A Clark County Transit agency is being established by the County and the cities of Vancouver, Camas, etc. which could provide this and other services.

b. The Clark County transit agency, when established, could enter into a contractual arrangement with Tri-Met to provide the proposed service, or

c. Another private carrier (i.e., Evergreen Stage Line) could be requested to provide the service.

2. Intersystem Transfers

It is recommended that a program of providing inter-system transfers be instituted between Tri-Met and Vancouver-Portland Bus Company and Vancouver Transit System resulting in a reduced fare for the riders. This proposal calls for riders from Vancouver/Clark County to Portland pay 35¢ fare on the Vancouver Transit System and be allowed to transfer to the private carrier and pay only an additional 10¢ to 35¢. Transfers to Tri-Met buses would be free. This transfer arrangement would result in a total one way trip charge of 45¢ to 70¢ which is a reasonable fare. Trips in the opposite direction would require the rider to pay 35¢ on Tri-Met, deposit 10¢ to 35¢ fare on the private carrier and receive a free transfer to the Vancouver Transit System. Each transfer of the public carriers collected by the private carrier would be billed back to the public carriers at 35¢. A similar arrangement may be worked out with Evergreen Stage Line, the private carrier serving the Camas-Washougal area. Discussions on this matter have been underway with the Vancouver-Portland Bus Company, Vancouver Transit System, and Tri-Met. When implemented, each agency must take steps to regularly inform their drivers of this inter-system arrangement.

Consideration must be given to the private carriers so that they will not receive any reduction in passenger revenue as a result of this procedure. The private carriers, unlike the public carriers, receive no subsidies to insure a continuation of service.

It is also recommended that Tri-Met concentrate on improving service in the north Portland area as an incentive to use the transfers and Tri-Met and Vancouver-Portland Bus Company revise schedules, where necessary , to reduce transfer times.

3. Customer Information Services

To improve customer convenience , provide additional public information and improve comfort for riders of public transit, thereby encouraging additional ridership, it is recommended that the following customer services be instituted:

a. Tri-Met should install toll free telephone service from the Vancouver area to its information office. This can be done for a nominal cost of approximately $6 per month plus 30¢ per call, and would provide Vancouver area residents with free information relating to Tri-Met lines when planning trips into the Portland area.

b. A route map should be placed in the Vancouver telephone directory illustrating Tri-Met, Vancouver-Portland Bus Company, Evergreen Stage Lines and Vancouver Transit System routes and points of transfer. The same map could also be placed in the Portland directory. The map will also contain information numbers for all carriers.

c. Tri-Met should review the location of bus shelters planned at Interstate Avenue and (1) Killingsworth Street and (2) Portland Boulevard and place the southeast shelters in such a manner that passengers could wait in the shelters and see buses on both lines approaching and can then move to the proper stop to complete their transfer.

d. When service improvements and extensions are instituted, the transit agencies should prepare attractive information folders which should include a route map, timetable and other pertinent information. These folders could be distributed to homes and businesses in the service area by community volunteer groups and be available on the buses and at terminals.

e. Service improvements should also be well publicized in the media. Press releases, conferences and advertising should accompany the inauguration of the improvement. Press releases could be issued and public statements made by local officials. Advertising

could be undertaken by the transit operator. In addition, transportation and environmental oriented government agencies should continue or expand their efforts to encourage carpooling or mass transit and lend support, where possible, to the marketing efforts of transit operators.

f. Tri-Met route maps should contain information of the routes of other carriers (i.e., Vancouver-Portland Bus Company) where transfers are likely. Similarly, the route maps of the other carriers should also have information pertaining to the Tri-Met routes.

4. Expansion of the Regional Carpool Program

A federally-funded regional carpool program was recently undertaken in Multnomah, Clackamas and Washington Counties which was administered by the Oregon Department of Transportation. This program was a very intensive computerized program for the three county area. At about the same time, the Washington State Department of Highways had a smaller carpool program underway in Clark County. The project staff concluded that greater success could be obtained by incorporating Clark County into the regional carpool program of Oregon Department of Transportation. Consequently, staff worked with Oregon Department of Transportation and the Washington State Highway Divison to expand the regional carpool program to include Clark County. Details for expansion of the program are being worked out and the program should be underway in Clark County in the very near future.

Expansion of the program in Clark County will include the following improvements:

a. Provide maps, information folders, and carpool application forms in public places in Vancouver and Clark County.

b. Provide a toll free number which Vancouver residents may call to obtain carpool information.

c. Expand the carpool grid system or develop a manual system to include the populated areas of Clark County in the program.

d. Provide park and ride facilities where carpoolers might meet to make carpool usage more convenient.

e. Contact (through employers) Clark County residents working in Portland and encourage carpooling.

5. Evaluation of Priority Treatment for High Occupancy Vehicles (NTECAP Demonstration Project)

It is recommended that Phase II of this project evaluate in more detail priority treatment for high occupancy vehicles (HOV). This may include an exclusive land for HOV and/or ramp metering and control system with transit priority provisions.

An application for Federal funding has been prepared by the project staff for implementation of a high occupancy vehicle lane under the National Transportation Energy Conservation Action Plan. This lane would be on the Interstate Route 5 freeway extending from Vancouver to a point in North Portland and provide a special vehicle lane for buses and high occupancy autos to relieve traffic congestion on the freeway and provide an incentive to motorists to utilize high occupancy vehicles in the corridor. It is envisioned that this lane would be provided in the south bound direction during the morning commute period. Additional study of priority treatment for high occupancy vehicles such as ramp metering in the corridor should be undertaken under Phase II, and is a part of the application.

6. It is recommended that an Interstate Bikeway, linking Vancouver to North Portland and the Portland Central Business District be constructed as developed by the regional bikeway program. This bikeway could be constructed at a minimal cost by making use of existing rights of way on the Interstate Bridge, on the Interstate Route 5 freeway on Hayden Island, through Delta Park and along Interstate Avenue. Some minor construction would be necessary on the approaches to the interstate bridges, on Denver Avenue and along Interstate Avenue to further encourage bicyclist safety.

While portions of this route have already been designated as a bikeway, improvements are necessary as existing conditions are detrimental both to bicyclist

safety and ease of travel. The construction cost of the bikeway is estimated at $105,000 and funds are available from highway revenues dedicated for bike facilities.

7. Recommendations for improving the existing highway operations include the following:

a. Pavement markings at a cost of about $1,500 by revising pavement markings i.e., traffic buttons, etc., on
   1. Union Avenue northbound on-ramp to Interstate Route 5 for improving freeway operations, and
   2. Interstate Route 5 northbound between Union Avenue on-ramp and the North Portland Harbor bridge to prohibit lane changes on the freeway approaching the curb.

b. Traffic signal installation and modifications are estimated to cost approximately $60,000 by the installation at,
   1. Portland Boulevard and the northbound off-ramp, and
   2. Union Avenue and Marine Drive

c. Ramp queue detection and control logic at the following locations to modify the off-ramp green time and prevent a queue from extending back to the freeway:
   1. Hayden Island off-ramps (under contract)
   2. Going Street and Interstate Avenue (existing) and
   3. Portland Boulevard northbound off-ramp (proposed)

d. Reduce Congestion on Interstate Route 5 by
   1. Utilizing the shoulder as a through lane at Portland Boulevard for southbound traffic and Portland Boulevard and Lombard Street for northbound traffic at an estimated cost of approxmately $15,000, or
   2. Ramp metering at Columbia Boulevard and Lombard Street could be used to reduce congestion for the south bound traffic. Northbound traffic could be metered at Williams Avenue, Going Street, and Denver Avenue
   3. Dynamic warning signs should be used to advise motorists on local streets of freeway congestion. Modification of the signal progression on Interstate Avenue,

Williams Avenue, (Vancouver Avenue) and Union Avenue to reduce stops for traffic in both directions would encourage motorists to use these facilities instead of the Interstate Route 5 freeway. A metering system including dynamic signs is estimated to cost $270,000 and $400,000.

e. Improve safety on Interstate Route 5 in Washington by
   1. Eliminating southbound on and off-ramps at 39th Street and constructing a ramp from the intersection of old U.S. 99 and Hazel Dell Avenue to the southbound on-ramp from Old U.S. 99 so that northbound Main Street traffic can enter the freeway southbound and
   2. Extending the southbound Fourth Plain Boulevard and Mill Plain Boulevard on-ramps to an approximate length of 1,300 feet. The cost of these improvements is estimated at $35,000.

f. The informal agreement between tugboat operators and the highway departments should be reaffirmed. The agreement stipulates that tugboat operators should seek, where possible, to avoid forcing bridge openings during the morning and evening peak hours. It is important to note, however, that such an agreement is not binding on the marine operators and compliance is dependent on the cooperation of the tugboat operators.

8. From the many potential improvements discussed herein, several are recommended for further analysis in Phase II of the project. These are in addition to others discussed elsewhere in this section and are as follows:

a. Exclusive Transit Roadway.
b. Work Schedule Revision (staggered work hours).
c. Suburban Employment facilities.
d. Ramp Control System with transit by-passes and dynamic warning signs.
e. Emergency Service: State highway officials should further investigate the possibility of providing towing, ambulance and traffic control services during the peak hours to more rapidly respond to freeway accidents thus reducing congestion and improving highway safety.

f. System Alternatives: Express Bus, Automatic busways, Light Rail Transit, Waterway Ferry and Trolly Bus

9. During Phase I of this project, it was apparent that new legislation would be needed in the State of Washington that would enable Clark County and the cities therein to create a county-wide transit system for the people of the county. The transit system would be established as identified in Chapter II and in addition to providing service within this county, would have authority to contract with other systems, if necessary, to provide service from within the county to areas outside the county and state for the benefit of county residents.

In addition to this need for new legislation being identified by the project, elected officials and citizens in Clark County as well as elsewhere in the state also saw this need. As a result, legislation similar to that proposed by the project was passed by the Washington State Legislature in April, 1974, (House Bill 670). This legislation enables counties in the State of Washington, other than King County, to create a county transportation service. It also authorized, subject to voter approval, a .3% sales tax to finance the service. Clark County and the cities therein have already taken advantage of the authority given them and some initial developments are underway for the creation of a county transit agency.

It is recommended that the Tri-County Metropolitan Transportation District of Oregon (Tri-Met) begin immediate negotiations with the privately-owned Vancouver-Portland Bus Company for the purchase of that system. Purchase of the privately owned system by Tri-Met would provide for the interface of publicly owned systems in the corridor and would result in the provision of transit service in the corridor as dictated by public policy. Tri-Met or the authorized Clark County transportation authority should also consider the possible purchase of Evergreen Stage Line or at least part of its operation which serves the Camas-Washougal area, part of the City of Vancouver, and certain unincorporated areas of the county.

The energy crisis, lack of additional vehicular capacity on the Interstate 5 facility and the environmental problems facing the area require early favorable action on the part of those involved in solving the transportation problems in the Portland-Vancouver Interstate 5 corridor.

APPENDIX A

This section contains illustrations and a brief description of a number of transportation systems and modes which may have application in the Interstate Bridge Corridor.

NEW SYSTEMS

A new system in this context may be an innovative development or simply the construction of existing technological capabilities not previously used at the location in question. Transportation systems are usually found in one of five states or levels of technical development with associate approximated "time lags" - the time required to obtain the final operation. These levels may be referred to as technical status and include:

	Status	Time Lag (years)
1.	Concept	1-2
2.	Research & Development	2-4
3.	Demonstration & Evaluation	3-5
4.	Implementation & Construction	4-8

The attached flow chart illustrates the development process in more detail. One should also realize that the time lag is usually determined by the institutional procedure and commitments rather than technology itself.

A COMPARISON OF THE CHARACTERISTICS OF THE VARIOUS TRANSPORTATION SYSTEMS WHICH MAY BE APPLICABLE IN THE INTER-STATE BRIDGE CORRIDOR

TYPE	NATURE OF SERVICE	ROADWAY	ACCESS CONTROL REQUIRED	PROPULSION	ENERGY EFFICIENCY PASS. MI/GAL	APPROX. OPER. MAX SPEED MPH	CAPACITY VEHICLE SIZE	FUTURE AVAIL. OR ENERGY	ROUTE FLEXILLITY	NOISE QUALITY	WEATHER SYSTEM AFFECTED	TECHNOLOGY STATUS	CAPITAL COST	IMPACT
Gravity-Vacuum Tube	Inter/Intra-Urban	Rail In Tube	Full	Electricity 1/3 Gravity 2/3	30	150	High	Fair	Poor	Good	Yes	R & D	Very High	Minor
Heavy Rail	Inter/Intra-Urban	Rail	Full	Electric/ Fossil Fuel	40	100	High	Fair/ Poor	Poor	Fair	Yes	Oper	High	Moderate
Light Rail	Intra Urban	Rail	Partial	Electric	80	50	Medium	Fair	Fair	Fair	Yes	Oper/Demo	Medium	Minor-Moderate
Monorail	Intra Urban/ Local	Rail	Full	Electric/ Fossil Fuel	30	45	Medium	Fair/ Poor	Poor	Fair	Yes	Oper	High	Moderate
Palleted Automated Transportation (PAT)	Intra Urban	Rail	Full	Electric	NA	50	Lower Medium	Fair	Good	Good	No	R & D	High	Moderate
Personal Rapid Transit (P.R.T.)	Intra Urban/ Local	Guideway	Full	Electric	NA	50	Lower Medium	Fair	Good	Good	Yes	R & D	High	Moderate
Aero-Train	Inter Urban	Air Cushion & Pavement	Full	Fossil Fuel	20	200	Very Low	Poor	Poor	Poor	Yes	Demo	Very High	Moderate
High Speed Tube Transit	Inter Urban	Magnetic Flux & Tube	Full	Electric/ Fossil Fuel	NA	500 +	High	Fair/ Poor	Poor	Good	Yes	Cnpt	Very High	Minor
Automobile	Local	Pavement	None	Fossil Fuel/ Electric	25	70	Low	Poor/ Fair	Good	Poor/ Good	No	Oper	Low-Very High	Minor to Major
Cycleways/Bikeways	Local	Pavement	Full/ None	Organic (Human)	760 (Equiv)	20	Very Low	Good	Good	Good	No	Cnpt/Oper	Medium	Moderate-Minor
Demand Responsive Bus	Local	Pavement	None	Fossil Fuel/ Electric	50	35	Low	Poor/ Fair	Good	Fair/ Good	No	Demo	Low	Minor
Automatic Busway (Dual Mode)	Local/ Intra Urban	Pavement	Full/ Partial	Fossil Fuel/ Electric	110	35 (60)	Medium	Poor/ Fair	Good	Fair/ Good	Partial	Cnpt	Medium	Moderate
Peddle Cars	Local	Pavement	None	Organic (Human)	760 (Equiv)	25	Very Low	Good	Good	Good	No	Oper	Medium	Moderate
Pedestrian	Local	Pavement	None	Organic (Human)	450 (Equiv)	4	Very Low	Good	Good	Good	No	Demo	Low	Minor
Hydrofoil	Inter/Intra Urban	Water	None	Fossil Fuel	25	40-60	Very Low	Poor	Poor	Fair	Yes	Oper	Low	Minor
Air Cushion Vehicle	Inter/Intra Urban	Water	Full	Fossil Fuel	30	40-60	Very Low	Poor	Poor	Poor	Yes	Oper	Low-Medium	Minor
Super Ferry	Inter/Intra Urban	Water	Full	Fossil Fuel	NA	25	Low	Poor	Poor	Fair	Yes	Oper	Low-Medium	Minor
Heli-Taxi	Intra Urban	Atmosphere	Full	Fossil Fuel	20	200	Very Low	Poor	Poor	Poor	Yes	Oper	Low-Medium	Minor
Express Bus	Local/ Intra Urban	Pavement	Full/ Partial	Fossil Fuel/ Electric	110	35-60	Medium	Poor/ Fair	Good	Fair/ Good	Partial	Oper	Medium	Moderate
People Mover Transit	Local/ Intra Urban	Guideway	Full	Electric	NA	25-50	Medium	Fair	Poor	Good	Yes	Oper	Medium	Moderate
Airship	Intra/ Urban	Atmosphere	None	Fossil Fuel	25	100	Very Low	Poor	Good	Fair	Yes	R & D	Medium	Minor

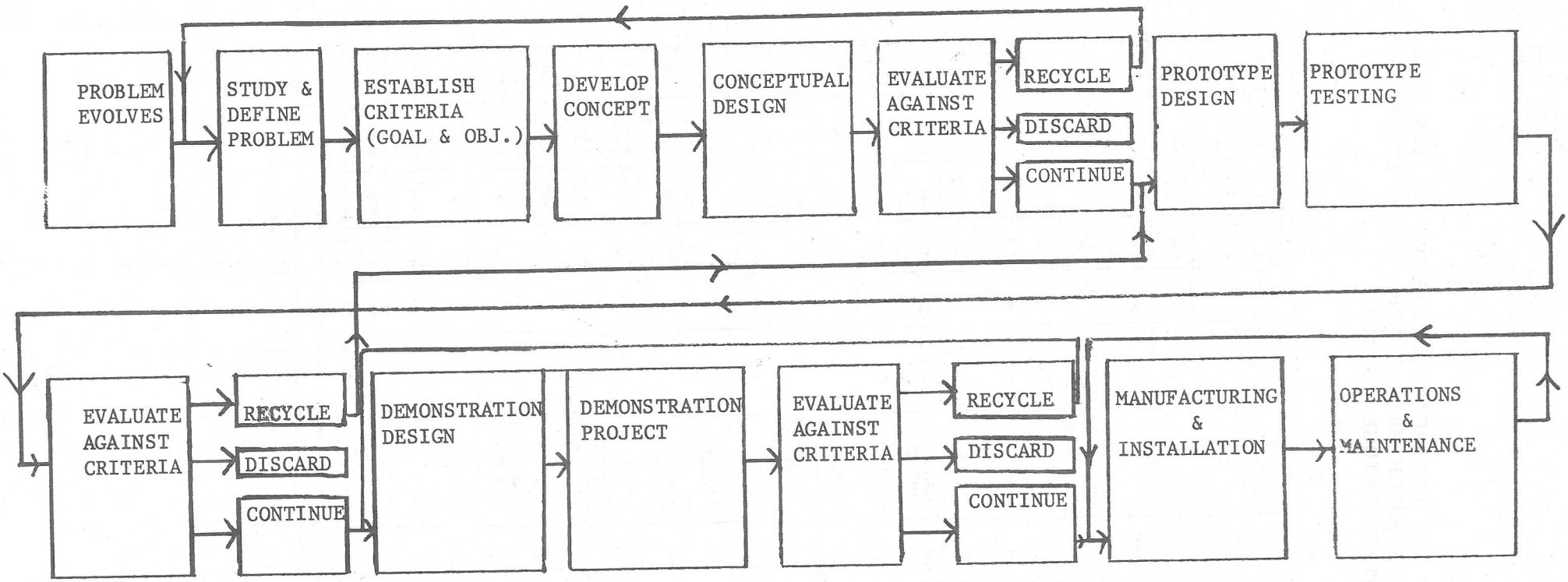
Notes:

The energy efficiency was gathered from several sources but generally was based on present occupancy levels rather than capacity.

Technology Status notation - Cnpt -Concept; R&D-Research and Development; Demo-Demonstration; Oper-Operational.

Light Rail systems have been in operation for years, but these are new vehicles not yet in operation.

Diagram A-1 FLOW CHART OF THE INNOVATIVE SYSTEM DEVELOPMENT PROCESS



GRAVITY-VACUUM TRANSIT (GVT) SYSTEM

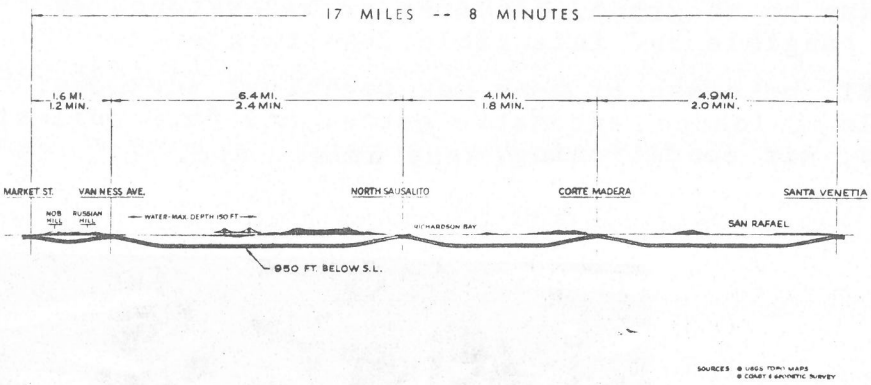


FIG. 8.—PROFILE OF THE SAN FRANCISCO TO MARIN SYSTEM

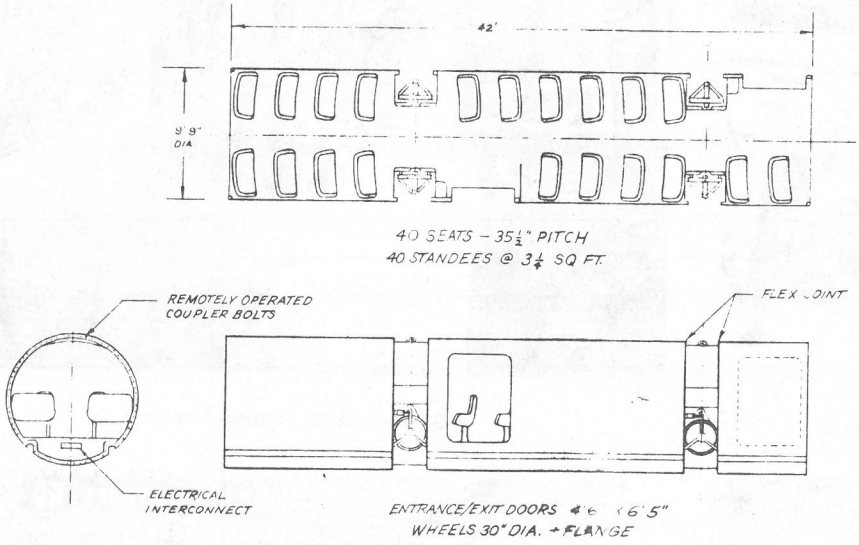


FIG. 15.—PASSENGER CAR

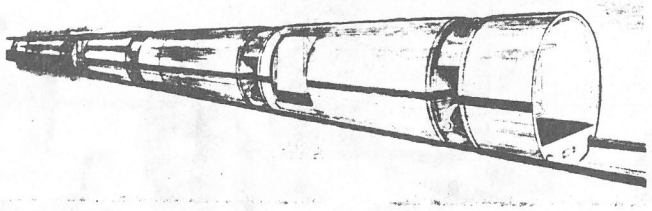


FIG. 14.—TRAIN PERSPECTIVES

General System Features

1. It employs gravity for roughly 2/3 of the total energy requirement and atmosphere air for the remaining 1/3.

2. By accelerating passengers in a fashion they cannot feel, GVT permits effective speeds substantially higher than the theoretical limit for any horizontal transportation system. Speeds in excess of 150 miles per hour are possible for urban systems.

3. GVT satisfies the ideals of low air pollution or above-ground eyesores, and virtually no environmental noise, no land severance or condemnation of land along the right-of-way.

4. By placing its stations at depths typical for London's deep-tube subway system, GVT avoids the urban disruption that accompanies cut-and-cover construction and still permits an economical tunnel cross section at slightly over half the cost of present transit tunnels.

5. This system is in the R & D stage; therefore, a practical system is probably a decade away if the R & D and demonstration results are favorable.

General System Features

1. May operate with fossil fuel engines or electric motors supplied by a third rail at maximum speeds near 100 mph.

2. Requires an extensive feeder system at the stations to supplement the rail lines which usually requires more dense development for feasibility considerations than systems with more route flexibility.

3. Lines and stations may be at grade, elevated or underground as required by the various tangible and intangible constraints.

4 New systems, ie. BART, make use of many new technical advances; namely, automatic vehicle guidance automatic gates, and fare collection, information systems, air conditioning, less noise, etc.

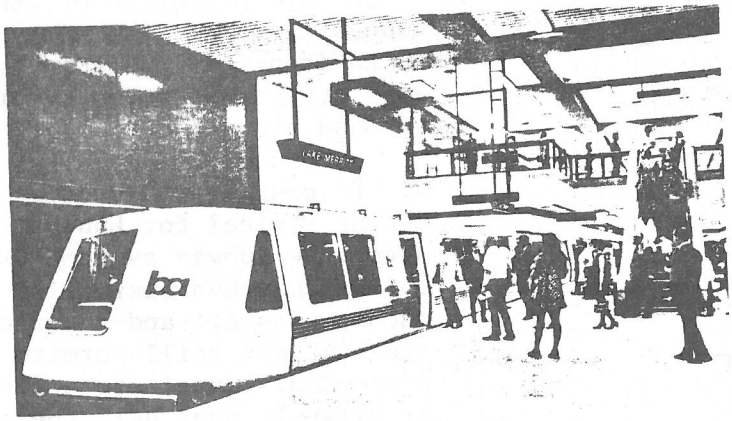


FIG. 3.—BART Train in Oakland Subway Station

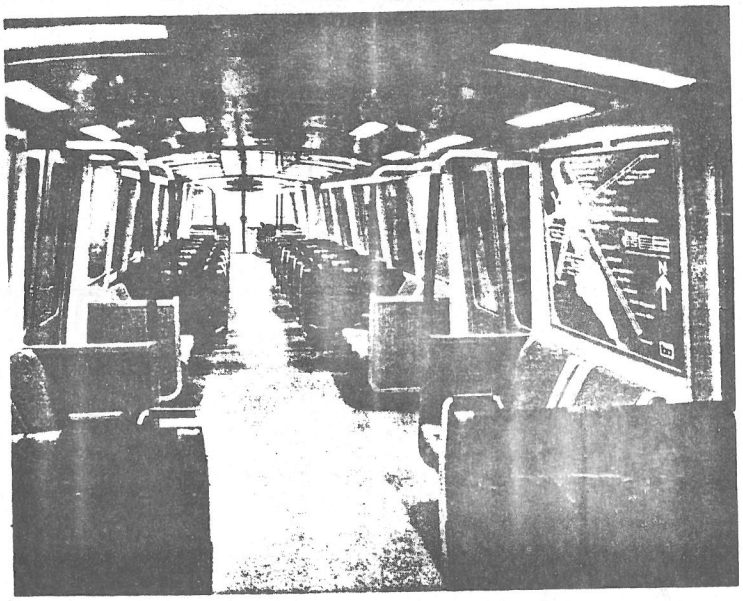


FIG. 6.—Interior Vehicle Design

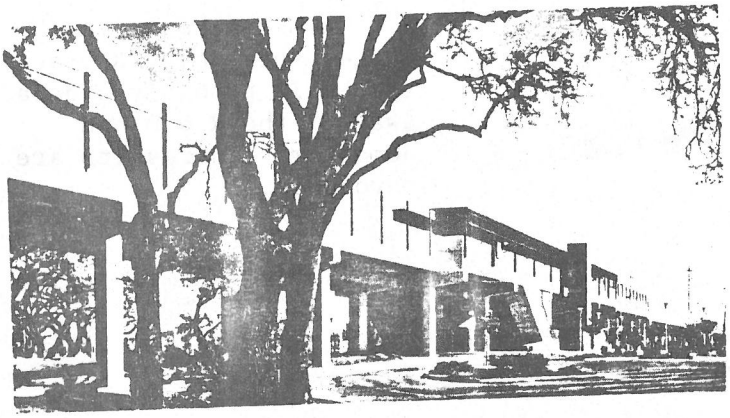


FIG. 4.—Typical Aerial Station

FIG. 7.—Self-Service Ticket-Vending Machines and Electronic Gates

LIGHT RAIL TRAIN SYSTEM

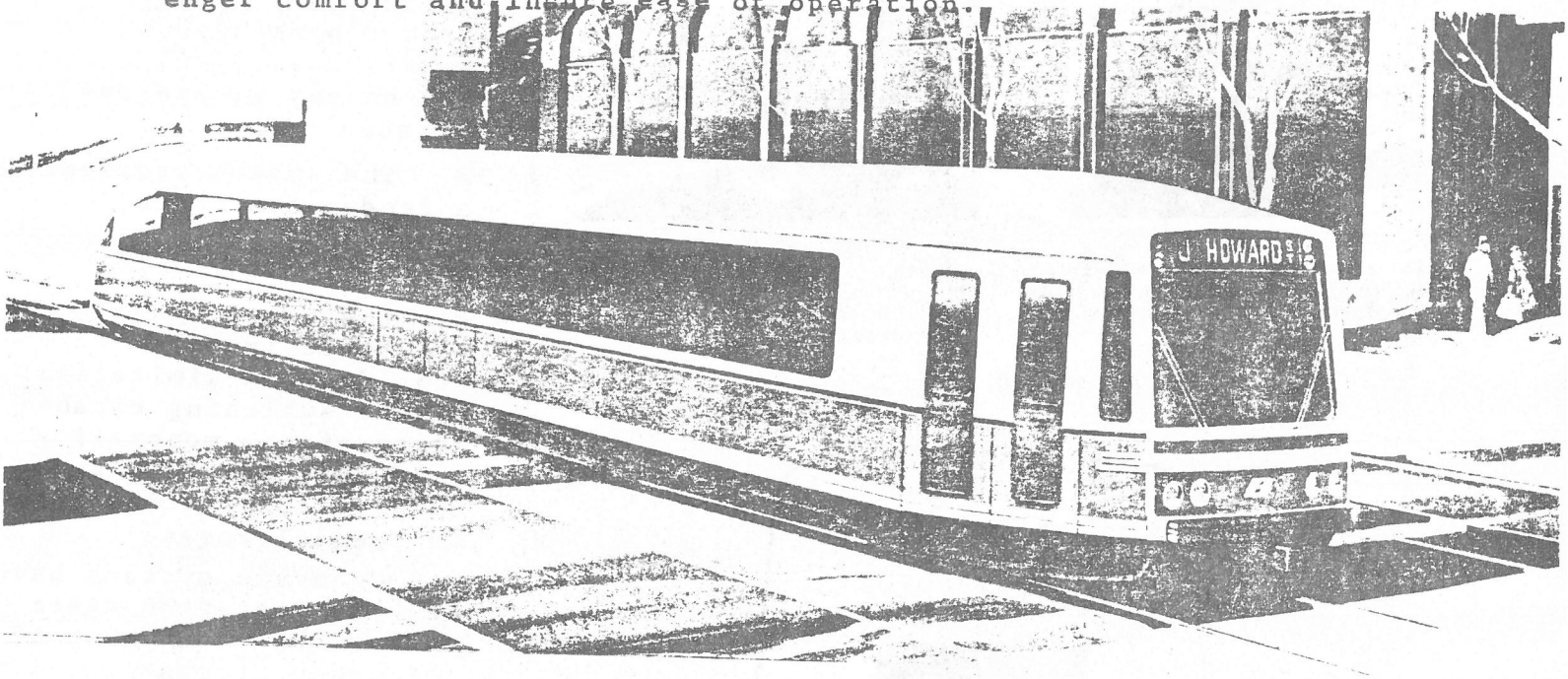
General System Features

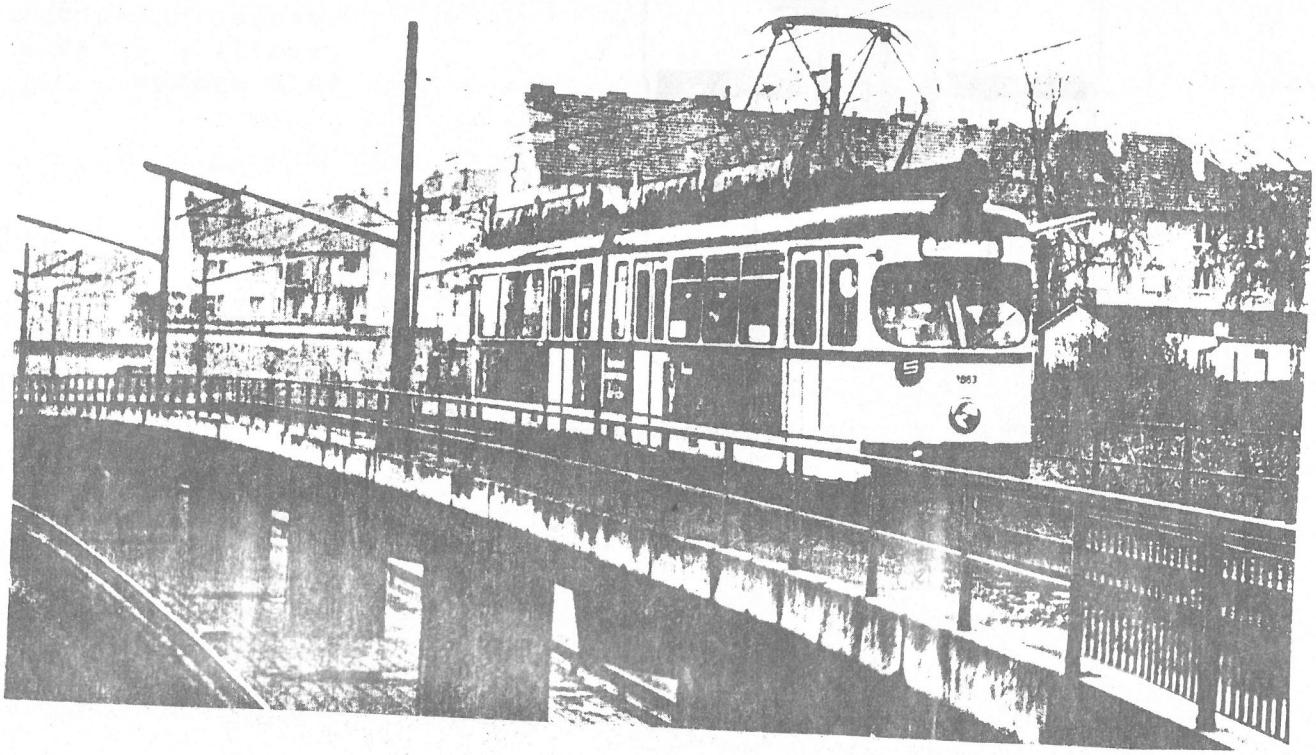
1. Trains usually operate at about 40-60 mph, with higher speeds possible in special circumstances. Power to drive the vehicles electric motors are supplied through overhead cables.

2. Trains (normally 3 vehicles) may operate on rails in mixed traffic or on a separate railway and may use overhead cables in common with trolley buses.

3. Light rail systems require feeder service at stations to collect and distribute passengers.

4. New light rail vehicles may be articulated to permit improved manuver ing on narrow city streets. In addition, vehicles may be equiped with airconditioning, automatic ticket gates and other devices to improve passenger comfort and insure ease of operation.





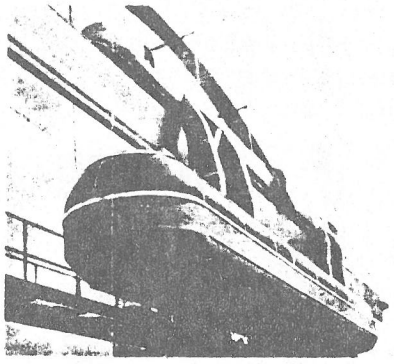


FIG. 14.—RUBBER TIRED SUSPENDED MONORAIL, DALLAS, TEXAS, 1956 (PHOTO COURTESY OF MAGUIRE, REF. 8.)

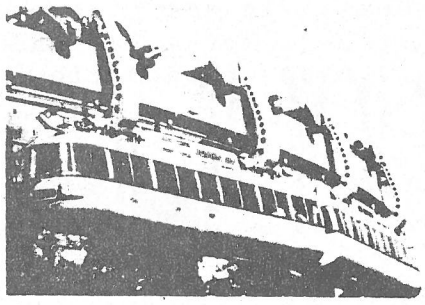


FIG. 15.—RUBBER TIRED SUSPENDED MONORAIL, TOKYO, JAPAN, 1957 (PHOTO COURTESY OF BOTZOW, REF. 2.)

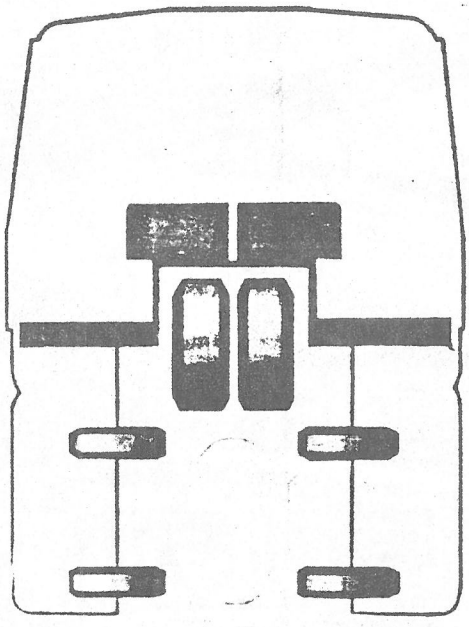


FIG. 21.—CROSS SECTION OF SUPPORTED MONORAIL SHOWING VERTICAL AND HORIZONTAL TIRES AND HOLLOW CONCRETE BEAM

General System Features

1. Trains operate on or below a large elevated rail (beam) and may be either propelled by fossil fuel or electrical energy at speeds of about 50 mph.

2. The system requires a feeder system to supplement the line service.

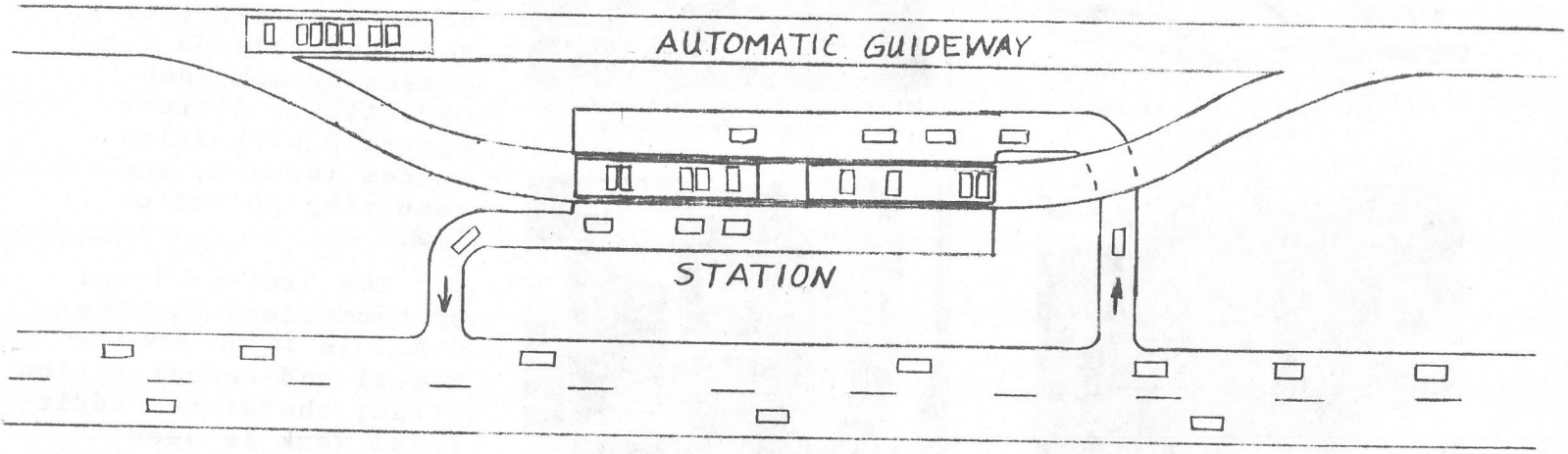
3. The massive "rail" structure imposes considerable limitation on the switching capability of the monorail and, therefore, it's usually constructed only in special cases.

4. Monorail systems have been in operation since early 1900's but much of the recent technology i.e automatic control, is readily adaptable to this system.

PALLETED AUTOMATIC TRANSPORTATION (PAT) SYSTEM

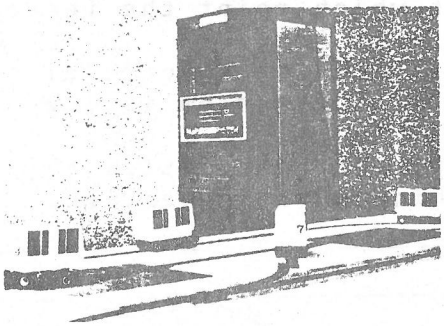
General System Features

1. The technology status of the PAT is only conceptural, although it is not new because a ferry system which transports autos, is a waterway version of a PAT system.
2. PAT is a dual-mode automatic system. Small feeder type vehicles are placed in large line haul vehicles for an express trip on a fixed guideway or a rail to a distribution station at which point the feeder vehicles desembark for final destination.
3. The system vehicle may utilize either fossil fuel or electrical propulsion sources. In terms of passenger units, the system is low polluting.
4. The system eliminates the need for passengers or commodities to change vehicles. This feature is desirable during adverse weather.

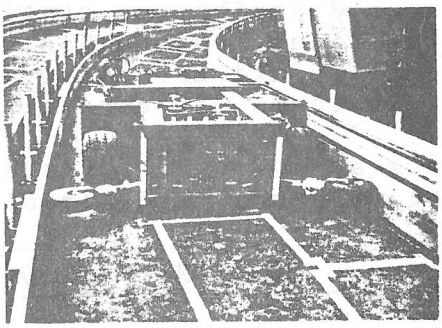


PERSONAL RAPID TRANSIT (PRT) SYSTEM

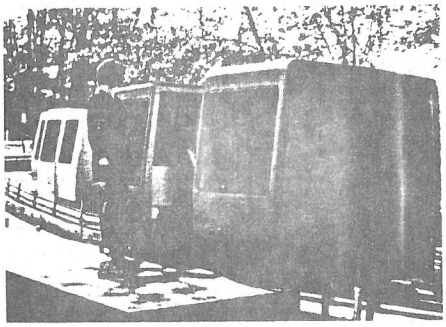
FIGURE 1 STARRCAR DEVELOPMENT & TESTING



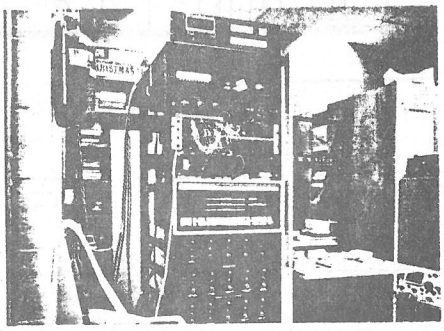
(A) Scale Model Transit System Under Computer Control



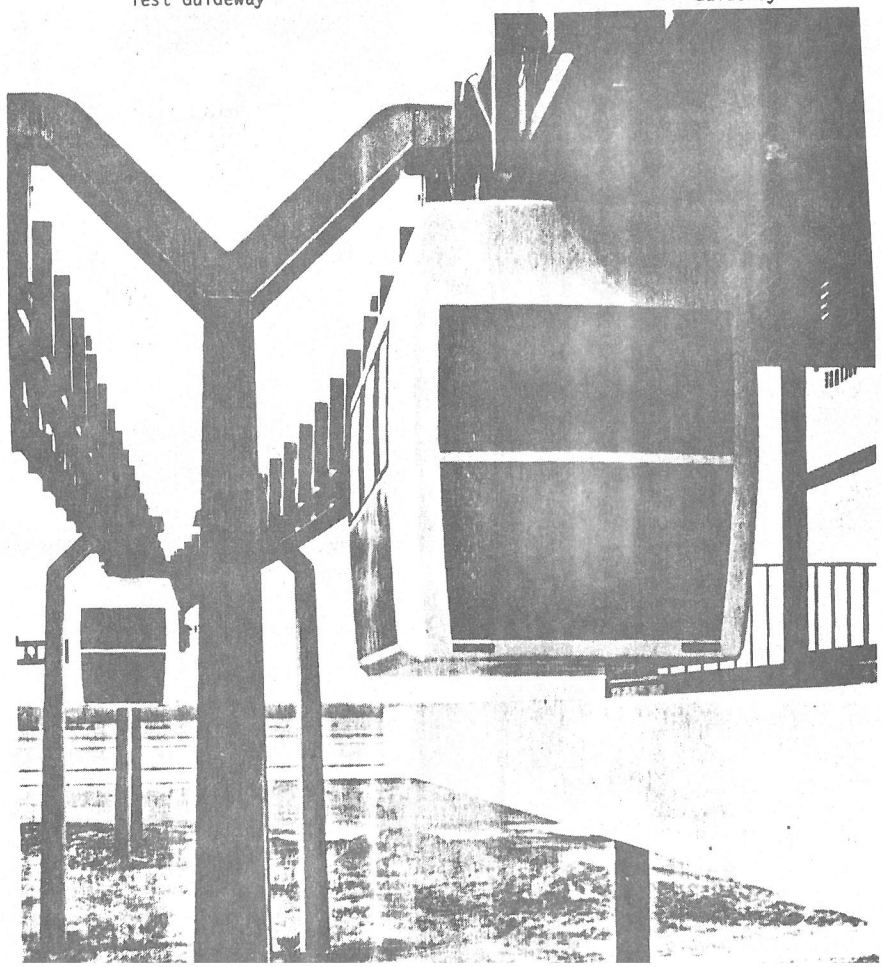
(B) Experimental Vehicle Automatically Guided on Test Guideway



(C) 6-Passenger Prototype Vehicles on Test Guideway



(D) Central Computer Control of Test Guideway



General System Features

1. A vehicle containing 4 to 8 passengers operate on a fixed but relatively small quideway or suspended from an overhead beam like one type of monorail.

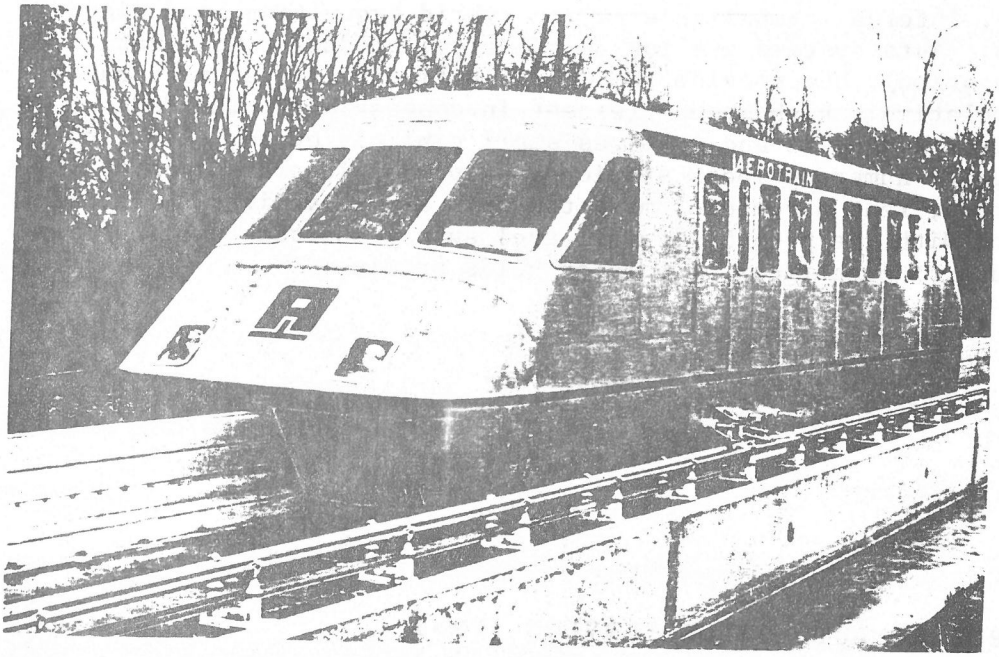
2. The system provides point to point service, eliminating transfers, through automatic control

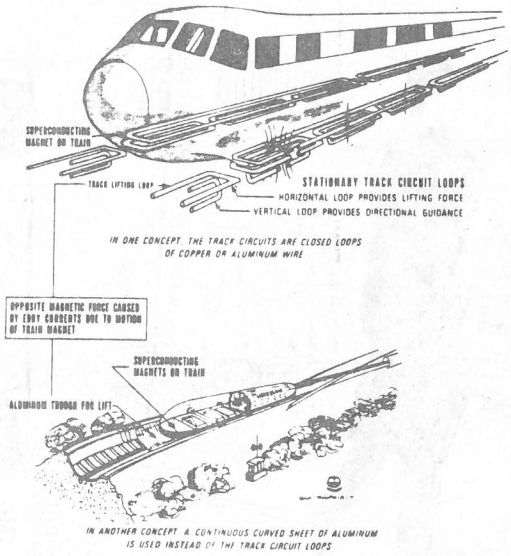
3. The vehicles are powered by electicity and generally do not exceed 50 mph when operating. Since a electric propulsion system is used, the resulting pollution is low.

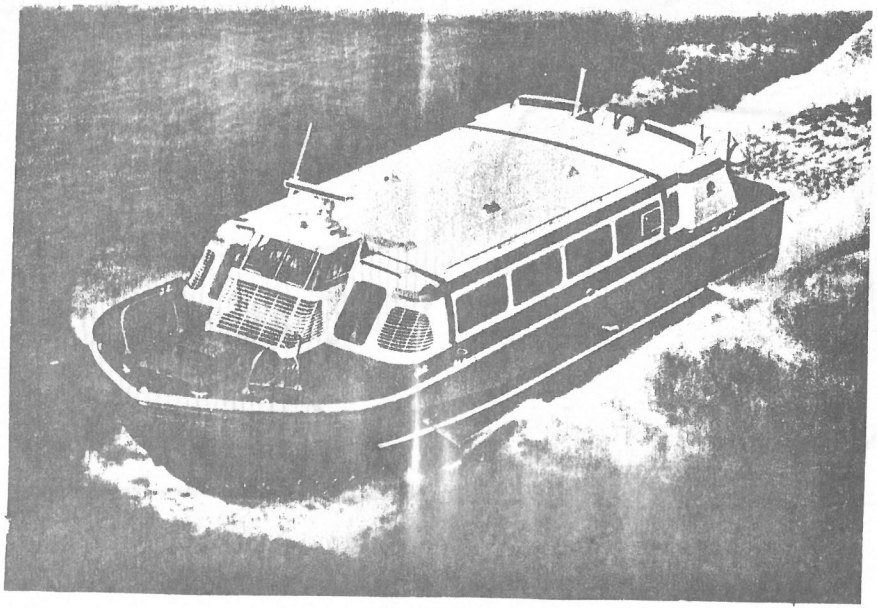
4. The present level of technology for the P.R.T is in the developmental and demonstration stage; therefore, additional work is need before the systems

5. The limited demonstrations have been extremely costly in comparison to estimates.

LEVITATING VEHICLE TRANSPORTATION (LVT) SYSTEMS





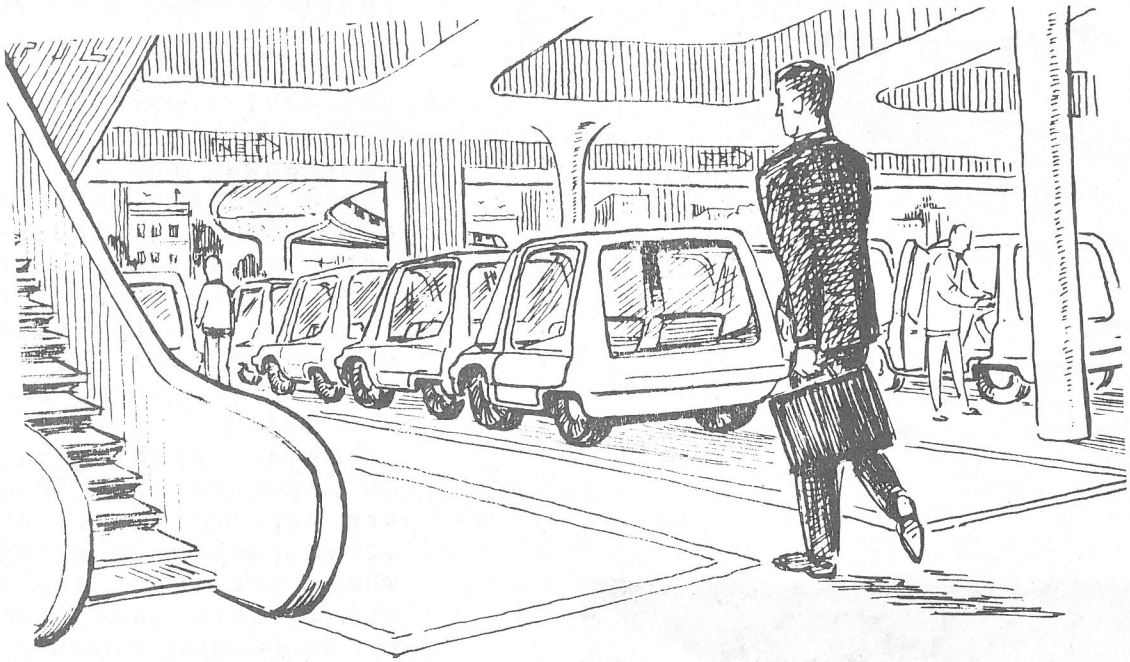


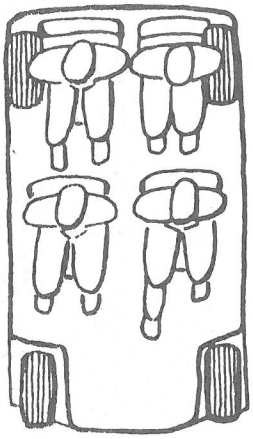
Levitating vehicles "ride" on a cushion of air or magnetic flux above a roadway which may be pavement, a metal tube or water. There are basically three types of levitating vehicles 1)air cushion tracked (Aero-Train), 2)High Speed Tube Transit (Magnetically Levitating) and 3)Air Cushion Waterway Craft (Hovercraft). This concept enables the vehicle to lift off its roadway and overcome surface friction and, thereby, obtain much higher speeds at a specified energy consumption level. For example the Aero-Train operating in France has achieved speeds of 200 mph and more. The magnetic levitating concept can easily obtain hypersonic speeds if a vacuumed roadway tube is used. These systems obviously are suited for interurban travel rather than intra-urban because these speeds are not attainable with urban station spacing requirements. The marine air cushion vehicles which operate at approximately 50 mph are applicable ot intra-urban passenger service where waterways are usable. Note that revision in the existing waterway speed limits may be necessary.

AUTOMOBILE SYSTEM

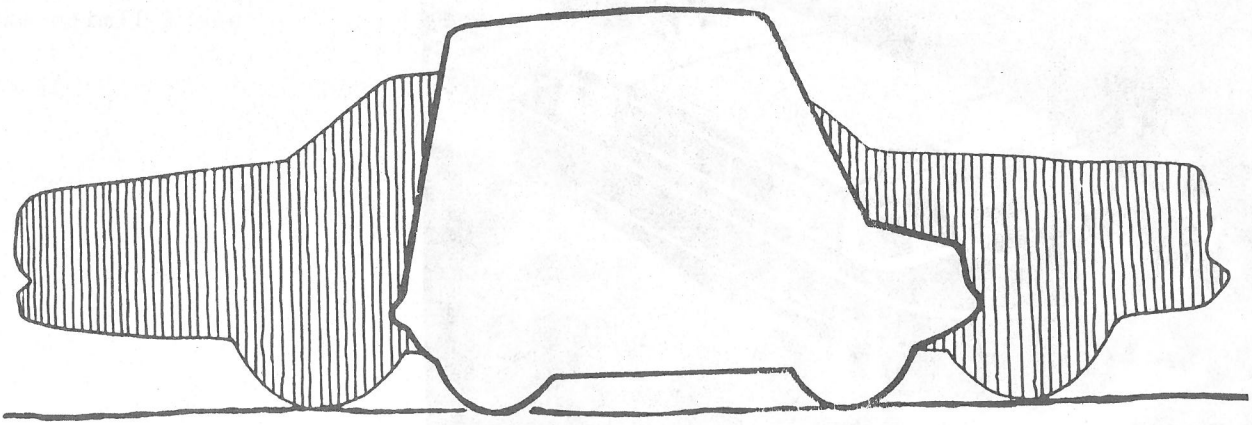
The automobile may be used in one of several ways or combination thereof, which may include the conventional use of the auto on streets and freeways, Public Automobile Service (PAS), internal combusion/electric hybrid propulsion, and electrically powered vehicles. Auto systems are low in capacity, produce considerable pollution (internal combustion), but provide considerable flexibility at reasonable out of pocket costs at relatively high speeds (except in congestion). The PAS concept makes use of existing streets and utilizes small publicly owned, electricly powered autos distributed to numerous local stations. A person in transit may walk or cycle to a local station, rent a vehicle, make the trip and leave it a the station nearest his destination. With the probably fossil fuel supply shortage within a few decades, the potential use of electrical propulsion holds promise.

PUBLIC AUTOMOBILE SERVICE (PAS)



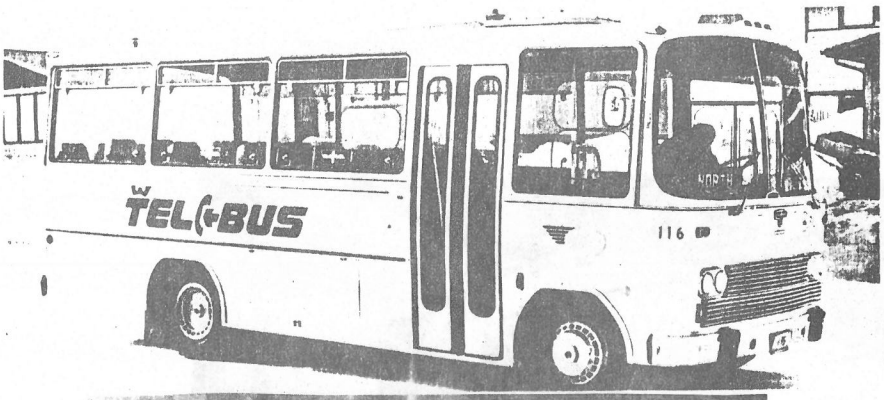


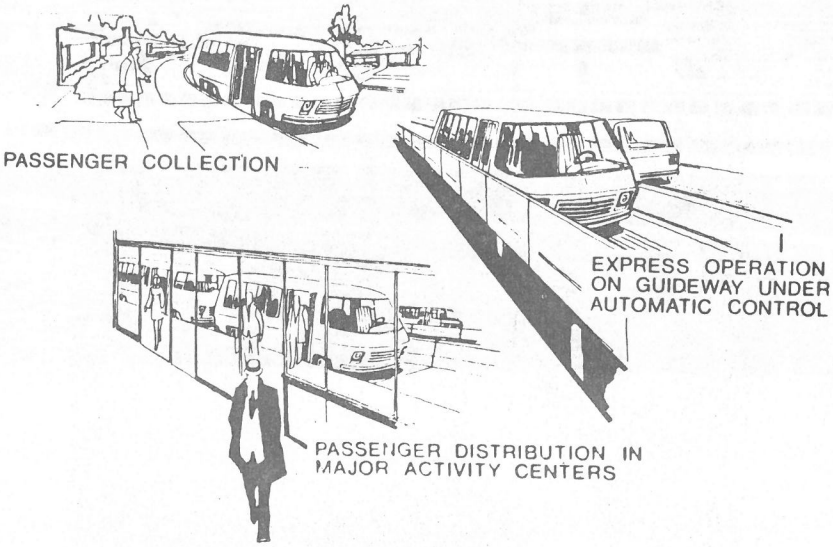
FOUR ADULTS
(Dual - Mode Vehicle)



BUS TRANSIT SYSTEM

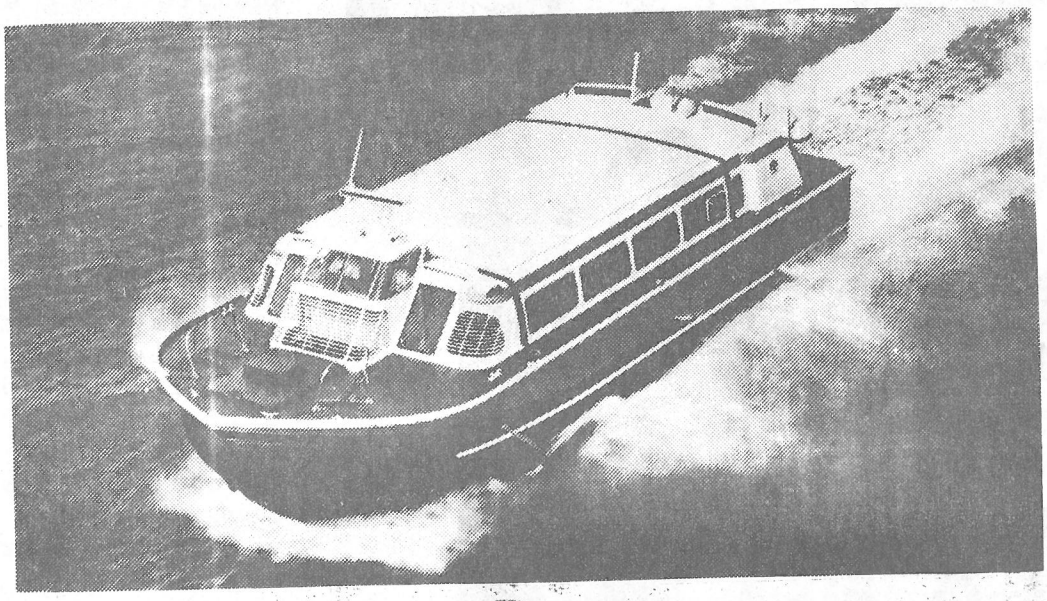
There are three types of bus transit systems considered herein; namely, Demand Responsive Bus (DRB), Express Bus System (EBS) and Automatic Busway System (ABS). The DRB operates locally on a pre-programed route and diverts from the route in response to requests for transit service. The type of service, using vehicles which are nornally designed to carry about 20 passengers, has been initiated and is providing valuable service to the public it serves. The EBS provides higher volume service at higher speeds with considerable flexibility for local service off the express line. EBS on exclusive facilities have been extremely sucessful carrying as many as 21,000 passengers per hour per lane and providing sufficient revenues for operating costs. The ABS is more a concept than a reality but there have been demonstrations and operations involving medium sized buses. The vehicles with about 20-30 passengers, operate with automatic control on fixed guideways. This concept uses a similar type, but dual mode, vehicle operating with a driver on local feeder service and changes to automatic control on an exclusive facility. Vehicles may also be coupled into trains.

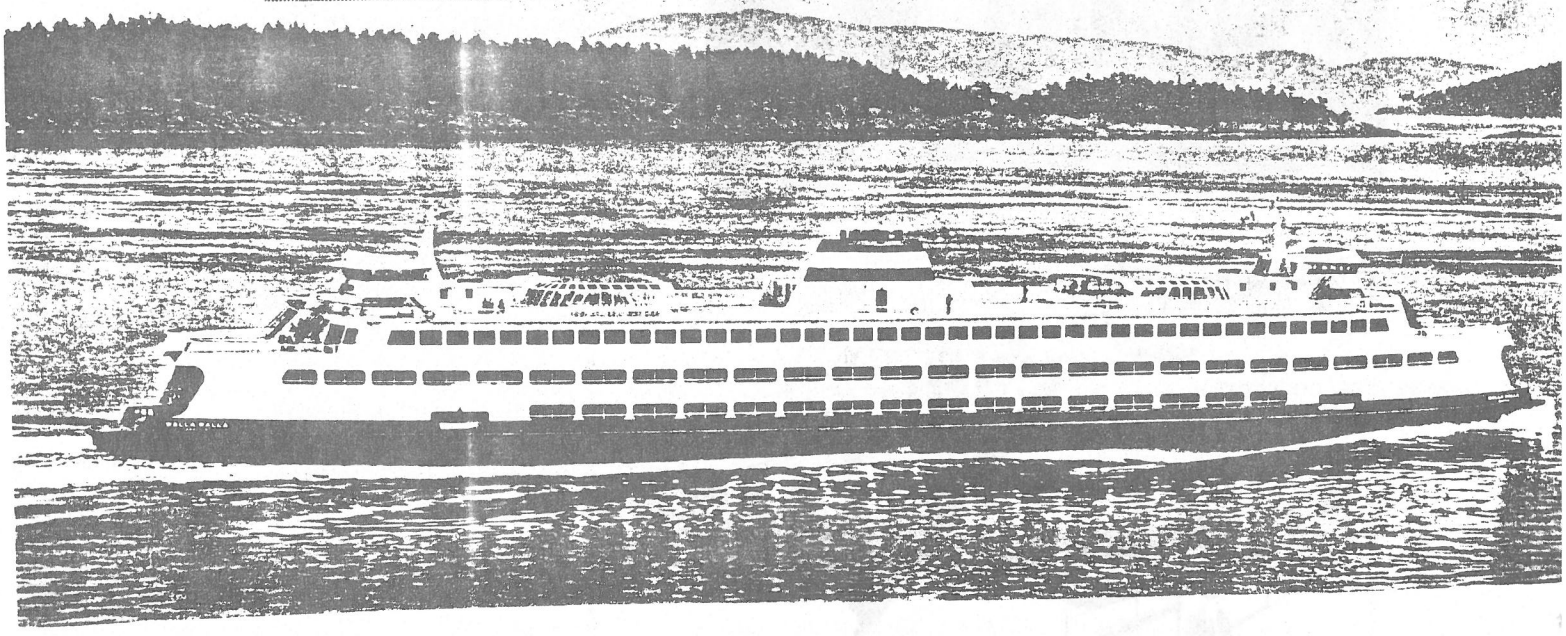




HYDRO-TRANSPORTATION SYSTEM

The major possibilities range from small (70 passengers) high speed craft, operating at about 50 mph, to large (2000 passengers)super-ferries operating at approximately 20 mph. Waterway systems make use of natural transportation roadways-water in the form of rivers, lakes, etc. These systems require feeder service and elaborate terminals but tend to be relatively high in energy efficiency. The auto carrying ferry systems are dual-mode.

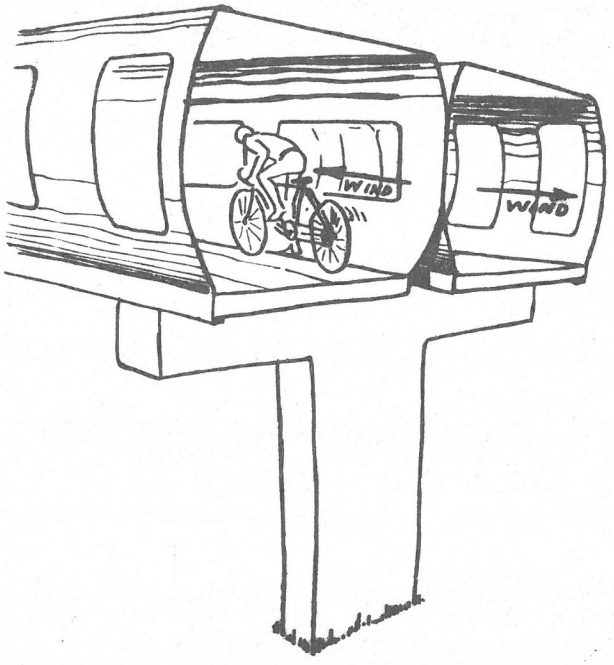




CYCLEWAYS

General System Features

The cycleway concept consists of enclosed roadway pairs, one for each direction. The atmosphere within the enclosed roadway is accelerated to provide a "sailing" affect for the cycle users.



HELI-BUS/TAXI SYSTEM

General Features

1. Large helicopters with seating capacity up to about 20 passengers with speeds in excess of a 100 mph.
2. Landing facilities may consist of shopping centers, airports, tops of large buildings or parking lots.
3. These systems have some disadvantages: low capacity, high noise levels and expensive operations.

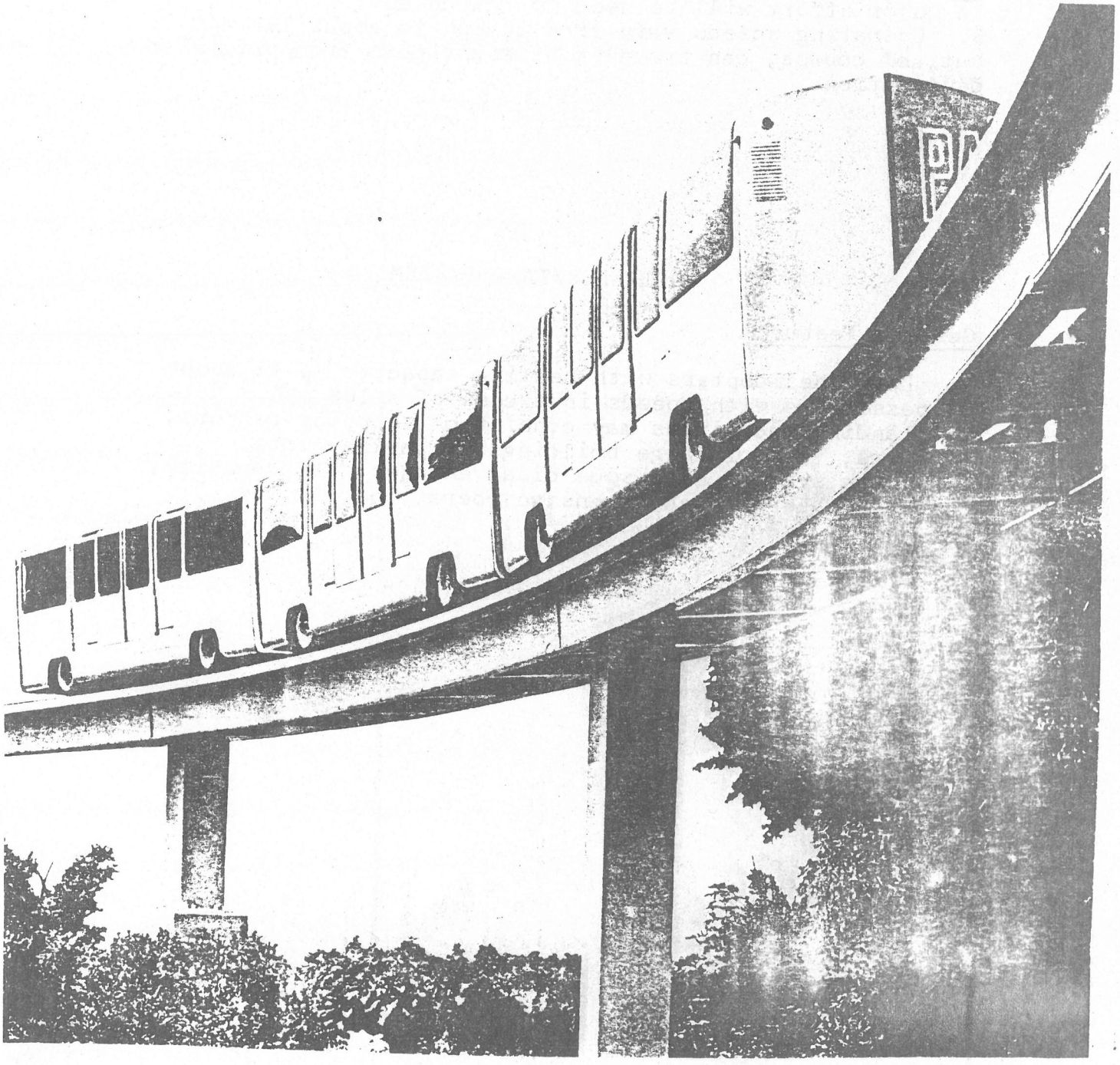
AIRSHIPS (DIRIGIBLES)

General Features

1. Existing aircraft have low capacity but large craft capable of carrying 400 passengers or cargo in excess of 200 tons appear feasible.
2. The aircraft propulsion is very efficient because it supplies energy for speed only and not for the "lifting" force.
3. Airships require "docking" time and facilities. This reduces the capability to serve the shorter trips and is, therefore, more suited for inter-urban travel.
4. Although dirigibles have been operating for decades their use was never widespread. There has been practically no research and development effort for 30 years; therefore, a major effort will be needed to "catch-up" if desired.
5. Operating speeds vary from 30 mph to about 100 mph but, ofcourse, the airship can travel a straight path from origin to destination.

PEOPLEMOVER TRANSIT SYSTEMS

Although Peoplemover Systems (PTS) generally, are applicable to transportation problems involving lower speeds and volumes than associated with the I-5 Corridor, there is one particular system which merits consideration. Vehicles with a capacity of 70 passengers operate automatically in train or single units at speeds up to 50 mph. It functions on an exclusive guideway and uses electricity for propulsion.



AIRSHIPS (DIRIGIBLES)

General Features

1. Existing aircragt has low capacity but large craft capable of 400 passengers or cargo in excess of 100 tons appear feasible.
2. The aircraft propulsion is very efficient because it supplies energy for speed only and not for the "lifting" force.
3. Airships require "docking" time and facilities. This reduces the capability to serve the shorter trips and is, therefore, more suited for inter-urban travel.
4. Although dirigibles have been operating for decades their use was never widespread. There has been practically no reaearch and development effort for 30 years; therefore, a major effort will be need to "catch-up".
5. Operating speeds vary from 30 mph to about 100 mph but, of course, can travel a straight path from origin to destination.

HELI-BUS/TAXI SYSTEM

General Features

1. Large helicopters with seating capacity up to about 20 passengers with speeds in excess of a 100 mph.
2. Landing facilities may consist of shopping centers, airports, tops of large buildings or parking lots.
3. These systems have some disadvantages: low capacity, high noise levels and expensive operations.

APPENDIX B

EXPANSION OF EXPRESS BUS SERVICE - FEASIBILITY CALCULATIONS

RIDERSHIP

The ridership for the express bus service was based on the modal split curves used in the "1990 Public Transportation Master Plan" (October, 1973) and used the following parameters:

1. Trip purpose - Home connected work
2. Family income range - Medium and High
3. Employment density - 720 empl/acre
4. Transit/auto cost ratio - 0.9 ($1.1 round trip fare)
5. Transit/highway travel time ratio - 2.0 (12 mile trip)

These characteristics yielded a modal split of 20% and the trips are tabulated on table VII-1.

The existing and expected ridership of the proposed service consisted of the following:

(Ridership-passengers per day)

Service Area	Existing	Expected	Increase
Mill Plain	62	175	113
Hazel Dell	55	123	68
Total	117	298	181

SYSTEM COST

Hazel Dell Service

Data: Existing Service - 4 morning & 4 evening one way trips
Route length = 11.4 miles (one way)
Proposed Service - 6 morning & 8 evening one way trips
Route length = 15.2 miles (one way)
Unit Operational Cost = $.75/line mile (V-P Bus Co.)
Marginal (additional) Line Mileage = Proposed - Existing
14 (15.2) - 8 (11.4) = 121 miles/day
Marginal Cost of Service = line mileage times unit cost
121 miles ($.75/mile) = $91/weekday

Mill Plain Service

Data: Existing Service - Presently, 62 passengers are served from the bus terminal in downtown Vancouver. This requires 1.3 buses to service these passengers each morning and evening.
Route length = 8.5 miles (one way)
Proposed Service - 6 morning and 8 evening one way trips.
Route length = 16.1 miles
Unit Operational Cost = $.75/line mile (V-P Bus Co.)

Marginal Line Mileage = Proposed - Existing
14 (16.1) - 5.2 (8.5) = 214 miles/day
Marginal Cost of Service = line mileage times unit cost
214 ($.75) = $160/weekday

Summary of Services Costs	Hazel Dell	Mill Plain	Total
Marginal cost of service	$91/day	$160/day	
Marginal passengers	68	113	181
Marginal revenue	$75/day	$124/day	$199/day
Operating deficit	($16/day)	($ 36/day)	
Annual operating deficit	($4100)	($9200)	($13,300)

Marginal Travel Costs
Data: $2.25/hr. for commuters' value of time. Assume each marginal passengers add 5 minutes to his/her one way trip

Marginal time = (181 pass/day) (10/60 hr/pass.) = 30.2 hrs/day

Marginal cost = 30.2 hrs/day (255 days/yr.) $2.25/hr = $17,300

Marginal fare cost:
Daily passenger revenues times 255
Annual cost = $199/day (255 day/yr) = $50,700/yr.

Summary of System Costs
1. Service Cost = $13,300/yr.
2. Time Cost = $17,300/yr.
3. Fare Cost = $50,700/yr.

SYSTEM BENEFIT

This analysis addresses only benefit/cost ratio, air pollution and energy efficiency and does not consider maintenance, land use impacts, safety and other considerations.

Benefit/Cost Ratio (B/C)

Data: Automobile Occupancy Rate = 1.24
Marginal auto operational cost for commuters = 9.9¢/mi
(assumes no change in auto ownership)
(see system cost for additional data)
Marginal Transit Travel:
Vehicles - (121+214=335) 255=85,500 vehicles mi/yr
Reduction in Auto Travel:
1.45/1.24 = 1.17 million vehicles mi/yr
Savings from reduced auto travel
1.17 (9.9¢) = $116,000/yr

$$B/C = \frac{\$116,000}{\$13,300 + \$17,300 + \$50,700} = 1.4$$

Air Pollution Reduction

Data:

	Type of pollution (annual)		
	Carbon Monoxide	Hydrocarbon	Nitrous Oxides
Bus (grams/veh.mi.)	10.90	14.70	13.84
Megagrams	.93	1.26	1.18
Autos (grams/veh.mi.)	37.20	7.03	5.70
Megagrams	43.50	8.23	6.67
Difference (Megagrams)	42.53	6.97	5.49

Reduction in total pollution = 55 megagrams/yr
= 60 tons/yr

Energy effeciency of fuel

Data:

Buses provide approximately 110 passengers mile per gallon
Autos provide approximately 25 passengers mile per gallon

Bus fuel required: 1.45 million passenger mile per year
110 passenger/mi/gal=
13,500 gal/year

Auto fuel required: 1.45 million passenger mile per year
25 pass/mi/gal =
58,000 gal/yr

Reduction in fuel consumption - 58,000-13,500 = 44,500 gal/yr

SUMMARY OF BENEFITS OF PROPOSED EXPRESS BUS SERVICE

1. Proposal B/C = 1.4
2. Proposal will reduce air pollution by 60 tons/yr
3. Porposal will reduce fuel consumption by 44,500 gal/yr

APPENDIX C
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