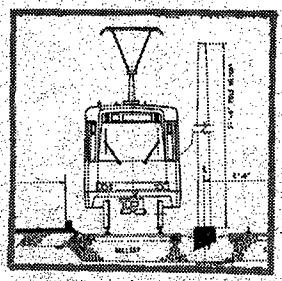
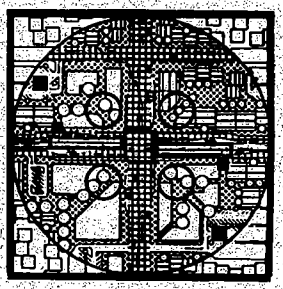
12-1-1977

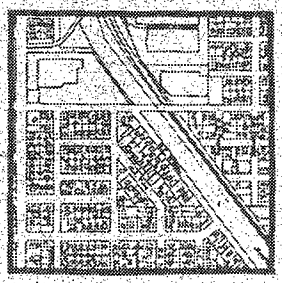
Light Rail Transit Station Zones: Technical Report

Tri-County Metropolitan Transportation District of Oregon

Banfield Transitway Project
Technical Report



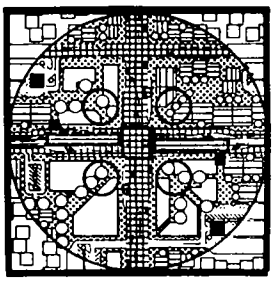




LIGHT RAIL TRANSIT STATION ZONES

Tri-County Metropolitan Transportation District of Oregon
Planning & Development Department
December, 1977

Banfield Transitway Project
Technical Report



LIGHT RAIL TRANSIT STATION ZONES

This report was prepared by the Planning and Development Department of the Tri-County Metropolitan Transportation District of Oregon (Tri-Met).

Light Rail Transit Project Manager - John R. Post

Station Zone Study Coordinator - Charles H. Fleisher

Valuable assistance in the preparation of material used in the report was received from staff members of Multnomah County Division of Planning and Development and the City of Portland's Bureau of Planning.

Tri-County Metropolitan Transportation District of Oregon
Planning & Development Department
December, 1977

TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 SUMMARY
2.1 Comprehensive Concept 2
2.2 Method of Evaluation 2
2.3 The Sets of Station Zones. 3
2.4 Principles and Design Concepts 11
2.5 Action Plans 11

3.0 STUDY BACKGROUND AND APPROACH
3.1 Regional Transit Strategies 13
3.2 Designation of LRT. 14
3.3 LRT Alignments 15
3.4 Comprehensive LRT Studies 16
3.5 Station Zone Description 16
3.6 Planning Constraints 19
3.7 System Service Objectives and Station Zones. 20
3.8 System Operation Criteria 20
3.9 Study Methodology 22

4.0 STATION ZONES IN DOWNTOWN AND ON THE BANFIELD LINE
4.1 Core Station Zones 25
4.2 Banfield Line Station Zones. 27
4.3 Banfield Station Zone Activities 28

5.0 STATION ZONES ON THE BURNSIDE BRANCH
5.1 Introduction 33
5.2 Summary. 33
5.3 Selection of Station Zones 37
5.4 Station Zone Activities. 42

6.0 STATION ZONES ON THE DIVISION BRANCH
6.1 Introduction 52
6.2 Summary. 52
6.3 Selection of Station Zones 55
6.4 Station Zone Activities. 63

7.0 STATION ZONES ON THE I-205 BRANCH
7.1 Introduction 72
7.2 Summary. 72
7.3 Selection of Station Zones 74
7.4 Station Zone Activities. 98

8.0 STATION ZONE PLANNING PRINCIPLES AND DESIGN CONCEPTS
8.1 Introduction 106
8.2 Systemwide Principles 106
8.3 Station Zone Principles 107
8.4 Component Principles 108
8.5 Design Standards and Concepts 114
8.6 Platform Design Criteria 114
8.7 Illustrative Platform Designs 118

9.0 STATION ZONE ACTION PLANS

9.1 Introduction 123
9.2 Platforms. 124
9.3 Pedestrian and Cyclist Circulation 125
9.4 Traffic Circulation. 126
9.5 Parking Areas 127
9.6 Bus Facilities 128
9.7 Interrelated Land Use/Activity 128
9.8 Conclusion 129

LIST OF EXAMPLES

1 Evaluation of Arterial Streets to Accommodate Park & Ride Traffic 45
2 Evaluation of Land Parcels in Station Zones to Accommodate Park & Ride Activities 46

LIST OF APPENDICES

Technical data in support of this study have been placed in an accompanying document under the following headings:

Appendix I: Banfield Line
Appendix II: Burnside Branch
Appendix III: Division Branch
Appendix IV: I-205 Branch

LIST OF TABLES

1 Downtown and Banfield Line Light Rail Transit Station Zone Characteristics. 4
2 Banfield/Burnside Light Rail Transit Station Zone Characteristics 5
3 Banfield/Division Light Rail Transit Station Zone Characteristics. 7
4 Banfield/I-205 Light Rail Transit Station Zone Characteristics 9

5 Comparative System Characteristics Selected U.S. Light Rail Systems 21
6 Range of LRT Station Costs 22

7 Feeder Bus Activity Banfield Line LRT 30
8 Pedestrian Patronage Banfield Line LRT 31
9 Downtown and Banfield Line Light Rail Transit Station Zone Characteristics. 32

10 Banfield/Burnside Light Rail Transit Station Zone Characteristics 35
11 Corridor Evaluation Criteria for Station Zone Locations 39
12 Station Zone Locational Criteria Satisfaction - Burnside LRT Corridor 41
13 Feeder Bus Activity Burnside Branch LRT. 43
14 Burnside LRT Alignment Proposed Feeder Bus Systems Delivery Capability 44
15 Burnside Branch Park & Ride Allocation 47
16 Characteristics of Sites Designated for P & R Parking Lots on Burnside Branch. 49
17 Pedestrian Patronage Burnside Branch LRT 50
18 Range of Possible Burnside LRT Walk-on Ridership Based on 1990 Household Trip Generation. 51

19 Banfield/Division Light Rail Transit Station Zone Characteristics. 53
20 Selected Division Corridor Station Zones. 62
21 Feeder Bus Capacity and Projected Ridership at Division Station Zones 65
22 Projected Division Corridor Park & Ride Demand 67
23 Park & Ride Criteria Satisfaction - Division LRT Corridor. 67
24 Division Branch Park & Ride Allocation 68
25 LRT Access by Auto and Pedestrian Modes - Division Station Zones 71

26 Selected Station Zone Locations - I-205 LRT Corridor 73
27 1990-P.M. Peak Hour Demands - I-205 Station Zones 74
28 1990 Patron Activity Distribution - I-205 Station Zones 75
29 Banfield/I-205 Light Rail Transit Station Zone Characteristics. 76
30 Component Criteria Satisfaction - I-205 Station Zones 82
31 1990 Feeder Bus Activity at I-205 Station Zones 100
32 Projected 1990 Feeder Bus Patronage at I-205 Station Zones 101
33 Parking Facilities at I-205 Station Zones - 1990 102
34 Projected 1990 Pedestrian/Bicyclist Patronage at I-205 Station Zones 103
35 Pedestrian and Bicyclist Street Classification at I-205 Station Zones 104

36 Applicability of Platform Variables 119

LIST OF FIGURES

1 Banfield/Burnside Light Rail Transit Station Zones 6
2 Banfield/Division Light Rail Transit Station Zones 8
3 Banfield/I-205 Light Rail Transit Station Zones. 10
4 LRT Illustrative Platform Types 12

5 Priority Transit Corridors in the Portland Region 14
6 Light Rail Transit Study Areas 15
7 Reference Zone Components. 18

7 Reference Areas at LRT Platforms 17
8 Station Zone Components. 18
9 Station Planning Methodology 24

10 Alternative Downtown Station Zones 26
11 Banfield Line Station Zones 28

12 Typical Intersection - Burnside LRT Corridor 34
13 Banfield/Burnside Light Rail Transit Station Zones 36
14 Existing Land Use - Burnside LRT 38
15 Anticipated 1990 Activity Pattern - Burnside LRT. 40
16 1990 Feeder Bus Access to Station Zones on Burnside LRT 42
17 Designated Park & Ride Lot Locations - Burnside LRT Corridor 48

18 Banfield/Division Light Rail Transit Station Zones 54
19 Typical Intersection - Division LRT Corridor 55
20 Existing Land Use - Division LRT. 57
21 Anticipated 1990 Activity Pattern - Division LRT 60
22 Proposed 1990 Feeder Bus Access - Division Station Zones. 64
23 Designated Park & Ride Lot Locations - Division LRT Corridor. 69

24 Banfield/I-205 Light Rail Transit Station Zones. 77
25 Existing Land Use - I-205 LRT 78
26 Anticipated 1990 Activity Pattern - I-205 LRT 79
27 General I-205 Station Zone Locations 81
28 Station Zone Sites Along I-205 83
29 Diagram of Components Sitting - Gateway Station Zone 86
30 Diagram of Components Siting - Mall 205 Station Zone. 89
31 Diagram of Components Siting - Division Station Zone 92
32 Diagram of Components Siting - Powell Station Zone 94
33 Diagram of Components Siting - Lents Station Zone 97
34 1990 Feeder Bus Access to Station Zones of I-205 LRT 99

35 Platforms (Illustrative) 109
36 Pedestrian and Cyclist Circulation (Illustrative) 110
37 Traffic Circulation (Illustrative). 111
38 Bus Facilities (Illustrative) 112
39 Parking Areas (Illustrative) 113
40 Interrelated Land Use/Activity (Illustrative) 114
41 LRT Illustrative Platform Type A. 120
42 LRT Illustrative Platform Type B 121
43 LRT Illustrative Platform Type C. 122

1. INTRODUCTION

A growing public and political awareness of the values of urban mass transportation coupled with paralleling studies by public agencies of the types of mass transit and their environmental and fiscal impacts on the region have resulted in an April 1978 public hearing on transit strategy implementation in Portland. Based on that hearing, a choice will be made between five alternative courses of action which could be taken to improve the provision of transit services within the eastern side of the region. Four bus-mode alternatives have been comprehensively evaluated as possible future East Side transit strategies. Study of a fifth, light rail transit (LRT), is presently being completed to provide a full spectrum of the cost and benefits of possible future urban mass transit actions. The light rail transit strategy is composed of a downtown segment, a Banfield Line and three alternative Branches to serve East County residents, i.e., the Burnside, Division and I-205 branches.

Several reports on the light rail transit alternatives are being prepared by Tri-Met for the Oregon Department of Transportation to enable completion of a draft environmental impact statement for the transitway project. These Tri-Met reports include East Side Transit Operations, Engineering Description and Operational Features, Station Zones, and Land Use Considerations. The purpose of this station zone report is to describe the methods, findings and recommendations of research undertaken to establish where stops would be most beneficially located along with East Side LRT alignments, to define what types of activities should be anticipated at these stops, to develop a preliminary program of facility requirements, to establish guidelines for the design and implementation of these light rail transit facilities, and to illustrate LRT platform types.

2. SUMMARY

2.1 COMPREHENSIVE CONCEPT

In the evaluation of stop locations, activities and facilities, the concept of "station zone" has been developed to comprehensively deal with the varied issues and anticipated actions surrounding platform areas. A station zone is defined as that area within 400 feet of the street intersection which has been designated as the approximate location where the LRT vehicles would stop to accept or discharge passengers.

There are three reference areas at LRT stops: (Figure 7)

(1) Platform Area: That area immediately adjacent to and including the LRT platform, generally within the street right-of-way in which the LRT is located.

(2) Station Zone: (as previously described)

(3) Station Service Area: That area of a community within 1/4 mile of an LRT platform.

Station zones have six components: (1) platforms, (2) pedestrian circulation, (3) traffic circulation, (4) parking--both short term and long term, (5) bus facilities, and (6) interrelated land use/activity on or at platforms. (Figure 8) Three types of station zones have been established based on the anticipated ridership potential as indicative of the magnitude and complexity of components within each zone, (1) Type A: Major Activity Node--high frequency high volume intermodal patron transfers, (2) Type B: Minor Activity Node--moderate frequency, moderate volume intermodal patron transfers with high peak period demands, (3) Type C: Local Service Node--peak period frequency, moderate volume patronage.

2.2 METHOD OF EVALUATION

Review of LRT systems operations requirements and evaluation of land use characteristics and planning objectives along the designated LRT alignments were

used to establish a preliminary set of locations for, and definitions of beneficial station zones. Systems operations requirements dealt with criteria from national and international examples for the number, spacing, function and environmental qualities of light rail transit stops. Land use characteristics included size, shape, spatial location, assessed value, current use, presence of structures, and neighborhood context. Planning objectives were derived from operable comprehensive plans and/or zoning ordinances, and discussions with planning staffs of the cities of Portland and Gresham, and Multnomah County.

The validity of selections, and accuracy of definition of the preliminary station zones were scrutinized by subsequent study of projected 1990 station zone activities, i.e., feeder bus access, automobile access, and pedestrian movements in station service areas. These activity studies established what LRT ridership could be possible at individual station zones and for the overall LRT system under various assumptions of patronage generation. These studies did not attempt to project LRT ridership (that is being dealt with in a separate computer modeling effort), rather to establish the order of magnitude and types of activities which could be anticipated at stops along an LRT system in 1990.

2.3 THE SETS OF STATION ZONES

The following illustrations and charts describe the sets of station zones selected during this study for the downtown area, the Banfield Line and the three alternative Branch alignments of the LRT. Stop locations were selected to optimize ridership capture and service patterns. Type designations were made on the basis of anticipated patronage volumes and frequencies. Vehicular and pedestrian activities were derived from Tri-Met patronage modelling of 1990 system useage. The projections of 1990 activities at station zones are recognized as order-of-magnitude numbers, only. Qualification of these numbers as shown in Tables 1, 2, 3, and 4 was made on the following bases:

KISS & RIDE	BUS TRANSFER	WALK-ON
Light- 0-100 patrons/peak hour (p/ph)	Light- 0-100 p/ph	Light- 0-100 p/ph
Moderate- 100-200 p/ph	Moderate- 100-300 p/ph	Moderate- 100-200 p/ph
Heavy- 200+ p/ph	Heavy- 300-2000 p/ph	Heavy- 200-1000 p/ph
	Very Heavy- 2000+ p/ph	Very Heavy- 1000+ p/ph

The range of possible downtown zones is due to the proposition of three alternative alignments in the CBD by the Downtown Circulation Study. For clarity, five downtown zones have been indicated in the following chart of zonal characteristics. Six station zones have been identified for the Banfield Line and are consistantly referenced in the Branch alternative diagrams. The Burnside Branch alternative of the LRT would have nine station zones with an alternative zone location in Gresham. This Gresham alternative zone location would occur within the Division Branch LRT alternative set of nine selected station zones, as well. The I-205 Branch alternative would contain five station zones.

Table 1

DOWNTOWN AND BANFIELD LINE LIGHT RAIL TRANSIT
STATION ZONE CHARACTERISTICS
(1990 P.M. Peak Hour)

DESIGNATION	LOCATION	Type	Projected Demand P&R Spaces Per Peak Hour *1	Total P&R Spaces Provided	Projected P&R Patrons Per Peak Hour *1	Projected K&R Vehicles Per Peak Hour *1	Projected K&R Patrons Per Peak Hour	Proposed Feeder Bus Per Peak Hour	Projected Feeder Bus Patrons Per Peak Hour *1	Projected Pedestrian Patrons Per Peak Hour *1
CBD 1 *2		A								
CBD 2 *2		A								
CBD 3 *2		A								
CBD 4 *2		B								
CBD 5 *2		B								
Coliseum	Holladay & I-5	C	0	0	0	0	0	96	475	0 *3
Union/Grand	Holladay @ Union & Grand	B	0	0	0	0	0	48	547	738
Lloyd Center	Holladay @ Holladay Park	A	0	0	0	0	0	48	330	1109
Hollywood	39th & Banfield	A	0	0	0	42	71	60	543	425
60th	60th & Banfield	C	0	0	0	201	267	24	176	325
82nd	82nd & Banfield	C	0	0	0	149	173	24	38	354

SOURCE: Tri-Met Model A-903-LTP Parabolic, 1977

*1 Numbers equal the sum of arrivals and departures during the peak hour.

*2 Refer to Downtown Circulation Study for station zone descriptions.

*3 Minor patronage may have been undetected by modeling.

Table 2

BANFIELD/BURNSIDE LIGHT RAIL TRANSIT
STATION ZONE CHARACTERISTICS
(1990 P.M. Peak Hour)

DESIGNATION	LOCATION	Type	Projected Demand P&R Spaces Per Peak Hour *1	Total P&R Spaces Provided	Projected P&R Patrons Per Peak Hour *1	Projected K&R Vehicles Per Peak Hour *1	Projected K&R Patrons Per Peak Hour	Proposed Feeder Bus Per Peak Hour	Projected Feeder Bus Patrons Per Peak Hour *1	Projected Pedestrian Patrons Per Peak Hour *1
CBD 1	Core	A								
CBD 2	Core	A								
CBD 3	Core	A								
CBD 4	Core Periphery	A								
CBD 5	Core Periphery	A								
Coliseum	Holladay & I-5	C								
Union/Grand	Holladay between Union & Grand	B			(See Table 1 for Downtown and Banfield Line characteristics)					
Lloyd Center	Holladay @ Holladay Park	A								
Hollywood	39th & Banfield	A								
60th	60th & Banfield	C								
82nd	82nd & Banfield	C								
Gateway	99th & Pacific	A	296	418	384	127	165	168	2237	383
102nd	102nd & E. Burnside	C	0	0	0	1	2	0	0	110
122nd	122nd & E. Burnside	B	182	250	236	79	102	12	5	0*2
148th	148th & E. Burnside	C	0	0	0	55	72	12	14	38
162nd	162nd & E. Burnside	B	14	250	19	10	13	0	0	25
172nd	172nd & E. Burnside	C	0	0	0	176	229	0	0	0*2
181st	181st & E. Burnside	A	173	250	225	74	96	12	43	284
192nd	192nd & E. Burnside	B	62	300	81	27	35	24	0*2	105
Gresham A	Old Fairgrounds	A	367	625	478	167	204	60	595	717
Gresham Alternative	1st & E. Burnside	B								

SOURCE: Tri-Met Model A-903-LTP Parabolic

*1 Numbers equal the sum of arrivals and departures during the peak hour.

*2 Minor patronage may have been undetected by modeling.

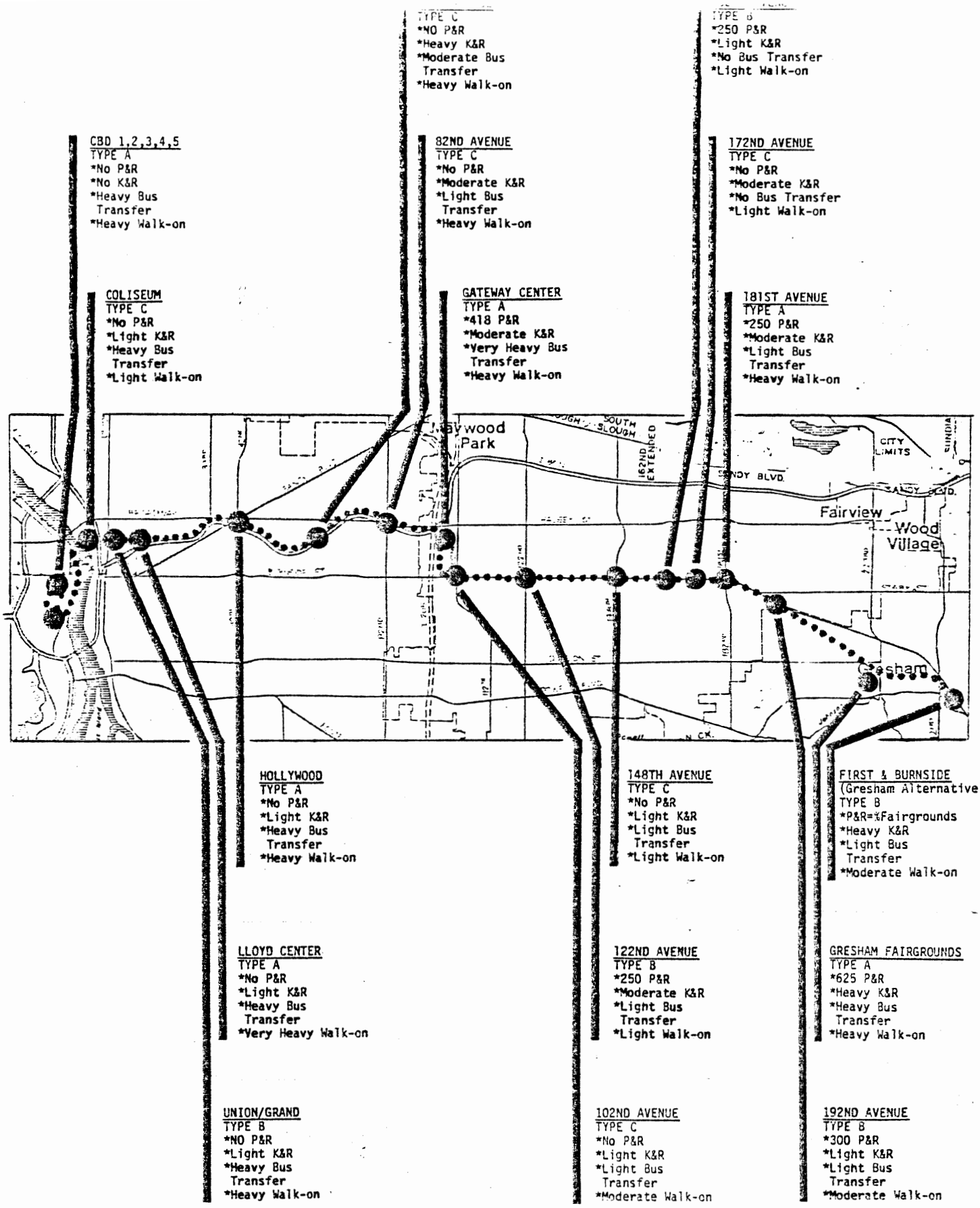


Figure: 1

BANFIELD/BURNSIDE LIGHT RAIL TRANSIT STATION ZONES

Table 3

BANFIELD/DIVISION LIGHT RAIL TRANSIT
STATION ZONE CHARACTERISTICS
(1990 P.M. Peak Hour)

DESIGNATION	LOCATION	Type	Mode Dominance*2	Projected Demand P/R Vehicles*1 Per Hour	Total P/R Spaces Provided	Projected P/R Patrons Per Peak Hr*1	Projected K/R Vehicles Per Peak Hr*1	Projected K/R Patrons Per Peak Hr*1	Proposed Feeder Buses Per Peak Hr*1	Projected Feeder Bus Patrons Per Peak Hr*1	Projected Pedestrian Patrons Per Peak Hour*1
CBD 1		A									
CBD 2		A									
CBD 3		A									
CBD 4		A									
CBD 5		A									
Coliseum		C				(See Table 1 for Downtown and Banfield Line characteristics)					
Union/Grand		B									
Lloyd Center		A									
Hollywood		A									
60th		C									
82nd		C									
Gateway	99th/Pacific	A	Auto	371	425	482	158	205	132	1265	510
Mall 205	I-205/S.E. Main	A	Auto	55	250	72	23	30	84	179	269
Division	I-205/E. Division	B	Transit	234	250	304	100	130	60	339	189
122nd	122nd/E. Division	C	Auto	237	250	308	100	130	18	7	173
136th	136th/E. Division	C	Transit	5	0	7	2	3	12	1	5
148th	148th/E. Division	C	Auto/ Transit	113	200	147	48	62	24	18	134
170th	170th/E. Division	C	Transit	28	0	37	8	10	12	0	475
182nd	182nd/E. Division	C	Auto	151	250	196	64	83	24	59	373
199th	199th/E. Division	C	Transit	5	200	7	2	3	12	1	1
Gresham A	Fairgrounds	A	Transit	468	625	608	201	261	78	332	768
Gresham Alternative	1st/E. Burnside	B									

SOURCE: Tri-Met Model V-90-3, ULOAD, 1977.

*1 Number equals the sum of arrivals and departures during the peak hour.

*2 Consideration unique to Division Branch. See report section 6.

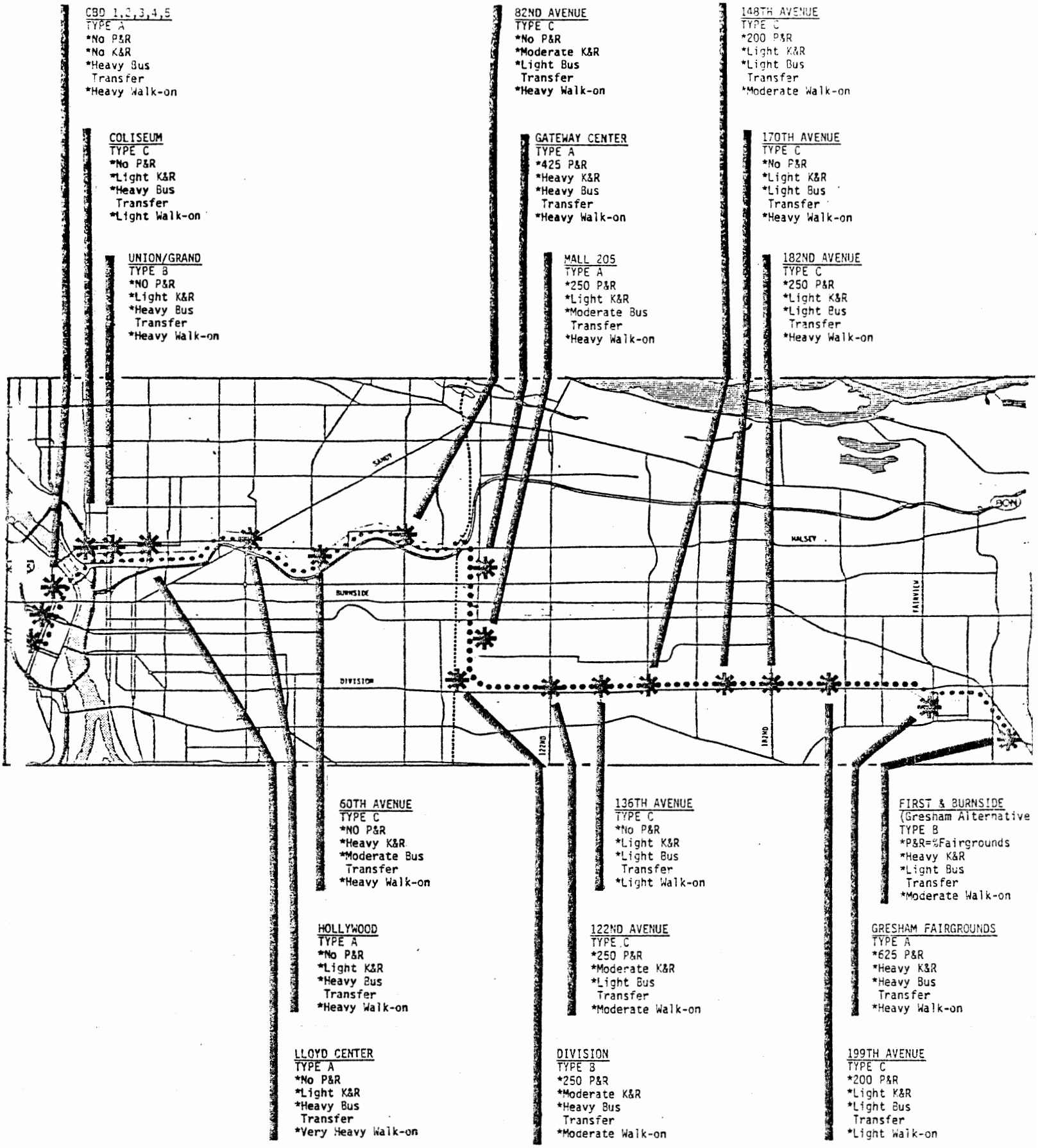


Figure: 2
BANFIELD/DIVISION LIGHT RAIL TRANSIT STATION ZONES

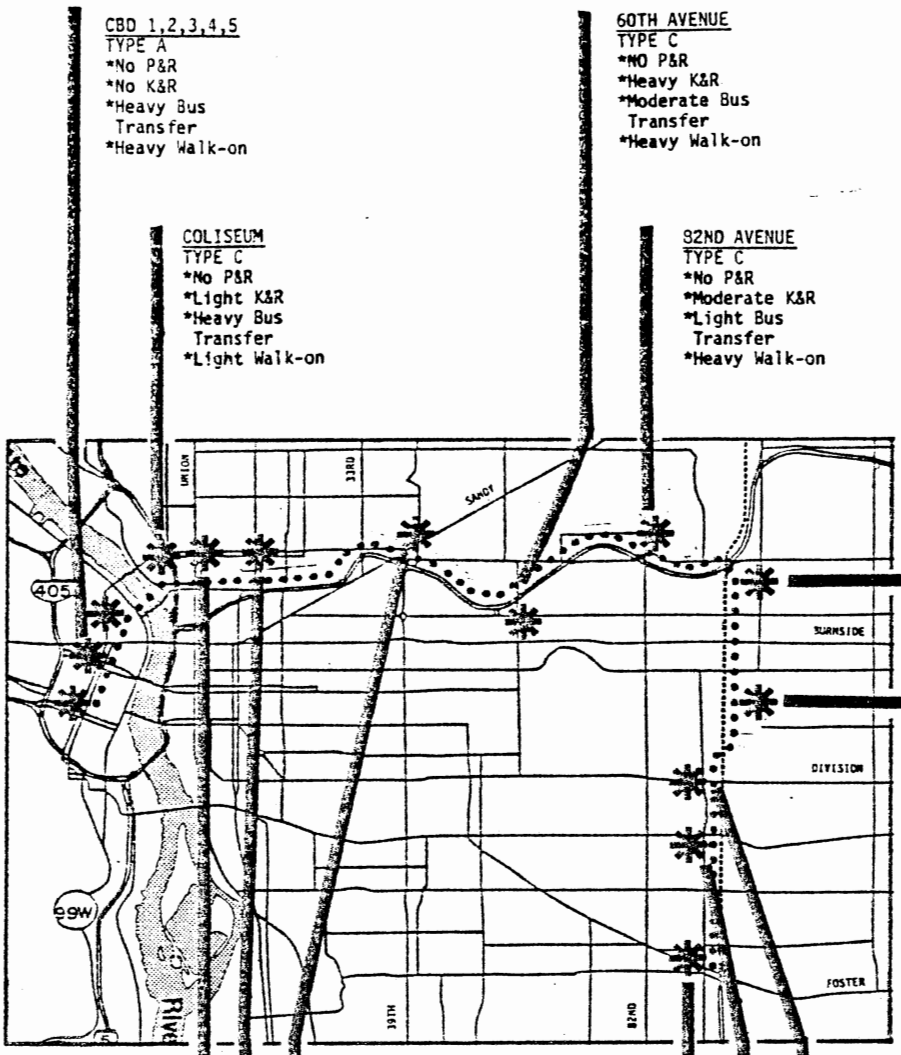
Table 4

BANFIELD/I-205 LIGHT RAIL TRANSIT
STATION ZONES
(1990 P.M. Peak Hour)

Designation	Location	Type	Projected Demand P&R Spaces Per Peak Hour *1	Total P&R Spaces Provided	Projected P&R Patrons Per Peak Hour *1	Projected K&R Vehicles Per Peak Hour *1	Projected K&R Patrons Per Peak Hour	Proposed Feeder Bus Per Peak Hour	Projected Feeder Bus Patrons Per Peak Hour *1	Projected Pedestrian Patrons Per Peak Hour *1
CBD 1		A			(See Table 1 for Downtown and Banfield Line characteristics)					
CBD 2		A								
CBD 3		A								
CBD 4		B								
CBD 5		B								
Coliseum		C								
Union/Grand		B								
Lloyd Center		A								
Hollywood		A								
60TH		C								
82ND		C								
Gateway	99TH & Pacific	A	323	425	399	138	200	75	1266	451
Mall 205	99TH & Main	B	46	150	60	19	26	54	92	308
Division	I-205& Division	B	70	175	91	30	39	36	608	285
Powell	I-205 & Powell	B	10	100	13	5	6	42	138	19
Lents	I-205 & Foster	A	207	250	256	89	128	39	577	83

SOURCE: Tri-Met Model W-90-3, 1977.

*1 Numbers equal the sum of arrivals and departures during the peak hour.



CBD 1,2,3,4,5
TYPE A
*No P&R
*No K&R
*Heavy Bus
Transfer
*Heavy Walk-on

60TH AVENUE
TYPE C
*NO P&R
*Heavy K&R
*Moderate Bus
Transfer
*Heavy Walk-on

COLISEUM
TYPE C
*No P&R
*Light K&R
*Heavy Bus
Transfer
*Light Walk-on

82ND AVENUE
TYPE C
*No P&R
*Moderate K&R
*Light Bus
Transfer
*Heavy Walk-on

GATEWAY CENTER
TYPE A
*425 P&R
*Heavy K&R
*Heavy Bus
Transfer
*Heavy Walk-on

MALL 205
TYPE A
*150 P&R
*Light K&R
*Light Bus
Transfer
*Heavy Walk-on

HOLLYWOOD
TYPE A
*No P&R
*Light K&R
*Heavy Bus
Transfer
*Heavy Walk-on

DIVISION
TYPE B
*175 P&R
*Light K&R
*Heavy Bus
Transfer
*Heavy Walk-on

LLOYD CENTER
TYPE A
*No P&R
*Light K&R
*Heavy Bus
Transfer
*Very Heavy Walk-on

POWELL
TYPE B
*100 P&R
*Light K&R
*Moderate Bus
Transfer
*Light Walk-on

UNION/GRAND
TYPE B
*NO P&R
*Light K&R
*Heavy Bus
Transfer
*Heavy Walk-on

LENTS
TYPE A
*250 P&R
*Moderate K&R
*Heavy Bus
Transfer
*Light Walk-on

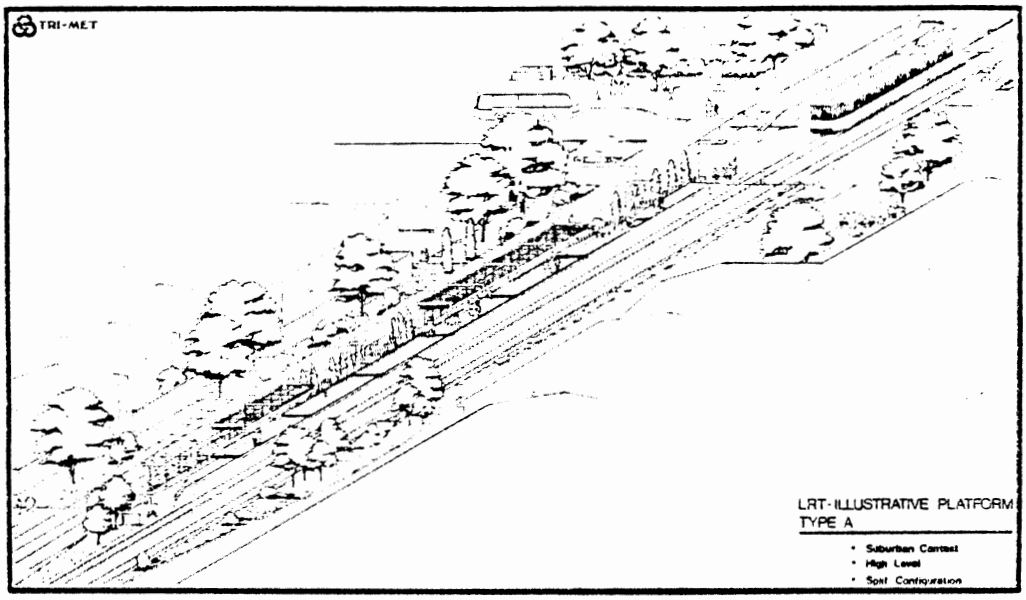
Figure: 3
BANFIELD/I-205 LIGHT RAIL TRANSIT
STATION ZONES

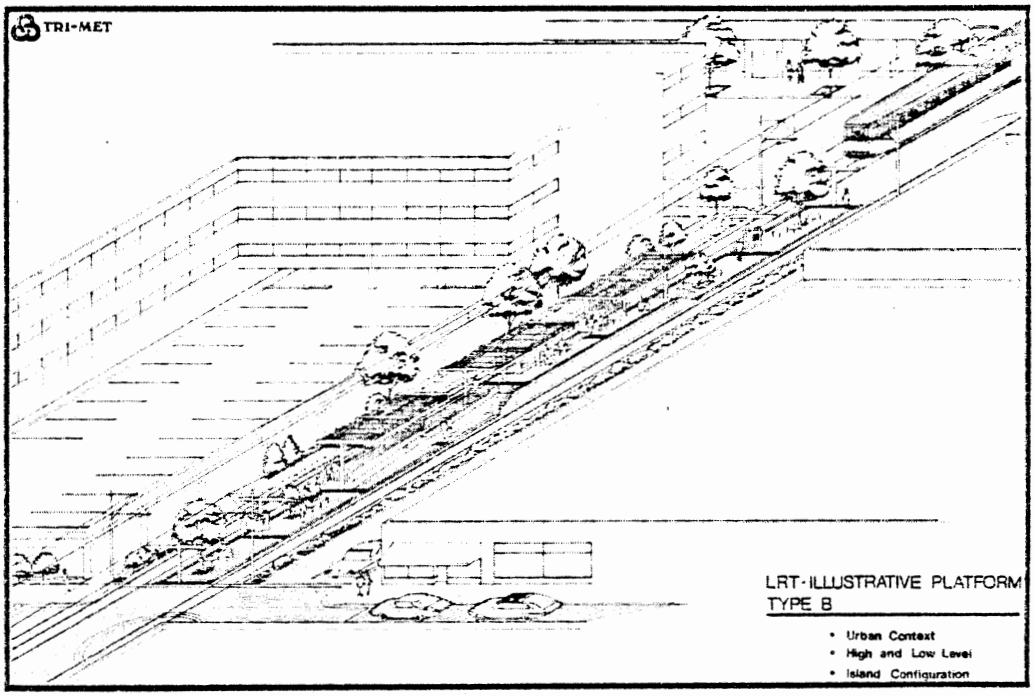
2.4 PRINCIPLES AND DESIGN CONCEPTS

Planning principles and exemplary platform design criteria have been developed for station zone components to clarify the intended relationships and types of physical facilities currently anticipated around LRT platform areas. Both principles and criteria can be used as guidelines for preliminary design of LRT facilities and neighborhood public/private action programs should light rail transit be selected as the appropriate East Side transit strategy in mid-1978. To illustrate the implications of these guidelines, three prototypical platform types have been developed, (A) high level, (B) mixed high and low level, (C) low level, as shown in Figure 4.

2.5 ACTION PLANS

This report represents the first phase of a multiphase set of studies and actions which would result in the development of efficient, safe and environmentally attractive station zones. A description of the next phase of interrelated actions dealing with station zones has been made as a suggested guide for local jurisdictions and state agencies, as well as Tri-Met. The discussion is organized by zonal components and suggests the desired conditions for each component, anticipated steps necessary to achieve these conditions and the agencies responsible for these steps should complete development responsibility and powers not be granted to a single transit system development authority.


TRI-MET
LRT-ILLUSTRATIVE PLATFORM
TYPE A
• Suburban Context
• High Level
• Spot Configuration


TRI-MET
LRT-ILLUSTRATIVE PLATFORM
TYPE B
• Urban Context
• High and Low Level
• Island Configuration

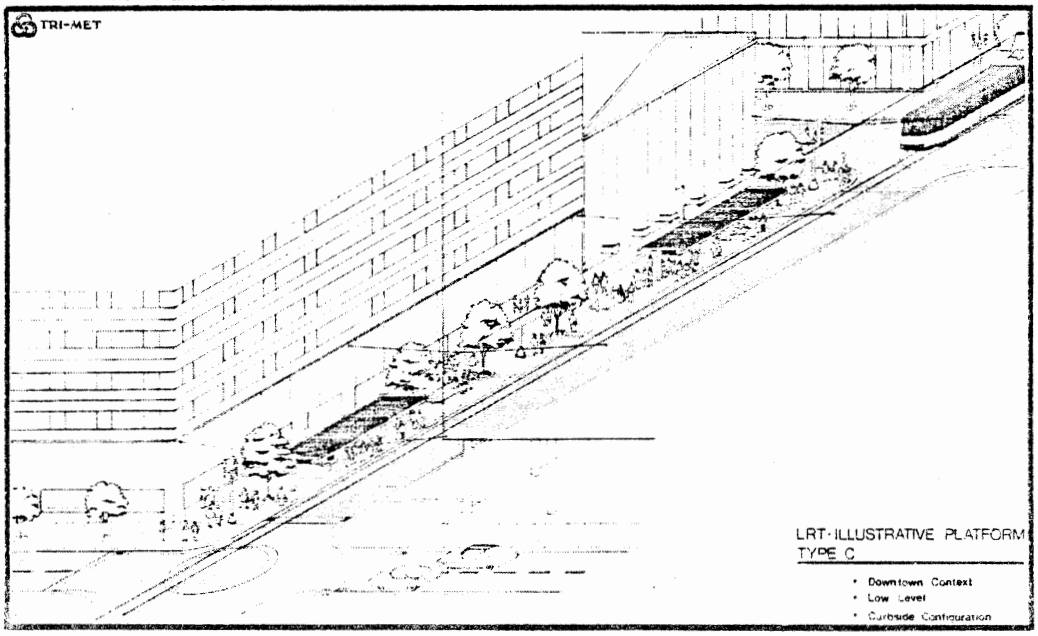

TRI-MET
LRT-ILLUSTRATIVE PLATFORM
TYPE C
• Downtown Context
• Low Level
• Curbside Configuration

Figure: 4

3. STUDY BACKGROUND AND APPROACH

3.1 REGIONAL TRANSIT STRATEGIES

The study of station zones along a light rail corridor in an eastern Portland alignment is a charge precipitated by an interrelated chain of local, county, state and federal transit-oriented actions commenced in 1969. The Tri-County Metropolitan Transportation District (Tri-Met) was created by the Oregon State Legislature to consolidate transit operation in Oregon's three most populous counties. This action, concomitant with the adoption of a regional transportation plan containing a $630 million freeway construction program in conflict with a growing national and local awareness by the public that the proliferation of highways would not solve urban mobility needs, led to renewed regional interest in the potentials of urban mass transit. During 1973 The Governor's Task Force was formed to recommend a more effective structure for the regional planning agency (Columbia Region Association of Governments) and to consider the future suitability of new urban freeways and urban mass transit in the Portland area. Passage of the Federal-Aid Highway Act of 1973 allowing funding of non-highway, public mass transit projects from the Interstate Highway resource supported the initial findings of the Task Force which were that there existed substantial support and technical rationale for realigning urban mobility emphasis away from sole reliance on automobile facilities. The final report of the Governor's Task Force in 1975 reaffirmed previous findings by recommending a reorientation of the future regional transportation system from an auto-dominated highway program to one including busways and/or light rail transit in major corridors radiating from the Portland Central Business District. This policy emphasis was sustained in the Interim Transportation Plan (ITP) adopted by CRAG in 1975 which called for construction of fixed transitways in regional corridors. In latter 1975 , the Interagency Coordinating Committee (ICC) of CRAG, composed of representatives from the area's political jurisdictions, the regional transit agency, the regional planning agency and the Oregon Department of Transportation, was established to take responsibility for technical direction and coordination of the transit corridor work. Planning on the Banfield Corridor, which subsequently received priority emphasis over the other designated corridors, was initiated in latter 1975 and by early 1977 resulted in the designation and analysis of five alternative transit strategies that conformed with the regional transportation policy.

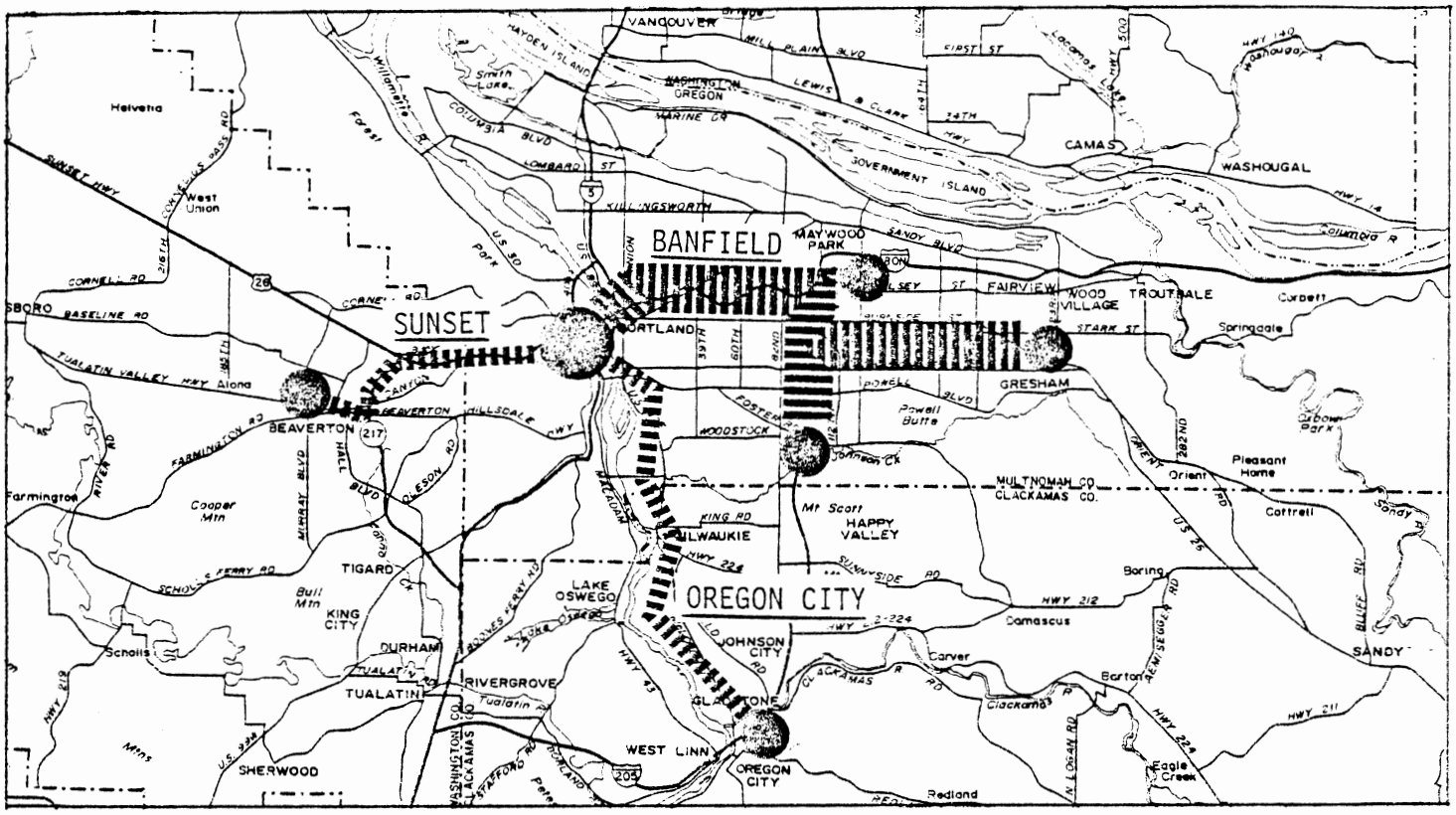


Figure: 5

PRIORITY TRANSIT CORRIDORS IN THE PORTLAND REGION

C.R.A.G., 1975

3.2 DESIGNATION OF LRT

The five basic transit alternatives under study in the Banfield Corridor in early 1977 considered the strategies of Transportation Systems Management (TSM) inprovements, High Occupancy Vehicle (H.O.V.) Lanes and Busways, including appropriate upgrading of the freeway for automobiles. A light rail transit system had been considered in the initial evaluations of early 1976, but had been deemed impractical due to cost and low ridership potential evidenced at that time. Subsequent studies completed in latter 1976 by Tri-Met resulted in more positive findings for light rail with respect to the other strategies under consideration. These findings were submitted to the I. C. C., which formally notified the CRAG Board of the possibility that light rail may be a realistic future transit alternative. The Board responded by directing Tri-Met to explicate their initial findings and bring the results to the Board's attention. Tri-Met completed a preliminary cost-effectiveness study of light rail in the Banfield Corridor in early 1977 with the conclusion that this mode appeared to be a competitive alternative and should be as comprehensively investigated as the five existing alternatives.

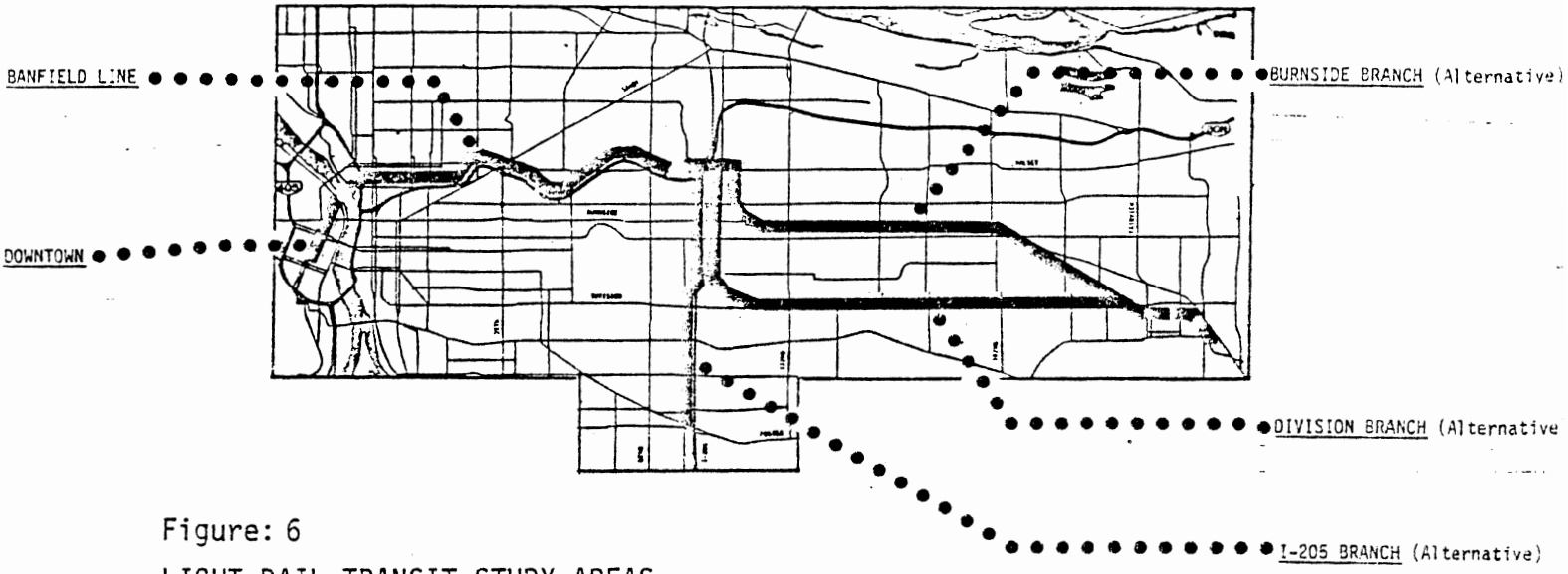


Figure: 6
LIGHT RAIL TRANSIT STUDY AREAS

Accordingly, in February 1977, the Tri-Met Board recommended to the CRAG Board that light rail transit should be developed as a full alternative in the eastern Portland transit strategies. The CRAG Board accepted this recommendation and designated Tri-Met as responsible for the required light rail investigations.

3.3 LRT ALIGNMENTS

A principal LRT alignment with three alternative East County branches has been identified for in-depth study. The origin of the LRT system was assumed to be in downtown Portland, though the precise alignment(s) was left to the separate, ongoing downtown circulation study. LRT would exit the downtown north across the Steel Bridge and run along Holladay Street to serve the Lloyd Center complex. Sullivan Gulch, the location of the existing Banfield Freeway, was assessed to be the most appropriate corridor in which to place the light rail system in East Portland. The Multnomah County Department of Planning and Development participated in the designation of three possible light rail alignments in East County, which were selected on the basis of existing and proposed land use, population concentrations, employment locations and traffic patterns. E. Burnside Street was selected to capture many future opportunities for light rail transit and result in the least disruption to existing neighborhoods and the transportation network in the County. The I-205 alignment was nominated as a potentially viable LRT branch due to the past transitway planning, existing distribution of urban land uses, accessibility, and the current I-205 construction program in this corridor. The Division Street LRT alignment from Gateway to Gresham was included as the third Branch alternative to evaluate the benefits to LRT, corridor land uses and peripheral East County communities of superimposing a major transit mode onto an intra-regional arterial street designated as a "transit way" in the CRAG ITP. The City of Gresham was selected as the logical eastern terminus of the Burnside and Division alternative alignments. This selection was predicated on the policies of the operative Multnomah County Comprehensive Plan and the CRAG Land Use Framework Element, 1977, which established Gresham as the eastern-most urban community in the future Portland Metropolitan Area by designating an urban growth boundary between three and five miles to the north, east and south of the present Gresham business district.

3.4 COMPREHENSIVE LRT STUDIES

Historical transportation events, actions, policies and designations in the Portland region have established a pro-transit emphasis for future urban movement of the citizens, have created the impetus for initial East Side mass transit strategies, have justified the inclusion of a light rail transit system in this set of transit strategies, and have specified least disruption/greatest benefit alignment corridor alternatives. With such factors in place, studies of specific elements of the proposed LRT, such as these station zone investigations, have been undertaken to comprehensively examine the costs, benefits and impacts of the light rail system in the Metropolitan Portland context.

3.5 STATION ZONE DESCRIPTION

The terms "station" or "stop", used to indicate LRT passenger boarding areas, generally connote images of the area immediately around platforms and were deemed inadequate to deal with the range of issues which must be addressed when designation of an LRT boarding area is made within an existing urban context. The term "station zone" was used to designate those areas along the LRT alignment where patrons would be able to move between automobiles, buses and light rail vehicles, as well as moving between transit vehicles and nearby businesses, homes and community activities. The broader definition of station zone addresses all factors contributing to the function and user satisfaction of those boarding/alighting areas to more effectively identify and suggest the coordination of the actions of the many agencies and other public/private entities which will bear directly on the success of station zones.

This approach to station area planning, formulation of action programs and the implementation of transit supportive projects should not be misinterpreted as suggesting massive redevelopment programs at all LRT station zones. In many cases, subtle physical or administrative changes will produce appreciable benefits to the operation and/or environmental qualities of a station zone. In certain instances, the projected and actual patronage at certain station zones would call for more expansive programs. Such development programs could also be accommodated within the concept.

The concept of station zones as an organizing framework for actions would encourage coordinated flexibility in dealing with future demands on the LRT system. As patronage demands increase at station zones, improvement program thresholds would be reached and action points stimulated. Application of the station zone concept would assure that enhancement of the transit facilities (as warranted by demand) would not occur in a vacuum, i.e., they would not become problem areas for local jurisdictions, because these jurisdictions would be constantly participating in the expansion programs.

A station zone is defined as that area within 400 feet (1.5 minute average walking distance) of the street intersection which has been designated as the approximate location where the LRT vehicles would stop to accept passengers. This area would contain the highest concentration of transit generated pedestrian, bicycle, automobile, bus and LRT movements and activity. Station zones do not replace, nor should they be confused with, station service areas around platforms which are defined as those areas and activities of a community within 1/4 mile of an LRT platform.

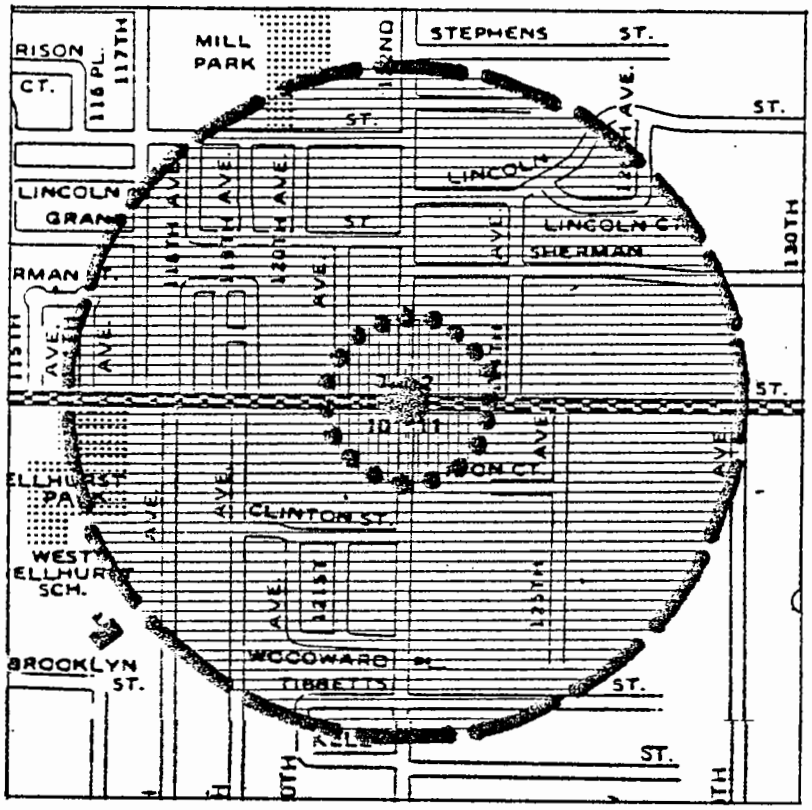


Figure: 7

REFERENCE AREAS AT LRT PLATFORMS

- Platform Area
- Station Zone (400 feet)
- Station Service Area (¼ mile)

Station zones are comprised of six components as described below.

(1) Platform: Physical developments at train boarding areas including platforms, protective cover, walls/enclosures, facilities, e.g., benches, waste receptacles, toilets, bicycle storage areas, etc., graphics, transit information, landscaping and other amenities.

(2) Pedestrian Circulation: Pedestrian and bicyclist improvements for transit patrons including pathways, storage facilities, signalization, roadway striping, crosswalk signs, illumination, landscaping and other amenities.

(3) Traffic Circulation: Roadway improvements at and near the platform area which directly enhance the flow of vehicles to and past the platform area including roadway reconstruction, channelization, striping and signalization.

(4) Parking: Transit related parking facilities for temporary (kiss & ride), midday and all-day (park & ride) automobile-using patrons to include automobile turnouts, parking spaces, illumination, graphics, landscaping and other amenities.

(5) Bus Facilities: Feeder bus facilities at or near the platform area to include patron boarding/alighting areas, bus pullout and layover areas, shelters, graphics, illumination, landscaping and other amenities.

(6) Interrelated Land Use/Activity: Public and/or private development of transit supportive land uses/activities within or immediately adjacent to the platform area. Note: This type of activity involves joint development opportunities in the station service area as discussed in the Land Use Report.

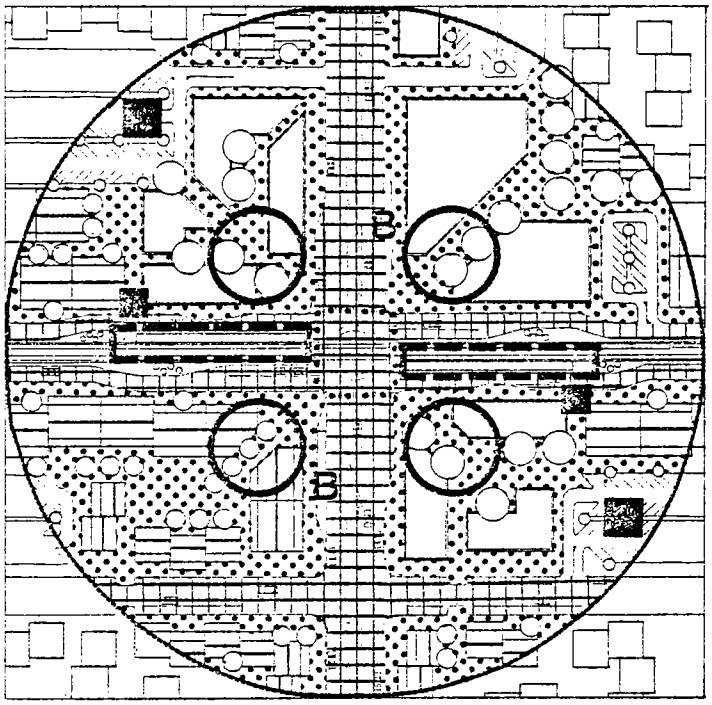


Figure: 8

STATION ZONE COMPONENTS

- Platform
- Pedestrian Circulation
- Traffic Circulation
- B — Bus Facilities
- Parking
  - -Park & Ride
  - -Kiss & Ride
- Interrelated Land Use Opportunities

The bases for distinction between station zones on the LRT alignment relate to ridership potential as indicative of the magnitude and complexity of components within each zone. The two areas of consideration are:

A. The extent of existing higher intensity transit supportive land uses and activities within the station service area around the platform, e.g., 1/4 mile from the platform, and the future potential within this service area for such transit supportive developments.

B. The short term frequency and volume of transit patron arrivals and departures by automobiles and buses to the LRT station zone, and the long term future potential of the zone to be the focus of high frequency, high volume transit associated activities.

The following descriptions of the station zone types were used in LRT station planning.

1. TYPE A: Major Activity Node

This type of station zone would be designated at existing concentrations of more intensely developed and varied types of land uses/activities, where these concentrations have high future mixed urban use/activity

development potential. A Type A zone would have frequent feeder bus service and good arterial streets access for park & ride and kiss & ride patrons, and the potential to accommodate increased future volumes and frequencies of both delivery systems. The station zone would provide a suitable environment for high frequency, high volume inter-modal patron transfers.

2. TYPE B: Minor Activity Node

Designation of a Type B station zone would be made in an area of moderately high existing development intensity and mix of uses/activities, and where the area would have a moderately high probable future development potential for transit supportive uses. Frequent feeder bus service would be available for patrons arriving by automobile. The zone would provide facilities satisfactory for moderate frequency, moderate volume inter-modal patron transfers with adequate space/facilities provision for higher peak-period demands.

3. TYPE C: Local Area Node

This type of station zone would be designated in an urban area where intra-regional automobile access is limited, and where limited or no feeder bus service will occur, but where the potential for intensification of land uses/activities in the station service area, principally in the form of higher density residential and local commercial uses, would appear good. The zone would provide basic facilities to accommodate, primarily, peak-period frequency, moderate volume patronage.

3.6 PLANNING CONSTRAINTS

Due to the specification of the LRT system within the designated alignments, certain constraints were accepted as "given" conditions in the planning of station zones.

1. The LRT alignment outside the CBD would be confined within either the median of a city/suburban street (Burnside, Division) or along the edge of a freeway (Banfield, I-205).

2. LRT alignment geometrics were to take precedence, and the LRT system design would be able to accommodate both the single and double-ended types of cars.

3. Platforms would be constructed adjacent to the LRT tracks, and, therefore, would have urban trafficways, e.g., freeway lanes, arterial traffic lanes and/or railroad tracks, on one or both sides.

4. Vehicular crossings of the LRT tracks should be minimized to maintain operational efficiencies.

5. In general, platforms should be placed at or near intersections of arterial streets to optimize access potential for bus and auto patron delivery systems.

6. All physical developments scheduled for, and facilities provided in, station zones shall be the minimum essential elements which satisfy the needs and objectives of the light rail system and surrounding community.

3.7 SYSTEM SERVICE OBJECTIVES AND STATION ZONES

The total number and spacing of station zones along a light rail system represent a strategic balance for maximizing total ridership potential between the extensive accessibility afforded by many platforms closely spaced, and the desirability of the system to long-haul commuters, who favor fewer station zones more widely spaced.

To reduce overall travel time in the case of the proposed light rail system, regional transportation policies indicate that the Banfield Line would have a "commuter" function and should have as few stops as possible to minimize line-haul travel time between the Gateway Center and downtown. The Burnside, Division and I-205 branches would be designed to serve both intra-county and county-city commuters. The latter group will desire as few station zones as possible, to minimize running times to downtown, but more frequent platforms would provide high walk-on accessibility to the system along the branches. If station zones were closely spaced, the LRT could attract local trip-riders within East County, e.g., to the Rockwood Commercial Center at 181st Avenue and Burnside, which would be desirable patronage, especially if this activity were concentrated in off-peak hours. The operational assumption is generally that all trains would stop at all station zones. With closer platform spacings on the branches, operational strategies could be developed to minimize movement interruptions for a few key "commuter" trains, as is done on the SEPTA Red Arrow LRT lines, the PATCO Lindenwold line, and the Penn Central commuter lines in Philadelphia. Such operational patterns may require design features not yet recognized in systems design, and their acceptability to potential users would need to be ascertained.

3.8 SYSTEMS OPERATION CRITERIA

Review of available data on light rail systems (principally, Light Rail Transit: State of the Art, UMTA, Jan 76) established the following planning criteria which formed implicit guidelines in the selection of station zone locations and definition of their components.

(1) The range of stations/route mile in selected American light rail systems is .82 to 2.5 stations/mile.

(2) In single track non-CBD configurations, platforms cannot be placed less than 1000 feet apart for safety to preclude train collisions.

(3) Operational characteristics of light rail cars would appear to require the least energy consumption when platforms are placed between .6 miles and 1.0 miles apart.

(4) Platform spacing of 1.0 miles would appear to be the transitional distance between high acceleration/low speed hardware (more efficient at less than 1.0 miles spacing) and low acceleration/high speed cars (more efficient at greater than 1.0 miles spacing).

(5) Typical average spacing of platforms in European light rail systems ranges between .21 miles to .41 miles; those in U. S. systems range between .4 miles to 1.2 miles.

Table 5

COMPARATIVE SYSTEM CHARACTERISTICS
SELECTED U. S. LIGHT RAIL SYSTEMS

URBAN AREA	CHARACTERISTIC			
	Route Miles	Number of Stations	Average Spacing (mi.)	Average Stations per Route-mile
South Hills Pittsburgh[1]	22.4	58	0.4	2.5
Shaker Heights[2]	13.1	28	0.5	2.1[4]
Buffalo[1]	10.7	18	0.6	1.7
PATCO Phil.[3]	14.5	12	1.2	0.8
Red Arrow Phil.[3]	13.3	50	0.3	3.8
Bullet Phil.[2]	13.2	22	0.6	1.7
Newark Subway[2]	4.2	11	0.4	2.5
Cleveland Rapid[3]	19.0	18	1.0	1.0

(1) Source: UMTA, LRT: State of the Art, 1976, p. 266.

(2) Source: General Motors Transportation Systems Center, Light Rail Transit Systems, August, 1975.

(3) Source: Carrington, A Statistical Summary of Rapid Transit Operating Characteristics, San Francisco, 1975.

(4) Station spacing about 1.0 per mile on "express" section (former railroad), and 0.3 miles along boulevards.

(6) Vertical flexibility exists in the siting of platforms, but increased cost factors and a 6% - 7% design grade in the platform approach and departure track must be considered if platforms are placed in other than grade level locations.

(7) There is horizontal flexibility in the siting of platforms, but "aside" or "off-line" platforms may increase costs and seriously affect efficient long haul systems operation.

(8) The design of station zones is a key to achieving ridership potential on a light rail system. Emphasis should be placed on the positive benefits to be realized by properly designed pedestrian systems and station zone environments specifically suited to the anticipated types of transit patron activities.

(9) The range of representative costs for "stations" (U. S. examples) is displayed in the following table:

Table 6

RANGE OF LRT STATION COSTS

Urban Area	Average Station Cost
A. Portland, typical platform development only, Reference System, May 1977.(1)	$ 63,000
B. Dayton	$ 67,000
C. 5.2% of Reference System, Case B. Preliminary estimate total LRT capital costs; Tri-Met, 2/77 (Review of proposed U. S. transit systems showed that "station" capital costs average approximately 5.2% of the overall systems capital costs).	$ 250,000
D. Pittsburgh, system rehabilitation(2)	$ 379,000
E. "Model" LRT (3)	$ 460,000
F. Denver(4)	$2,285,000
G. Los Angeles(5)	$3,300,000

Sources: USDOT State of the Art, Light Rail Systems, p. 267-273.
DeLeuw-Cather South Hills Corridor Transit Alternatives Study, 1976.

(1) Excluding parking and access.

(2) Rehabilitation of existing system, low cost for right of way and construction. State of the Art report gives somewhat higher station costs.

(3) 7.84 mile line assumed for cost comparison, Wilbur Smith & Associates, 1977.

(4) Automated system, fully grade-separated.

(5) Substantial portion of line in subway.

3.9 STUDY METHODOLOGY

Segmental references based on differing physical/economic contexts along the LRT alignments were used to structure the analytical discussions of the factors effecting station zone locations and descriptions. The station zone locational findings of the extensive research performed by previous study teams on the Downtown area and Banfield line of the LRT were accepted. Station zones were located at the stops designated in these studies and LRT classifications

(A, B or C) were developed for each zone based on the anticipated frequency and volume of future patronage.

Detailed analytical evaluation for station zones had not previously been made along the proposed light rail branch alignments on Burnside, Division and I-205. These alignments received the principal thrust of analytical work in this study to identify station zones and thereby complete the working sets for all alignments. The previously documented operational criteria of light rail systems relevant to station spacings and total number of stations on a particular route were applied to the alignments. Major crosstown bus routings which intersected the light rail line and particularly the locations of significant transfer points on the designated LRT alignments were allocated increased weightings in zonal location evaluation. Good automotive access to zones was considered important, hence, as previously stated, platforms were generally oriented to arterial intersections with the LRT.

The evaluation of existing and potential future land uses/activities in the designated light rail corridors was undertaken with substantial data assistance from the planning staffs of the City of Portland and Multnomah County. Existing land uses in the corridor (1/4 mile on each side of the alignment) were analyzed to identify the presence of transit-supportive activities. Transit-supportive activities were generally defined as more intensely developed residential, commercial and employment activities. Future potential land use judgments were made by considering the probability of areas in the corridor to be developed or redeveloped to more intense, transit-supportive uses. These judgments were guided by data on land value, land use controls, recent development trends, and the location of urban services. Reallocations of projected 1990 population and employment to the LRT corridor were stipulated by the County and City to indicate the potential magnitude of change which could be expected to support the LRT system. Finally, a review of existing neighborhood character was made to ascertain the suitability of areas along the corridor for short and long term redevelopment intensification. Station zone suitability was then evaluated according to the operational, access, and land use criteria on an area by area basis along the corridors to identify station zone locations on each branch alignment.

Definitive study was undertaken of LRT support systems for each non-CBD station zone to more fully describe the projected 1990 activities and facilities within the selected zones. Proposed 1990 bus routing and frequencies through zones and inter-modal transfers were documented to establish the potential number of patrons who could be served by the LRT system at each zone. 1990 park & ride demand figures were derived from patronage modelling and/or projected from LRT system capacity. The number of park & ride spaces which could be accommodated within each zone was established by considering both the 1990 projected unused capacity of arterial streets accessing zones and the parking capacity of lower assessed value parcels near designated platform locations within zones. Projections of potential resident "walk-on" patronage, i.e., those residents within 1/4 mile of a platform who would be inclined to walk to and from the light rail transit, were derived from the City and County reallocations of population and/or patronage modelling. In general, emphasis in evaluating zonal activities was placed on peak-period travel as the critical operational condition. Concurrent with the possible system activity evaluation, study was made of the joint development and value capture opportunities around each station zone. The bases for study were land susceptibility, probability of future intense land redevelopment

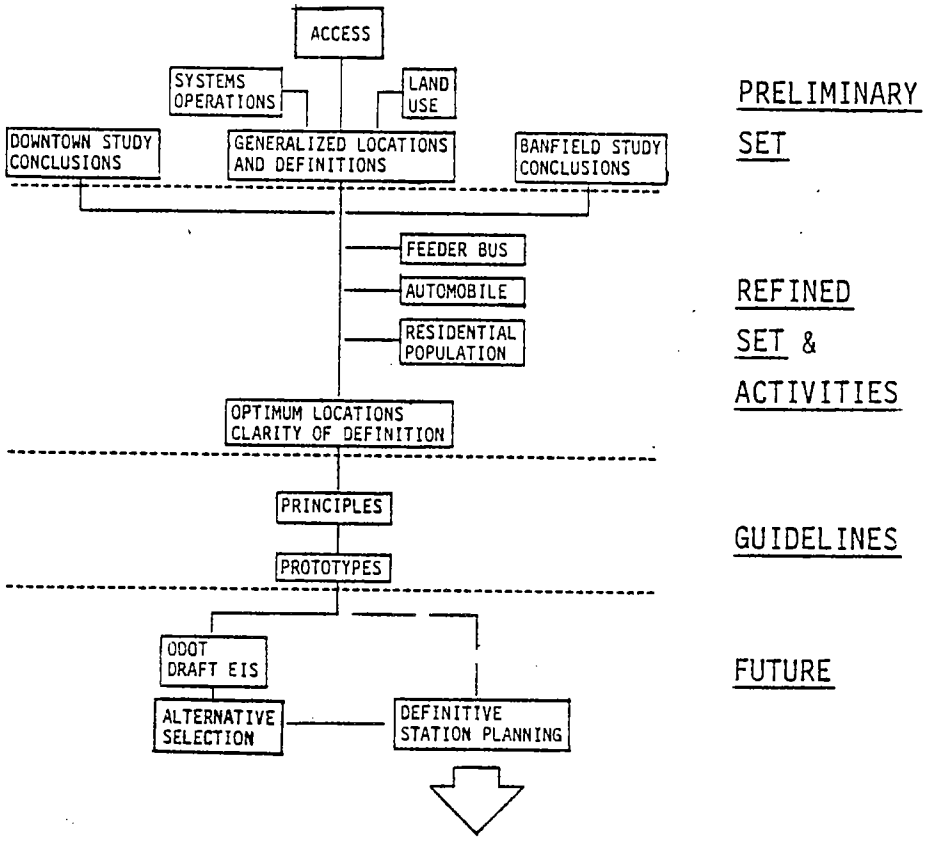


Figure: 9

STATION PLANNING METHODOLOGY

and the magnitudes and compexity of the anticipated type of station zones. Comprehensive discussion of this aspect of the LRT planning study and the revised land use assumptions may be found in the Land Use Report published as a separate document by Tri-Met.

The previous analytical studies culminated in the designation of a set of station zones which would be sensitively located and clearly defined for each alignment alternative. The final planning, design, construction and operation of LRT station zones could be undertaken by a variety of separate professional efforts. Planning principles were developed as guidelines for the coordination of such separate future development programs. Further clarity of intent was conveyed by exemplary station zone design criteria addressing features of platforms. Prototypical platform designs were developed to illustrate these principles. Action programs, as suggestions of the developmental processes and responsible agencies for station zone components, were compiled to establish a format for future actions if the light rail technology were selected as the East Side Transit Strategy.

4. STATION ZONES IN DOWNTOWN AND ON THE BANFIELD LINE

4.1 CORE STATION ZONES

The principle issues considered in the location of LRT platforms in the Portland commercial/business core area were how to provide the most accessible light rail service to the greatest number of potential users while providing optimum interface with other mass transit in the core, e.g., regional buses, inter-regional buses, without creating negative impacts on the traffic movements, pedestrian circulation and visual environments of the CBD. The Downtown Circulation Study produced by Tri-Met in June, 1977 contains in-depth discussion of the comprehensive analysis made to resolve these issues. The following is a synopsis of that study's contents.

Quite logically, the location of downtown platforms would be wholly dependent on the alignment of the LRT track in the core area. Track alignment was influenced by the City's Parking and Circulation Policy, which designated auto and non-auto streets in the core area, and the existing and future location of intense concentrations of workers/shoppers as indicated by the redevelopment objectives of the City of Portland "Downtown Development Program." Consideration was also given to the role of major downtown transit improvements, e.g., the Transit Mall, to the light rail alignment and service patterns, and to LRT operational geometric constraints within the 200' x 200' block grid of the downtown. Statistical and policy research of the existing and probable future locations of major office and commercial activities established the Core Area, that portion of the downtown defined as the Retail Center bounded by 10th, Stark, 3rd and Taylor, and the Major Office Corridor bounded by Park, Burnside, 3rd and Clay, as the location of the greatest number of potential transit riders, hence the principal area to be served by the LRT.

Platforms in the downtown core area would be placed as frequently as operationally feasible due to the anticipated high volume - high frequency service pattern of LRT. The Downtown Circulation Study designated LRT platforms at a minimum of three block intervals along the alignment, e.g., approximately 640 feet (.12 mile) center to center. The light rail system would enter the downtown area via the Steel Bridge north of the core area. First and Fifth Streets were selected as those "non-auto" streets within the City's Parking and Circulation Policy upon

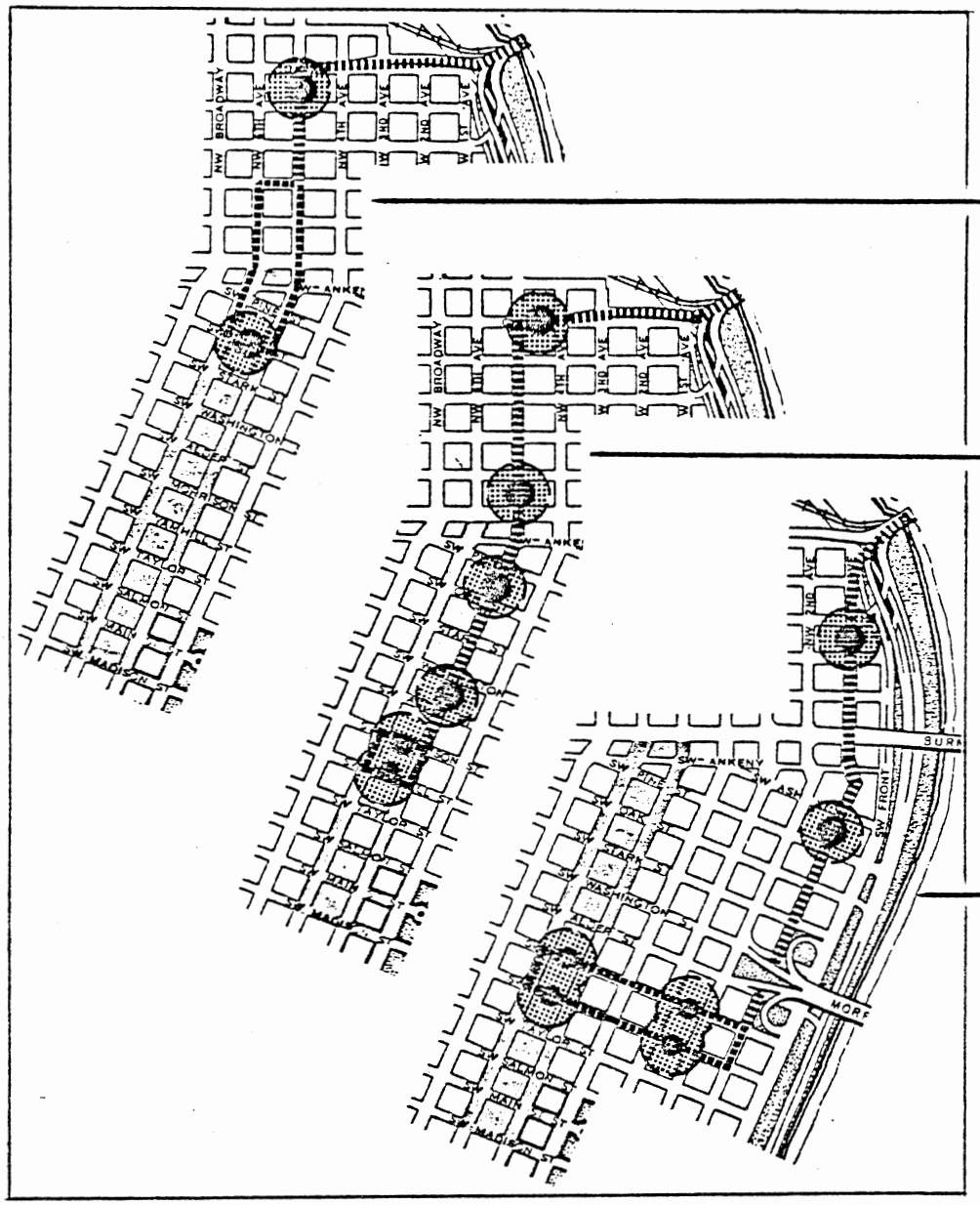


Figure: 10

ALTERNATIVE DOWNTOWN STATION ZONES

which the LRT alignment could be placed to penetrate the core area to the south. Three downtown alignment options are being studied. The first alignment descends from the Steel Bridge and turns south on 5th Avenue to Davis Street in a double track arrangement. At Davis a single track continues on 5th to Oak, turns east to 6th Avenue and returns to Davis to close the loop. Platforms would be located at Glisan between 4th and 5th, and on Oak between 5th and 6th. The second alternative is similar to the first except that the double track on 5th Avenue is extended to a single track turn-around loop using Morrison, Yamhill and 6th Avenue. Four core and two core periphery platforms have been identified for this alternative. The third alternative employes a new ramp from the Steel Bridge descending to the intersection of N.W. Everett and 1st Avenue. Double track continues along 1st to a single track couplet on Morrison and Yamhill, joining along the west side of 6th Avenue. Core area platforms would be placed on each leg of the Morrison-Yamhill couplet between 5th and 6th, and between 2nd and 3rd. Two additional platforms would be placed on 1st between Pine and Ash, and between Davis and Everett. Implicit in the CBD radial LRT system's description is the probability of high volume, high frequency use of core platforms and station zones. For this reason, all LRT station zones in the Downtown have been classified Type "A".

4.2 BANFIELD FREEWAY STATION ZONES

The segment of the LRT alignment from the eastern end of the Steel Bridge at Interstate 5 and Holladay Street to the Proposed I-205 expressway had been the corridor in which many of the previous East Side Transit Strategies involving buses and other HOV's would be placed. As such, the corridor had received intensive study to satisfy DEIS requirements prior to the addition of LRT to the set of alternative strategies in early 1977. A comprehensive discussion of station planning in this corridor was presented in Banfield Transitway Station Analysis, Tri-Met, February 1, 1977. Review of the criteria, evaluation and conclusions of this report during this LRT planning process has not altered the original findings of station zone locations and description other than to change the design characteristics of platform areas to accommodate light rail vehicles instead of express buses. The salient points of this previous analysis are outlined below.

The Banfield Transitway is defined as an express corridor in the overall regional transit strategy. The operational objective would be to move the greatest number of people through the corridor as rapidly as possible, station zones being few and widely spaced. Intermediate station zones on the transitway would, however, be an important feature differentiating this project from most existing transitways elsewhere. Without stops, the transitway would act simply as a channel in which to shuttle suburban trips to and from the downtown area, primarily during peak hours. Stops are required to allow urban residents, who would share in the facility's cost, to share in its benefits. Intermediate stops would also benefit suburban passengers by making a wider variety of regional destinations accessible. In addition, the use of the facility throughout the day, rather than simply during commuting hours, would be more likely if stops are present to allow areawide accessibility.

In the original transitway study, a series of specific criteria were developed from more general, systemwide transit objectives. These criteria were used to identify which station zones along the corridor would ultimately be considered as part of the transitway project as well as to evaluate possible sites for facilities within each station zone. These criteria included:

(1) Proximity to major trip generators.

(2) Logical connection points to local transit service.

(3) Minimize out-of-direction travel for express or local bus service.

(4) Location of transit improvements within existing public rights-of-way.

(5) Minimize disruption and displacement impacts.

(6) Easy and convenient pedestrian access.

(7) Minimize automobile conflicts and traffic congestion.

(8) Minimize negative environmental impacts on "critical receptors."

(9) Seek benefits of joint development.

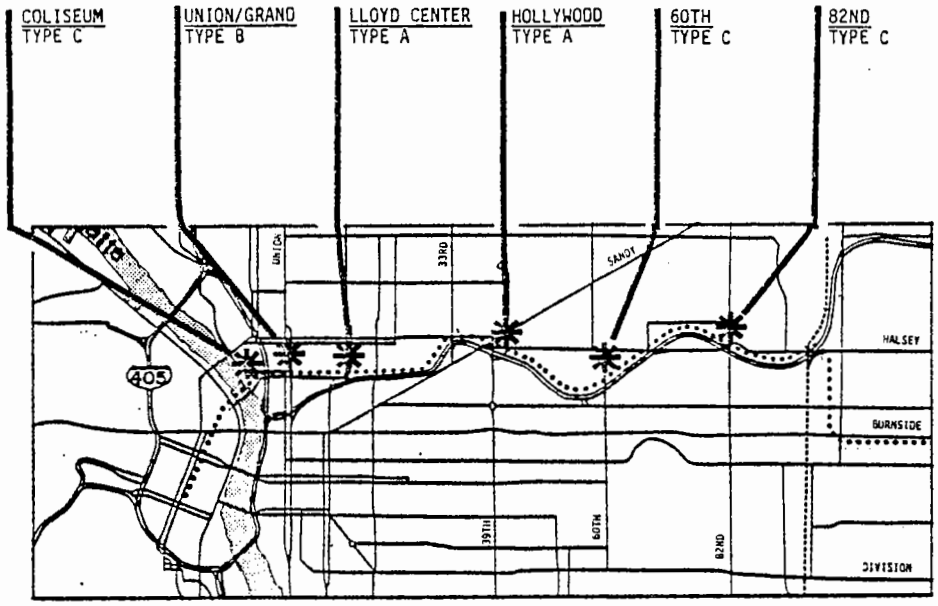


Figure: 11
BANFIELD LINE STATION ZONES
Source: "Banfield Transitway Station Analysis", Feb. 1977

Initially, eight station zones were identified in the Banfield Freeway based on unique characteristics which they appeared to offer toward contributing to the success of the project. The original list included station zones at 82nd, 60th, 47th, 39th (Hollywood), 28th, the Lloyd Center, Union/Grand Avenues, and the I-5/Holladay Street intersection.

Station zones at 47th and 28th Avenues were dropped from further consideration midway through the previous study process. These zones were initially selected, in part, because of the transit trip generation potential of the sites based on existing land uses, but were eliminated because of low patronage projections from subsequent computer modeling, lack of available land in the area for needed transit facilities, and cost considerations.

Final station zone designations on the Banfield line of the light rail system are shown in Figure 11.

4.3 BANFIELD STATION ZONE ACTIVITIES

INTRODUCTION

Patronage projections by Tri-Met have occurred subsequent to the Banfield Transitway Station Analysis report. These projections provide insight into the types and magnitudes of LRT-generated activities which might occur in 1990. The following discussions outline the key aspects of these efforts as they relate to the Banfield station zones. Refer to Appendix I-B1 for modelling output tables and activity diagrams.

FEEDER BUS

Network Strategy: The 1990 East Portland feeder bus network would be designed with radial and north-south routings on the arterial street grid. The radial routes would carry the majority of city residents traveling to the from the downtown. The north-south routes would provide wider city and regional accessibility and would act as feeder buses to the light rail system in the Banfield corridor.

1990 Feeder Buses: All station zones on the Banfield Line would be served by feeder buses. Table 7 indicates the applicable feeder bus lines and patronage projections for these lines during the 1990 p.m. peak hour period. These projections are only concerned with LRT-generated feeder bus useage at station zones and do not account for overall useage of the lines for other purposes or through trips during all day operations. As an example, only 6 persons are projected to get off line 7 at the Coliseum station zone, while 1584 persons would pass through the station on this feeder bus line during the period. Ample feeder bus capacity would exist to accommodate the projected 1990 peak hour patronage demands created by LRT.

Operation and Accommodation of Feeder Buses: The location of the LRT in Sullivan Gulch and within the developed urban environment of Lloyd Center raises several issues concerning the movement of feeder bus and patrons and the location of bus stops relative to LRT platforms. These have not been completely resolved at this time. All feeder bus lines would operate "through" Banfield station zones and the intent would be to provide bus stop and layover areas as close to LRT platforms as practical. At 60th and 82nd, overpass reconstructions could result in land widenings to accommodate buses directly over the LRT platforms. In Hollywood, several off-street mustering plans are being considered as discussed in the Banfield Analysis report previously cited. Near the Lloyd Center and Union/Grand LRT platforms, far side bus stops would appear the most practical. Vacant, state-owned land under the I-5 freeway could be developed for feeder bus purposes near the Coliseum LRT platforms.

AUTOMOBILE ACCESS

Park & Ride: Pursuant to City of Portland policy, facilities to accommodate park & ride activities for LRT patrons will not be provided at Banfield station zones. Further, such activities are to be discouraged in neighborhoods around station zones by long term parking restrictions on City streets.

Kiss & Ride: These LRT generated activities would be accommodated within Banfield station zones. Patronage modelling projected between zero and 200 kiss & rise vehicles passing through the different Banfield station zones during the p.m. peak hour period. The majority of station zones would easily accommodate such kiss & ride automobile activity. Further facilities and traffic design studies would be required at 60th and 82nd to accommodate the projected demand without creating congestion.

PEDESTRIANS AND BICYCLISTS

Demand and Accommodation: In the Banfield corridor, the bulk of light rail patronage is projected to arrive at, and depart from station zones by walking or riding bicycles. Priority must be given to pedestrians in station zones to

Table 7

FEEDER BUS ACTIVITY
BANFIELD LINE LRT
(Network A-90-3 LTP-Parabolic)
1990 P.M. Peak Hour

STATION ZONE	N-S FEEDER BUSES				E-W FEEDER BUSES			
	Line	#/Hr.*1	Route	Patrons*2	Line	#/Hr.*1	Route	Patrons*2
COLISEUM	4	12	Interstate Avenue	30	13		Holladay	3
	5	12	Williams	16	22		"	20
	7	12	Union via Holladay	6				
	20	12	Interstate Avenue	71				
	161	12	" "	215				
	170	12	" "	114				
UNION/GRAND	5		Williams/ Union	16	13		Holladay	64
	7		Union	329	22		"	138
LLOYD CENTER	9*3		15th	161	22		Holladay	23
	13*3		24th	4				
	25		20th	142				
HOLLYWOOD	16		42nd	93	18		Broadway/ Halsey	123
	17*3		42nd	95	24		Sandy	116
					124		"	116
60TH AVENUE	19		60th	172	22		Glisan	4
82ND AVENUE	23	12	82nd	12	18	12	Halsey	26

*1 #/Hr. = Total number of buses passing through a station zone traveling both ways on the particular line during the period.

*2 Patrons = The total number of LRT-generated bus riders boarding or alighting from buses within the station zone on the particular line during the period.

* Lines 9, 13 and 17 technically operate north-west.

assure safe and convenient movements between transit modes, and between the zones and surrounding communities.

Tri-Met modeling has projected the number of "walk-mode" patrons who would use the Banfield station zones during the p.m. peak hour. These projections did not consider the reallocation of population and employment associated with the development of the LRT as described in the Land Use report. The impact of this reallocation in the City portions of the LRT alternatives would be so slight, however, that the current patronage projections would represent a reasonable order of magnitude for 1990 pedestrian activities.

Table 8

PEDESTRIAN PATRONAGE
BANFIELD LINE LRT
(Network: A-90-3 LTP-Parabolic)
1990-PM Peak Hour

STATION ZONE	WALK-IN	WALK-OUT
COLISEUM	0*1	0*1
UNION/GRAND	549	189
LLOYD CENTER	682	427
HOLLYWOOD	152	273
60TH	109	216
82ND	85	269

*1 Minor patronage at Coliseum may have been undetected by model.

Table 9

DOWNTOWN AND BANFIELD LINE LIGHT RAIL TRANSIT
STATION ZONE CHARACTERISTICS
(1990 P.M. Peak Hour)

DESIGNATION	LOCATION	Type	Projected Demand P&R Spaces Per Peak Hour *1	Total P&R Spaces Provided	Projected P&R Patrons Per Peak Hour *1	Projected K&R Vehicles Per Peak Hour *1	Projected K&R Patrons Per Peak Hour	Proposed Feeder Bus Per Peak Hour	Projected Feeder Bus Patrons Per Peak Hour *1	Projected Pedestrian Patrons Per Peak Hour *1
CBD 1 *2		A								
CBD 2 *2		A								
CBD 3 *2		A								
CBD 4 *2		B								
CBD 5 *2		B								
Coliseum	Holladay & I-5	C	0	0	0	0	0	96	475	0 *3
Union/Grand	Holladay @ Union & Grand	B	0	0	0	0	0	48	547	738
Lloyd Center	Holladay @ Holladay Park	A	0	0	0	0	0	48	330	1109
Hollywood	39th & Banfield	A	0	0	0	42	71	60	543	425
60th	60th & Banfield	C	0	0	0	201	267	24	176	325
82nd	82nd & Banfield	C	0	0	0	149	173	24	38	354

SOURCE: Tri-Met Model A-903-LTP Parabolic, 1977

*1 Numbers equal the sum of arrivals and departures during the peak hour.

*2 Refer to Downtown Circulation Study for station zone descriptions.

*3 Minor patronage may have been undetected by modeling.

5. STATION ZONES ON THE BURNSIDE BRANCH

5.1 INTRODUCTION

The three following sections of the station zone report discuss the detailed planning processes undertaken to locate, classify and describe station zones along the LRT branch alternatives. All sections reach a similar breadth and level of detail in findings. There were limited differences in the data base from which station zone activities were derived for the three branches, but, since activities projections at this stage are intended only as approximations, findings are comparable. Should a system-wide understanding of station zones within a complete LRT alternative be desired, e.g., a possible LRT system would be: Downtown+Banfield Line+Division Branch, the findings for the Downtown and Banfield Line station zones found in Section 4 of this report could be combined with the Branch conclusions, i.e., Sections 5, 6 or 7, to obtain a total picture of the different sets of potential station zones.

5.2 SUMMARY

The Banfield/Burnside LRT system would extend from downtown Portland east to Gresham--a distance of approximately 14.5 miles. Detailed evaluation of light rail patronage opportunities along the Burnside Branch identified a set of nine suitable locations between Gateway and Gresham for LRT station zones in 1990. These evaluations considered existing and probable future land use, transportation access characteristics, and applicable control mechanisms in a segmental analysis of the designated Burnside corridor.

Transit generated activities were considered on a branch-wide and individual station zone basis. The feeder bus network proposed for East County in 1990 would have an east-west line on Glisan and Stark Streets, approximately one-half mile north and south of the Burnside LRT alignment, and north-south cross-town routes intersecting the LRT at most station zones. Feeder bus operations through the Gateway, 122nd, 148th, 182nd, 192nd and Gresham station zones would be coordinated with LRT operations to optimize patron transfer potential. The proposed feeder bus capacity would appear adequate to accommodate the projected 1990 p.m. peak hour demand.

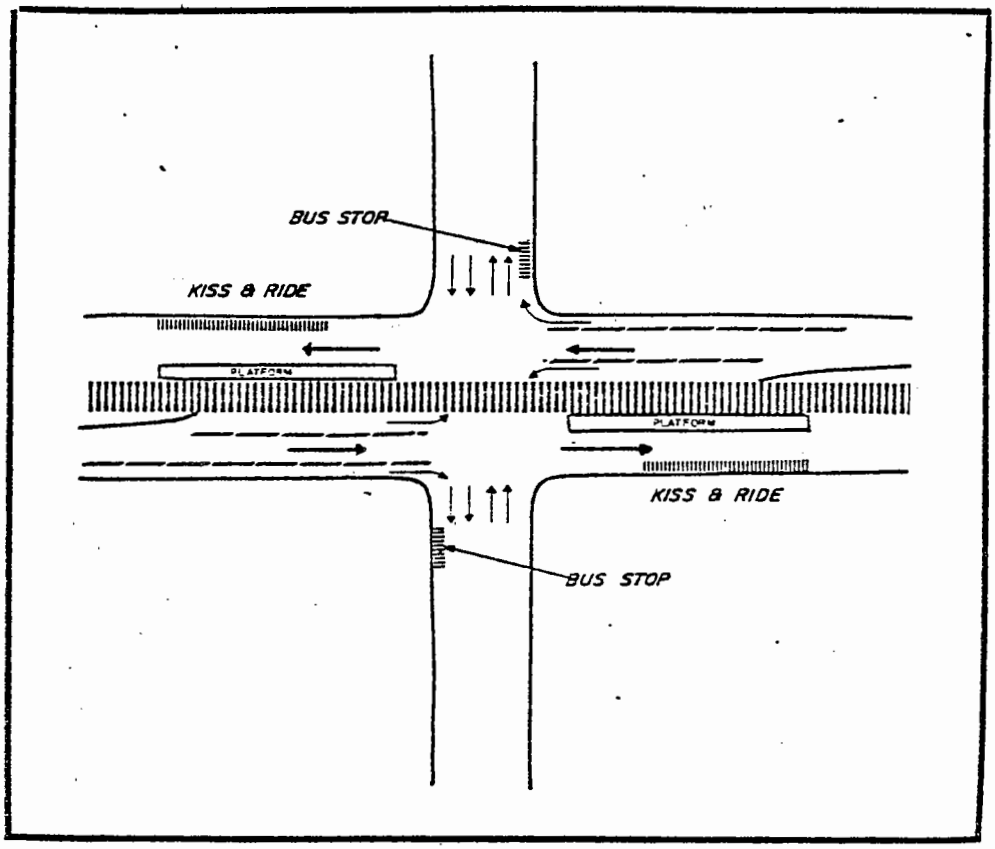


Figure: 12

TYPICAL INTERSECTION

LRT on Burnside with provision for feeder bus stops and kiss and ride short term parking.

Approximately 2100 park & ride spaces would be provided along the Branch to accommodate long term, midday and handicapped patron parking requirements. These would be developed in lots of 400 to 600 at major station zones, and 250-300 within neighborhoods along the alignment. Capacity studies were made to assure that access roadways to station zones, and developable land parcels within station zones could accommodate the proposed facilities. Kiss & ride activities would take place principally on-street adjacent to the LRT platforms with back up capacity available in the park & ride lots. The magnitude of kiss & ride activities was projected by Tri-Met modelling to be between 1 and 176 cars in the p.m. peak hour at individual station zones.

Walk-mode patrons, i.e., those who would walk to and from the LRT station zones, were found to represent a significant proportion of the activity within station zones, particularly at Gateway, 181st and Gresham. Tri-Met modeling projected up to 700+ patrons walking in and out of individual station zones along the Burnside Branch in 1990. Actual walk in/out patronage at station zones could exceed projections, because current Tri-Met modeling does not account for the reallocation of population and employment to support LRT in the County as described in the Land Use report.

Sketch designs were made to study physical layouts of station zone components. Figure 12 illustrates the typical relationships anticipated within station zones along the Burnside LRT. Features of the arrangement include split LRT platforms, far-side bus stops on arterial cross streets, and kiss & ride waiting areas beside platforms on Burnside. Refer to Section 8 of this report for a more thorough discussion of station zone component relationships.

Table 10

BANFIELD/BURNSIDE LIGHT RAIL TRANSIT STATION ZONE CHARACTERISTICS (1990 P.M. Peak Hour)

DESIGNATION	LOCATION	Type	Projected Demand P&R Spaces Per Peak Hour *1	Total P&R Spaces Provided	Projected P&R Patrons Per Peak Hour *1	Projected K&R Vehicles Per Peak Hour *1	Projected K&R Patrons Per Peak Hour	Proposed Feeder Bus Per Peak Hour	Projected Feeder Bus Patrons Per Peak Hour *1	Projected Pedestrian Patrons Per Peak Hour *1
CBD 1	Core	A								
CBD 2	Core	A								
CBD 3	Core	A								
CBD 4	Core Periphery	A								
CBD 5	Core Periphery	A								
Coliseum	Holladay & I-5	C								
Union/Grand	Holladay between Union & Grand	B			(See Table 1 for Downtown and Banfield Line characteristics)					
Lloyd Center	Holladay @ Holladay Park	A								
Hollywood	39th & Banfield	A								
60th	60th & Banfield	C								
82nd	82nd & Banfield	C								
Gateway	99th & Pacific	A	296	418	384	127	165	168	2237	383
102nd	102nd & E. Burnside	C	0	0	0	1	2	0	0	110
122nd	122nd & E. Burnside	B	182	250	236	79	102	12	5	0*2
148th	148th & E. Burnside	C	0	0	0	55	72	12	14	38
162nd	162nd & E. Burnside	B	14	250	19	10	13	0	0	25
172nd	172nd & E. Burnside	C	0	0	0	176	229	0	0	0*2
181st	181st & E. Burnside	A	173	250	225	74	96	12	43	284
192nd	192nd & E. Burnside	B	62	300	81	27	35	24	0*2	105
Gresham A	Old Fairgrounds	A	367	625	478	167	204	60	595	717
Gresham Alternative	1st & E. Burnside	B								

SOURCE: Tri-Met Model A-903-LTP Parabolic

*1 Numbers equal the sum of arrivals and departures during the peak hour.

*2 Minor patronage may have been undetected by modeling.

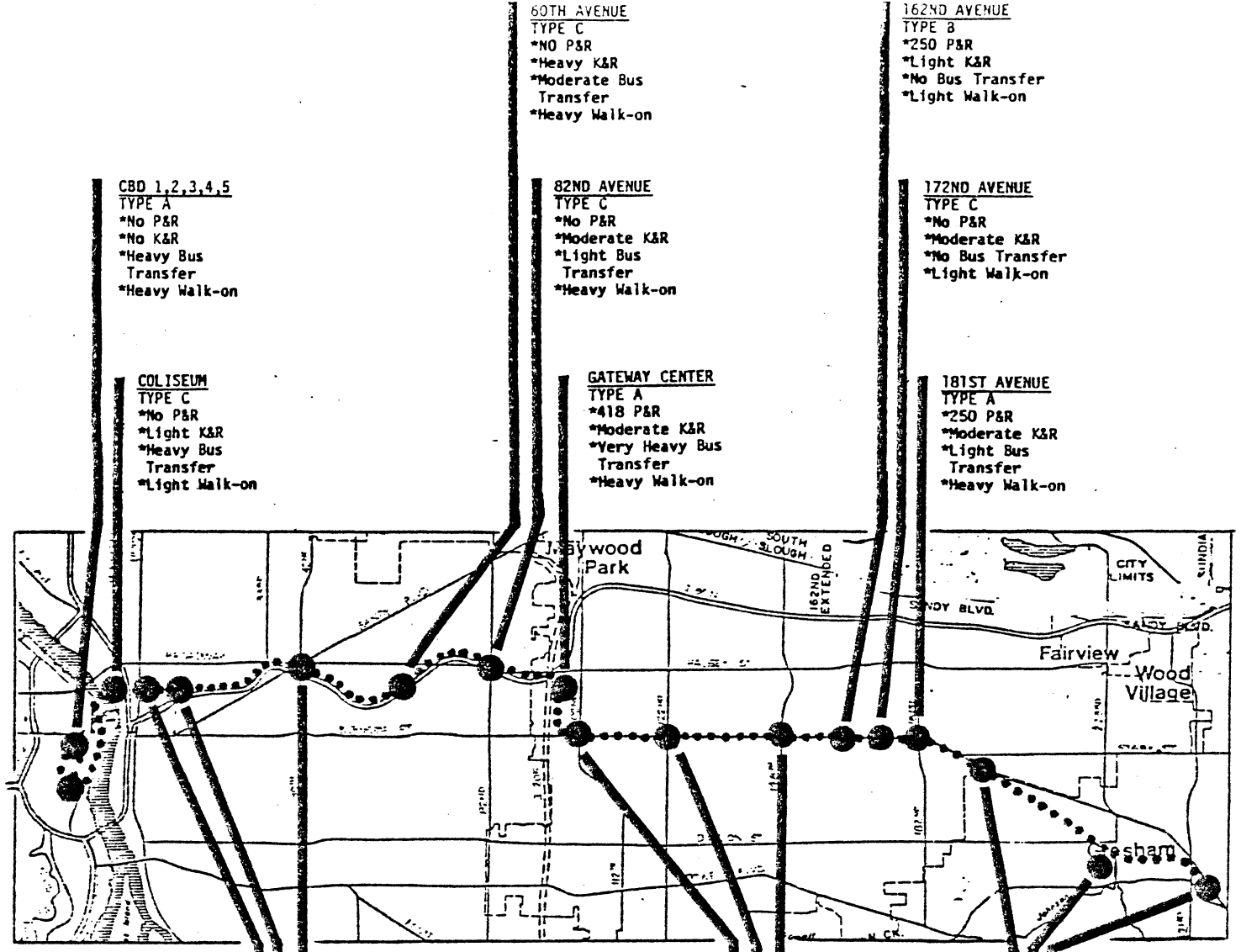


Figure: 13

BANFIELD/BURNSIDE LIGHT RAIL TRANSIT STATION ZONES

5.3 SELECTION OF STATION ZONES

BURNSIDE STREET AS A TRANSIT CORRIDOR

Burnside Street has historically been perceived as a secondary east-west arterial street in the County. Emphasis to upgrade the street from its two lane configuration has not come from County traffic planning and, except for the Rockwood area, significant reconstructions have not been funded and implemented. Development has responded to the low accessibility of Burnside by locating primarily at major north-south arterial intersections, e.g., 122nd and 181st. Strip commercial development has been held to a minimum, especially between 122nd and 181st along Burnside.

Four separate future activity centers are anticipated along the Burnside light rail alignment. The Gateway center area, drawing its strength from the I-205 freeway, existing arterial streets and the enhanced transit accessibility resulting from the development of the LRT, should continue as a viable mixed use regional center.

Commercial developments around the 122nd and Burnside intersection are substantial. The presence of a large parcel of vacant land zoned for intensified uses and of an appreciable number of other parcels with characteristics susceptible to market redevelopment suggest an enlarged urban activity node here in the future. The segment of the Burnside LRT corridor between 162nd and 192nd exhibits unusually high potentials for future, transit-supportive land uses. This segment is anchored by the existing, substantial Rockwood commercial center. Existing multi-family and commercial transitional developments and an abundance of susceptible parcels identified by Multnomah County staff analysis in the remainder of the segment suggest a good probability for intensive land use redevelopments in the future. The fast-growing Gresham core at the eastern terminus of the LRT alignment has been identified as the fourth transit-supportive activity center.

Placement of a light rail system within the existing and anticipated future Burnside traffic and land use patterns should result in the creation of transit dominant activity and circulation patterns around station zones. The reconstructed Burnside Street will remain as a two lane, minor arterial with paralleling major arterials, i.e., Glisan and Stark, to the north and south. Arterials intersecting Burnside would be expected to accommodate the distribution of any increased traffic volumes resulting from intensified land uses in the LRT corridor.

Though transit dominance is probable, certain urban design issues would still require close attention. Pedestrian and vehicle flows would need to be sensitively handled around LRT platforms -- with a bias toward the priority of pedestrian movements. Traffic turning movements caused by park & ride access points should be dealt with to preclude interruptions of arterial traffic, yet provide easy access to transit facilities. The presence of the LRT alignment passing through the Burnside communities should enhance these environments with devices such as landscaping, lighting and pedestrian crossings.

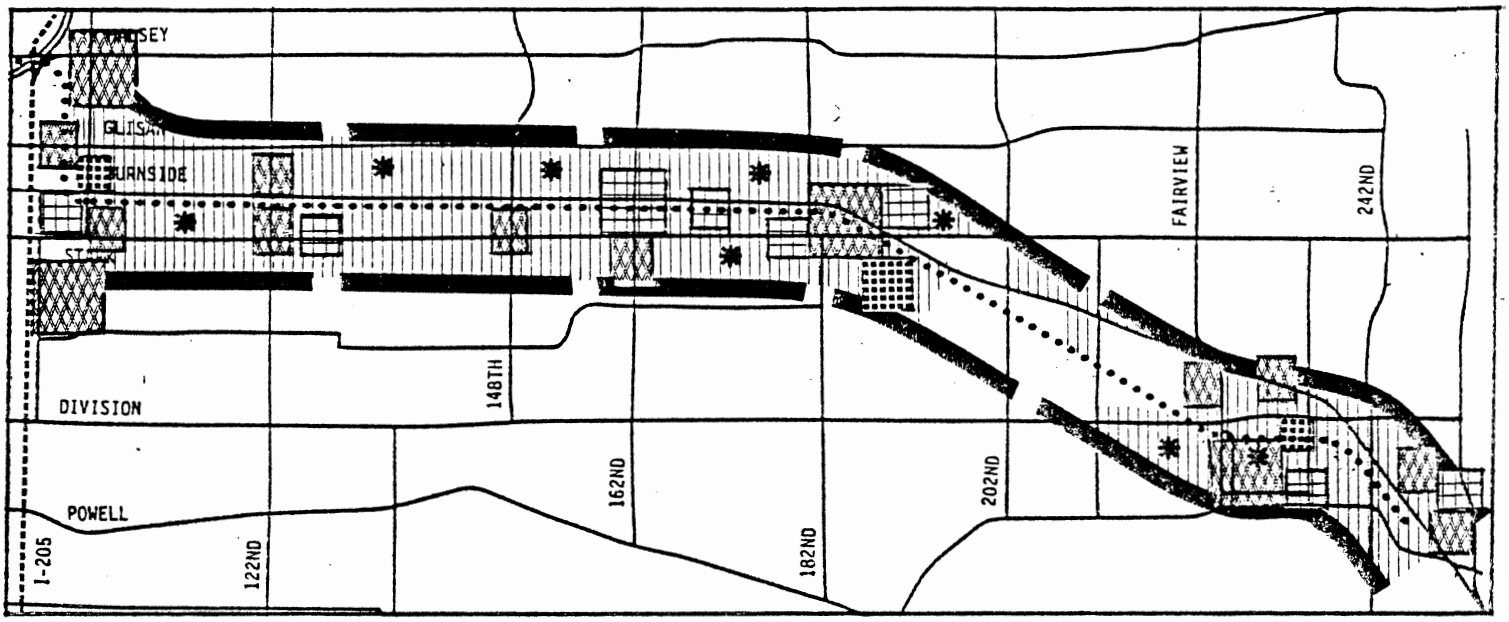


Figure : 14

EXISTING LAND USE - BURNSIDE LRT

Commercial
Industrial
Single Family Dwellings
Multi-Family Dwellings
Community Services
Undeveloped Land

EVALUATION OF THE BURNSIDE CORRIDOR

Whereas the Banfield Freeway station zones would be infrequently located because that segment of the light rail alignment would operate primarily as an express corridor, it was determined that the light rail ridership could be optimized in the East Burnside branch by developing station zones more closely, if justified by the potential of individual areas, to provide a high level of transit patronage. The set of land use evaluation factors shown in Table 11 was established to assess the level of patronage which could be anticipated at each arterial crossing of the LRT alignment. The system's operation criteria previously discussed were implicity considered in the Burnside station zone evaluation. Additional consideration was given to auto and feeder bus access potential along the corridor.

The Gateway Center area was recognized as potentially the most significant transportation/community nodal point on the Burnside LRT due to the pattern and intensity of existing and planned land uses, and the area's accessibility. The Gateway Center would be the location of a major transit transfer station zone. The attraction of the Gateway Center could be expected to divert patronage and activity from the 102nd and Burnside area. However, the future urban pattern in the 102nd station service area would be expected to follow the comprehensive plan designations of moderate density residential developments with local service commercial uses. This area should, therefore, be serviced by a simple, Type C, light rail platform.

	Factor	Conditions Analyzed	Implicit Criteria
(1)	Existing Land Uses	Whether the existing land uses within 1/4 mile of the intersection were of the type and intensity to stimulate transit ridership on the proposed LRT.	Sufficiently diverse and intense land uses should exist within 1/4 mile of a proposed LRT platform to suggest that ample ridership would be generated when the transit system begins operation.
(2)	Land Susceptibility	The number, size and location of land parcels with low assessed value near designated intersections as indicative of sites for potential redevelopment.	(See Future Land Use below.)
(3)	Comprehensive Plan Land Use/ Activity	The types of land uses indicated within 1/4 mile of intersections by the Multnomah County Comprehensive Plan to ascertain whether planned uses along the Burnside alignment would be sufficiently intense to support LRT in the future.	(See Future Land Use below.)
(4)	Future Land Use	Consideration of 1) existing land use patterns, 2) susceptibility of areas to future, more intense redevelopment, and 3) currently planned land use changes for the future coupled with the impacts of LRT development on Burnside led to judgmental conclusions on the type and intensity of transit supportive land uses which could be anticipated around each arterial intersection in the LRT corridor.	Light rail transit should be developed in high intensity corridors. Station zones should be located in areas with existing transit-supportive land uses and activities, where such areas also have a high potential for extensive, intense transit-supportive future developments within 1/4 mile of the LRT platform.

Table 11

CORRIDOR EVALUATION CRITERIA FOR STATION ZONE LOCATIONS

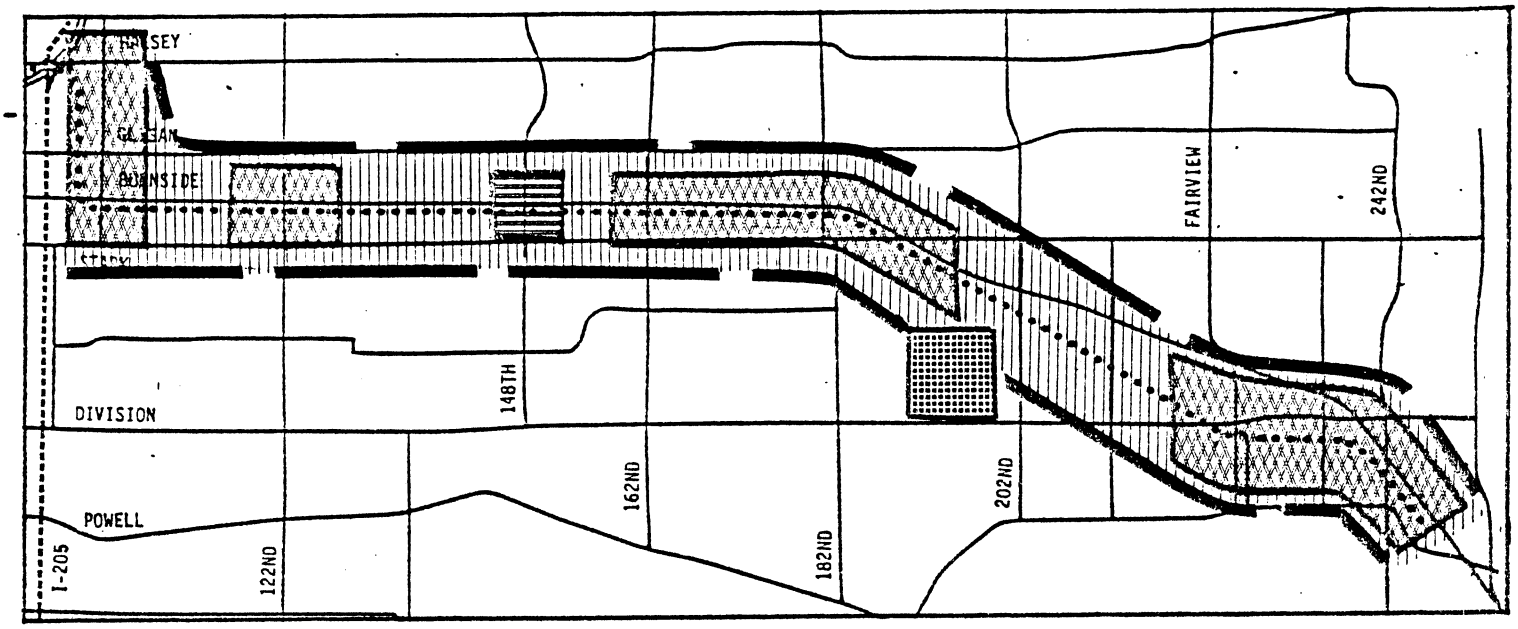


Figure: 15 ANTICIPATED 1990 ACTIVITY PATTERN - BURNSIDE LRT

High Intensity Commercial/Multi-Family Residential Corridor

Major Concentration Commercial/ Multi-Family Residential

Major Concentration Multi-Family/Local Commercial

Major Concentration Industrial

Single Family Neighborhoods

Sub-Regional Commercial Center

The potentials of the 113th and Burnside area were evaluated, but justification could not be established for development of an LRT station zone. Conversely, the 122nd and Burnside area exhibits positive characteristics to support the light rail system. This area has an established mix of moderate intensity commercial activities and the area's land susceptability and land use controls suggest enlarged urban nodal activities in the future. The area is highly accessible and is served by feeder bus lines. A Type B station zone with park & ride facilities was deemed suitable for 122nd and Burnside.

The 139th and Burnside area had certain characteristics supportive of transit, but the lack of accessibility, land susceptability and existing land use controls allowing future higher intensity uses, could not justify a platform in this area during the initial operations of the LRT. Land reservations should be made along the alignment at 139th for a future, Phase II platform, which would be built when justified by demand. 148th and Burnside had similar, but somewhat more positive characteristics. The area enjoys better accessibility and some indications of intensified land uses south of Burnside. The systems operations strategy for Burnside suggests more closely spaced station zones to enhance community service. A simple station zone appeared appropriate at the 148th area in light of the distance from the proposed LRT facilities at 122nd and the favorable community characteristics around 148th.

Evaluation of the Burnside corridor from 162nd to 192nd revealed the potential of a transit-supportive development zone. Evidence of land use conversion to more intense activities exists throughout this segment of Burnside and future intensification is supported by land use controls. Station zones were designated at 162nd, 172nd, 181st and 192nd in conformance with the light rail stations spacing parameters. There appeared to be sufficient existing and planned urban activities within the Gresham Center to warrant the consideration of two LRT station zones. Historically, the Fairgrounds, west of the Gresham business district, has been the location of a transit nodal point. This location was allocated an LRT station zone, and, due to the perceived urban growth dynamics of the Gresham area, an alternate station zone location was designed on the eastern side of the Gresham Center.

The evaluation of the Burnside corridor established nine initial station zones with one alternative in Gresham, and a future possible platform location at 139th. The evaluation of station zone potentials along Burnside is summarized in Table 12. A more complete discussion of the evaluation process has been placed in Appendix II-A1 of this report.

Arterial Intersection	Transit Supportive Existing Land Uses	Susceptibility For More Intense Development	Transit Supportive Planned Land Uses	Transit Supportive Possible Future Land Uses	Sub Regional Auto Access	Existing Feeder Bus Service	Proposed Feeder Bus Service	Additional Transit Significance	Recommended Station Zone Type
Gateway Center	●	●	●	●	●	◒	●	*1	Type A
102nd	◒	●	●	◒	◒	O	O		Type C
113th	O	O	O	O	O	O	O		None
122nd	◒	●	●	●	●	◒	●		Type B
139th	O	◒	O	◒	O	O	O		None (Possible Phase II)
148th	◒	O	◒	●	◒	◒	◒		Type C
157th	◒	O	O	O	O	O	O		None
162nd	◒	●	●	●	◒	◒	◒		Type B
172nd	◒	◒	O	◒	O	O	O		Type C
181st	●	●	●	●	●	◒	●		Type A
188th	●	O	●	◒	◒	◒	O		None
192nd/ 194th	◒	●	●	●	●	O	◒		Type B
202nd	O	●	◒	O	◒	O	O		None
212th	O	●	O	O	◒	O	O		None
221st/ 223rd	O	(Insufficient data to complete evaluation)							
Fair-Grounds	◒	●	●	◒	●	O	●	*2	(Type A)
Cleveland Avenue	O	(Insufficient data to complete evaluation)							
Hogan Avenue	O	(Insufficient data to complete evaluation)							
1st & Burnside	◒	●	●	◒	●	O	◒	*2	(Type B)

● = Excellent
◒ = Good
O = Poor

*1 Major transfer point for multiple transit modes.
*2 Possible eastern terminal of LRT.

Table 12
STATION ZONE LOCATIONAL CRITERIA SATISFACTION-BURNSIDE LRT CORRIDOR

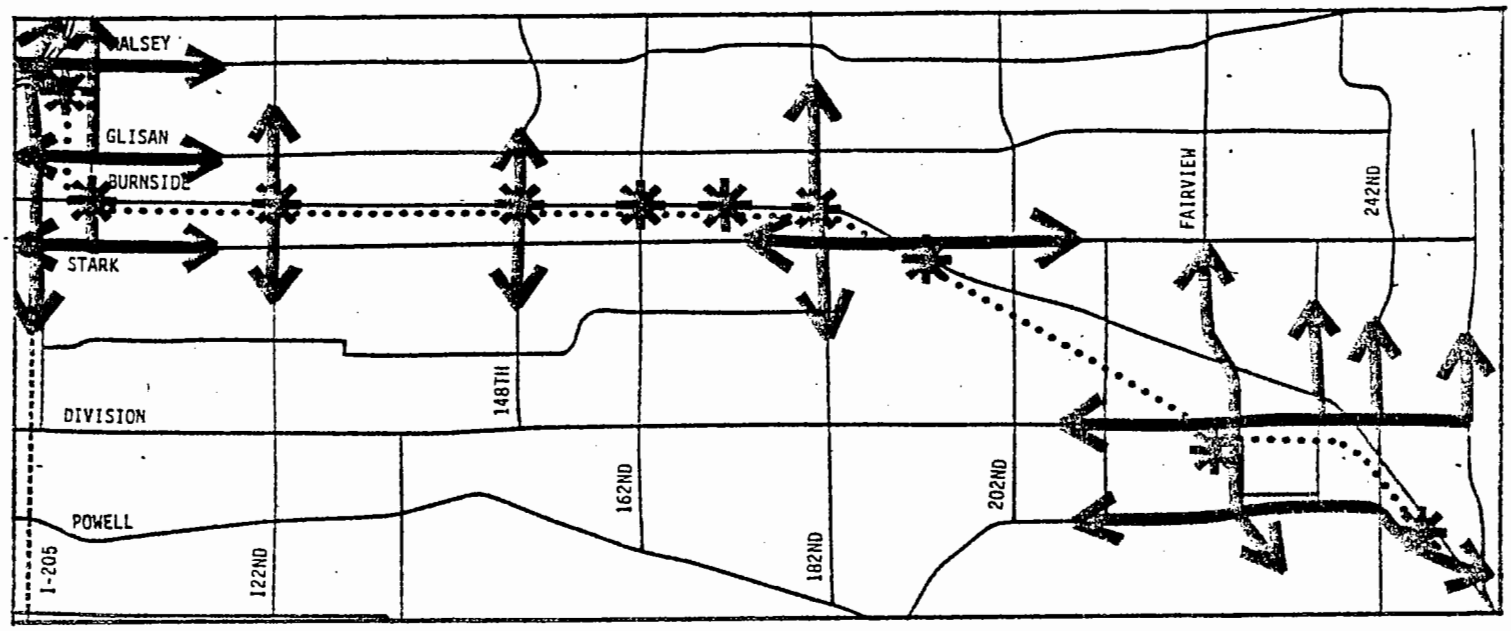


Figure: 16
1990 FEEDER BUS ACCESS TO STATION ZONES ON BURNSIDE LRT
(Network 90A-01)

5.4 STATION ZONE ACTIVITIES

INTRODUCTION: The subsequent steps in the cycle of station zone evaluation on the Burnside Branch dealt with describing on a branch-wide and zone-by-zone basis the possible numbers and frequency of vehicles and pedestrians which could be expected during LRT operations. Systems design and patronage modeling by Tri-Met provided the data from which activities descriptions were derived. For certain activities a "patron delivery capacity" study was completed to assure that station zone conditions would be able to adequately accommodate the projected 1990 demands.

FEEDER BUSES

Network Strategy: The Burnside Branch light rail line would act as a major east-west express trunk line within an overall grid of transit services in East Multnomah County. Express and local bus lines would operate on the arterial street system, both north-south and east-west. The proposed service grid will provide transit accessibility to all activity centers in East County, and by varying route frequencies, could be readily adapted to changing patronage demands in the future.

1990 Feeder Buses: Seven of the nine selected LRT station zones along Burnside would be accessed by feeder buses in 1990. These station zones are Gateway Center, 102nd, 122nd, 148th, 181st, 192nd and Gresham. Routings and frequencies of these feeder buses would be coordinated with light rail transit operations in station zones to assure systems connections in East County transit services.

1990 Projected Demand and Service Capacity: Table 13 indicates the type of feeder bus activities projected for each station zone on the Burnside Branch during the p.m. peak hour period. Gateway Center and Gresham would have the greatest volume of activities during this period in 1990. These modeling projections do not account for the reallocation of population and employment along the Burnside Branch as discussed in the Land Use Report. Further, the projections do not reflect total daily feeder bus ridership generated by LRT operations nor do they account for other daily ridership on the feeder buses.

Table 13

FEEDER BUS ACTIVITY
BURNSIDE BRANCH LRT
(Network Reference A-90-3 LTP Parabolic)
1990-PM Peak Hour

STATION ZONE	N-S FEEDER BUSES				E-W FEEDER BUSES			
	Line	#/Hr.*1	Route	Patrons*2	Line	#/Hr.*1	Route	Patrons*2
GATEWAY	134	12	I-205(Div.)	316	14	12	Halsey(Fremont)	16
	98	12	I-205	433	18	12	Halsey	71
	99	12	I-205	665	22	12	Glisan	0
	117	12	I-205	254	30	12	I-205(Market)	120
	130	12	I-205(Market)	27	78	12	102nd(148th)	0
					114	12	102nd(Fremont)	117
					61	N/A	N/A	N/A
					118	12	Halsey	197
					122	N/A	N/A	N/A
					128	12	I-205(Stark)	21
122ND	70	12	122nd	5				
148TH	78	12	148th	14				
181ST	72	12	181/182	43				
192ND					128	12	Stark	0
					130	12	Stark	0
GRESHAM	72	12	Cleveland	294	75	12	Roberts	102
	73	12	Hogan/Kane	57	134	12	Division	140
					136	12	Powell	2

*1 #/Hr. = Total number of buses passing through a station zone traveling both ways on the particular line during the period.

*2 Patrons = The total number of LRT-generated bus riders getting off of, or onto buses on the particular line during the period.

A "delivery capacity" analysis of the proposed feeder bus network was undertaken to assess relative supply and demand volumes. The number of feeder buses accessing each station zone during a peak hour was multiplied by the possible passenger loading per bus, 70 patrons, to establish the maximum feeder bus carrying capability. Percentages of these maximum capabilities were derived for each station zone to more accurately reflect LRT-generated feeder-bus useage. As displayed in Table 14, the projected 1990 LRT-generated bus patronage would utilize between 10% and 40% of the feeder bus network capacity within Burnside station zones. An outline of the capacity analysis has been placed in Appendix II-B2.

Table 14

BURNSIDE LRT ALIGNMENT PROPOSED FEEDER BUS SYSTEMS DELIVERY CAPABILITY
(Network: A-90-01)
Peak Hour

Percent of Possible Bus Ridership Which Would Transfer to LRT During Peak Hour *1

STATION ZONE	30%	10%	Variable % *2	
			Case A	Case B
Gateway	2,205	735	3,675 (50%)	735 (10%)
102nd	252	84	252 (30%)	84 (10%)
122nd	63	21	63 (30%)	21 (10%)
148th	136	42	136 (30%)	42 (10%)
162nd	0	0	0 (0%)	0 (0%)
172nd	0	0	0 (0%)	0 (0%)
181st	136	42	210 (50%)	42 (10%)
192nd	252	84	420 (50%)	84 (10%)
Gresham	945	315	1,575 (50%)	315 (10%)

*1 LRT headways assumed to be 10 minutes.

*2 Percent of feeder bus patron delivery capability noted to right in ( ). Refer to preceding text and Appendix I-B1 for explanation of variable % assumptions.

Operation and Accommodation of Feeder Buses: Two types of feeder bus operations are planned within Burnside station zones and each type would require different facilities arrangements. At the station zones with a high level of activity, i.e., Gateway and Gresham, off-street facilities would be provided. These could include bus berths adjacent to the light rail line, and a turnaround loop with bus layovers nearby. Station zones accessed by feeder buses on arterials would provide similar facilities at farside stops as illustrated in Figure 12. These stops would allow layover of two buses in each direction to assure coordination of feeder bus movements with LRT operations.

AUTOMOBILES

Park & Ride Supply and Demand

City policy dictated that park & ride facilities would not be provided at station zones from 82nd Avenue to downtown Portland--the Banfield Line. The capability of station zones on the light rail alignment between Gateway and Gresham to provide facilities for those patrons who would arrive by automobile, i.e., park & ride and kiss & ride activities, was established by evaluating the available 1990 capability of existing arterial streets to deliver auto traffic to the station zones, and the carrying capacity of suitable land parcels of low assessed value within station zones to provide long and short-term parking spaces. A summary of the process and findings is presented below. Refer to Appendix II-B3 for a more complete description of the steps taken and calculations.

To evaluate the 1990 capability of arterial streets in station zones to carry transit-generated automotive traffic, the unused "D" level traffic capacity for each arterial was established by comparing projected 1990 peak-hour traffic volumes with the carrying capacity of the existing configurations of these streets. Because the projected 1990 traffic volume data available when this analysis was made had taken into account all regional developments except the

Example 1

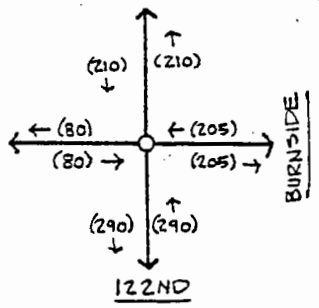
EVALUATION OF ARTERIAL STREETS TO ACCOMMODATE PARK & RIDE TRAFFIC

122ND AND BURNSIDE

STEP 1: Access Arterials Characteristics

Access Street	R.O.W. Width	Paved Width	"D Level" Capacity as Constructed	"D Level" Capacity Within R.O.W.	(ADT) 1975 Traffic	% Existing Capacity 1977	(ADT) Projected Traffic 1990	% Existing Capacity 1990
122nd	90'	4 lanes 76'	28,800	30,000	24,300	84%	24,600(N) 23,000(S)	85% 80%
Burnside	80-100'	2 lanes 36'	12,000	12,000	8,500	71%	7,900(E) 10,400(W)	66% 87%

STEP 2: Directional Capacity Evaluation



Total Available Peak Hour Capacity: (inflow or outflow) 500 (122nd) + 285 (Burnside)= 785

Potential P&R Vehicles: 50% X 785 = 392

Capacity Deficiencies: 122nd is projected to run at 85% capacity (N) and 80% capacity (S). Burnside is projected at 87% (W) in 1990.

Assumed Directionality of P&R Traffic: 80% would use 122nd (N & S) 20% would use Burnside (E & W)

STEP 3: Supportable Lot Sizes

Lot Size	Required 122nd	+ or -	Required Burnside	+ or -
1000	400	-150	100	+43
500	200	+50	50	+93
300	120	+130	30	+113
100	40	+210	10	+133

operation of the LRT, 50% of the unused peak-hour arterial capacity was allocated for park & ride automobiles, and 50% was allocated to kiss & ride automobiles and feeder bus traffic. Assumptions were made on the probable percentage of peak-hour park & ride traffic which would approach station zones on each access arterial. This "directional capacity" was then compared with the assumed directional traffic demand which would be generated by a range of lot sizes (100 spaces to 1000 spaces) to ascertain the capability of the arterial streets providing access to each station zone to accommodate the number of automobiles from parking lots of various sizes. Example 1 illustrates the process.

The projected 1990 traffic volumes on arterial streets did not take into account the traffic which would be generated by higher intensity redevelopment in station service areas. This additional traffic must be considered when detailed analysis of local traffic congestion is made in station zones, but was assumed not to significantly affect the previously described arterial streets capability analysis.

To establish the storage capacity of the station zones, parcels within zones which Multnomah County had indicated were of low assessed value, i.e., high susceptibility for redevelopment, were analyzed by size, character, and spatial location with respect to the probable LRT platform siting. A judgment

Example 2

EVALUATION OF LAND PARCELS IN STATION ZONES TO ACCOMMODATE PARK & RIDE ACTIVITIES

122ND AND BURNSIDE

PARCEL ANALYSIS:

Parcel	Suscep. & Code	Suscep.	Size	# Cars	Existing Use	Adjacent Uses	Street Access.	Pedest. Access to LRT	Land Bank
A	X		1.5 Ac 65,200 sf	163	Commercial	S.F.(W) Major Com.	Excellt.	Excellent	+
A		X	1 Ac 44,400 sf	109	"	"	"	"	"
B	X		7.6 Ac 328,800 sf	822	Vacant	S.F.(E) Major Com.	Excellt.	Excellent	++
C	X		2.3 Ac 100,000 sf	250	SF Resid.	S.F.(W) Comm.	Excellt.	Poor	±
C		X	2.75 Ac 120,000 sf	300	"	"	"	Poor	"
D	X		2.3 Ac 100,000 sf	250	SF Resid. Minor Comm.	S.F.(W) Commer.	"	Excellent	++
D		X	2.75 Ac 120,000 sf	300	"	"	Excellt.	"	"
E	X		.25 Ac 11,050 sf	27	SF Resid.	SF Resid.	Good	Poor	-

NOTE: E susceptibility questionable in aerial.

JOINT USE OPPORTUNITIES:

EXISTING: Possibilities exist in existing commercial parking lot adjacent to Burnside in northeast quadrant. Further possibilities at vacant service station and/or large vacant site in southeast quadrant. None west of 122nd Street.

FUTURE: Above, plus significant possibility of shared parking with development of large vacant site in southeast quadrant.

STATION ZONE COMPATIBILITY: At and near the intersection, 122nd Street divides significantly different land uses/activities. Major commercial developments lie east of the street, single family residential and marginal commercial to the west. The predominant auto-oriented commercial/service uses, large undeveloped parcel at the intersection, and indicated susceptibility of eastern land suggests that this station zone would be highly compatible with Park and Ride facilities.

was made of the overall suitability of the existing area character to be compatible with park & ride and kiss & ride facilities, and an assessment of joint use of existing and proposed parking lots was made. Example 2 illustrates the type of data collected on land parcels for each station zone.

Park & Ride Allocations

At the conclusion of the park & ride capacity study, it became evident that so much park & ride capacity existed throughout the Burnside segment of the LRT that guidance on the appropriate system-related quantity of parking would not be forthcoming from the analysis. The findings of the capacity analysis, however, presented an excellent data base and parameters for a parking program based on providing a specified percentage of total LRT ridership. Computer modeling of LRT ridership potential at that time indicated that auto access passengers could provide approximately 30% of the total LRT ridership of which fifty percent (50%) was assumed to be park & ride, 50% kiss & ride. Using the high range LRT capacity of 6500 passenger/hour in one direction and the assumption that peak hour loadings represented approximately 68% of peak period activity, it was calculated that 1672 parking spaces would be required to accommodate the peak hour park & ride transit users. Twenty-five percent (25%) additional parking spaces were added to this total to accommodate midday park & ride, handicapped patrons and the design load factor. These 2093 spaces were allocated to station zones along the alignment according to a "capture" strategy which anticipated approximately 30% of the park & ride facilities in the Gateway/122nd area, 30% at the Gresham terminus, and the remainder distributed in the middle segment of the line as shown in Table 15.

Table 15

BURNSIDE BRANCH PARK & RIDE ALLOCATION
(# Parking Spaces)

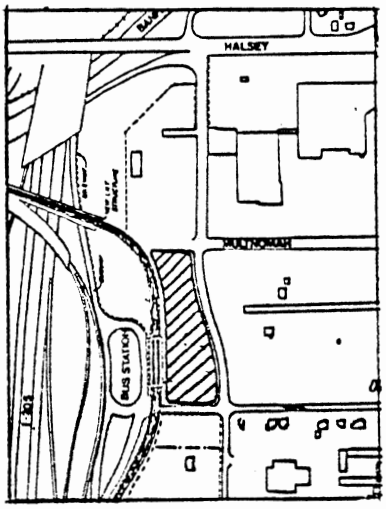
	Gateway	102nd	122nd	148th	162nd	172nd	181st	192nd	Gresham	Total
Peak Period	334	0	200	0	200	0	200	238	500	1672
Midday/ Handicapped	84	0	50	0	50	0	50	62	125	421
Total	418	0	250	0	250	0	250	300	625	2093
% Total	20%		12%		12%		12%	14%	30%	100%

Review of susceptible land in station zones identified in the capacity analysis in light of the parking demand resulting from the systems allocation established which parcels on the LRT alignment would be designated for park & ride development.

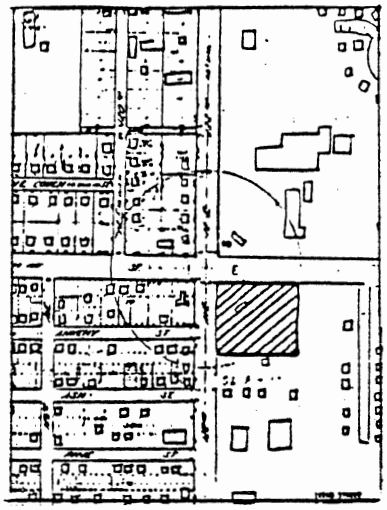
Figure: 17

DESIGNATED PARK & RIDE LOCATIONS

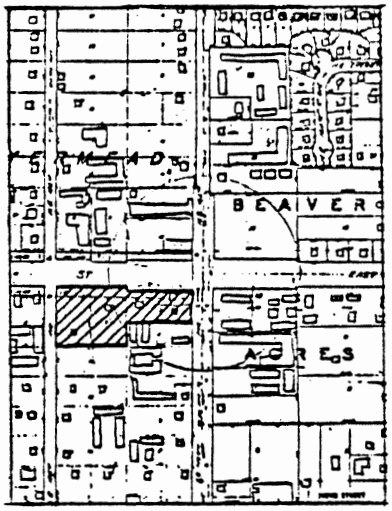
BURNSIDE LRT CORRIDOR



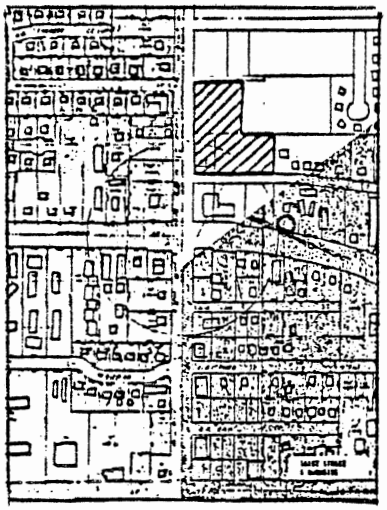
GATEWAY CENTER



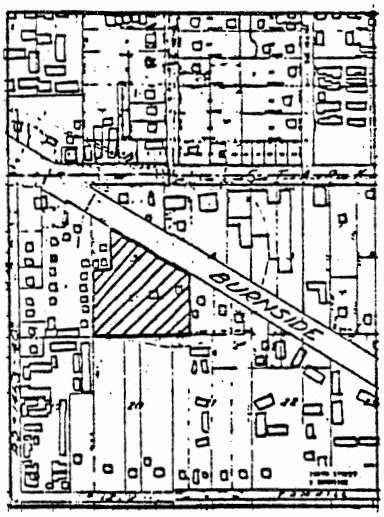
122ND & BURNSIDE



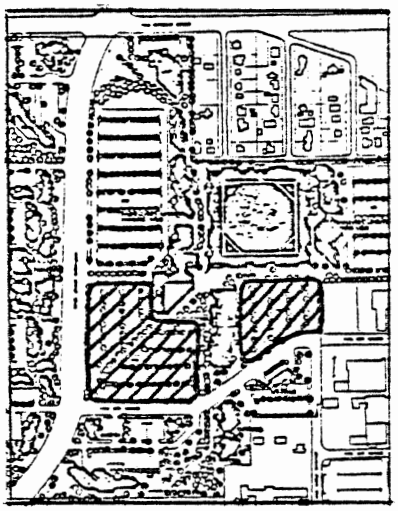
162ND & BURNSIDE



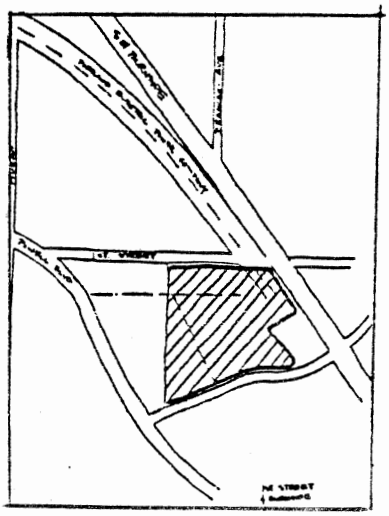
181ST & BURNSIDE



192ND & BURNSIDE



FAIRGROUNDS



(Alternative Gresham Location)

FIRST & BURNSIDE

Table 16

CHARACTERISTICS OF SITES DESIGNATED FOR* P & R PARKING LOTS ON BURNSIDE BRANCH

P & R SITE	DISTANCE FROM INTERSECTION	1976 ASSESSED VALUE	EXISTING USES	DISLOCATION
Gateway	300'	-	Vacant	None
122nd	300'	$343,670	Vacant	None
162nd	400'	$55,520	Residential	4 Resi.
181st	450'-600'	$100,900	Resi/Vacant	1-2 Resi.
192nd	250'	$120,510	Resi/Vacant	1 Resi.
Fairgrounds	400'	Shared use of parking lots		None
(Alternative Gresham Location)				
1st. Str. Burnside	300'	$162,750	Mostly Vacant	1 Comm. 3 Small Structures

*Refer to Appendix II-B4 for complete discussion of P & R site selection.

Kiss & Ride Facilities

Study of kiss & ride facilities provision within station zones was less complicated than the park & ride analysis due to the temporal nature of the activities. In general, during the park & ride study, arterial access streets to station zones on Burnside were shown to have adequate 1990 capacity to accommodate traffic created by kiss & ride activities. The potential for local congestion around platforms due to auto and bus movements is a separate issue which must be addressed later in the traffic planning and design of zones. Kiss & ride facilities within station zones were envisioned as temporary parking spaces adjacent to a waiting area, e.g., a sidewalk, with direct pedestrian access to the LRT platforms and bus stops. Should kiss & ride demand exceed the capacity of these temporary spaces, midday park & ride areas, which would be empty during the a.m. and p.m. peak hour periods, could be used to accommodate such momentary kiss & ride overflows. At Gateway and Gresham, kiss & ride facilities would be located off-street within the station zones parking areas. At the other Branch station zones, temporary parking areas would be provided on Burnside parallel with the LRT platforms as illustrated in Figure 12. If the average kiss & ride dwell time at these temporary parking spaces were equal to one-half the proposed LRT headway, i.e., 5 minutes, each space could accommodate 12 kiss & ride vehicles

per hour. Patronage modeling of the A-90-3 LTP-Parabolic network has projected the following kiss & ride demand during the p.m. peak hour in 1990: Gateway + 102nd - 128 cars; 122nd + 148th - 272 cars; 162nd + 172nd + 181st + 192nd - 263 cars; Gresham - 15 cars.

PEDESTRIAN BICYCLISTS

Walk In - Walk Out Patronage

The final means of station zone access analyzed for the Burnside LRT dealt with pedestrian movements to and from the platforms. Pedestrian movements were assumed to include bicyclists. Pedestrian movements would occur between station zone facilities, e.g., LRT platform to bus stop, kiss & ride area to LRT platform, and between the station zone and surrounding land uses. Safe and convenient pedestrian movements within and around station zones will be essential to the perceived and actual success of the light rail system. Priority of movements must be given to pedestrians over vehicles at station zones to enhance patronage capture and satisfaction.

Tri-Met patronage modeling has projected an order-of-magnitude estimate of the 1990 p.m. peak hour pedestrian movements associated with transit operations. Table 17 contains the results of this modeling. It should be noted that this modeling effort did not account for the Revised Land Use case described in the Land Use report.

Table 17

PEDESTRIAN PATRONAGE BURNSIDE BRANCH LRT
(Network: A-90-3 LTP-Parabolic)
1990 - P.M. Peak Hour*1

STATION ZONE	WALK IN	WALK OUT
GATEWAY	143	240
102ND	27	83
122ND	0	0
148TH	16	22
162ND	5	20
172ND	0	0
181ST	56	228
192ND	26	79
GRESHAM	382	335

*1 The model projections of demand and location of demand are approximate only. The zero demands indicated for 122nd and 172nd resulted from a deficiency in the modeling and may not accurately reflect demand at these locations.

The deficiency of the Tri-Met modeling projections in not accounting for the Revised Land Use case reallocations was partially overcome by supplementary study of the LRT ridership which could be generated by intensified residential redevelopments within station service areas (1/4 mile). Along the Burnside alignment the peak-hour ridership was calculated as the most critical LRT loading situation and factoring of walk-on ridership was not made to reflect varying directions of LRT travel and mid-trip transfers. Other walk-on or walk-off patronage generated at station zones by adjacent land uses, e.g., commercial, employment, was not considered. The sources for 1990 residential populations around station zones was the Tri-Met Land Use report. 1990 reallocations in this report were made with the assistance of the City of Portland Planning Bureau and the Multnomah County Planning Department. The total number of 1990 households within station service areas along Burnside was projected as 14,131.

A limited Eastside survey of bus ridership within 1/4 mile of bus routes during 1970 by Tri-Met found that 31 peak period transit trips were generated by each existing household per year. On a daily basis, this would suggest that there would be approximately one peak period transit rider for every ten households within 1/4 mile of a transit line in 1970. Ridership has increased since 1970, and it is estimated that the present household trip generation factor may be approaching one peak period transit rider for every five households. The range of system-wide walk-on ridership potential from projected 1990 households in the Burnside corridor is presented in Table 18. A process explanation has been placed in Appendix II-B5.

Table 18

RANGE OF POSSIBLE BURNSIDE LRT PEAK HOUR WALK-ON RIDERSHIP BASED ON 1990 HOUSEHOLD TRIP GENERATION*1
(Data Source: Land Use report, Tri-Met, 1977)

	Riders/Household/Peak Hour					
	1/3	1/5	1/6	1/8	1/10	1/16
BRANCH TOTAL	2822	1694	1411	1059	847	530
GATEWAY	268	161	134	101	80	50
102ND	233	140	167	88	70	44
122ND	241	145	120	91	73	45
148TH	220	132	110	81	66	41
162ND	361	217	181	136	108	68
172ND	391	234	196	146	117	73
181ST	311	187	155	117	94	58
192ND	338	203	169	127	101	64
GRESHAM	459	275	229	172	138	86

*1 Table considers possible LRT ridership generation only from projected residential land uses. Walk-on patronage may be greatly understated at station zones where large commercial or office developments are scheduled in the future.

6. STATION ZONES ON THE DIVISION BRANCH

6.1 INTRODUCTION

A Division Street alignment is under study as a second alternative branch for the light rail transit strategy proposed for the East Side of the Portland region. This branch would link with the Banfield Line at the Gateway Center in the west, pass south along I-205 to Division Street and then east in the median of Division Street to Gresham.

This study identifies a preliminary set of LRT station zone locations along the Division branch by analyzing the urban/suburban factors in the corridor which would contribute to transit patronage generation. Designated station zones are described as to the magnitude of anticipated transit facilities, and the anticipated volumn and frequencies of pedestrian and vehicular activities within these zones.

6.2 SUMMARY

The Division Street corridor presents an environment of auto dominant commercial development. The level, type and distribution of development suggests limited short-term transit support and there is a correspondingly small amount of susceptible property for major transit supportive development. The abundance of auto-oriented strip development presents modest, long-term opportunity for redevelopment if a strong transit element were to be introduced and be reinforced by land use controls of the local jurisdictions.

A total of ten station zones have been proposed on the Division Branch of the LRT: three along I-205, six along Division Street, and a primary and alternative zone in Gresham. A profile of these station zones is provided in Figure 19.

Division station zones would be served by all patron delivery modes, e.g., feeder bus, automobiles and pedestrian/cyclist activities. Peak hour feeder bus patronage would be highest at I-205 station zones, i.e., Gateway - 1265 projected patrons, Mall 205 - 179 patrons, Division - 339 patrons, and in

Table 19

BANFIELD/DIVISION LIGHT RAIL TRANSIT
STATION ZONE CHARACTERISTICS
(1990 P.M. Peak Hour)

DESIGNATION	LOCATION	Type	Mode Dominance*2	Projected Demand P/R Vehicles*1 Per Hour	Total P/R Spaces Provided	Projected P/R Patrons Per Peak Hr*1	Projected K/R Vehicles Per Peak Hr*1	Projected K/R Patrons Per Peak Hr*1	Proposed Feeder Buses Per Peak Hr*1	Projected Feeder Bus Patrons Per Peak Hr*1	Projected Pedestrian Patrons Per Peak Hour*1
CBD 1		A									
CBD 2		A									
CBD 3		A									
CBD 4		A									
CBD 5		A									
Coliseum		C				(See Table 1 for Downtown and Banfield Line characteristics)					
Union/Grand		B									
Lloyd Center		A									
Hollywood		A									
60th		C									
82nd		C									
Gateway	99th/Pacific	A	Auto	371	425	482	158	205	132	1265	510
Mall 205	I-205/S.E. Main	A	Auto	55	250	72	23	30	84	179	269
Division	I-205/E. Division	B	Transit	234	250	304	100	130	60	339	189
122nd	122nd/E. Division	C	Auto	237	250	308	100	130	18	7	173
136th	136th/E. Division	C	Transit	5	0	7	2	3	12	1	5
148th	148th/E. Division	C	Auto/ Transit	113	200	147	48	62	24	18	134
170th	170th/E. Division	C	Transit	28	0	37	8	10	12	0	475
182nd	182nd/E. Division	C	Auto	151	250	196	64	83	24	59	373
199th	199th/E. Division	C	Transit	5	200	7	2	3	12	1	1
Gresham A	Fairgrounds	A	Transit	468	625	608	201	261	78	332	768
Gresham Alternative	1st/E. Burnside	B									

SOURCE: Tri-Met Model V-90-3, ULOAD, 1977.

*1 Number equals the sum of arrivals and departures during the peak hour.

*2 Consideration unique to Division Branch. See report section 6.

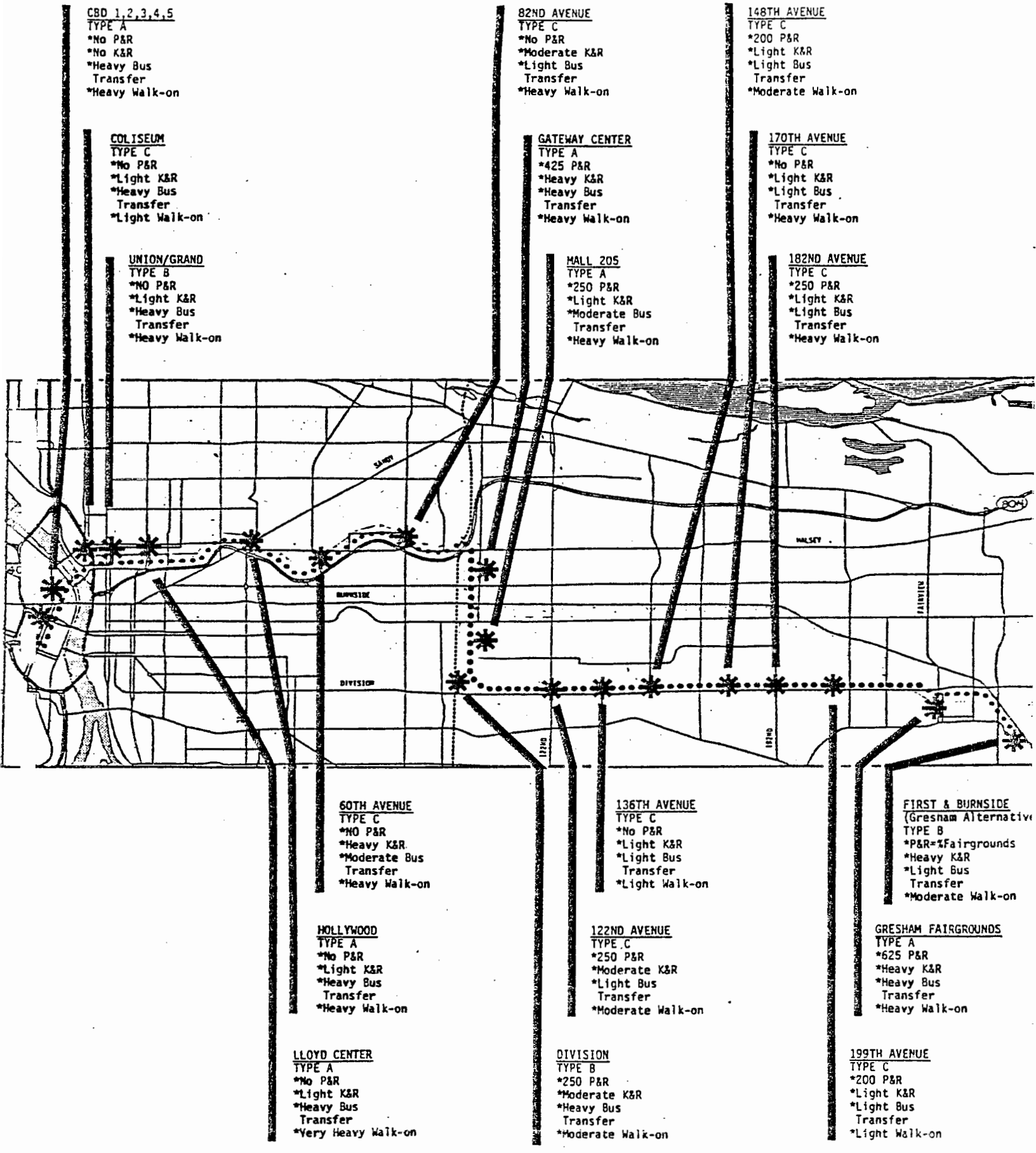


Figure: 18
BANFIELD/DIVISION LIGHT RAIL TRANSIT STATION ZONES

Gresham - 332 projected patrons. Kiss & ride and park & ride activities would occur similarly throughout this LRT branch with over 850 peak hour park & ride patrons and over 350 kiss & ride patrons projected for the three zones along the I-205 freeway. Pedestrian/cyclist activities, as a reflection of land use patterns, are projected to occur in 1990 in about the magnitude and with the same distribution as automobile-using patrons. Appendix III-B1 contains the modeling activity summary for the Division branch.

Figure 18 illustrates the typical relationships anticipated within station zones along the Division LRT. Features of the arrangement include split LRT platforms, far-side bus stops on arterial cross streets and on Division, and kiss & ride waiting areas beside the platforms on Division. Refer to Section 8 of this report for a more thorough discussion of station zone component relationships.

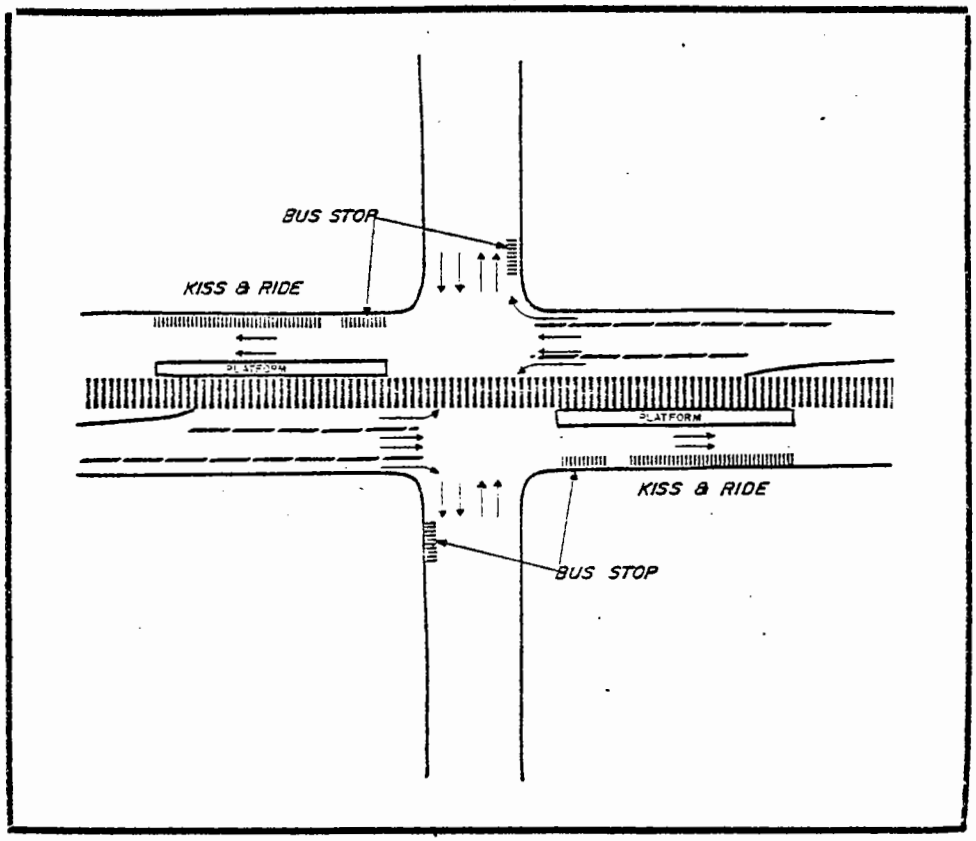


Figure: 19

TYPICAL INTERSECTION

LRT on Division with provision for feeder bus stops and kiss and ride short term parking.

6.3 SELECTION OF STATION ZONES

DIVISION STREET AS A TRANSIT CORRIDOR

Division Street east of I-205 is a distinctly different transit environment than the Burnside alignment previously discussed. Whereas Burnside Street at present and in the anticipated future is a minor, two-lane community arterial street, Division Street continues to be recognized as a major, four-land intra-county arterial, which will be supported by a significant interchange at I-205. The introduction of LRT into Division Street would be viewed as the superimposition of two, dominant movement systems within one transportation corridor--

a strategy similar to that which places the LRT or bus transitway in Sullivan Gulch next to an upgraded Banfield Freeway. Theoretically, such a superimposition would have the practical advantages of least community disruption when the LRT is developed, and the possibility of capitalizing on existing higher intensity land uses and activities along such an established transportation corridor for LRT patronage.

The existing land use pattern along Division is highly auto-oriented, but questionable in transit supportive quantity and quality. The principal mixed commercial center (122nd and Division) contains only about 200,000 square feet of building area. According to the Draft Multnomah County Framework Plan, such a center would be classified "community" (smaller than "regional" = 250,000 to 750,000 square feet GLA, and "super regional" = greater than 750,000 square feet GLA) and would have a market area population of 37,500 to 125,000 people. Such a center would not appear significant on a regional transit line such as the proposed LRT. To further illustrate the existing limitations of the Division transit "attractors", the total building square feet of the three major mixed commercial centers on Division (i.e., 122nd, 162nd, and 182nd) only approximate the building square footage found in the K-Mart and adjacent shopping center along Burnside Street near Fairview in northern Gresham.

Division, as a major traffic street, has spawned innumerable small strip commercial land uses throughout its length from I-205 to 182nd Avenue. The Draft County Framework Plan, 1977, states that such uses will not be encouraged in the future, rather mixed commercial uses are to be clustered along arterial streets. Though this Framework policy is very transit-supportive, even if these strip commercial uses are reclassified as non-conforming uses, it will take some time to remove them from Division. The historic recognition and use of Division Street as a principal traffic arterial by the planners and the public has led to almost total build-out along Division and, therefore, a lack of susceptible land for redevelopment along the corridor. Presumably, this condition is the result of marketing pressure along this high access, high visibility auto-oriented street. The existing pattern of higher value land parcels and improvements, such as the strip commercial previously discussed, and the lack of undeveloped parcels between I-205 and 182nd, suggest that future redevelopment of transit-supportive intensified land uses would be very much of an infill process--a difficult type of redevelopment to successfully manage. A second type of "hard edged" or permanent land use along Division is institutional activities, principally schools. Analysis of the Division corridor has shown that public and private schools are frequently located close to the street, e.g., within 200 to 250 feet, and often occur in one of the quadrants of principal intersections (two at 148th, one at 162nd and 182nd). The rationale for the original placement of these schools has not been researched, but a transit policy to remove or alter them would appear ill-advised. Their presence near the proposed LRT alignment would preclude higher intensity redevelopment on these sites.

Division raises urban design issues for LRT due to its arterial characteristics. All auto-oriented land uses along the street have been obligated by the Multnomah County land use controls to provide ample automobile parking stalls for their customers. Parking lots have logically been placed next to the street with the business establishments behind. This situation is most pronounced in larger mixed use centers at principal intersections--logical transit stop locations. Such a physical disposition of parking and buildings is the anti-

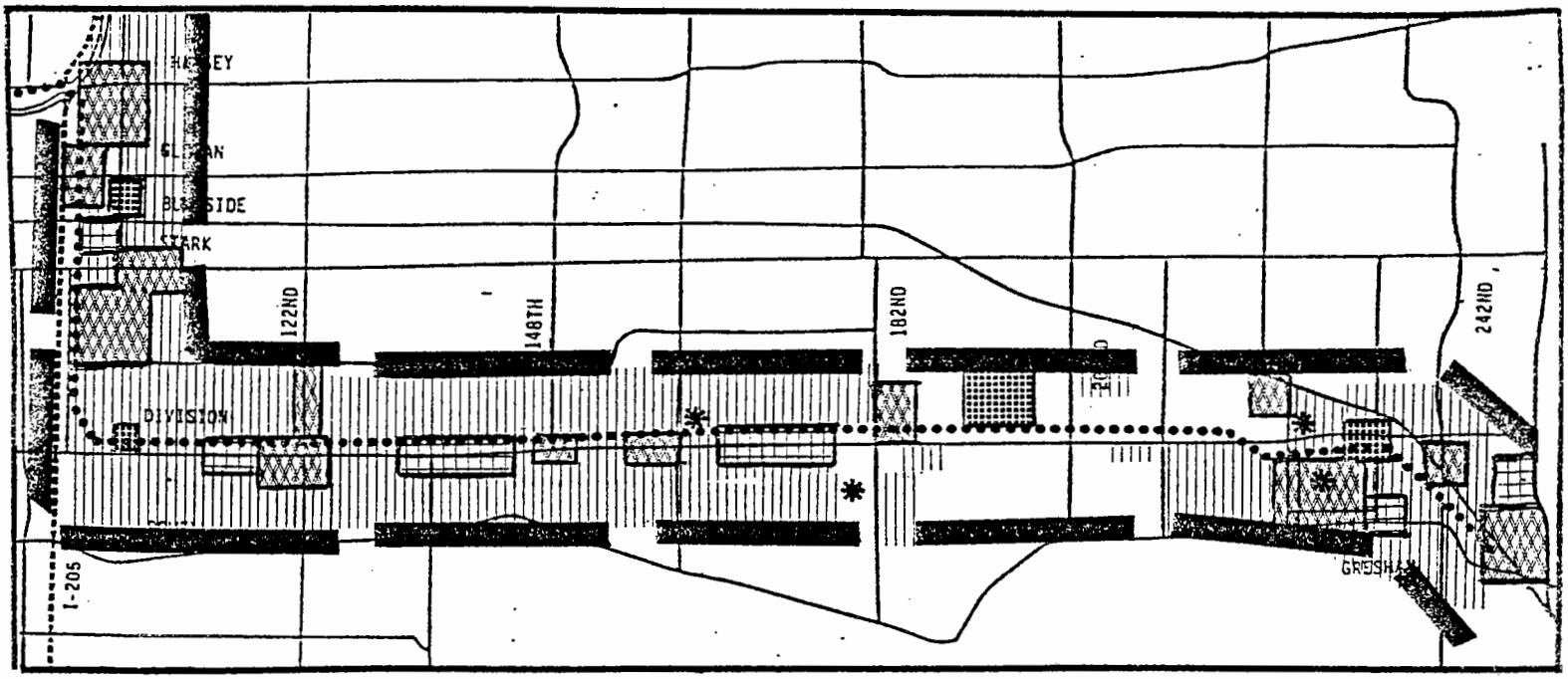


Figure: 20

EXISTING LAND USE - DIVISION LRT

Commercial
Industrial
Single Family Dwellings
Multi-Family Dwellings
Community Services
Undeveloped Land

thesis of the pedestrian oriented environment sought for transit station service areas. Further complicating the pedestrian environment transit objective is the situation of the LRT in the median of a highly trafficked, four-lane arterial street. In contrast with the Burnside alignment, pedestrian crossing strategies on Division would probably have to be more sophisticated, hence more costly. In any case, the continual superimposition of major traffic and a major transit alignment at intersecting arterials on Division would probably preclude pedestrian sensitive environments around these LRT stops. Greater environmental potential is foreseen for mid-arterial station zones such as those at 136th and 170th. The coincidence of high auto and transit access may create enhanced re-development emphasis along the corridor in the mid or longer term future.

STATION ZONE STRATEGY FOR DIVISION

The previous discussion of Division Street characteristics presented a somewhat negative, but not atypical context for the introduction of a mass transit system. In light of the perceived transit opportunities and constraints along

Division, a bimodal strategy was developed for the evaluation of future land use scenarios on Division. The attributes of high automobile access would continue to support certain types of land uses. The task in locating LRT stops and anticipating the redevelopment of transit supportive land uses was seen as carefully fitting the placement and scale of transit facilities into this auto-dominated environment in such a way that traffic and transit were mutually supportive. The strategy was conceived as dynamic. An initial set of transit emphasis and auto emphasis points would be identified for the short term (1990), but latitude would be acknowledged for the longer term future when as yet unpredictable events may cause a shifting of emphasis from auto to transit at certain points.

The 1990 LRT stop location strategy was to designate moderate facilities at points of existing auto-dominated mixed community commercial higher intensity residential activities, and to focus transit emphasis around more complete transit facilities at stops located at the few points on Division where transit supportive redevelopment would appear most realistic in the short term. Stops at the mixed commercial-residential centers would acknowledge the present auto dominance of these centers, but would serve to provide transit system connectivity with feeder bus routes on north-south arterials, e.g., 122nd, 148th, 182nd, and Gresham. These stops would be strategically situated to capitalize on a public or business community shift twoard transit usage in the future. In the interim, resources could be focused on non-auto dominated LRT stop locations, e.g., 136th and 170th, to initiate transit supportive land use intensifications.

EVALUATION OF THE DIVISION CORRIDOR

As with the Burnside LRT alignment alternative, a systematic evaluation of the existing and probable future transit and traffic-supportive factors was undertaken for the Division corridor. The appropriate station zone locations for the I-205 segment of the Division branch -- Gateway, Mall 205 and Division -- were established by past planning efforts (see Section 7 for discussion). The Division station zone at I-205 would appear to have the added role of intercepting northbound auto and feeder bus patrons from the south and southeast. Along Division proper, arterial intersections were recognized as the most accessible locations for station zones (similar to the locational rationale used in the Burnside alignment evaluation), but were also perceived as the most intense traffic activity areas due to Division's arterial role in the county. Arterial intersections along Division were also found to be the location of principle developments—created by the high auto accessibility. Hence, arterial intersections were seen to have both supportive and detrimental characteristics for the types of activities associated with LRT station zones. Unlike the Burnside corridor analysis, arterial intersections along Division were not accepted as the only appropriate locations for LRT station zones.

The corridor segment along Division from 99th east through the 112th Street intersection would not have appreciable transit-patronage opportunities for the 1990 period. The land use pattern of principally single family houses is interrupted by two major features, i.e., Kelly Butte(S) and a large gravel pit (N), which serve to break up neighborhood continuity and limit the land area available for community development.

The existing single family neighborhoods are fringed by mixed, small strip commercial and light industrial uses along Division. The 112th and Division intersection is, presently, very low key, featuring a fast food restaurant, gas stations and similar auto dependent uses. Limited multi-family redevelopments have occurred around this intersection in compliance with the previous County comprehensive plan. Though several areas of susceptibility exist in the segment, the anticipated quantity and quality of transit-supportive redevelopment in 1990 was interpreted as low. A station zone at 112th and Division would make sense from an operational standpoint--i.e., 112th is about three quarters of a mile from I-205 and one-half a mile from 122nd. Therefore, in 1990 reservations should be made at this intersection which will allow the establishment of a station zone at 112th in the post-1990 period when justified by patronage-generating redevelopment.

The principal urban feature in the corridor segment between 115th and 129th Streets along Division is the complex of auto-generated mixed commercial, multi-family residential and office uses at, and around the 122nd intersection. Though not vast on a regional scale, only classified as a "community" commercial center in the County Draft Framework Plan, the area represents the most significant existing transit patronage attraction area on the Division alignment with the exception of Gresham. The intersection, quite naturally, enjoys a high level of accessibility and a feeder bus route is proposed to run on 122nd. Land use redevelopment to more intense use, principally multi-family residential, is in evidence and the characteristics of nearby single family or vacant parcels suggest that transit-supportive redevelopments would continue to occur in the area. For these reasons, an LRT station zone would be developed at 122nd and Division in 1990 under a major auto/minor transit strategy.

Interpretation of the apparent land use and redevelopment activities east of 122nd identified Division at 136th as an area of high local potential for transit patronage generation. The dynamic process of intensified land use redevelopment is well represented by newer, large townhouse and apartment developments and the remainder of the station service area has numerous instances of large lot, lower improvement value single family residences. North and south auto access to the area, though possible along 136th (N) and 135th (S), would be circuitous. The County Comprehensive Plan allows limited commercial and extensive multi-family uses in the area. 136th would be seen as one of two station zone locations on Division where transit dominance could be established via a wholly supportive intense redevelopment pattern and strong pedestrian linkages between the LRT platform and these patronage generators.

Within the next corridor segment, 148th and Division has a combination of existing land uses and accessibility to support the light rail transit. In the station service area, 1/4 mile around this intersection, there are approximately 350 apartments and an 80-unit mobile home park. Commercial land uses, though allowed by the Comprehensive Plan and zoning, have not matured--being presently represented by strip commercial, a small grocery store ($\pm$ 18,000 sq. ft.) and a moderately large restaurant and bar. Part of the commercially zoned land in the southwest quadrant of the intersection is vacant, but, according to County staff, development plans for this parcel have been approved. The area would be accessed by arterial streets and would be serviced by a feeder bus line in the 1990 network. Though the current signs of transit support are good at 148th, the area suffers from lack of future potential due to constraints on land availability. Viable institutions are interpreted as "fixed" land uses.

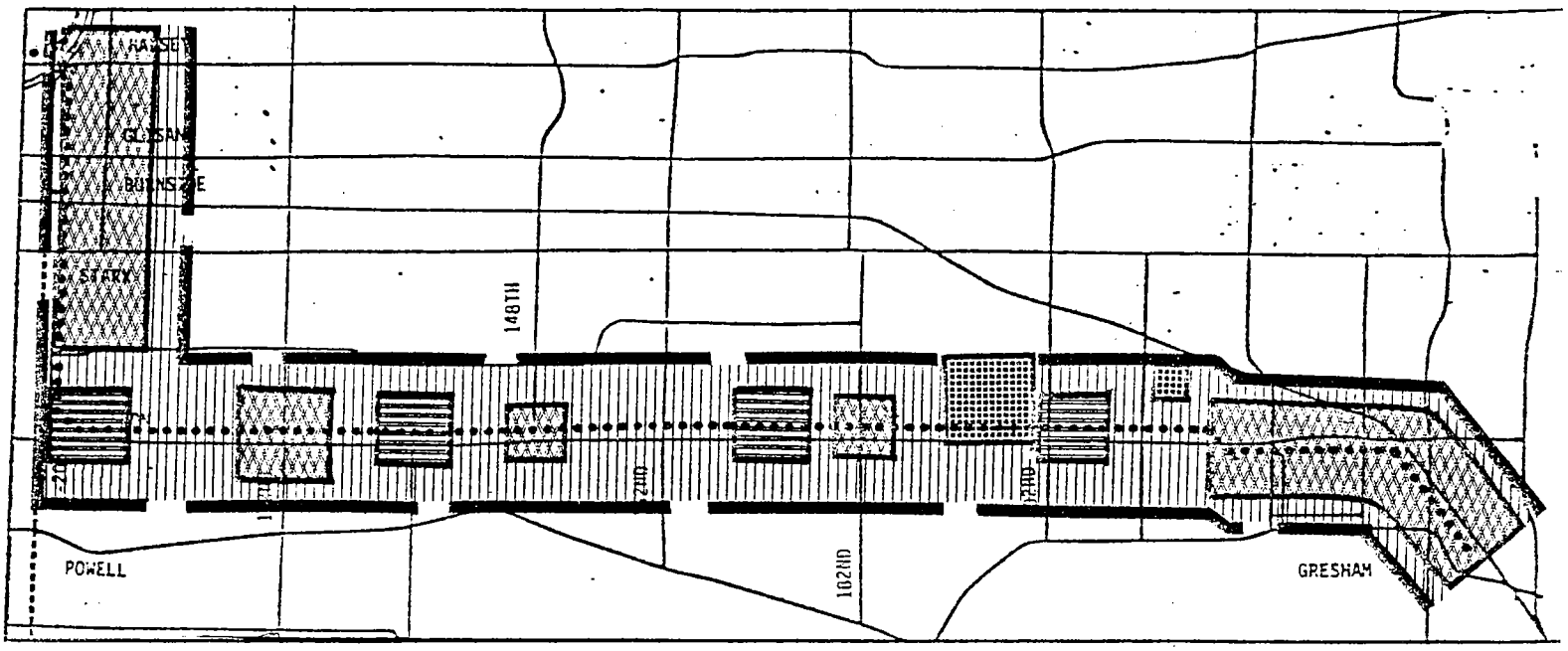


Figure: 21 ANTICIPATED 1990 ACTIVITY PATTERN - DIVISION LRT

High Intensity Commercial/Multi-Family Residential Corridor

Major Concentration Commercial/ Multi-Family Residential

Major Concentration Multi-Family/Local Commercial

Major Concentration Industrial

Single Family Neighborhoods

Sub-Regional Commercial Center

Schools are located close to the 148th intersection in the northeast (private) and southwest (public) quadrants. These institutions are understood to be integral parts of the surrounding, substantial single family neighborhoods. They would not produce or attract significant transit patronage. They would preclude redevelopment of relatively large land areas near platforms and, by their nearness to the intersection, would interrupt any intensive transit-supportive land use patterns which may be initiated as a result of the LRT development in the future. 148th and Division would be a suitable location for the development of an LRT station zone under a strategy wherein transit and auto dependence are considered equal in the foreseeable future.

The 162nd and Division intersectional area in the next segment of the corridor displays many of the characteristics found at 148th, but it is recommended that the development of a station zone at this location be delayed until Phase II in the post-1990 period. Existing north-south auto access is comparable to 148th, but no feeder bus line is scheduled for 162nd in 1990. Existing commercial development is somewhat more cohesive, but remains very small convenience shopping (± 15,000 sq. ft.). The northeastern quadrant of the intersection is completely occupied by a school. The other quadrants are occupied by single family residences, modest apartment units and miscellaneous strip

commercial along Division. Some susceptability has been identified through Multnomah County staff analysis, but insufficient signs exist to suggest significant transit supportive redevelopments in the near term future. Adequate reservations should be made at 162nd to permit the establishment of an LRT station zone at a time in the future when justified by the intensity of activities in the area.

One of the principal constraints on the establishment of a station zone at 162nd and Division during Phase I of the LRT is the truly transit-supportive conditions found at 170th and Division during evaluation of the corridor. The principal criteria justifying the development of a station zone were:

(1) The existence of transit supportive land uses within 1/4 mile of the probable platform location and

(2) That a high probability of transit supportive future developments exist within this same area.

170th would appear to have a unique combination of these attributes--very similar to those found at 136th and Division. North of the 170th location lies a 300 unit mobile home park, assumed to be occupied by persons who would most benefit from transit accessibility. Northwest of the 170th intersection is a new movie theater--a marginal, but possible, transit patronage attractor. The most distinctive feature of the area beyond the existing pattern of land uses is the abundance of vacant and large, lower improvement value land surrounding the proposed platform location on the northeast, southeast, and southern sides. As with 136th, 170th could become an exemplary higher density, mixed use, pedestrian oriented transit nodal point. A station zone would be developed at 170th and Division during Phase I of the LRT to promote and support such a development pattern.

The 181st and Division area would be able to justify the establishment of a light rail station zone, but like 148th and 162nd, presents constraints on future redevelopment for transit supportive land uses. 181st and Division has enjoyed high auto accessibility for some time, yet this area is only about one mile south of the Rockwood commercial district on Burnside.

Consequently a "neighborhood" node of auto oriented commercial development has occurred in the northeast quadrant of this intersection (± 80,000 sq. ft.). The southeastern quadrant is used by a well-established auto dealer. The northwest and southwest quadrants are "soft" but constrained by the presence of a substantial single family neighborhood (NW) and two schools (SW). The remainder of the 1/4 mile station service area is occupied by established single family neighborhoods which would appear difficult to redevelop. Some intensification of the land use pattern would be permitted within the County Comprehensive Plan and a feeder bus route is scheduled to access the intersection in 1990, but significant changes in the present suburban pattern is difficult to visualize. A station zone should be established in the vicinity of 181st and Division under the major auto/minor transit strategy.

Until the recent past, the land area along Division between 181st and Wallula in Gresham had remained undeveloped--used for rural and extractive mining pursuits. As peripheral suburban pressure increased from both the County and Gresham edges, these land-dependent uses gave way to typical, lower intensity,

higher value suburban developments. This process of conversion is continuing at present, hence the existing pattern of land uses finds new subdivisions south of Division and extractive mining/vacant land with limited residential uses north of Division. The existing land use pattern holds little promise of generating significant transit patronage. The area would, however, appear to have unique opportunities for transit in Phase I and Phase II of the LRT development. There is no other area along the Banfield/Division alignment comparable to the land use pattern north of Division which is devoid of urban or suburban developments. Much as a manufacturer supports the development of a new product from the income produced by his established product line, it would not appear inconsistent to establish an LRT station zone in this segment of the corridor to optimize future land use patterns, while anticipating that the bulk of patronage and LRT revenue would be derived from the other twenty-two station zones on the line in the short term. There would be a definite

Table 20

SELECTED DIVISION CORRIDOR STATION ZONES

Stop Location	Stop Type	Station Zone 1990 Dominance		Park & Ride Spaces*1	Feeder Bus
		Auto	Transit		
Gateway	Major (A)	x		425	x
Mall 205	Major (A)	x		250	x
Division	Moderate (B)		x	250	x
112th	Phase II (Minor)	x			
122nd	Minor (C)	x		250	x
136th	Minor (C)		x		
148th	Minor (C)	x(equal)	x	200	x
162nd	Phase II (Minor)	x			
170th	Minor (C)		x		
182nd	Minor (C)	x		250	x
199th	Minor (C)		x	200	
Gresham (Fairgrds)	Major (A)		x	625	x
Gresham (East)	Alternative				

*1 For discussion of preliminary park & ride allocations on Division Branch, see Part 6.4 of this report.

short term purpose for a station zone in this area--the provision of ample park & ride facilities for the system. Such a purpose would appear most rational here, in an undeveloped area of relatively low land values surrounded by newer, and growing suburban developments. The platform would be placed immediately west of the Portland Traction right-of-way which crosses Division at approximately 199th and the patron parking area would be developed to the north. These facilities at this location could be modified to best accommodate the types and magnitudes of patronage flows generated by or attracted to the land uses which develop in the area. The prospects are exciting, in that manufacturing, office, multiple family residential and commercial uses would be permitted within the operable Gresham Comprehensive Plan and the existing zoning classifications.

From the Portland Traction station zone, the LRT alignment would continue east along Division to terminate either in the Fairgrounds site or in the East Gresham site. The locational rationale and transit supportive land use and circulation patterns for the Gresham station zone termini are discussed in Section 5 of this report dealing with the Burnside alignment.

THE SET OF STATION ZONES

Pursuant to the stop location strategies, and the analyses of the Division corridor characteristics previously discussed, the set of Division alignment station zones is presented in Table 20.

6.4 STATION ZONE ACTIVITIES

FEEDER BUS

1990 Service Connectivity Strategy:

The 1990 transit network assumes three modes of service: light rail, express bus and local bus. All three modes would be integral to and integrated with the transit network of the Division Street LRT alternative.

The function of the network would be to achieve optimum access to: (1) the LRT line; (2) express bus lines; (3) other local lines, and (4) local destinations. The station zones would become the transfer points which would enable these functions to be coordinated and optimized.

The LRT line would be the east-west trunk between Gresham and the CBD. Along its Division Street segment the LRT would be paralleled by a local bus line, which would accommodate patrons between the LRT stops. These bus riders could transfer to the LRT line at any of the Division Street station zones. Other feeder buses, operating on north/south arterials, would intersect the LRT at the station zones and would serve to broaden the effective width of the LRT service corridor.

Express bus lines operating on I-205 between Oregon City and Vancouver would parallel the I-205 segment of the LRT line with connections at station zones.

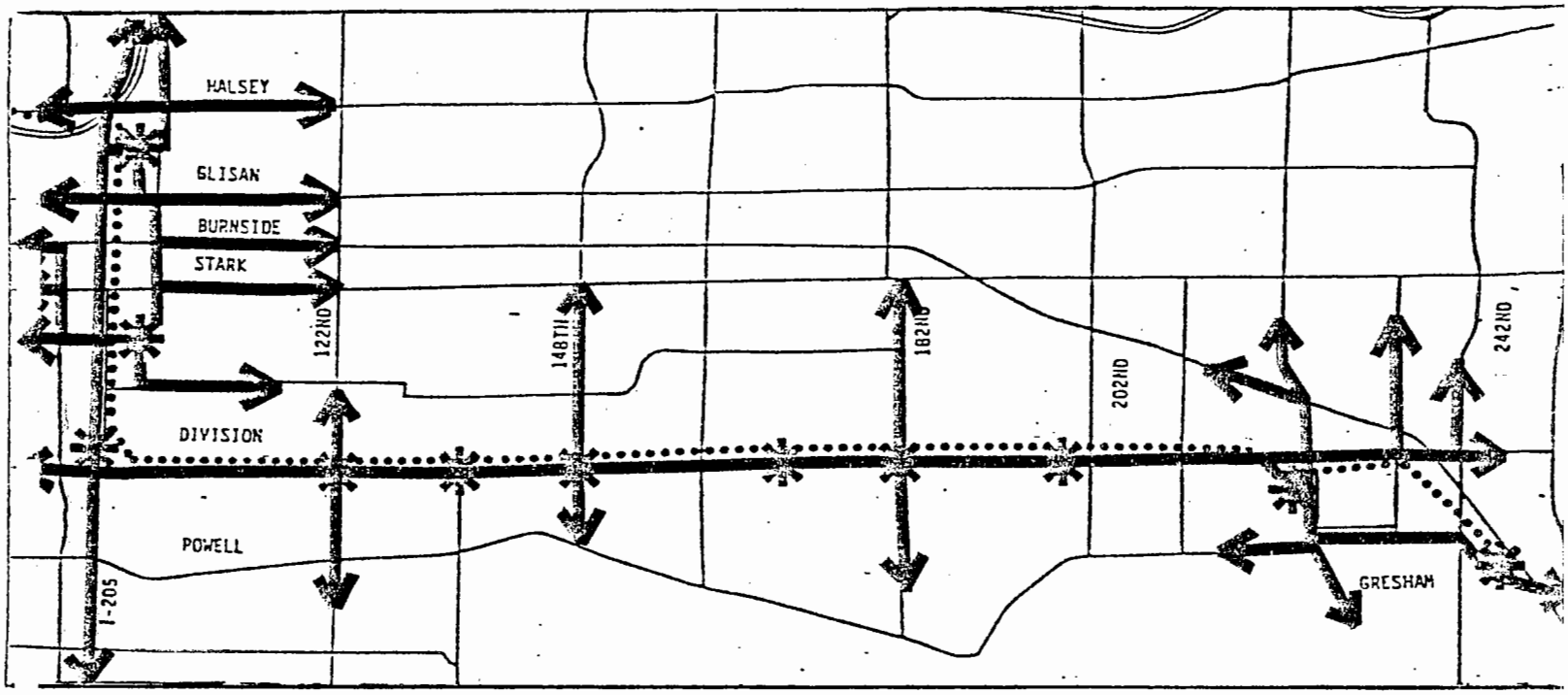


Figure: 22
PROPOSED FEEDER BUS ACCESS - DIVISION STATION ZONES

These common points would serve to interface the CBD oriented east-west LRT system with the north-south CBD by-pass corridor of I-205. Each of the I-205 segment station zones would also be a focal point of east-west local bus lines. These lines, operating under "timed transfer", would provide direct transit connection between the LRT service and neighborhoods as far east as Troutdale.

The Banfield segment of the Division Street LRT alternative would have the same feeder bus connections as discussed in the Banfield/Burnside LRT alternative.

Routings and Frequencies in the Division Segment

This section summarizes the feeder bus network which was the service base for the demand modelling performed by Tri-Met. Detailed feeder bus data has been placed in Appendix III-B2. Express bus service linking the I-205 corridor points of Oregon City, Sunnyside, Lents, Portland International Airport and Vancouver with the LRT corridor at the Division, Mall 205 and Gateway station zones would operate in peak hours with ten minute headway, synchronized with LRT operations. Bus service from east Multnomah County communities would access the LRT at Gateway via Halsey, Glisan and Stark (the latter via Mall 205 and I-205) with five and ten minute peak hour headways. Local feeder buses operating on Southeast Division parallel to the LRT line and north-south feeder buses intersecting Division at 122nd, 148th and 182nd would have "timed transfer" five and ten minute headways during peak hours. Local service into the Gresham station would be provided from all directions by a total of six feeder bus lines with peak hour frequencies also varying between five and ten minutes.

Potential Service Capacity and Projected 1990 Demand by Station Zone

The projected 1990 feeder bus ridership demand is taken from the V-90-3 modelling run, ULOAD Report 3 tables (Sept. 30, 1977). The potential service capacity of the 1990 feeder bus network was computed by multiplying the number of p.m. peak hour bus departures at each station zone based on modelled headways by 70 (maximum bus loading including standees). The number of buses on through-line routings was doubled to account for two-way operations through the station zone.

Table 21 shows the potential p.m. peak hour feeder bus capacities and their projected 1990 ridership. Appendix III-B3 provides this information by line and station zone.

Table 21

SUMMARY*1

FEEDER BUS CAPACITY VS. PROJECTED RIDERSHIP AT DIVISION STATION ZONES*2
(1990-P.M. Peak Hour)

STATION	Number of Lines Served	Number of Departing Buses During P.M. Peak Hour	Capacity (70 per bus)	Projected 1990 Ridership from Station Zone
Gateway	12	114	7,980	1,079
Mall 205	7	72	5,040	614
Division	5	54	3,780	586
122nd	2	18	1,260	9
148th	2	24	1,680	12
182nd	2	24	1,680	24
Gresham	7	51	3,570	288
TOTALS		351	24,570	2,612

SOURCE: Network V-1990-3 Demand Model, Tri-Met, September, 1977.

*1 See Appendix III-B3 for data by line and station zone.

*2 Projected 1990 feeder bus ridership from station zones during P.M. peak hour should not be confused with total feeder bus P.M. peak hour ridership.

Accommodation of Feeder Bus Activity within Station Zones

The greatest volume of feeder buses serving a station zone would be at Gateway, followed by Mall 205, Division/I-205 and Gresham. These four station zones would accommodate the feeder buses internally--that is, off-street and directly

adjacent to the LRT platforms. Typical operational diagrams of I-205 station zones are discussed in Section 7 of this report.

The Division Street station zones would be relatively uncomplicated in terms of feeder bus activity. The 122nd Avenue station zone would be served with eastbound and westbound local bus service operating parallel to the LRT on Division. Northbound and southbound buses intersect on 122nd Avenue. Stops for all four directions would be curb-side on the far side of the intersection. Figure 18 illustrated a typical arrangement of bus stops at such station zones as 122nd. The same arrangement could be valid for the 148th and 182nd Avenue station zones--each of which would have a single parallel line and a single intersecting north-south bus line.

It is assumed that there would be "no parking bus zones" designated at each stop along Division. These on-street bus areas would accommodate both feeder buses in operation, and those laying over to coordinate movements with LRT. Conventional shelters of a scale similar to those now in use by Tri-Met would be erected. Projected 1990 peak hour traffic volumes for all the arterials involved would not appear to warrant reconstruction of streets to provide bus stop turnouts in the short term. Explicit traffic data for the Division corridor is to be found in Appendix III-B4.

AUTOMOBILES

Provisions for Auto Using Patrons

Auto access to the transit services would be accommodated at most station zones along the Division LRT alternative. This would permit persons to: (1) arrive by auto, park, and ride transit or, (2) arrive as an auto passenger who is dropped off to ride transit, i.e., kiss & ride. T.R.B. research has shown that approximately 70% of transit riders who access transit via automobile park their cars at or near the point of access. The remaining 30% are auto passengers dropped off at the point of transit access. This ratio of 70% park & ride, 30% kiss & ride has been used to identify the approximate scale of the two auto-related activities within the station zones.

Provisions for Park & Ride

The allocation of park & ride facilities along the Division LRT branch was derived from an analysis of demand modelling, existing and future access, parcel availability and neighborhood compatibility.

Unconstrained demand modelling of patronage based on the 1990 reallocation of population and employment by Multnomah County and the Cities resulted in a demand for over 2,900 parking spaces along the Division LRT corridor as shown in Table 22.

Table 22

PROJECTED DIVISION CORRIDOR PARK & RIDE DEMAND
(1990)

Station Zone	P.M. Peak Hour Terminating Trips	Projected Parking Spaces (Unconstrained Demand)
Gateway	512	638
Mall 205	78	97
Division/I-205	312	389
122nd	352	439
136th	4	5
148th	167	208
170th	43	54
182nd	220	274
199th	6	8
Gresham	696	868
TOTAL PARK & RIDE CAPACITY REQUIRED		2,980

SOURCE: V-1990-3 Demand Modelling, Tri-Met, September, 1977.

Policy and practical implications deemed it unwise to totally accommodate the projected, unconstrained demand. Analysis of Division corridor segments to ascertain the suitability of areas to accommodate park & ride activities, Table 23, established where park & ride facilities could best be developed and the general order of magnitude of such accommodations.

Table 23

PARK & RIDE CRITERIA SATISFACTION - DIVISION LRT CORRIDOR

Area	Existing Access	Future Access	Parcel Avail.	Neighborhood Compatibility
Gateway	+	+	+	+
Mall 205	+	+	+	+
Division	+	+	0	-
112th	0	+	-	0
122nd	+	+	-	+
136th	0	0	+	+
148th	+	+	+	+
162nd	+	+	0	0
170th	0	0	0	0
182nd	+	+	0	0
199th	0	+	+	+
Gresham	+	+	+	+

Key: + = Good; 0 = Fair; - = Poor

The allocation of park & ride spaces along the Branch were constrained to the range of maximum spaces established by the Burnside Branch studies, and by the ratio of demand between Division station zones as established by patronage modelling. The following station zone allocations were determined to be the most reasonable distribution of the park & ride function within the corridor:

Table 24

DIVISION BRANCH PARK & RIDE ALLOCATION
(# Parking Spaces)

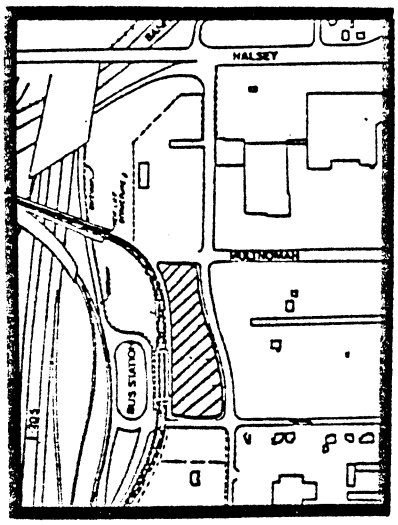
Type Spaces	Gateway	Mall 205	Division	122nd	148th	182nd	199th	Gresham	Total
Peak Period	383	225	225	225	180	135	180	563	2116
Midday/ Handicapped	42	25	25	25	20	15	20	62	234
Total	425	250	250	250	200	150	200	625	2350
% Total	18%	11%	11%	11%	8%	6%	8%	27%	100%

The model projected strong utilization of park & ride access to transit along Division. In actuality, one could expect the users to distribute themselves more evenly as drivers divert to less congested sites to reduce walking distance, exit queues, etc. Should actual park & ride patronage demand exceed the corridor station zone capacities there would be strong justification for improving feeder bus service to accommodate this additional demand. The amount of property required for park & ride was computed at a rate of 400 square feet per auto to permit adequate landscaping for community compatibility and user satisfaction. Park & ride sites at Gateway, Mall 205 and Division would be the same as those discussed in the I-205 Branch alternative of the LRT. These I-205 components are discussed in Section 7.3 of this report.

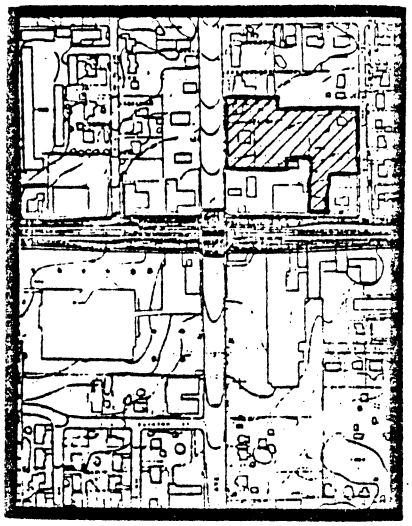
The 122nd Avenue station zone site for park & ride on Division would consist of 2.53 acres which would be assembled from five parcels. The assembled site would have frontage along 122nd, Division and 124th. Maximum parking capacity would be 275 parking spaces. The 148th Avenue station zone site for park & ride would consist of 7.93 acres assembled from three parcels with access to 148th, Taggart and Division. The total area would exceed estimated demand requirements; however, the assemblage involves undivided lots and it is assumed that excess property could be either sold or developed for other transit supportive purposes. The 182nd Avenue station zone site for park & ride would consist of 2.85 acres assembled from three parcels along the north side of Division Street. Maximum capacity would be 310 automobile parking spaces. The 199th Avenue station zone site for park & ride would consist of 3.74 acres in one parcel with frontage on Division Street and the Portland Traction Co. Railway. Total capacity would be 407 auto spaces. The park & ride sites at 122nd, 148th and 182nd are at perimeter locations within the station zones to permit transit related redevelopment adjacent to the LRT platforms and feeder bus stops. The 199th Avenue station would be in an industrial area

DESIGNATED PARK & RIDE LOT LOCATIONS

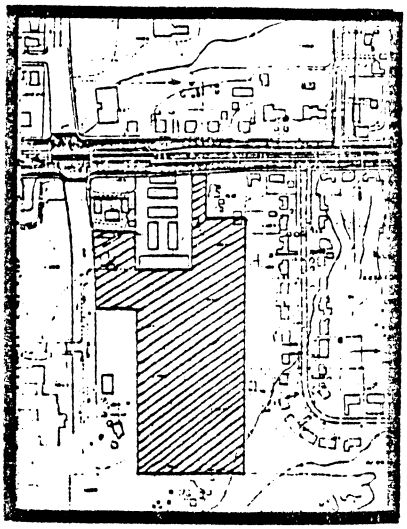
DIVISION LRT CORRIDOR



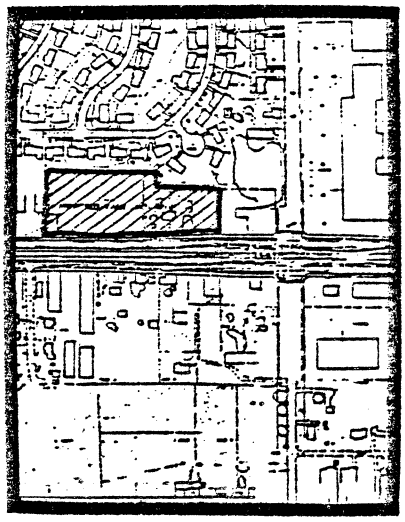
GATEWAY CENTER



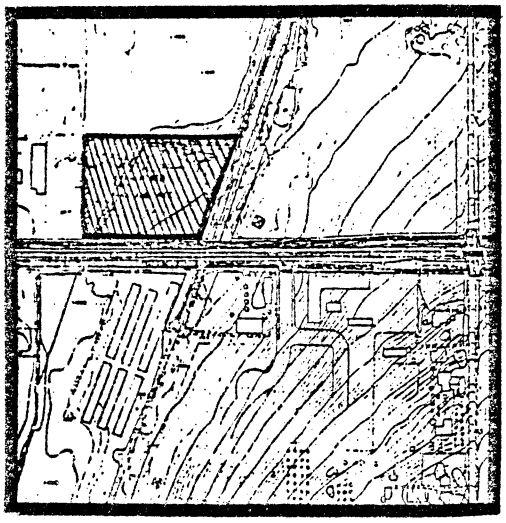
122ND & DIVISION



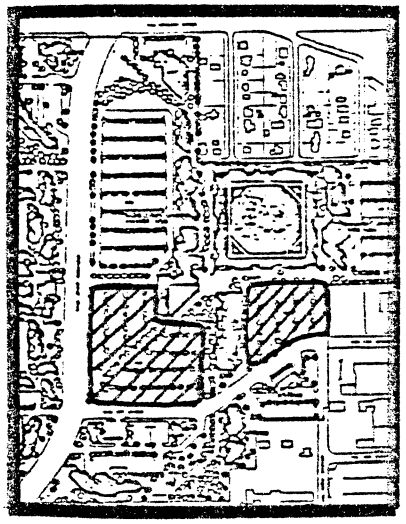
148TH & DIVISION



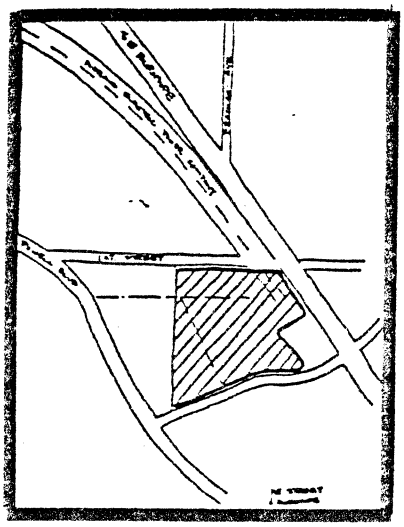
182ND & DIVISION



199TH & DIVISION



FAIRGROUNDS



(Alternative Gresham Location)

FIRST & BURNSIDE

adjacent to the LRT maintenance yards to the north. Appendix III-B5 provides further park & ride site data, calculations, and location maps.

Provisions for Kiss & Ride

The kiss & ride activity within each station zone is projected to generate nearly as many auto movements as park & ride in peak periods and must therefore be given substantial attention. The demand modeling numbers for auto-accessed ridership along Division were factored to determine potential levels of kiss & ride activity at each station zone. The number of terminating p.m. peak hour transit trips departing each station zone by automobile were split 70% for park & ride and 30% for kiss & ride. The latter were then divided by 12 (assuming half the LRT headway for average p.m. waiting time) to determine the average number of kiss & ride spaces required within each station zone in 1990. The results were: Gateway-10, Mall 205-2, Division/I-205-6, 122nd-7, 136th-1, 148th-3, 170th-1, 182nd-4, 199th-1, Gresham-13.

As with accommodations for feeder buses, the parking areas for kiss & ride autos at Gateway, Mall 205, Division/I-205 and Gresham are part of the internal station zone/off-street design and are discussed in the I-205 section of this report. At the Division Street station zones, Figure 18, it is proposed that short-term, driver occupied parking for kiss & ride would occur adjacent to the LRT platforms at curbside near bus bays. Kiss & ride spaces would be placed adjacent to the eastbound platforms in the respective station zones. This would accommodate the directional demand during the p.m. peak hour for terminating trips. Fewer westbound kiss & ride parking spaces would be needed, because a.m. peak hour kiss & ride activity usually does not include parking--just pull-over to drop-off passenger for transit.

PEDESTRIANS AND BICYCLISTS

Walk/Bike Activity

All of the station zones would be established as "pedestrian precincts", that is, areas designed in scale and mood to the convenience and perception of pedestrian activity. Activities such as park & ride would in general be placed in the perimeter areas to reduce auto activities near LRT platforms. Priority would be given to pedestrian movements around platforms.

The patronage modeling by Tri-Met projects pedestrian access to transit to be nearly equal in volume as auto related access. Table 25 summarizes the number of p.m. peak hour originating and terminating trips by these modes at each station zone.

Table 25

LRT ACCESS BY AUTO AND PEDESTRIAN MODES - DIVISION STATION ZONES
(1990 - P.M. Peak Hour)

	Auto Mode			Walk Mode		
Station Zone	Terminating	Originating	Total	Terminating	Originating	Total
Gateway	512	176	688	344	166	510
Mall 205	78	24	102	162	107	269
Division	312	123	435	127	62	189
122nd	352	85	437	139	34	173
136th	4	5	9	3	2	5
148th	167	43	210	106	28	134
170th	43	10	53	379	96	475
182nd	220	62	282	296	77	373
199th	6	3	9	1	0	1
Gresham	696	173	869	336	432	768
TOTALS	2,390	704	3,094	1,893	1,004	2,897

SOURCE: V-1990-3 Demand Modelling, Tri-Met, September, 1977.

7. STATION ZONES ON THE I-205 BRANCH

7.1 INTRODUCTION

Development of the light rail system within the I-205 right-of-way south of Gateway to Lents has been evaluated as a third alternative alignment Branch for the Banfield LRT. This section of the report focuses on the location, siting and accommodation of projected activities within the transit station zones along this alternative alignment. Previous sections of this report have dealt with the study background and overall approach (Section 3), station zones on the basic downtown/Banfield LRT Line (Section 4) and station zones on the other two branch alternatives, i.e., Burnside (Section 5) and Division (Section 6). Subsequent portions of this report deal with planning guidelines and design concepts (Section 8) and future implementation programs (Section 9).

7.2 SUMMARY

The general urban areas along I-205 in which transit stations should be placed had been identified by previous busway studies and were accepted as appropriate for LRT station zone locations. Placement of zones on the eastern or western side of I-205 were implicit in this acceptance (Figure 27). These station locations proved appropriate for LRT operations and would appear to optimize the existing land use and transportation developments, proposed developments and public policies along the corridor (Table 26).

The possible sitings of station zones within the designated locations were, in general, severly constrained by the geometrics of the LRT in the preliminary alignment designs. The LRT alignment would be required to follow the transit corridor provided in the design of the I-205 freeway. As such, the light rail would be obligated to wind its way over and under cross streets as prescribed by the ODOT design. Within the criteria established for siting, the station zones at Mall 205, Powell and Lents could have been shifted slightly north or south of the indicated busway station sitings. The LRT station zone sites at Gateway and Division were essentially fixed. Figure 28 shows the selected LRT station zone sites along the I-205 branch.

Table 26

SELECTED STATION ZONE LOCATIONS
I-205 LRT CORRIDOR

STATION ZONE	DISTANCE FROM PREVIOUS S.Z.	URBAN ACTIVITY CENTERS SERVED
Gateway	0	.Gateway Center .Other higher intensity mix uses .Proposed major commercial development
Mall 205	5900 feet	.Mall 205 .Adventist Hospital .Proposed major commercial development
Division	3400 feet	.Proposed planned residential/ local commercial redevelopment
Powell	3650 feet	.Proposed planned residential/ local commercial redevelopment
Lents	5000 feet	.Lents Community Center .Future district commercial/ residential rehabilitation

Design constraints were also prevalent in the placement of station zone components within the sites. The two key site determinants were the location of the LRT tracks, i.e., the required location of the platform component, and the location of access arterials. In several cases, the spatial location of these determinants would result in an arrangement of station zone components which would not necessarily encourage an intimate pedestrian relationship with surrounding urban land uses. Illustrations 29-33 show preliminary component organizations within station zone sites.

Patronage modeling provided the raw data from which a description was made of probable activities within each station zone along I-205 (Appendix IV-B1). The purposes of these descriptions were to evaluate site suitability, establish access priorities, and to formulate initial facilities programs for 1990 demands. Table 27 contains the vehicular and patron demands as modeled by Tri-Met. Table 28 is an assessment of 1990 activity patterns for the station zones.

Evaluation of probable site capacities as guided by criteria were made to assess whether station zones could accommodate projected demands. It was concluded that all zones should be able to accommodate the projected activities, except for parking demands. As presently conceived the Gateway and Lents zones would be unable to accommodate the projected number of parking spaces at

Table: 27

1990 P.M. PEAK HOUR DEMANDS - I-205 STATION ZONES
(Reference Network: 90W-03)

STATION ZONE	PATRONS MOVING THRU ZONE	VEHICLES MOVING THRU ZONE					FACILITIES					
		LRT	BUS	P&R	K&R	BIKES*1	PLATFORM	BUS BERTH	BUS*2 LAYOVER	SHORT TERM PRKG (K&R)	LONG TERM PRKG (P&R)	BIKES*1 STOR.
GATEWAY	2028-2098	12	75	323	138		Multiple	8		12	748	
MALL 205	426	12	54	46	19		Single	5-6		1-2	107	
DIVISION	927	12	36	70	30		Single	4		2-3	162	
POWELL	148	12	42	10	5		Single	4-5		1	23	
LENTS	929	6	39	207	89		Multiple	4		7-8	479	

*1 Detailed evaluation of bicyclist patronage and facilities requirements has not been completed.

*2 Bus layover requirements not yet established.

grade. Additional land acquisition or structured parking may prove justifiable at both locations. Adequate land area exists within the I-205 right of way to accommodate projected parking demands at the other station zones, and in the case of the Powell zone to accommodate extra parking to partially compensate for the Lents constraints.

7.3 SELECTION OF STATION ZONES

ESTABLISHED PARAMETERS

The I-205 Branch of the light rail system would perform a transit role similar to as that of the Division and Burnside Branches. In a regional sense, the Banfield Line would be an express link between Gateway and the Lloyd Center/Downtown areas and the I-205 branch would be an intercept cordon to collect and distribute trips between East County communities and the principle regional features at, and around the Downtown. In an internal sense, the future I-205 corridor is envisioned as a chain of bustling urban activities linked together by "short haul" transit.

"The intent of the concept is to help reduce the necessity for scattered, low-density patterns of new land development and the traffic growth that necessarily accompanies such development patterns. The intent is to provide an efficient, attractive and permanent transit service that will attract new development, as it occurs, to locate within the corridor and in the station areas where it can make use of the transit service and support it, rather than locate in a scattered, lower-density, automobile-based pattern.

Table 28

1990 PATRON ACTIVITY DISTRIBUTION - I-205 STATION ZONES
(Reference Network: 90W-03, 1977; P.M. Peak Hour)

ACTIVITY	MODE	STATION ZONES				
		GATEWAY	MALL 205	DIVISION	POWELL*1	LENTS
		# %	# %	# %	# %	# %
	LRT	1491-71%	273 - 64%	641 - 69%	95 - 64%	679 - 73%
	BUS	370-18%	37 - 9%	154 - 17%	28 - 19%	165 - 18%
ARRIVALS	P&R CAR	72- 3%	10 - 2%	21 - 3%	11 - 7%	43 - 5%
	K&R CAR	36- 2%	5 - 1%	9 - 1%	5 - 3%	22 - 2%
	WALK/BIKE	129- 6%	101 - 24%	102 - 11%	9 - 6%	20 - 2%
-PREDOMINANT MODE(S)		LRT	1. LRT 2. WALK	LRT	LRT	LRT
		# %	# %	# %	# %	# %
	LRT	319-16%	103 - 24%	190 - 20%	25 - 17%	135 - 15%
	BUS	896-44%	45 - 11%	454 - 49%	110 - 74%	412 - 44%
DEPAR-TURES	P&R CAR	327-16%	50 - 12%	70 -7.5%	2 - 1%	213 - 23%
	K&R CAR	164- 8%	21 - 5%	30 - 3%	1 - 1%	106 - 11%
	WALK/BIKE	322-16%	207 - 49%	183 - 20%	10 - 7%	63 - 7%
-PREDOMINANT MODES(S)		1. BUS 2. ALL OTHERS EVEN	WALK	1. BUS 2. LRT& WALK	BUS	1. BUS 2. AUTO

*Low patron figures may be attributable to modeling bias which would tend to assign a portion of actual Powell demands to other stations zones.

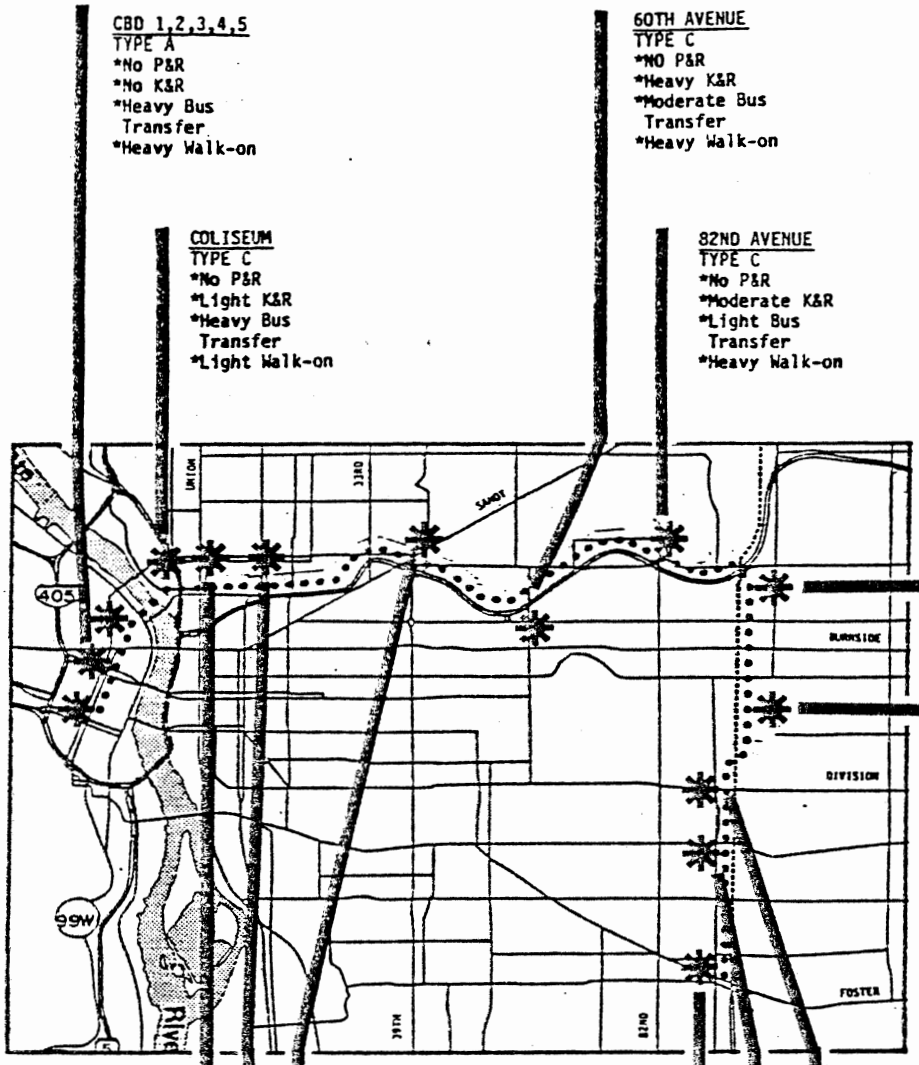
Table 29

BANFIELD/I-205 LIGHT RAIL TRANSIT
STATION ZONES CHARACTERISTICS
(1990 P.M. Peak Hour)

Designation	Location	Type	Projected Demand P&R Spaces Per Peak Hour *1	Total P&R Spaces Provided	Projected P&R Patrons Per Peak Hour *1	Projected K&R Vehicles Per Peak Hour *1	Projected K&R Patrons Per Peak Hour	Proposed Feeder Bus Per Peak Hour	Projected Feeder Bus Patrons Per Peak Hour *1	Projected Pedestrian Patrons Per Peak Hour *1
CBD 1		A			(See Table 1 for Downtown and Banfield Line characteristics)					
CBD 2		A								
CBD 3		A								
CBD 4		B								
CBD 5		B								
Coliseum		C								
Union/Grand		B								
Lloyd Center		A								
Hollywood		A								
60TH		C								
82ND		C								
Gateway	99TH & Pacific	A	323	425	399	138	200	75	1266	451
Mall 205	99TH & Main	B	46	150	60	19	26	54	92	308
Division	I-205& Division	B	70	175	91	30	39	36	608	285
Powell	I-205 & Powell	B	10	100	13	5	6	42	138	19
Lents	I-205 & Foster	A	207	250	256	89	128	39	577	83

SOURCE: Tri-Met Model W-90-3, 1977.

*1 Numbers equal the sum of arrivals and departures during the peak hour.



CBD 1,2,3,4,5
TYPE A
*No P&R
*No K&R
*Heavy Bus
Transfer
*Heavy Walk-on

COLISEUM
TYPE C
*No P&R
*Light K&R
*Heavy Bus
Transfer
*Light Walk-on

60TH AVENUE
TYPE C
*NO P&R
*Heavy K&R
*Moderate Bus
Transfer
*Heavy Walk-on

82ND AVENUE
TYPE C
*No P&R
*Moderate K&R
*Light Bus
Transfer
*Heavy Walk-on

GATEWAY CENTER
TYPE A
*425 P&R
*Heavy K&R
*Heavy Bus
Transfer
*Heavy Walk-on

MALL 205
TYPE A
*150 P&R
*Light K&R
*Light Bus
Transfer
*Heavy Walk-on

HOLLYWOOD
TYPE A
*No P&R
*Light K&R
*Heavy Bus
Transfer
*Heavy Walk-on

DIVISION
TYPE B
*175 P&R
*Light K&R
*Heavy Bus
Transfer
*Heavy Walk-on

LLOYD CENTER
TYPE A
*No P&R
*Light K&R
*Heavy Bus
Transfer
*Very Heavy Walk-on

POWELL
TYPE B
*100 P&R
*Light K&R
*Moderate Bus
Transfer
*Light Walk-on

UNION/GRAND
TYPE B
*NO P&R
*Light K&R
*Heavy Bus
Transfer
*Heavy Walk-on

LENTS
TYPE A
*250 P&R
*Moderate K&R
*Heavy Bus
Transfer
*Light Walk-on

Figure: 24

BANFIELD/I-205 LIGHT RAIL TRANSIT STATION ZONES

The diversity of activities and the accessibility to other places would make it possible for people living or working in the corridor to carry on a full range of activities both within the corridor and regionally without having to use automobiles."

Transit Access Review, Conradt, 1975

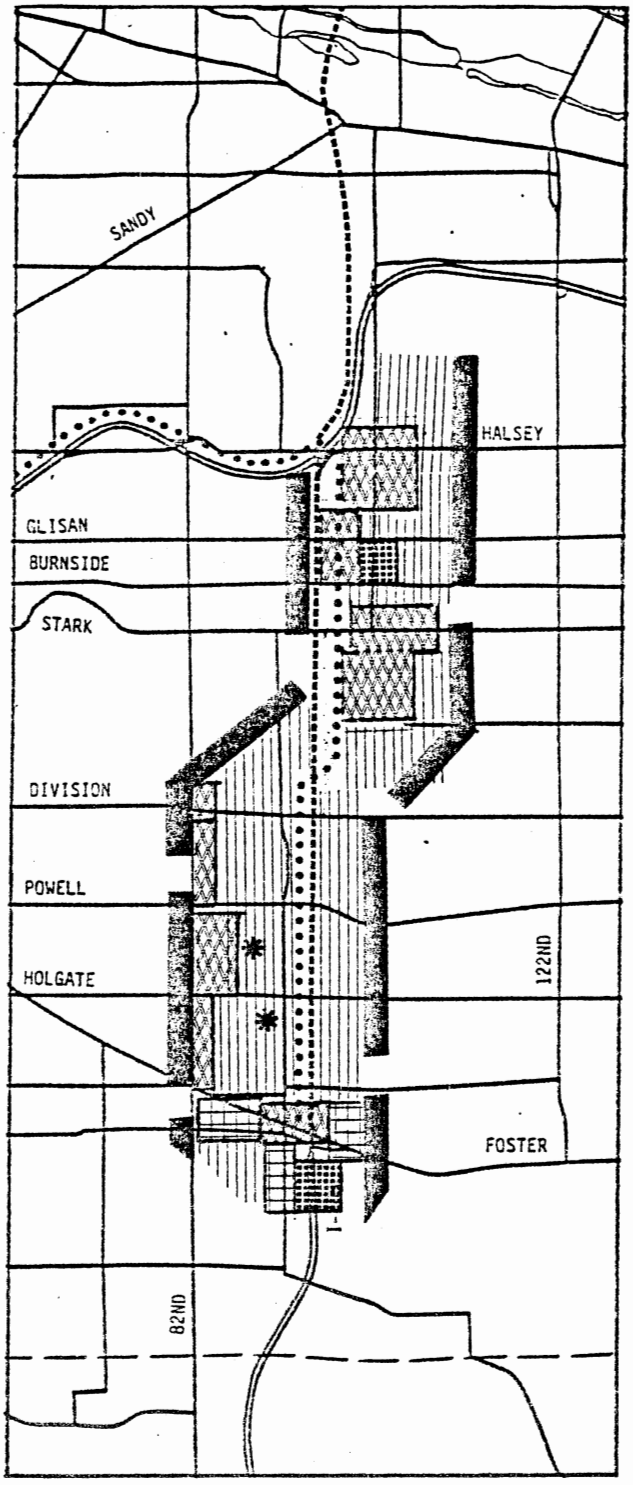


Figure: 25

EXISTING LAND USE - I-205 LRT

- Commercial
- Industrial
- Single Family Dwellings
- Multi-Family Dwellings
- Community Services
- Undeveloped Land

In this capacity the I-205 branch station zones should provide intimate pedestrian access to nearby urban activities and neighborhoods, while being directly accessible from East County arterial streets to intercept automobile-using patrons. Station zones should also be readily accessible to city-routed and county-routed feeder buses.

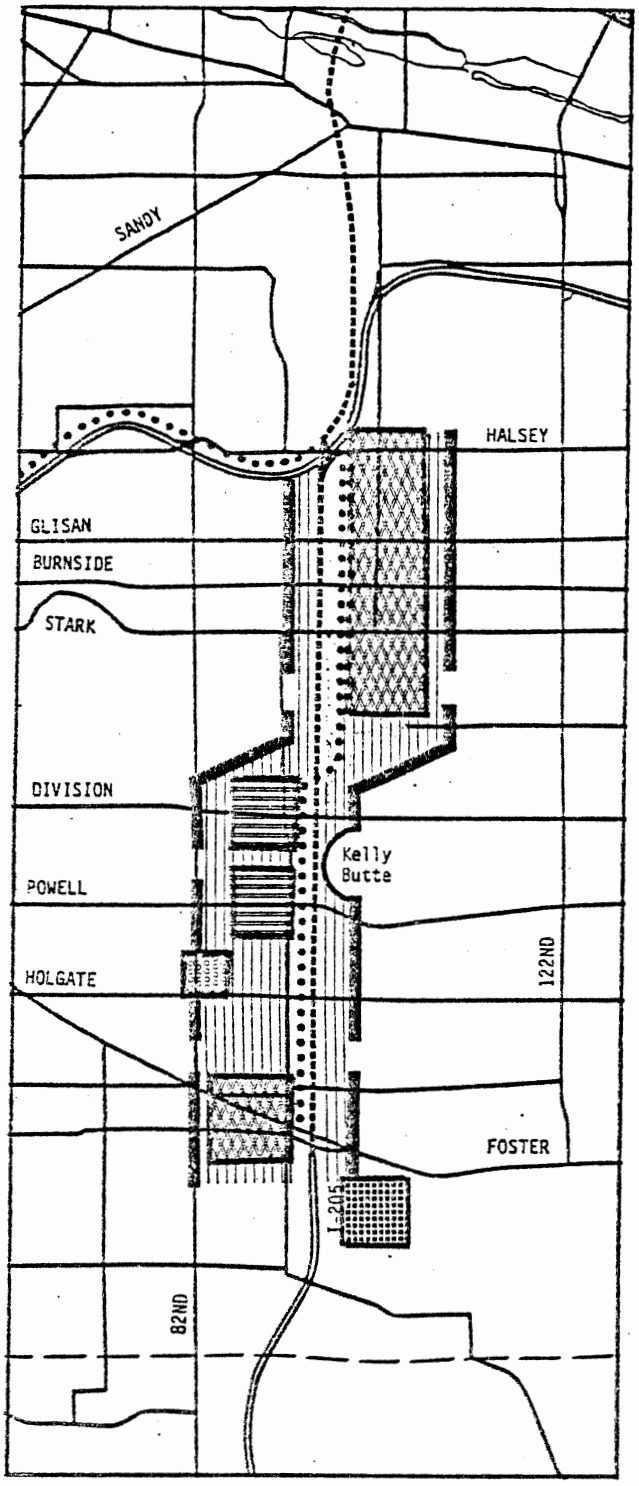


Figure: 26

ANTICIPATED 1990 ACTIVITY PATTERN - I-205 LRT

High Intensity Commercial/ Multi-Family Residental Corridor

Major Concentration Commercial/ Multi-Family Residential

Major Concentration Multi-Family/Local Commercial

Major Concentration Industrial

Single Family Neighborhoods

Sub-Regional Commercial Center

Unlike the Burnside and Division LRT alignments which represented transit planning in a new corridor, the study of station zones in the I-205 LRT alignment took place within an historically well researched corridor. Specific stations, albeit park & ride facilities only, were identified in the corridor as early as 1971. Building upon earlier research, study of the busway alternative in the I-205 corridor in later 1975 established a set of seven bus stations along the freeway from the Columbia River south to the Lents area. Though evaluative studies of busway station locations are not available, it can be justifiably assumed that those seven station designations optimized (1) busway operations, (2) the relationship of the stations with nearby significant urban activity centers, and (3) accessibility by automobiles and feeder buses. The set of seven stations have been universally acknowledged by public bodies involved with planning in the I-205 corridor, land use and transportation policies had been developed to reinforce these station locations, and the I-205 construction documents and the right-of-way acquisition program by ODOT reserved space for stations at the acknowledged locations. Rather than attempt to deny the six years of planning and policy-making which established the busway station locations by undertaking an autonomous corridor planning evaluation to identify the locations for LRT station zones, the applicable busway station locations were accepted as appropriate for the LRT station zones pending further study of station details. The set of accepted LRT station zone general locations included:

1. Gateway - East
2. Mall 205 - East
3. Division - West
4. Powell/Holgate - West
5. Lents - West

Note: The Airport and Columbia/Sandy stations originally considered for the I-205 busway are not applicable to the I-205 LRT.

A planning constraint decendent from previous transit planning in the corridor was the placement of the LRT station zones to the east or west of the I-205 freeway lanes. Again these choices had been made in previous busway planning, and the choices had been reinforced by policies and programs. A broad brush analysis of the significant urban activity patterns and future potential areas showed that these historical decisions were made on the basis of optimizing the transit-land use relationships, hence the east and west side biases were seen equally applicable to LRT activities. The suffix notations in the above listing indicate on which side of the freeway lanes the LRT station zones would occur.

Acceptance of the previously discussed parameters, and the objective to cause as little disruption as possible in the construction of the LRT dictated that LRT station zone facilities and activities would be confined primarily to residual I-205 right-of-way. The lateral and vertical alignment flexibility of the LRT would be constrained by over- and underpass design commitments previously made for the I-205 transit way. The distance between the freeway lanes and the edge of the right-of-way varies from approximately 180 feet up to as much as 300 feet producing long, narrow sites for LRT facilities. Within these residual

I-205 areas are a continuous pedestrian/bicycle pathway system, and earth beams or walls to attenuate freeway noise. Both of these design elements would have to be maintained when station zone facilities were introduced.

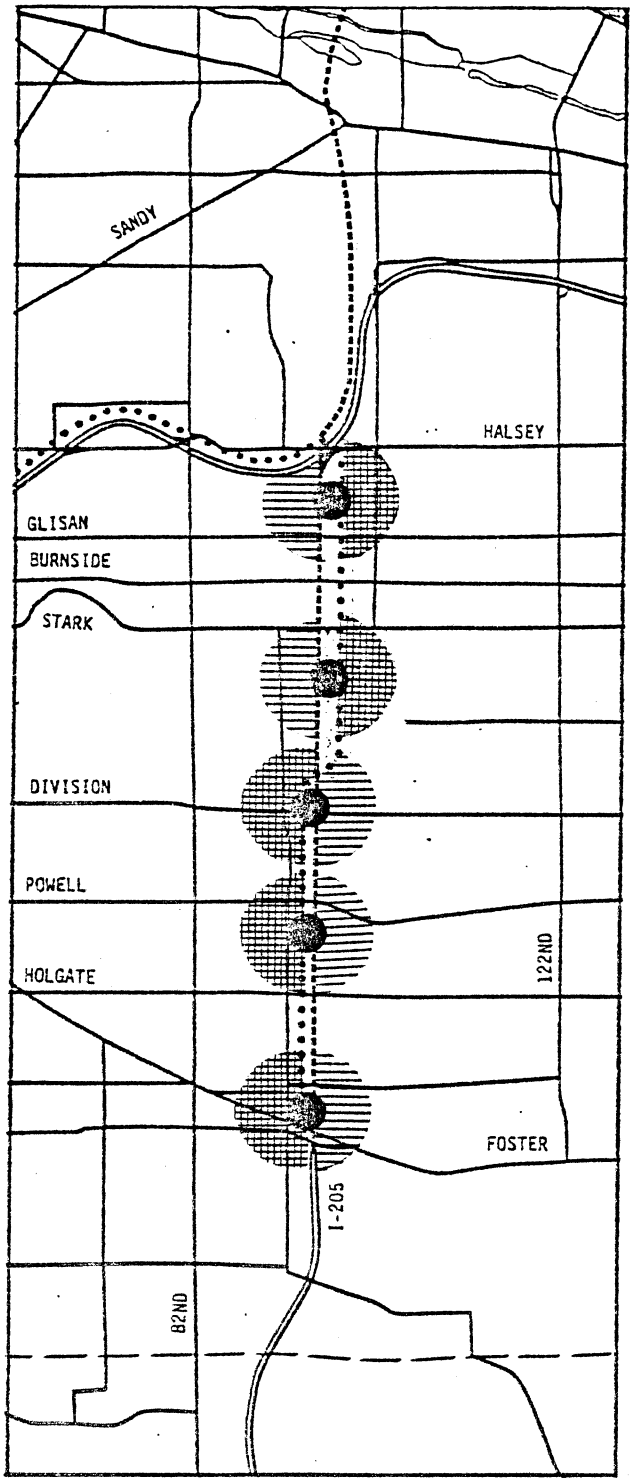


Figure: 27

GENERAL I-205 STATION ZONE LOCATIONS

- Direct Service Areas

- Indirect Service Areas

GATEWAY

MALL 205

DIVISION

POWELL

LENTS

THE I-205 ISSUE - SITING

The acceptance of general locations and east-west biases for station zones along I-205 obviated the segmental land use-accessibility evaluation of the corridor to establish station zone locations. This type of evaluation had been a principle part of the planning for the other two branches, i.e., Burnside and Division. In contrast, the siting of platforms and other station zone components at arterial intersections along these two East County alignments were found to be rather straightforward, but the conditions along I-205 necessitated a more in-depth analysis to properly place station zone components, e.g., platforms, parking etc., within the designated general location. The siting of station zones and placement of zonal components along the I-205 alignment were based on the planning principles developed in this study and described in Section 8 of this report.

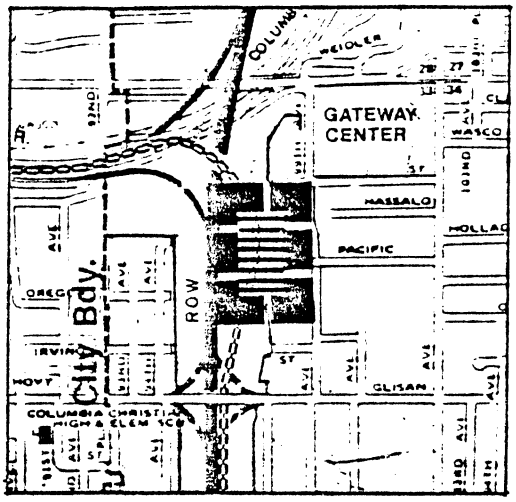
Table 30

COMPONENT CRITERIA SATISFACTION
I-205 STATION ZONES*1 - SUMMARY

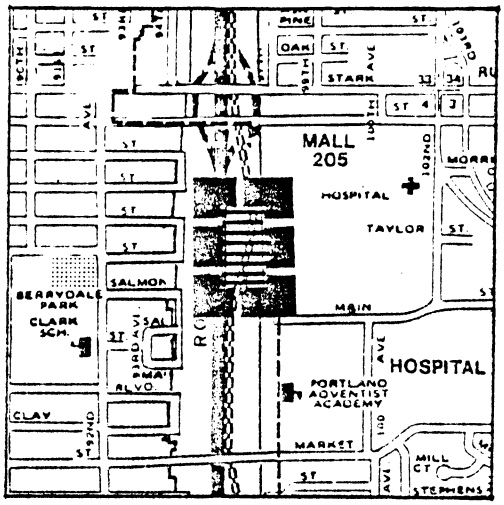
+ G = GOOD
0 F = FAIR
- P = POOR

COMPONENT	CRITERIA	STATION ZONES				
		GATEWAY	MALL 205	DIVISION	POWELL	LENTS
	Level site-properly spaced	+	+	0	0	+
	Land Use Propinquity	-	0	-	-	+
PLATFORM	Pleasant Environment	0	-	+	-	+
	Visibility	+	+	0	0	+
	Properly Sized	PRELIMINARY DESIGN ISSUE				
PEDESTRIAN CIRCULATION	Convenient and Safe	0	0	+	+	+
	Bikeway Access	+	overpass	+	+	+
	Separated Movements	-	-	-	-	+
	Accommodate Traffic	+	+	+	+	+
TRAFFIC CIRCULATION	Arterial Access	0	0	+	+	+
	Off-street Activities	+	+	+	+	+
	Separated Movements	+	+	+	+	0
BUS FACILITIES	Arterial Access	0	0	+	+	+
	Turnaround Loop	+	+	+	+	+
	Off-street Activities	+	+	+	+	+
	Separated Movements	+	+	+	+	+
	Short term @ Platform	+	+	+	0	+
PARKING	1990# & Expandable	+	+	0	0	0
	Arterial Access	0	0	+	+	+
	Distance from Platform	0	+	0	+	-
	Joint Use	0	-	-	+	-
INTERRELATED LAND USE	Opportunity Creation	-	-	0	+	0

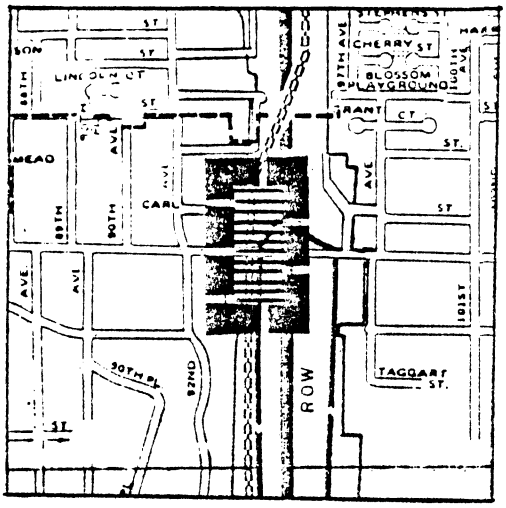
*1 Evaluations are based on existing site conditions. It is assumed that planning and development programs during LRT implementation would lead to proper satisfaction of all criterion.



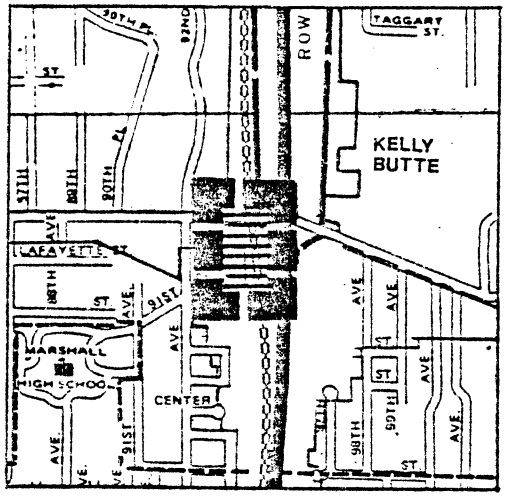
GATEWAY CENTER



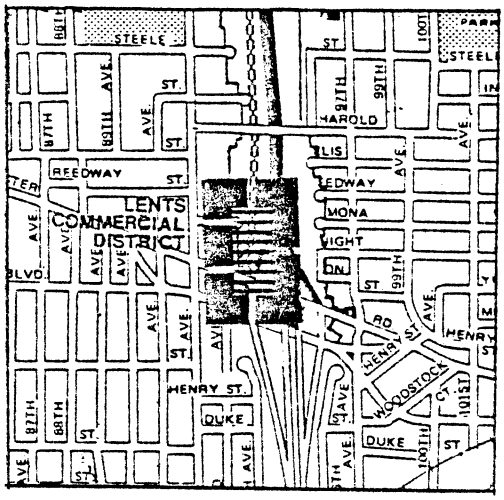
MALL 205



DIVISION



POWELL



LENTS

Figure: 28
STATION ZONE SITES ALONG I-205

DESCRIPTION OF STATION ZONES

The following section describes the purpose, function, and preferred siting of light rail station zones and components along the I-205 branch. Short term, 1990, and longer term, past 1990, strategies are promulgated to reflect the dynamic planning process. Both the opportunities and constraints of selected station zone sites are discussed as guidance to subsequent design and planning

efforts. The following descriptive information is augmented by the information contained in the next section, Station Zone Activities.

Gateway Center

Purpose And Function

The Gateway Center station zone would play several significant roles in 1990 LRT operations. As the pivotal point in the Banfield/I-205 light rail system, Gateway would be obligated to accommodate additional trackage to permit the mixing, staging and reversing of light rail vehicles, and trackage to access the maintenance and storage yard to the north. Post-1990, should the initial light rail system be successful, the Gateway design should be able to accommodate the operational requirements occasioned by another East County branch, i.e., Burnside and/or northern extension of the light rail to PIA and across the Columbia.

The principal patronage function of the Gateway station zone in 1990 and beyond will be the transfer of patrons from one travel mode to another. The importance of the Gateway transfer activities is amplified by the projection that three to twelve times as many patrons would be circulating through the Gateway station zone during p.m. peak hour in 1990 than through the other I-205 station zones. In 1990 p.m. peak hour (as modeled by Tri-Met) transfer from light rail to feeder buses would appear the predominant activity ($\pm$ 45% of outflow patrons) with all other modes, i.e., LRT, P&R, K&R, walk/bike, being used about equally ($\pm$ 16% of outflow patrons each).

A further role of the Gateway station zone would be to facilitate the movement of patrons between the platform area and the larger commercial center adjoining the site. At present, and possibly in 1990, there would not exist an intimate adjacency between these two activities, thus this zonal role may be delayed until significant redevelopment occurs closer to the zone. Historical signs indicate that such redevelopment will occur.

General Station Zone Siting

In that the station zone must contain the platform component and that the possible platform locations are severely constrained in the Gateway area, the LRT station zone site would be essentially fixed. The platforms would be limited in northern placement by the LRT Banfield flyover ramp elevations and configuration, and would be limited in southern placement by downward inclination of the LRT tracks to properly pass 24 feet under Glisan Street. Hence the station zone would be located roughly halfway between Halsey Street (N) and Glisan Street (S) and would be principally confined within the existing eastern edge of the I-205 right-of-way. The available area within the I-205 right-of-way varies in width between 220 feet and 250 feet and is approximately 500 feet in length, i.e., approximately 2.7 acres. The land is undeveloped and fairly level, but would not appear large enough to accommodate 1990 activity demands. Consequently, a cleared, level parcel of approximately 3.2 acres between the right-of-way and extended 99th Avenue (as presently designed) has been recommended for acquisition and development.

Zonal Components

Because of the operational complexities at Gateway, multiple parallel platforms would be required for the LRT. Without pedestrian access from the west side of I-205 (the nearest pedestrian accessway across I-205 will be at Glisan 1400 feet south, and at Halsey 1200 feet north of the platform site), the platforms should be placed as close to the eastern edge of the right-of-way as possible. Placement of the platforms on the eastern edge of the right-of-way would optimize future opportunities. The platforms would be roughly equidistant from all existing transit supportive activities within the super block bounded by Halsey (N), I-205 (W), Glisan (S) and 102nd (E), i.e., mixed commercial center 800'-1500', multifamily residential units (SE) 1000'-1500', and new apartment units (S) 500'; and from larger, potential development sites, i.e., motel (N) 500'-1100', mixed commercial (E) 350'-1300', and multifamily residential (S) 600'-1300'.

The area immediately around the station zone is not presently very amenable to pedestrians being dominated by auto-oriented mixed commercial uses. The construction and anticipated heavy traffic use of 99th Street adjacent to the zone will probably not improve the situation. The projected pedestrian generation by the transit operations in 1990, up to 350 persons in the p.m. peak hour, would require some attention to assure safe movement between the platform area and nearby commercial and residential land uses. As future developments occur around the zone, safe pedestrian linkages to the LRT platform area should be established. Within the station zone, equal attention would be required to permit unimpeded pedestrian movements.

Principal vehicular access to the station zone would be via 99th Street from either Halsey or Glisan - with a distinct bias toward Glisan due to the City's Arterial Streets Classification Policy designation and County's classification of Glisan, and I-205 accessibility. Mid-block (E & W) streets, i.e., Multnomah and Pacific, could be used for access and egress, as well. The existing area street pattern would appear effective for the collection and dispersion of transit generated traffic in 1990. Should expected new developments occur in the area, either pre- or post- 1990, upgrading of the areas' streets would probably be required to accommodate increased traffic demands.

The projected magnitude of feeder bus activity during the p.m. peak hour (75 buses handling 1200-1300 patrons) would require that bus berths be immediately adjacent to the LRT platforms. Providing all patrons with cross-platform transfers (bus to LRT) would not be possible because of the multiple LRT platforms required, but propinquity and safe, efficient transfers must be provided. Much of the excess I-205 right-of-way would probably be occupied by the multiple platforms and trackage of the LRT. Bus loops containing berths and layover spaces would probably be located east of the platforms.

The parking demand as modeled by Tri-Met would be very high at the Gateway station zone, between 700 and 800 spaces. The siting of this facility would be to the northeast of the LRT platforms between the I-205 row and 99th Avenue. This area, approximately 2 to 3 acres, would only accommodate 250-375 parking spaces. Further design study would be required to ascertain how the additional spaces of the projected 1990 "constrained" parking demand would be provided. Three options appear feasible. Additional land could be purchased to provide at-grade parking. The most logical parcel for such acquisition would lie immediately east

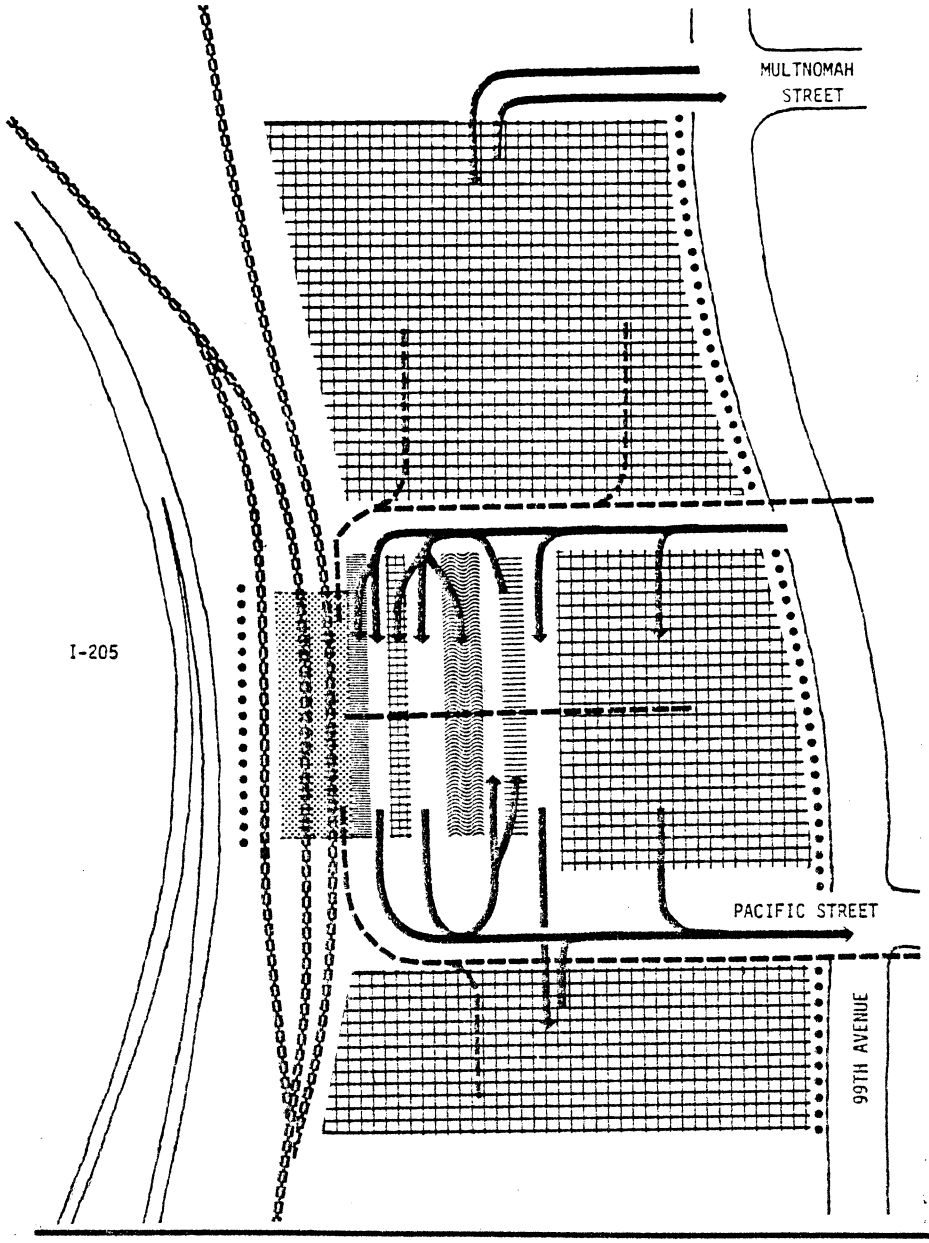


Figure: 29

DIAGRAM OF COMPONENTS SITING

GATEWAY STATION ZONE

- LRT Tracks
- Platform Area
- Bus Berths
- Bus Layover
- Park & Ride Lot
- Kiss & Ride Spaces
- Special Parking
- Vehicular Circulation
- Pedestrian Circulation
- Landscape Buffering

of 99th Avenue. Such actions could prove counterproductive, however, because (1) this land is expected to be very expensive and (2) significant, transit supportive commercial developments proposed for this area could be interrupted by the station zone land acquisition. A second way to provide the required parking spaces would be to build structured parking within the station zone site. Two levels would appear sufficient; however, three levels would provide for future expansion and/or could accommodate other station zone activities on the ground level, e.g., bus berths, kiss & ride spaces, etc. The apparent principal constraint to this strategy would be the construction cost of the parking decks. On a cost comparison, however, it may prove less expensive than additional land acquisition. The third method to provide parking, possibly a variation on the first two, would be to work out a cooperative joint use agreement with adjacent land developers. In the short term predevelopment period, undeveloped peripheral sites could be used for at-grade parking, perhaps on a low cost lease arrangement. Other joint use arrangements may be possible after adjoining parcels have been developed.

Mall 205

Purpose and Function

The Mall 205 zone would be an on-line transit transfer point with a significant percentage of projected walk-in/walk-off patronage in 1990. Approximately fifty-four buses would access the station zone during the p.m. peak hour, one third of which would be considered the principal patronage carriers. In 1990, feeder buses are projected to carry only 9% of the p.m. peak hour inflow traffic and 11% of the outflow traffic. Subsequent land use intensification along East County routes could increase the actual number of patrons using feeder buses to the Mall 205 station zones. 1990 projections of p.m. peak hour indicate that a substantial number of the inflow patrons would walk/bike into the station zone and half the patrons departing from the zone would walk. Such a phenomena is not overtly supported by the existing land use pattern around the zone, but the presence of the large, mixed commercial center substantiates a transit attraction (shopping) and generation (employment) potential for the area. Proposed significant commercial enlargements to Mall 205 and institutional developments to the east of I-205 suggest that the pedestrian orientation of the station zone could intensify in the future.

General Station Zone Siting

The LRT alignment between Washington (N) and Market (S) near Mall 205 places fewer constraints on platform location than at Gateway and Division. The platform, sic the station zone, could be developed anywhere within a 1200 foot north-south portion of the I-205 right-of-way. The principal alignment constraint would be that the LRT must run adjacent to the I-205 freeway lanes with station zone facilities and activities east of the alignment between the platforms and adjoining land use. Station zone siting would be dependent on relative platform adjacency to existing and probable future transit supportive land uses, and accessibility. To thoroughly investigate the potentials of the Mall 205 station zone, three different sitings were studied.

The site selected would provide the greatest number of relative benefits in the short and medium term future to the LRT system. As with the Gateway station zone, the horizontal inflexibility of the LRT alignment would mean that the selected site would not be proximate to significant existing supportive land uses. The site would, however, be strategically placed with respect to existing and probable future activities in the area. Within a quarter mile of the LRT station zone would be a commercially developable five acre vacant parcel within the I-205 right-of-way (N), an existing large mixed commercial center (NE), and a large, commercially developable parcel currently occupied by a private high school, but which was proposed for acquisition and mixed commercial development in the recent past (SE). Due east at a slightly greater distance would be a new hospital and multifamily developments. At such time in the future that the area were developed to its potential, and in light of the distances between the LRT station zone and surrounding urban activities (and between the activities themselves) it would not be unrealistic to consider a local Jitney service to augment LRT access to the area.

Zonal Components

Due to the existing spatial disposition of site elements, i.e., (west to east) 1) I-205 freeway travel lanes, 2) LRT alignment, 3) 220 foot unused right-of-way,

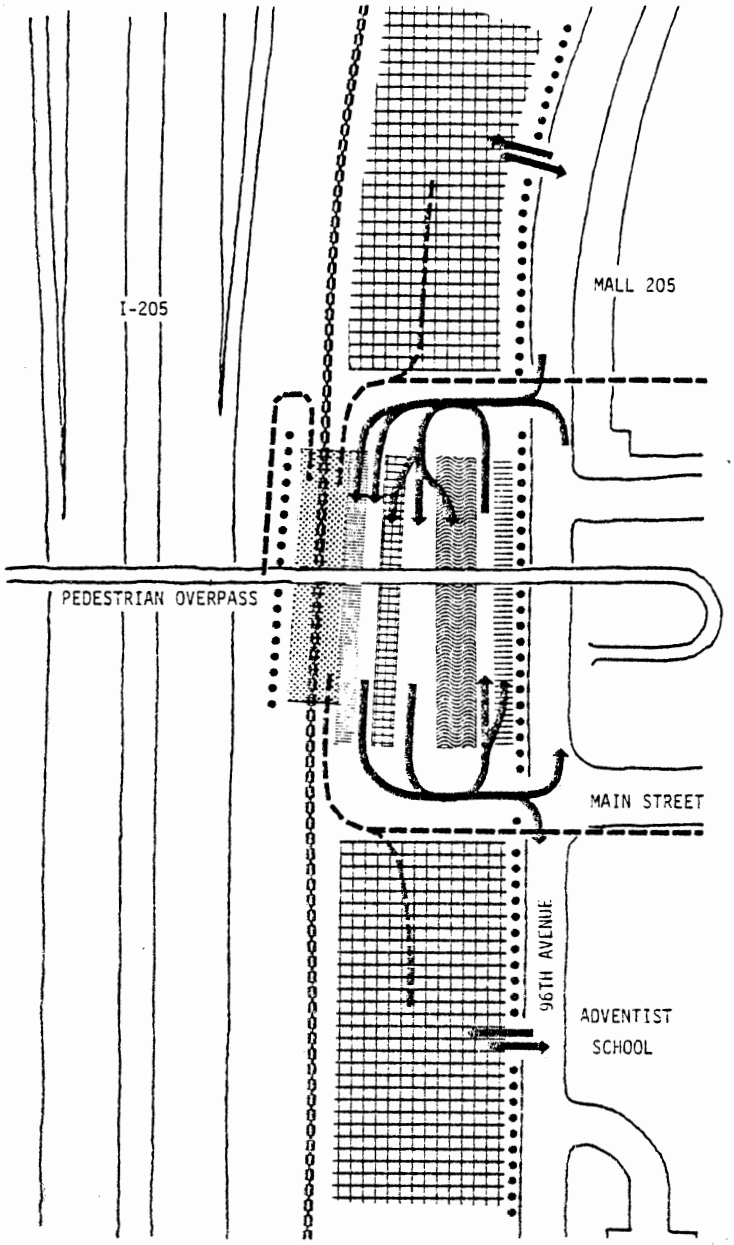


Figure: 30

DIAGRAM OF COMPONENTS SITING

MALL 205 STATION ZONE

- LRT Tracks
- Platform Area
- Bus Berths
- Bus Layover
- Park & Ride Lot
- Kiss & Ride Spaces
- Special Parking
- Vehicular Circulation
- Pedestrian Circulation
- Landscape Buffering

4) 96th Avenue (principal access roadway), and 5) private land uses east of 96th, the LRT platform would be located immediately east of the I-205 freeway and, at the present time, at about the same elevation as the freeway. Such a siting could prove to be a most unpleasant environment for patrons waiting to board the LRT. Techniques, such as heavy landscaping, sound berms or walls and variations in elevation should be employed to mitigate the negative environmental impacts of the freeway on the platform. The platform so sited would be highly visible from both I-205 and local access roadways. The remainder of the site organization would be rather straight forward.

Feeder bus berth, layover zones and turnaround would be placed between the platform and 96th Avenue. Kiss & ride spaces and special parking for handicapped patrons would also be placed east of the platforms. Longer term parking would be developed to the north and south of the "central" zone

facilities. Though the available right-of-way is narrow, approximately 200 feet useable for parking, the site has the advantage of being "open-ended", that is the park & ride facilities could be extended in later phases to the north or south as warranted by demand so long as the walking distance to the platform does not exceed the 1000 foot criterion. Pedestrian access to the site would be adequate if not exceptional. The platform would be directly accessible from the single family neighborhood to the west via the pedestrian walkway to be provided over I-205 between SE Salmon Street and SE Main. Pedestrian access from the east could prove more difficult due to the auto-oriented nature of developments on that side and the anticipated increased traffic activity on 96th Avenue. If the LRT is to become an integral part of the area, vastly improved pedestrian linkages would be required to the eastern land uses.

Vehicular access to the station zone would be from the Washington-Stark couplet (N), and/or Market Street (S) and, perhaps, Divison via 96th. The A.S.P. classifies each street in the Washington-Stark couplet as a neighborhood collector; however, with a full access I-205 interchange and the large number of auto-oriented activities in the area it is logical to assume that this couplet would continue to accommodate a large volume of traffic. Division has been classified as a major city traffic street east of I-205. Market Street south of the station zone, though classified as a local service street, would provide the only street connection across I-205 between Division and the Washington-Stark couplet, and would penetrate several higher intensity residential neighborhoods east of the Mall 205 area for a distance of approximately one mile. The 1990 feeder bus networks have been designed to use these streets and it can, therefore, be assumed that feeder buses would access the LRT station zone from Washington-Stark and Market via 96th.

Division Street

Purpose and Function

From an operational service perspective, an LRT station zone at Division would be justified as a transit transfer point, i.e., on a major arterial street 3400 feet south of the Mall 205 station zone and 3600 feet north of the Powell zone. The Division zone would probably function as an autonomous transfer point in the short-term future due to the existing character of adjacent land uses, and the modest redevelopment future projected for the area. The projected 1990 p.m. peak hour patronage within the zone would be in the same order of magnitude as that at the Lents station zone, but the principal patronage outflow during that period would occur on feeder buses ($\pm$49%) and the LRT ($\pm$20%). The latter figure suggests p.m. peak hour intra corridor movements and/or reverse flow commuting from the Division station zone. 1990 automobile useage during the period is projected to be low, $\pm$4% inflow patronage and $\pm$11% outflow patronage.

General Station Zone Siting

As with the Gateway station zone, constraints on the alignment of the light rail tracks essentially fix the location of the platform (and thus the station zone) near Division Street. Approximately 900 feet to the north of Division

Street, the light rail alignment would pass under I-205 through the Lincoln Tunnel. Vertical and horizontal track alignment would be fixed by this structure. As presently designed, the LRT, in a cut, would pass under a Division Street bridge structure, then climb sharply to the south reaching grade shortly before Powell Street. As the LRT passes under Division Street, it would be at least 24 feet below the existing ground level. Should the LRT be constructed in this manner, the station zone platforms would have to be placed immediately north of the Division bridge structure at the minus 24 foot elevation, Placement further north would make the platforms less accessible from the surface, placement further south would exacerbate the ±5% track grade needed to climb Kelly Butte. Discussions have been held on the possibility of bringing the alignment to grade at Division. Operationally, this would appear feasible and should result in lower LRT construction costs and more tolerable track gradients. The at-grade crossing of Division Street may require specific operational strategies to compensate for possible traffic interruptions. Should the LRT alignment be brought to grade at Division, the station zone site containing the platform would still be located proximate to Division to the north or south, because of access requirements and the availability of large, useable parcels of excess I-205 right-of-way at these locations. An at-grade alignment at Division would allow more efficient station zone movements and would probably result in lower construction costs for the station zone components.

Zonal Components

The vehicular access potential at Division would appear adequate with some limitation on expanded future traffic flows. Principal access to the station zone should be made from Division Street. This street is a major arterial penetrating East County and in the present design strategy of I-205 would be connected with Powell along the freeway to accommodate arterial traffic flow to the west. The section of Division between the western I-205 access ramps and 92nd Avenue, from which station zone access movements would be made, has been redesigned to perform as a neighborhood collector street. Presumably, this street configuration could accommodate the projected 36 buses, ±20 inbound park & ride vehicles and ±30 kiss & ride cars during the p.m. peak hour in 1990. Should these volumes increase dramatically in the future, the ability of Division to accommodate the demand should be restudied. Additional 92nd Avenue access or egress opportunities could be provided from the station zone to the south and north of Division.

The intermittant and special facilities of the station zone should be placed north of Division near the LRT platform. These facilities would probably include bus berths and layover spaces, kiss & ride parking spaces, and any special longer-term parking areas provided for handicapped and elderly patrons. Should the platform remain at the minus 24 foot elevation, an elevator or escalators would probably be required to assist patrons in vertical circulation. The northern parcel within the I-205 right-of-way to be used for station zone facilities is small and has the additional requirements to provide for sound attenuating earth berms and the I-205 pedestrian/bike way. This northern site would not appear adequate for all facilities in 1990, hence, midday and longer-term park & ride parking spaces would be provided in a second excess right-of-way parcel immediately south of Division. This

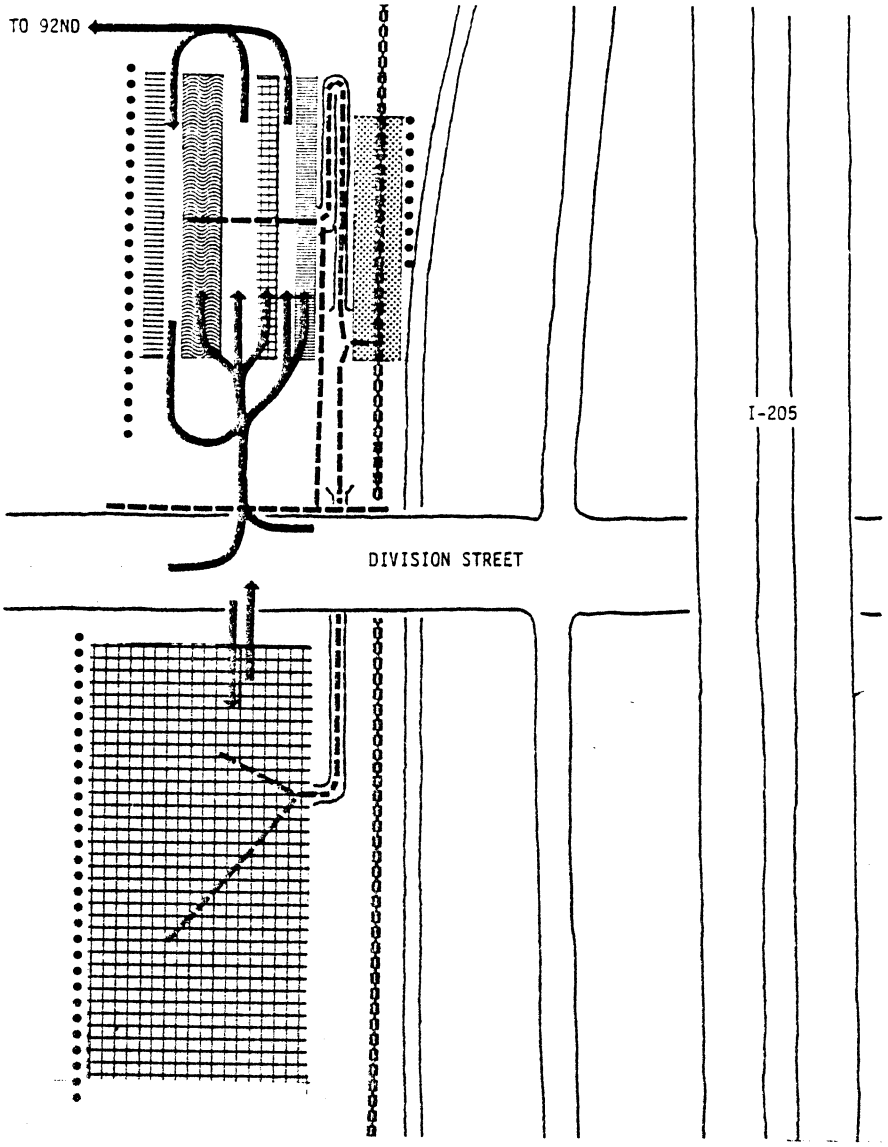


Figure: 31

DIAGRAM OF COMPONENTS SITING

DIVISION STATION ZONE

- LRT Tracks
- Platform Area
- Bus Berths
- Bus Layover
- Park & Ride Lot
- Kiss & Ride Spaces
- Special Parking
- Vehicular Circulation
- Pedestrian Circulation
- Landscape Buffering

siting of parking has the advantage of providing up to approximately 300 spaces (1990 modeled demand is about half that number) and could be accessed by both Division and Clinton Streets. The principal disadvantage of this siting would be the distance of the parking spaces from the platform. Should the platform remain depressed, a pedestrian connection should be provided under Division Street to the parking area, and gradual ramps could be used south of Division to make the 24 foot elevation transition.

The fixed location of the Division platform component adjacent to the freeway would require the other circulation and facilities components of the station zone to be placed west of the LRT alignment. This is unfortunate because pedestrians from existing or future adjacent land uses would have to walk through all the station zone facilities to access the platform. The platform would not be well integrated with surrounding land uses. A possible design strategy to ameliorate this situation would be to create an east-west landscaped pedestrianway connecting the platform area with the adjoining land uses.

Powell

Purpose and Function

In 1990, the Powell station zone would function almost entirely as a transit transfer point. According to Tri-Met ridership activity projections, 73% of the p.m. peak hour patrons would arrive at the station zone by either LRT or feeder bus, and approximately 91% would depart by the same modes. This activity pattern could be modified if significant patron-generating land uses were developed within the station service area (1/4 mile) in the future. Park & ride facilities of a moderate nature would be provided within the station zone in the initial phase.

General Station Zone Siting

Siting determinants at Powell are as complicated as those at Division. The LRT alignment would pass ±24 feet above Powell Street. As at Mall 205, a variety of station zone sitings would appear possible between Powell and Holgate streets. From a confined horizontal alignment at Powell, i.e., between the freeway ramps at Powell and the back of an existing structure, the LRT alignment travels south through the unused edge of the I-205 right-of-way, varying in width between 340 feet and 400 feet (the widest LRT right-of-way segments along I-205) before passing under Holgate Street. Evaluation of station zone accessibility showed that vehicular traffic should enter and leave the station zone via Powell Street. Two siting alternatives based on this accessibility bias were studied. The site in the southeast quadrant of Powell and 92nd Avenue was selected as having the greatest potential to function smoothly, provide transit accessibility for vehicles and pedestrians, and create the least neighborhood disruption. A two-phase development strategy would develop the excess right-of-way parcel of ±1.6 acres along Powell in the first phase for most transit related facilities. In the longer-term future, the option of acquiring the bowling alley would be pursued and the whole site could be developed with LRT related facilities and transit supportive land uses.

Zonal Components

The platform would be located at the elevated height of the LRT alignment halfway between Powell and the northern property line of the Barlow School. In such a location the platform would be partially visible from the surroundings. Full visibility would occur in Phase II with the removal of the large existing building. The difference in elevation between the platform and the supporting transit facilities, i.e., feeder bus berths, kiss & ride spaces, etc., would present a complicated design challenge to station zone architects. Pedestrian access would be encouraged from Powell, which has been classified both as a boulevard and for pedestrian paths with crossings by the City's A.S.P. Access from the bus berths and parking facilities to the LRT platform would be integrated with the pedestrian ramp currently planned at this location for the pedestrian/bike way paralleling I-205.

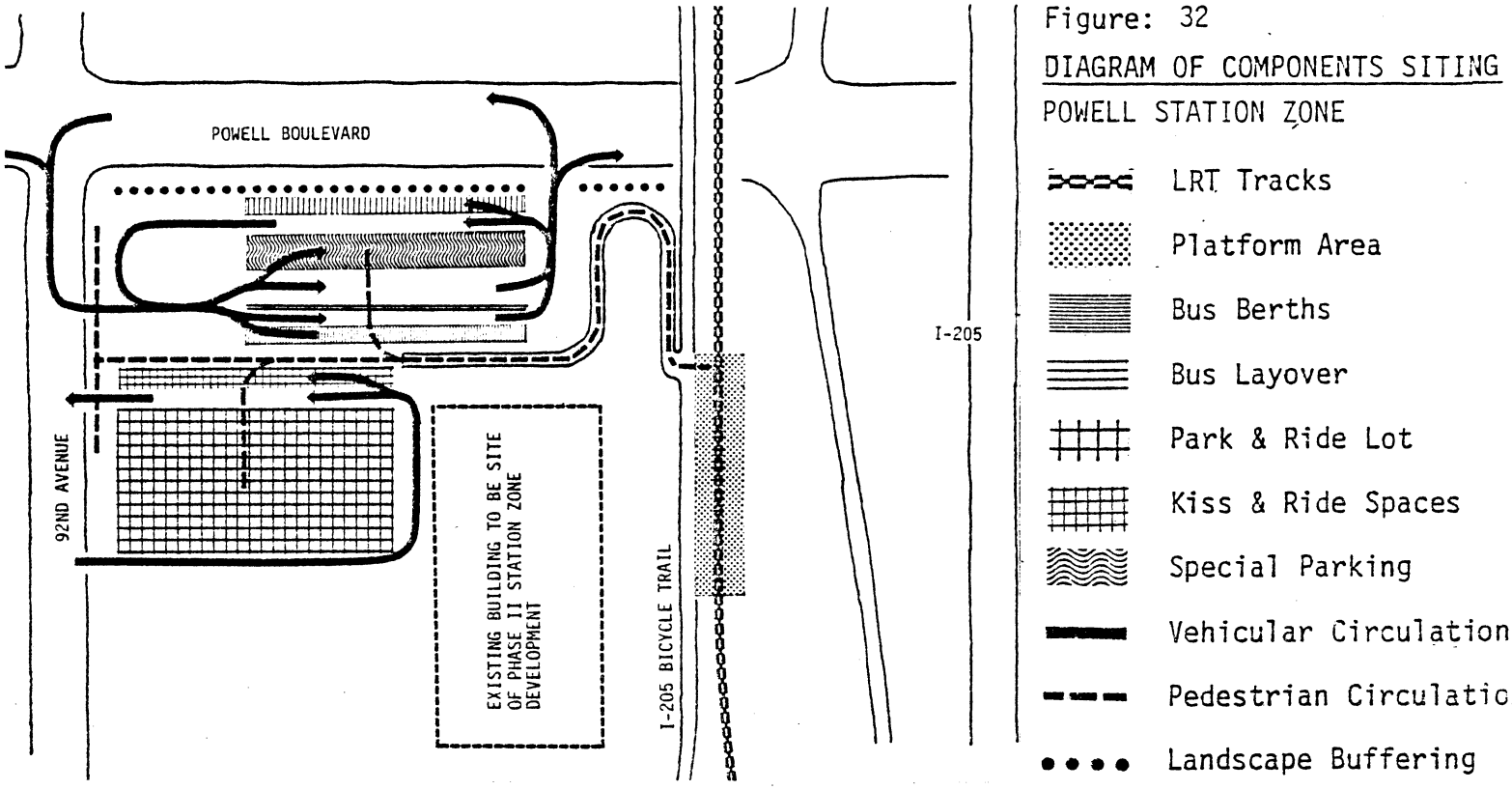


Figure: 32
DIAGRAM OF COMPONENTS SITING
POWELL STATION ZONE

Vehicular access would be from Powell, as previously discussed. Powell has been classified as a major city traffic street west of I-205 by the A.S.P. A bus turnaround loop would occur within the 1.6 acre excess right-of-way parcel in phase 1 to provide berths, layovers and bus redirection as required. In subsequent phases, the feeder bus facilities could be relocated closer to the platform in a more elevated site presently occupied by a structure. Kiss & ride and special parking facilities would also be provided within the 1.6 acre excess right-of-way parcel along Powell. Definitive design studies have not been made in this parcel to ascertain its ability to accommodate all programmed activities. Should the parcel prove inadequate in size for all vehicular requirements, serious consideration should be given in the short term to negotiating use of the northern portion of the existing bowling alley parking lot for park & ride and kiss & ride facilities. These would remain directly accessible via walkway from the LRT platform.

The strategy suggested for the Powell station zone would provide, perhaps, the best future opportunity for the development of controlled interrelated land uses within the station zone. The future acquisition of the large single ownership bowling alley parcel would obviate the constraints of small parcel land acquisition present at Division and Powell. Such acquisition would free-up a significantly large parcel of land pregnant for development and immediately adjacent to an LRT platform. Though in a regional sense the parcel would not have unlimited development potential, it would occupy a prime marketable location, i.e., LRT accessibility plus the Powell and 92nd Avenue corner and certain I-205 access. Coordinated transit/land use objectives should be pursued in the designation and design of this site.

Lents

Purpose and Function

The Lents station zone will play a trio of operational-service roles. As the terminal branch station, the zone must accommodate the necessary turn-around trackage to permit reversal of trains in service and storage of peak period "tripper" trains. The terminal situation also requires the station zone to act as a major patron transfer point between the LRT and automobile and bus modes accessing the east, west and south. Finally, though the existing Lents business center near Foster is in a depressed state, the area has a number of opportunity characteristics which should result in rejuvenating public and/or private sector developments. The LRT station zone would directly serve this center and, as a major public capital investment program, should bolster the area's renaissance as a neighborhood asset.

General Station Zone Siting

Development on the eastern side of the right-of-way at Foster (the only pedestrian connection to the Lents station from the east) presently consists of single family residences and scattered, small commercial activities. Major industrial activity occurs approximately 2500-4000 feet east of the station. Such a distance is considered too far for employees to walk, but this industrial area along Johnson's Creek could be readily served by a shuttle bus service from the station zone. The Woodstock-Foster couplet will essentially have a full interchange with I-205. Increased auto access may increase development pressures east of the right-of-way, but the area is within City control and these pressures would logically be deflected to the westside to rejuvenate the Lents business/commercial center. It would appear that the principle direct service area for the Lents station should be the western side of the right-of-way.

The existing land uses of the Lents business/commercial area have been in a state of decline for a number of years and do not presently portend any significant ridership generation. This area, however, holds the greatest potential for future change, and, therefore, has a logical affinity for the terminal platforms.

The Police Athletic League (P.A.L.) facilities on 3 acres north of the Lents center along 92nd Avenue are a significant social feature in the community-serving a membership of 1200 boys and 400-500 girls (during summer programs) and sharing their facilities with innumerable neighborhood groups, e.g., drum and bugle corps. The regional headquarters for Boys Club are located in the building, as well. The P.A.L. activities would probably be modestly supported by LRT. Though the P.A.L. is oriented primarily to the surrounding depressed areas, certain staff and members may arrive by LRT and could use the bikeway along I-205 to access P.A.L. facilities.

The right-of-way edge at Ramona Street has a mix of modest commercial and residential structures of lower improvement value. These do not presently influence siting of the LRT station zone, rather are the types

of uses which would be upgraded as a result of significant adjacent land use improvements.

The present uncertainty about the future developmental changes in the Lents business center suggests that the siting of the LRT station zone follow a conservative rationale. The zone would be adjacent to the potential development areas of the Lents pedestrian district, but free to operate independently and efficiently until such time as redevelopment programs are clarified. Due to the constraints on available land, the site of the station zone would probably contain two parcels. The platform and attendant feeder bus and kiss & ride activities would be developed on a parcel bounded by I-205 (E), Foster (S) and Lents commercial area (W). Park & ride facilities would be constructed on the residual land parcel between Foster and Woodstock under I-205.

Zonal Components

To optimize opportunities in the area, the LRT platform should be placed within the I-205 right-of-way adjacent to the Lents business center. If major development plans were initiated in the area prior to construction of LRT facilities, a reevaluation of platform siting should be made to assure proper integration of transit opportunities with proposed land uses. A platform siting next to the commercial center would optimize the "pedestrian district" designation in the A.S.P., would permit direct access from the pedestrian and bicycle pathways designated by the A.S.P. along Foster Road, would permit direct and visible access by automobiles and feeder buses from the traffic-transit Foster/Woodstock couplet, and would link the platform with the environmental amenity programs associated with the designations by the City of the Lents pedestrian district and Foster Road as a Boulevard. The platform should be placed as near to Foster as possible to reduce the walking distance to the park & ride facilities under I-205.

The freeway along the eastern edge of the right-of-way allocated to the LRT, due to its impact on environmental conditions, would be a poor neighbor for any station zone elements frequently used by patrons, e.g., platforms, kiss & ride or park & ride activities. LRT storage and car-make-up tracks and bus layover spaces should be placed against this edge.

On site circulation, feeder bus berths, short-term and special parking, and landscaping should be placed between the storage layover elements on the east and the platform on the west. The shape and size of this site would not permit the placement of all station zone elements in contiguity. Longer-term parking under I-205 should have direct, conflict-free connections to the platform and every landscape device should be employed to reduce the perceived distance between the two station zone components.

Existing use patterns and A.S.P. designations clearly indicate that principal vehicular access to the LRT station would be from the Foster/Woodstock couplet. Secondary access may be possible on Ramona, though 92nd connecting Foster and Ramona is designated for "neighborhood" traffic only by the A.S.P. Harold Street (N), also designated for neighborhood traffic, might provide

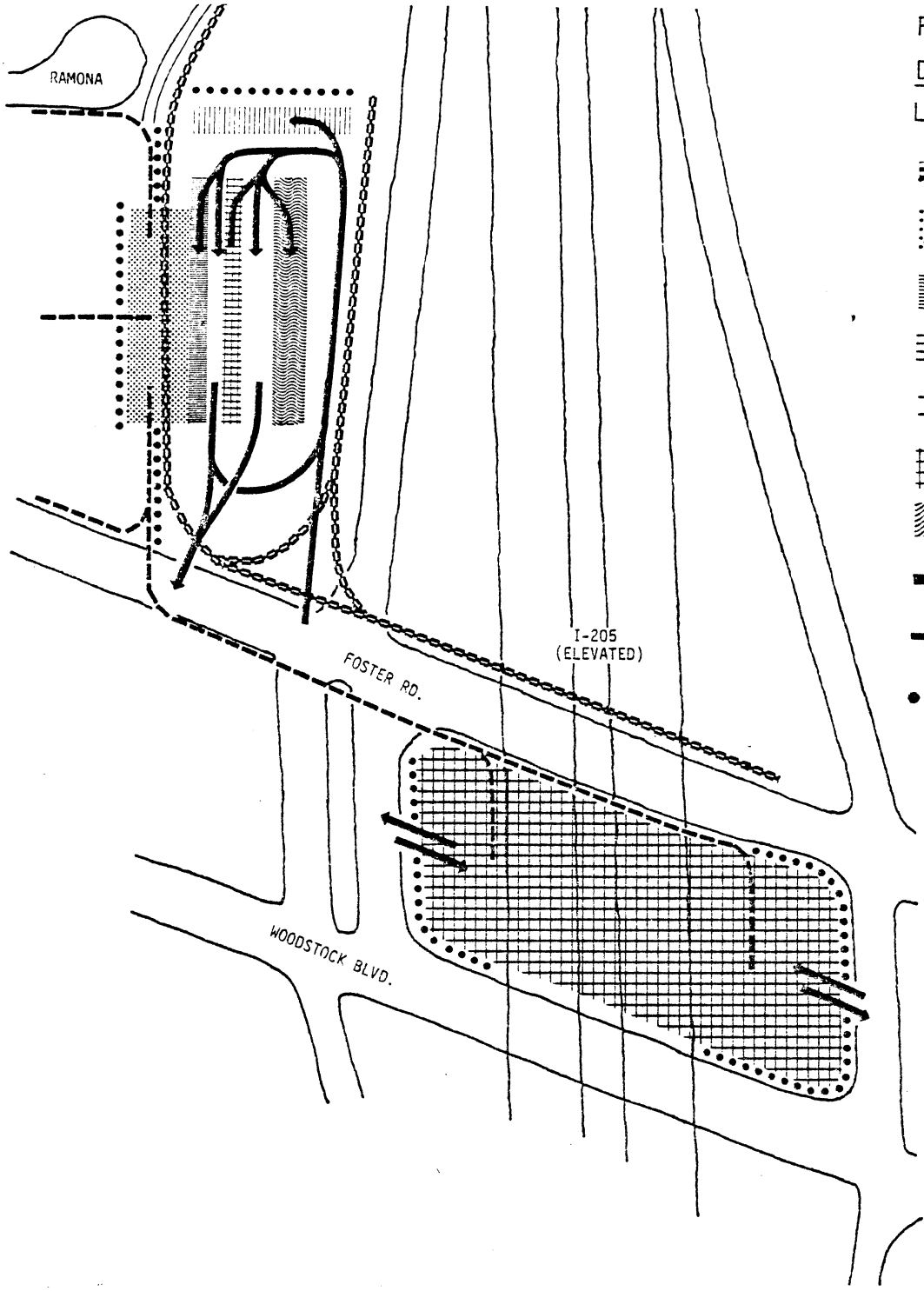


Figure: 33

DIAGRAM OF COMPONENTS SITING

LENTS STATION ZONE

- LRT Tracks
- Platform Area
- Bus Berths
- Bus Layover
- Park & Ride Lot
- Kiss & Ride Spaces
- Special Parking
- Vehicular Circulation
- Pedestrian Circulation
- Landscape Buffering

access to the LRT station. No other existing streets could be used to access the station zone. Conradt's busway studies (1975) and the City's recent urban renewal plans show a separation of transit (Foster) and traffic (Woodstock) on the couplet. This must be assumed as a possible strategy. If that were the case, a traffic linkage, as shown in ODOT Plan 3, would have to be established between the I-205 ramps off Foster and Woodstock to the south. Internal organization of the LRT station

zone should optimize Foster/Woodstock principal access and should obviate conflicts within the site between autos, buses, pedestrians and LRT vehicles.

The bikeway planned along I-205 should access the LRT platform and must connect with a City designated bikeway which will run along Foster.

As previously discussed, principal pedestrian access to the station would be expected from the west side of the I-205 right-of-way. Much of the Lents business/commercial center has been designated a "pedestrian district" in which "automobile-oriented land uses are to be discouraged" and pedestrian amenities developed. Further, Foster has been designated as a pedestrian street, which would call for design treatments to create a safe and pleasant pedestrian environment in a corridor dominated by another mode.

Should major reconstruction of the Lents business/commercial center take place and the pedestrian district designation be respected, there would be a tremendous opportunity for the coordination of pedestrian-oriented land use-transportation programs in the area.

7.4 STATION ZONE ACTIVITIES

INTRODUCTION

The intent of the station zone studies for the LRT alternative is to describe where the zones should be located and how these transit entities would operate within the existing and probable future urban situations. The previous discussion covered the locational rationale for station zones and zonal components along the I-205 alignment. This section of the report will describe the anticipated vehicular and patron movements and volumes within station zones as a confirmation of zone location selection, to permit more accurate description of potential positive and negative impacts created by station zone developments and operation, and to form the basis for derivation of preliminary facilities programming for station zones.

FEEDER BUS

Network Strategy

Feeder bus routes would be established along arterial streets radiating to the east and west from station zones in the I-205 corridor. Two overlapping north-south routes paralleling I-205 would compliment this basic system. With a few exceptions, these routes would be discontinous at station zones, i.e., city routes would enter from the west, turn around and depart to the west, while Multnomah County routes would come from the east and return to the east. These routes would provide local access along the arterials, would provide access to significant urban land uses within the I-205 corridor, and would furnish access to the light rail station zones permitting transfers for more regionally-oriented transit trips. The bulk of LRT patronage would be expected to arrive and depart on East County routes. Some patronage may use western lines; however, the City route interfaces with station zones on I-205 would be primarily for the

purpose of operational end-of-the-line activities and turnarounds. Both eastern and western routes may be synchronized with the LRT arrivals at station zones via the "timed transfer" operational strategy.

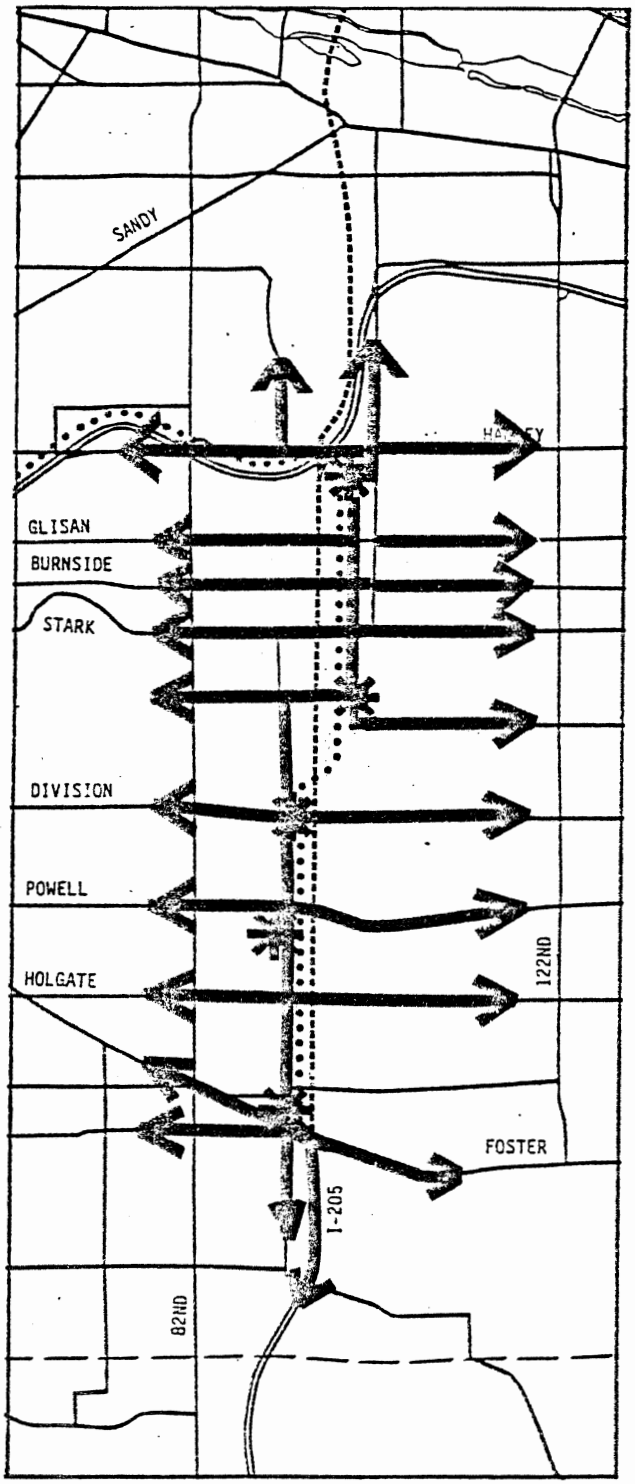


Figure: 34
1990 FEEDER BUS ACCESS TO STATION ZONES OF I-205 LRT

In total, approximately 246 feeder buses are projected to access the I-205 station zones during the p.m. peak hour in 1990. Most routes would operate with 10 minute headways in concert with the proposed headways of the LRT in the corridor. The following table describes the intended feeder bus activities at I-205 station zones.

Table 31

1990 FEEDER BUS ACTIVITY AT I-205 STATION ZONES
(NETWORK REFERENCE: 90W-03 PM PEAK HOUR)

STATION ZONE	EAST COUNTY LINES (EAST)				CITY LINES (WEST)				PARALLEL LINES (N & S)			
	LINE	#/HR	S.Z. MOVEMENT	ACCESS ROUTE	LINE	#/HR	S.Z. MOVEMENT	ACCESS ROUTE	LINE	#/HR	S.Z. MOVEMENT	ACCESS ROUTE
GATEWAY	61	3	Reverse	Banfield	14	6	Reverse	Halsey	97*3	6	Reverse	102nd
	78*1	6	"	Halsey	18	6	"	"	99*4	12	Through	102nd
Total:	114	6	"	"	22	12	"	Glisan				
	117	6	"	Banfield								
75 buses	118	6	"	Halsey								
	122	6	"	Glisan								
		33				24				18		
MALL 205	126	6	Reverse	Burnside	26	6	Reverse	Burnside	97*3	12	Through	102nd
	128	6	"	Stark	30	12	"	Market	99*4	6	Reverse	102nd
Total:	130	6	"	Market								
54 buses		18				18				18		
DIVISION	134	12	Reverse	Division	34	12	Reverse	Division	97*3	12	Through	92nd
					*2	(6)	"					
Total:												
36-(54*2) buses		12				12(18)				12		
POWELL	78*1	6	Reverse	Powell	36	6	Reverse	Powell	97*3	12	Through	92nd
	136	12	"	"	38	6	"	Holgate				
Total												
42 buses		18				12				12		
	70	3	Reverse	Foster	32	6	Reverse	Foster	97*3	12	Through	I-205&92nd
					40	6	"	Ellis-92				
LENTS					42	6	"	Woodstock				
					46	6	"	J. Creek-92nd				
Total:												
39 buses		3				24				12		
ALL ZONES												
Total:												
246-(252)*2 buses												

*1 Line 78 would operate between Gateway and Powell via 148th.

*2 Possible 6 additional peak hour buses through Division station depending on final network assignments.

*3 Line 97 would be a northbound parallel feeder line from Oregon City serving all stations during p.m. peak hour, which would terminate at Gateway.

*4 Line 99 would be a southbound parallel feeder line from Vancouver serving Gateway; terminating at Mall 205 during p.m. peak hour.

The 90W-03 modeled network for 1990 projected feeder bus patronage during the p.m. peak hour period to and from I-205 station zones as documented in the following table.

Table 32

PROJECTED 1990 FEEDER BUS PATRONAGE AT I-205 STATION ZONES
(NETWORK REFERENCE: 90W-03 PM PEAK HOUR)

STATION ZONE	PEAK HOUR ARRIVALS	% SUPPLY*[1]	PEAK HOUR DEPARTURES	% SUPPLY*[1]
GATEWAY	370	13%	896	30%
MALL 205	37	2%	45	2%
DIVISION	154	12%	454	36%
POWELL	28	2%	110	7%
LENTS	165	26%	412	65%

*[1] Supply was computed by adding 100% East County lines capacity to 50% parallel lines capacity and 0% City lines capacity due to the regional service objectives of the I-205 branch of the LRT. Capacity/bus: 45 seated and 25 standing equals 70 passengers.

The patronage figures for 1990 feeder bus lines in the above table should be recognized as representing only that number of feeder bus riders which would be generated by the LRT activities in the corridor within a specific hour of the day. To assess the efficiency and/or cost effectiveness of the 1990 feeder bus network associated with the I-205 LRT, generation from the other purposes of these lines would have to be assessed, i.e., local service function through the eastern region and access to future urban developments at activity centers in the I-205 corridor.

AUTOMOBILES

Provision for Automobile-Using Patrons

The previous description of station zone operational programs for the Burnside and Division branches of the LRT in 1990 did not include park & ride facilities on the Banfield line between Gateway and the downtown, but did make provisions for between 2100 and 2400 long and short term parking spaces on the outer branches. The rationale for these branch provisions stems from a phased LRT capture strategy which rationalizes that in order to maximize LRT patronage from the initiation of service,

every delivery mode, i.e., feeder bus, walk/bike, kiss & ride and park & ride should be accommodated as appropriate in the early years of service. Hence, park & ride, a transit patron delivery method used successfully in the Portland region at the present time, used throughout the country as a means to muster patrons at specific transit nodes, and a consistant program item in all fixed rail systems in North America would appear a justifiable station zone component in all LRT branch studies. In the post-1990 period, a period difficult to anticipate in the decade of the 70's, park & ride facilities on the LRT branch(es) could become obsolete and atrophy. Similarly, these facilities could be adapted to future delivery mode demands through enlargement or modification. It would appear unrealistic from the aspects of user-demand and operational cash flow to not provide a balanced net of park & ride facilities along the LRT branch alternatives at this stage of transit planning for 1990 conditions. In a like manner, kiss & ride activity, as a transitory phenomenon within station zones, would be accommodated as per modeled projections at all zones within the LRT branches and line with the exception of downtown zones.

The Gateway and Lents station zones have been historically recognized as significant for auto access to an express transit system operating along I-205. 1990 demand modeling has confirmed this significance. 1990 modeling has also shown reasonable demands for peak hour auto access at the other three I-205 station zones. Provision of park & ride facilities at zones would be dependent on the criteria previously discussed in this report. Analysis of station zone sites in the "Selection of Station Zones" has brought out the limitations of each site for automobile facilities. This balance of rationale, demand and supply has established a set of 1990 I-205 station zone automobile facilities as indicated in the following table.

Table 33

PARKING FACILITIES AT I-205 STATION ZONES-1990
(REFERENCE NETWORK: 90W-03 PM PEAK HOUR)

STATION ZONE	AUTO DEMAND*[1]				AUTO SUPPLY		
	Person Trips	K & R Cars	P & R Cars	Parking Lot Spaces	Site Parking Capacity*[2]	1990 K&R Spaces	1990 Parking Lot Spaces
GATEWAY	599	138	323	748	350 @Grade +280 Deck 630	12	425
MALL 205	86	19	46	107	435	1-2	150
DIVISION	130	30	70	162	375	2-3	175
POWELL	19	5	10	23	100 Phase I +500 PhaseII 600	1	100
LENTS	384	89	207	479	250 F-W +403 I-205 653	7-8	250 1100

*[1] Assumptions
A. Auto Loading: 1-3 people/car
B. Mode Split: P & R = 70% demand, K & R = 30% demand
C. K & R Space Turnover: 12 cars/hour
D. Peak Hour % Peak Period: Peak Hour P & R Demand = 60% Peak Period P & R Demand
E. Special Parking: Midday and Handicapped Spaces - 10% total lot spaces
F. Lot "design load factor" = 80% (to preclude spillover into surrounding streets)

*[2] That number of parking spaces which could be developed within 1000 feet of the proposed platform site inside available I-205 right-of-way (or adjacent vacant parcels) based on 400 s.f./parking space.

PEDESTRIAN AND BICYCLISTS

Walk/Bike Demand and Environments

The Tri-Met patronage modeling efforts for this branch form the basis for discussion within this section. The projected 1990 pedestrian/cyclist activity at individual station zones during the p.m. peak hour varies between 9 persons to 129 persons arriving at zones and 10 persons to 322 persons departing from zones.

Table 34

PROJECTED 1990 PEDESTRIAN/BICYCLIST PATRONAGE AT I-205 STATION ZONES
(Reference Network: 90W-03 PM Peak Hour)

	PEAK HOUR ARRIVALS		PEAK HOUR DEPARTURES	
STATION ZONE	NUMBER	% TOTAL PATRONS	NUMBER	% TOTAL PATRONS
GATEWAY	129	6%	322	16%
MALL 205	101	24%	207	49%
DIVISION	102	11%	183	20%
POWELL	9	6%	10	7%
LENTS	20	2%	63	7%

In many of the zones, there would appear to be a number of walk/bike features upon which to build. Foremost would be the pedestrian/bike path being constructed in conjunction with and parallel to the I-205 freeway. This pathway would pass through four of the five station zones (the exception being Mall 205 which is connected by an overpass) and could become a pleasant means of access to LRT platforms from neighborhoods and activities north and south of station zones. The city's recently adopted Arterial Streets Policy has classified many of the arterial streets accessing station zones as either "pedestrian paths with crossings' or "bicycle pathways", or both. Certain streets have also been classified as "boulevards" indicating future, rather pleasant pedestrian and bicyclist environments. (Table 35)

Table 35

PEDESTRIAN AND BICYCLIST STREET CLASSIFICATION AT I-205 STATION ZONES
Source: Arterial Streets Classification Policy, City of Portland, April, 1977.

STATION ZONE	Arterial/ Street	Classified Pedestrian	Classified Bicycle	Classified Boulevard
GATEWAY	Halsey	No	No	Yes
	Glisan	No	Yes	Yes
MALL 205	Stark	No	Yes	Yes
	Washington	West of I-205	No	No
DIVISION	Division	Yes	No	Yes
POWELL	Powell	Yes	Yes	Yes
	Holgate	No	Yes	No
LENTS	Foster	Yes*[1]	Yes	Yes
	Woodstock	No	No	Yes

*[1] Lents area bounded by 94th, Ellis, 88th and Tollman classified as "pedestrian district."

Practically, the modifications of these arterial streets to create the "classification" environments would take some time. However, affixing the station zones to these arterials and acknowledging the probable future modification would strengthen the role of LRT around zones.

Though projections and policies support pedestrian and bicyclist activities at most station zones, the traffic and land use situations around zones could make such activities somewhat hazardous and unpleasant in the short term. Three of the five designated station zone sites would lie immediately north or south of major arterial streets which are expected to continue to carry appreciable traffic. Each station zone would also be bounded by a traffic street to the east or west, e.g., Gateway by 99th, Division by 92nd, and Lents by 92nd. Most walking patrons could be expected to come from these directions. The possibility of these adjacent streets becoming impediments to convenient, safe pedestrian and bicyclist movements must be obviated. The suggested 1990 strategy to accomplish this would be demand-activated signalized pedestrian crossings or other appropriate treatments at several places on the bounding streets. Grade separation is not anticipated and would probably prove unsatisfactory at most station zones due to the level topography and unwillingness or immobility of patrons to climb up and down such structures.

Perceived future developments adjacent to station zones could appreciably enhance the number of pedestrian/bicyclist patrons and the environment through which they would pass. Strong pedestrian linkages could be established between the LRT platform and future mixed commercial/residential at Gateway, Mall 205 and Lents; and between the platform and planned residential/local commercial land uses at Division and Powell.

8. STATION ZONE PLANNING PRINCIPLES AND DESIGN CONCEPTS

8.1 INTRODUCTION

The generalized locations of the station zones along the light rail alignments and possible activity programs for each zone have been established in the preceding sections. This section examines the principles and guidelines for the location of specific components within station zones, and for design and program features of these components. These principles have been derived from four sources: regional transportation goals and objectives, including those adopted by the Tri-Met Board of Directors; the transit station goals promulgated by the Tri-Met General Manager in 1976; light rail systems operational requirements, and the practical experience and design studies by Tri-Met Planning and Development staff. The second part of this section discusses platform design standards and concepts.

8.2 SYSTEMWIDE PRINCIPLES

Certain planning relationships which would affect individual station zones should be considered from a systemwide basis. Such relationships concern the objectives of consistency and balance within the system.

COMPONENT FRAMEWORK

The basic identification of, and relationships between station zone components, such as described in this report, should be promulgated as a consistent, area-wide set of guidelines for each station zone. Such a planning framework should assure consideration of all zonal factors and, by its guidance, should result in a relative consistency of relationships between zones to increase operational efficiency and assist patrons in the use of all zones.

PATRON DELIVERY SYSTEMS

The program for facilities to accommodate feeder bus, park & ride, and kiss & ride activities throughout LRT should be understood as interrelated sets of patron delivery subsystems, and the distribution of these facilities along the alignments should result from policy, operational and community compatibility strategies.

ACCESSIBILITY GUIDELINES

System accessibility principles for the handicapped and elderly should be developed and universally applied. Such principles would directly affect station zone components to resolve such issues as the height of platforms.

8.3 STATION ZONE PRINCIPLES

Relationships applicable throughout station zones would influence the final planning and development of individual components. Such principles would present a consistent, coordinated set of guidelines to the various agencies which would share responsibility for developments within the zones.

COMMUNITY INTEGRATION

Development of each station zone should build from the existing opportunities in the surrounding community and should create benefits for that community and place emphasis on minimizing negative impacts.

FLEXIBLE OPPORTUNITIES

The context in which a station zone would be developed should have the potential to accommodate expansion of LRT station zone facilities, if such is warranted in the future.

PROPINQUITY OF ELEMENTS

All station zone improvements should occur within 400 feet of the intersection designated as the location of a station zone and most should be as close to the LRT platform as practical. The quality of patron transfers would directly affect ridership potential and distance-of-transfer would be an important factor in the perceived quality of such transfers.

FACILITIES COORDINATION

The number, type and placement of facilities within station zones should result from a cognizance of the operational requirements of the system, the personal needs of transit patrons, the availability of such facilities within the context of the station zone, and the needs of each surrounding community. Distribution of such facilities in station zones should be made to optimize use and preclude duplication.

IMPLEMENTATION

All transit-related improvements should be developed according to a coordinated implementation program guiding the actions of the transit agency, local community, county/city departments and State agencies.

8.4 COMPONENT PRINCIPLES

PLATFORMS

Location

Where feeder bus transfers would not take place off-street, platforms on the LRT tracks should be located close to arterial feeder bus routes to facilitate efficient and safe patron transfers.

Facilities

Facilities provided at platforms should reinforce the operational effectiveness of the transit system while facilitating transit user needs in an aesthetically pleasing and safe environment.

Flexibility

Platforms should be able to function with both double and single track, and other operational requirements which may arise. Platform facilities programs should be planned for expansion beyond minimum basic elements. Such expansion would be warranted by ridership growth and funding availability in the post-1990 period.

Identity

Platform areas should establish a positive transit identity by being recognizable "places" which act as consistent reference points for the community. This would be achieved through sensitive planning and design.

Visibility

The LRT platforms should be highly visible from access roadways and nearby areas to assure user orientation upon approach, and safety while within platforms.

Community Integration

Platform developments should optimumly result in functional and aesthetic improvements to the adjacent community, and should not physically or visually disrupt the existing and planned activities of the surrounding areas.

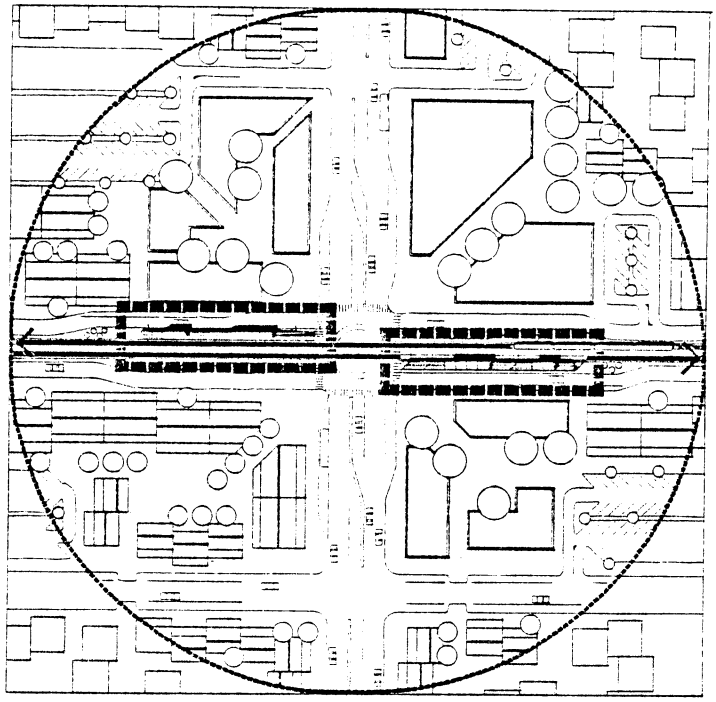


Figure: 35
PLATFORMS (illustrative)

PEDESTRIAN/BICYCLIST CIRCULATION

Area Access

Pedestrian circulation systems in station zones should assure unhindered and safe access between transit modes, adjacent businesses and the surrounding community. Emphasis should be placed on creating a pedestrian precinct within a station zone with pedestrian circulation separated from trafficways wherever possible to improve safety and environmental qualities. In a like fashion, bikeways should be separated from footpaths and trafficways within zones.

Characteristics

Pedestrian circulation ways should be adequately sized to accommodate anticipated flows, should be properly designed for safety and security, and should be aesthetically designed as pleasant environments. Pedestrian circulation systems should accommodate the needs of the elderly, handicapped and young.

Coordination

Pedestrian and bicyclist circulation systems should be coordinated with existing neighborhood circulation patterns to simultaneously provide transit access and reinforce land use patterns. When such a coordinated circulation system has been established as a movement framework in an area, new developments in and around the station zone should be located and designed to reinforce this system and enhance the framework.

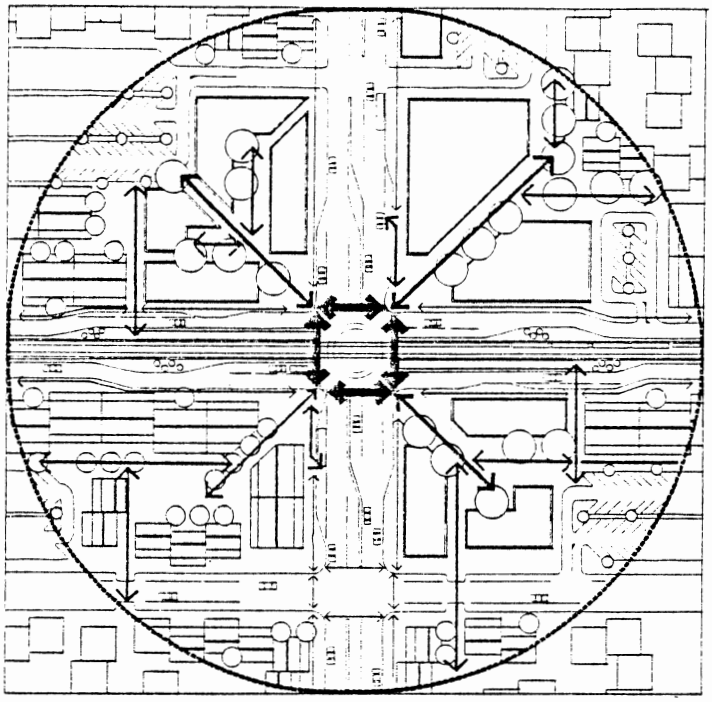


Figure: 36
PEDESTRIAN AND CYCLIST CIRCULATION
(illustrative)

TRAFFIC CIRCULATION

Uncongested Movement

All modes of vehicles should be able to circulate within and through zones in an efficient and uncongested manner.

Movement Priority

Priority of traffic movement within zones should be given to public transit modes with adequate provisions made for private vehicles.

Adjoining Neighborhoods

Transit generated traffic circulation patterns within zones should not disrupt the continuity of existing neighborhoods.

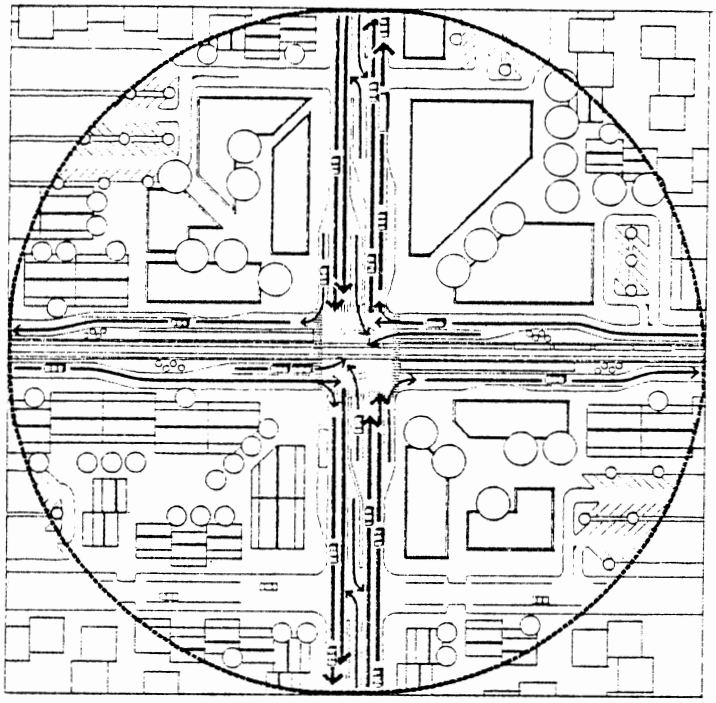


Figure: 37
TRAFFIC CIRCULATION (illustrative)

BUS FACILITIES

Stop Locations

Adequate provision should be made to allow buses to stop for passengers on the "far side" of intersections or in off-street areas out of main traffic flows on arterial streets. Bus "layover" areas and turnaround loops should be provided near stops, as required, to permit coordination of bus movements with the LRT schedules.

Stop Characteristics

Bus waiting areas should be easily identifiable and should have a safe and pleasing environment, including lighting, landscaping, benches, shelters and transit information. Patron boarding and alighting areas should be linked to the pedestrian circulation system.

Coordinated Facilities

Facilities provided at bus boarding areas should be coordinated with those provided throughout the zone and should be of a similar type and quality as those provided at LRT platforms.

Scheduling of Feeder Buses

The number and frequency of feeder buses through station zones should be closely coordinated with the scheduling of the LRT vehicle arrivals and departures in the station zone, and with the anticipated and monitored volumes of ridership.

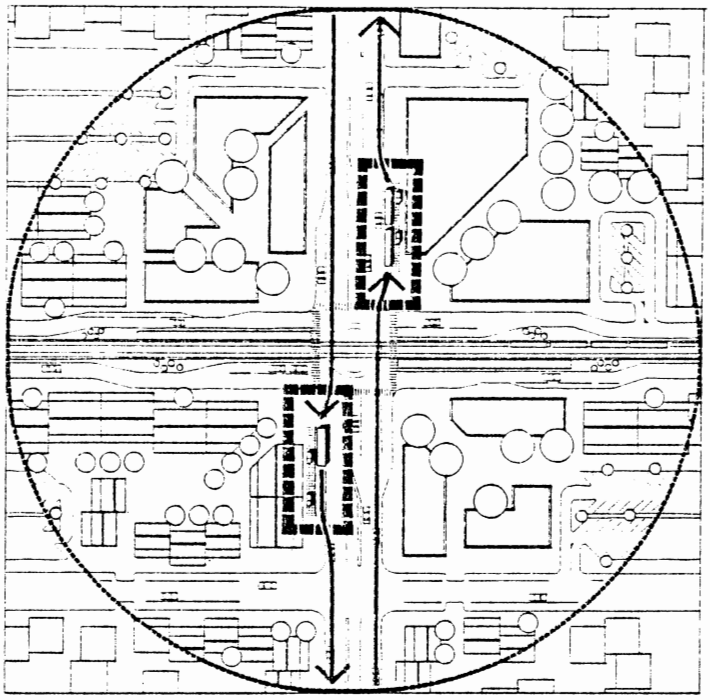


Figure: 38
BUS FACILITIES (illustrative)

PARKING AREAS

Access

Parking areas should have direct, and preferably multiple, automotive access from adjoining arterial streets, and should have pleasant, safe direct pedestrian access to LRT platforms. Kiss & ride activities should be accommodated by temporary parking spaces provided within the street right-of-way, or along main access roadways in off-street zones, with direct pedestrian access to the LRT platform and indirect access to feeder bus boarding areas.

Neighborhood Integration

The siting and design of parking areas should encourage park & ride patrons to use nearby neighborhood facilities as well as the transit system. Parking areas should have environmental qualities which are compatible with the surrounding neighborhood character and create a positive image for transit.

Security

Parking areas should provide adequate security for unattended vehicles as well as park & ride patrons during the day and night.

Multiple Use Possibilities

Shared use of parking areas should be encouraged wherever possible. Parking areas should be planned and designed to accommodate possible future redevelopment within value capture programs, and should be adaptable to future patron demands.

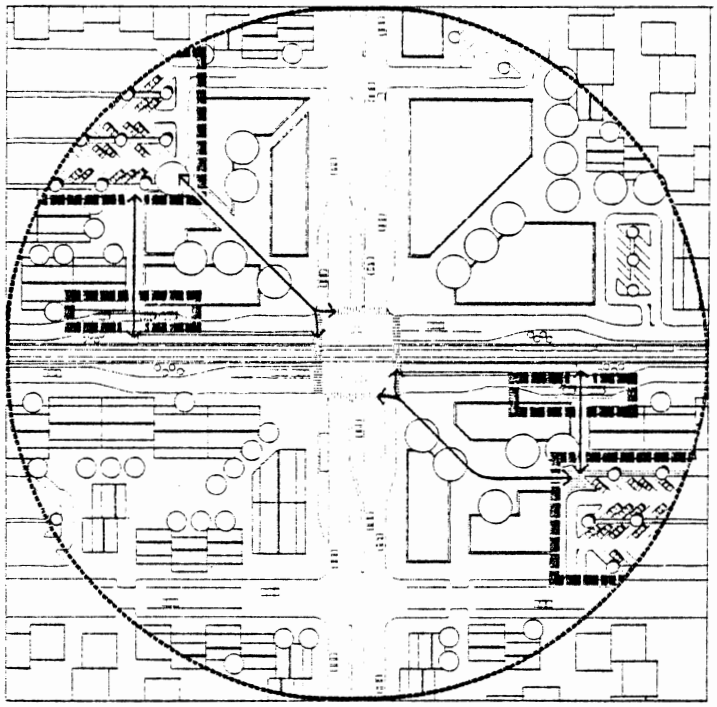


Figure: 39
PARKING AREAS (illustrative)

INTERRELATED LAND USE/ACTIVITIES

Location

Transit supportive or supportable activities which are compatible with the surrounding community should be located on, or immediately adjacent to, platforms where practical.

Type

Activities should be encouraged which are both permanent, e.g., field offices of governmental agencies, and temporary, e.g., weekend exhibitions, in nature.

Occurrence

Consideration should be given to the programming of interrelated land uses/activities whenever the LRT development process obligates the transit district to acquire land areas outside public rights-of-way, or whenever local authorities encounter opportunities through development controls, excess right-of-way acquisition, or other incentives.

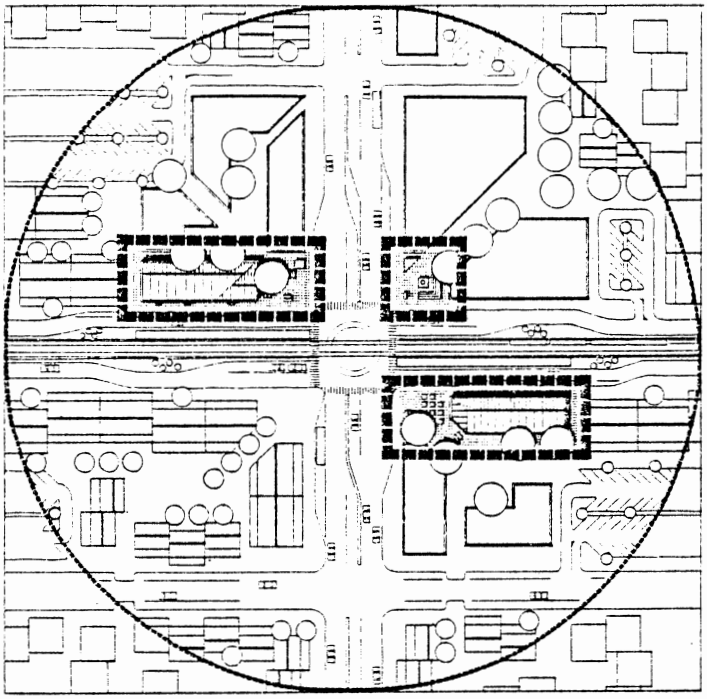


Figure: 40
INTERRELATED LAND USE/ACTIVITIES
(illustrative)

8.5 DESIGN STANDARDS AND CONCEPTS

It is probable that station zones and zonal components would be designed and constructed by separate agencies, departments and through contracts with private consultants. Because of the complexity inherent in the development of the many separate, yet coordinated, station zones on the proposed alignments of the light rail transit system, a set of specific design guidelines would be required to assure consistency of approach and cost-effectiveness of implementation throughout the selected system. The purpose of this section of the station zone report is to set forth a limited set of design criteria for LRT platforms as an example of the type and extent of required guidelines. Should the LRT be selected as the East Side Transit Strategy, a full set of design criteria would be required to guide the many efforts which would create zonal components. Such a full set may address topics such as: vehicle data and clearances, codes, acoustics, parking and site work, etc., as well as platform criteria expanded beyond the following example.

8.6 PLATFORM DESIGN CRITERIA (EXEMPLARY)

PHYSICAL DIMENSIONS

Length

Platforms shall provide a linear boarding area adjacent to LRT trains of 200'-0." (Length of car x 1.2).

Width

The minimum suggested platform width for varying situations is indicated below. Width may be increased in high-frequency, high-volume patronage situation.

		Configuration		
		Island	Split	Curbside
Vertical Plane	Low	12"-0"	10'-0" each	8'-0" each
	High/Low	14'-0"	10'-0" each	10'-0" each
	High	14'-0"	10'-0" each	10'-0" each

Height

Low Level: 8" above top of LRT rail (standard curb height), High Level: 3'-3" (1.0 meter) above top of LRT rail.

PLATFORM SURFACE

The walking surface of platforms should be of a non-skid material, be a material which will wear well when exposed to the Portland climate, and be handsome and distinctive. The paving materials and patterns selected for LRT platforms should be consistent with such materials used on other major transit projects in the region to present a consistent "transit image."

CLIMATIC PROTECTION (Cover & Partitions)

Modularity

Roofs, roof supporting systems and partitions should be designed as modular components. There should be a minimum complete unit to which additional components can be added to allow additive or subtractive flexibility with cost effectiveness.

Materials

Supporting systems should be of a permanent, low maintenance material. Roofs and partitions should be of a transparent or translucent material to maximize natural lighting of the platform and to permit observation of the platform (especially those located below or above street level) for security.

Location

A module or modules of cover should be located not greater than 50'-0" from the primary platform access point to assure protection for less mobile patrons. Additional cover should be provided elsewhere on the platform as warranted by patronage and to optimize train loadings.

Amount

First priority for climatic protection should be given to those platforms where it is anticipated that patrons would be waiting to board the LRT. (in the case of the LRT alignments under study, these would appear to be the inbound, CBD-oriented platforms on the East County branches; the outbound platforms in the CBD and possibly both platforms on the Banfield line.) The number of protection modules provided at any one platform should be directly proportional to the projected or monitored number of patrons using that platform.

LIGHTING

Area Coverage

Platform areas should be completely lighted with a sufficient intensity of illumination to provide safety, security and identity; but such illumination should be limited to the platform areas only and should not penetrate adjacent neighborhood areas nor create visual difficulties for drivers within adjacent arterial streets and intersections.

Feature Highlights

Higher intensity "feature" lighting should be used as a design element to emphasize functional and aesthetic aspects of platform areas.

FACILITIES

Coordination

Wherever possible, platform facilities should be physically integrated with climatic protection modules. Such coordination should include the design, placement and location of initial and subsequent facilities.

Location

Transit operations facilities, e.g., schedules, route information and ticket machines should be placed at all primary and secondary platform access points, as well as at other platform locations as justified. Personal comforts, e.g., benches, waste receptacles, telephones should generally be associated with climatic protection modules.

Placement

Facilities should be placed in non-boarding zones within platforms to be out of the way of the anticipated major movements of patrons.

PLATFORM LANDSCAPING

Within Platform

Within low-level platforms, trees with a mature branching structure, not to exceed 14'-0" at maturity and with lower branches trimmed to 6'-0", may be planted in the non-boarding areas. Other landscaping in non-boarding areas should include shrubs and ground cover species with low maintenance requirements.

Platform Edge

Low-level, screen planting should be considered along the track-side and outside of high-level platforms.

Platform Area

Wherever possible, mixed low and high planting should be established immediately adjacent to platforms particularly as visual and accoustic buffers between platforms and freeways. Such planting should not interrupt pedestrian movements nor visibility of patrons, train operators or vehicle operators in the platform area.

PROVISIONS FOR HANDICAPPED

Mountable Curbs

Depressed curb sections shall be provided at all primary and secondary points of access to platforms.

Access to High Level Platforms

Both ramps (1:12 slope maximum) and stairs shall be provided to all high-level platforms. Ramps shall have a minimum width of 3'-0" to accommodate one wheelchair in one direction; 5'-0" to accommodate the passage of two wheelchairs. Ramp handrails shall be provided on at least one side at a height of 32", measured from the surface of the ramp. Ramps shall have at least 6'-0" of straight, level clearance at the top and bottom. Ramps shall have level platforms at 30'-0" intervals for the purposes of rest and safety.

Accessways

All accessways to include doors and gates shall be a minimum of 32" clear opening and shall be operable by a single effort.

Reference

All provisions of the American National Standard Specifications for Making Buildings and Facilities Accessible to, and Usable to the Physically Handicapped, approved 1961, reaffirmed 1971, shall apply to the design of, and specification for platforms, as minimum standards.

STATION ZONE IDENTIFICATION

Signage

Signs identifying the platform within a specific community should be readable from a distance of 400 feet and should be placed at the primary access points. Other identification signs should occur along the platform to be visible by all riders on an LRT vehicle when at the platform.

8.7 ILLUSTRATIVE PLATFORM DESIGNS

CONCEPTS RATIONALE

The planning principles and platform design standards were used as guidelines in the preparation of design concepts for typical platform areas. The concepts illustrate platforms in different Portland contexts, with different configurations and different heights to assist discussions and understanding of what types of facilities might be built in station zones along the LRT alignment. The concepts were developed to show the implications of the outstanding design issues. All platforms have the common elements of cover/facilities modularity, textures and landscaping as discussed in the previous section.

MATRIX OF PLATFORMS

The issues of platform height and configuration remain flexible at this time. Decisions made during this phase of LRT planning limited these variables to the situations shown in the following matrix.

Table 36

APPLICABILITY OF PLATFORM VARIABLES*[2]

Height	Configuration: Island	Configuration: Split	Configuration: Curbside
Low	Lloyd Center Gulch Burnside Division I-205	Lloyd Center*[1] Gulch Burnside Division I-205	Downtown
High/Low	Lloyd Center Gulch Burnside Division I-205	Lloyd Center*[1] Gulch Burnside Division I-205	Downtown
High	Lloyd Center Gulch Burnside Division I-205	Lloyd Center*[1] Gulch Burnside Division I-205	Downtown

*[1] Split platform in the Lloyd Center area would require use of public sidewalk for inbound platform.

*[2] More complex station zones, e.g., Gateway and Gresham, were not considered in matrix due to more individualized contextural influences.

DESIGN CONCEPTS

The following platform design concepts have been developed to elicit discussion.

Illustrative Platform A

- Context: Suburban
- Configuration: Split
- Height: High Level

Illustrative Platform B

- Context: Urban
- Configuration: Island
- Height: High/Low

Illustrative Platform C

- Context: Downtown
- Configuration: Curbside
- Height: Low

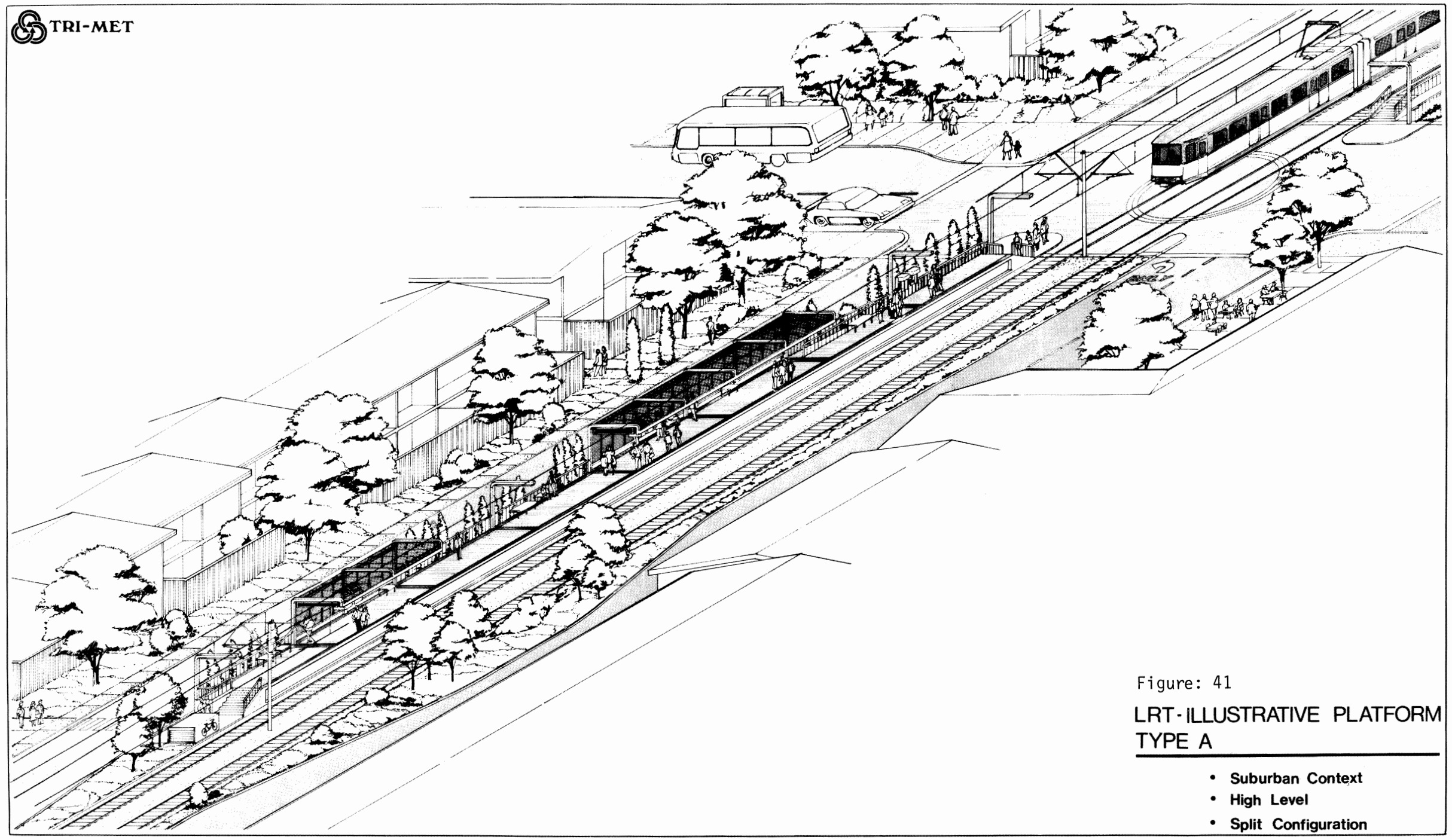


Figure: 41

LRT - ILLUSTRATIVE PLATFORM TYPE A

- Suburban Context
- High Level
- Split Configuration

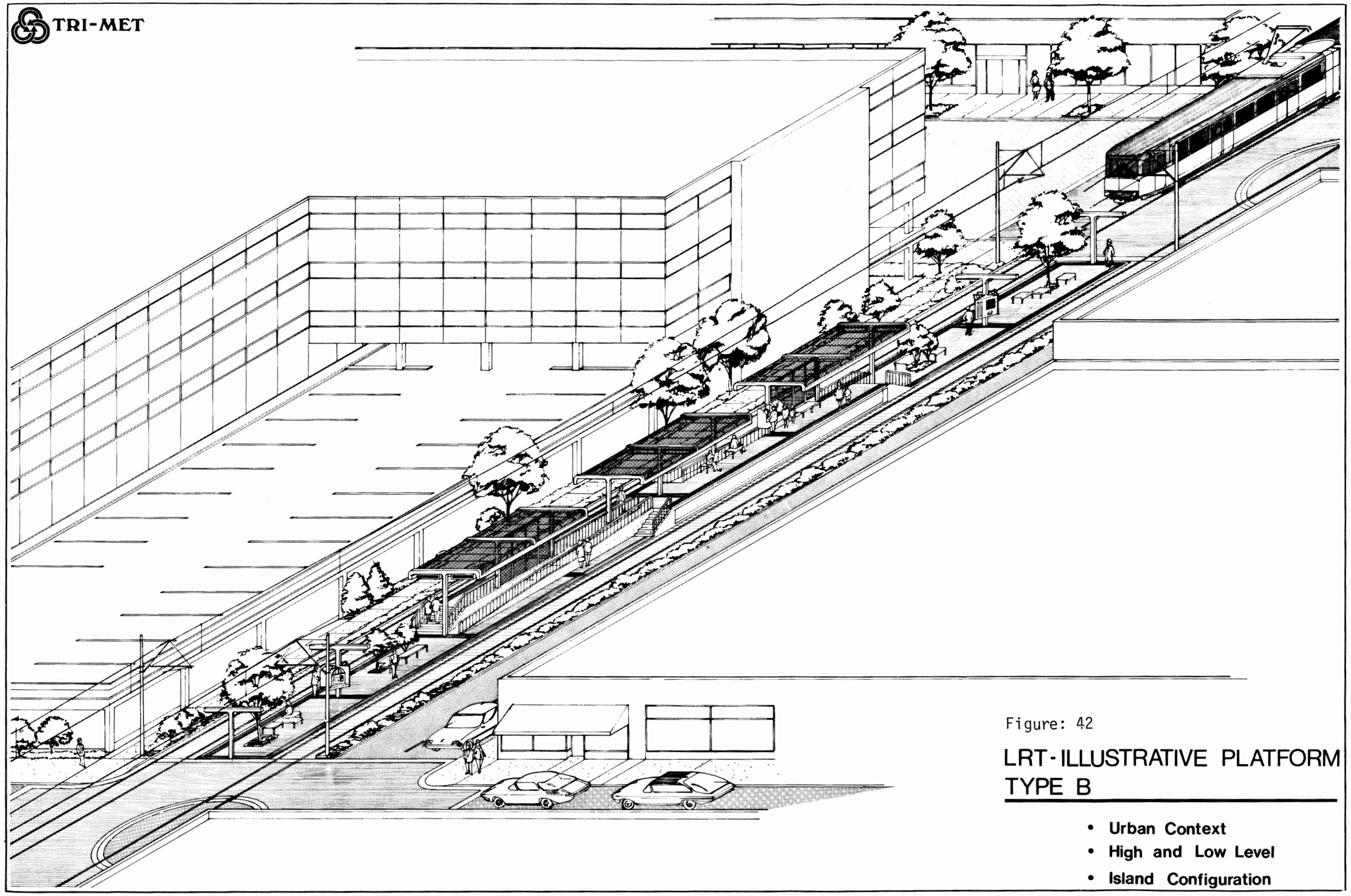


Figure: 42

LRT - ILLUSTRATIVE PLATFORM TYPE B

- **Urban Context**
- **High and Low Level**
- **Island Configuration**

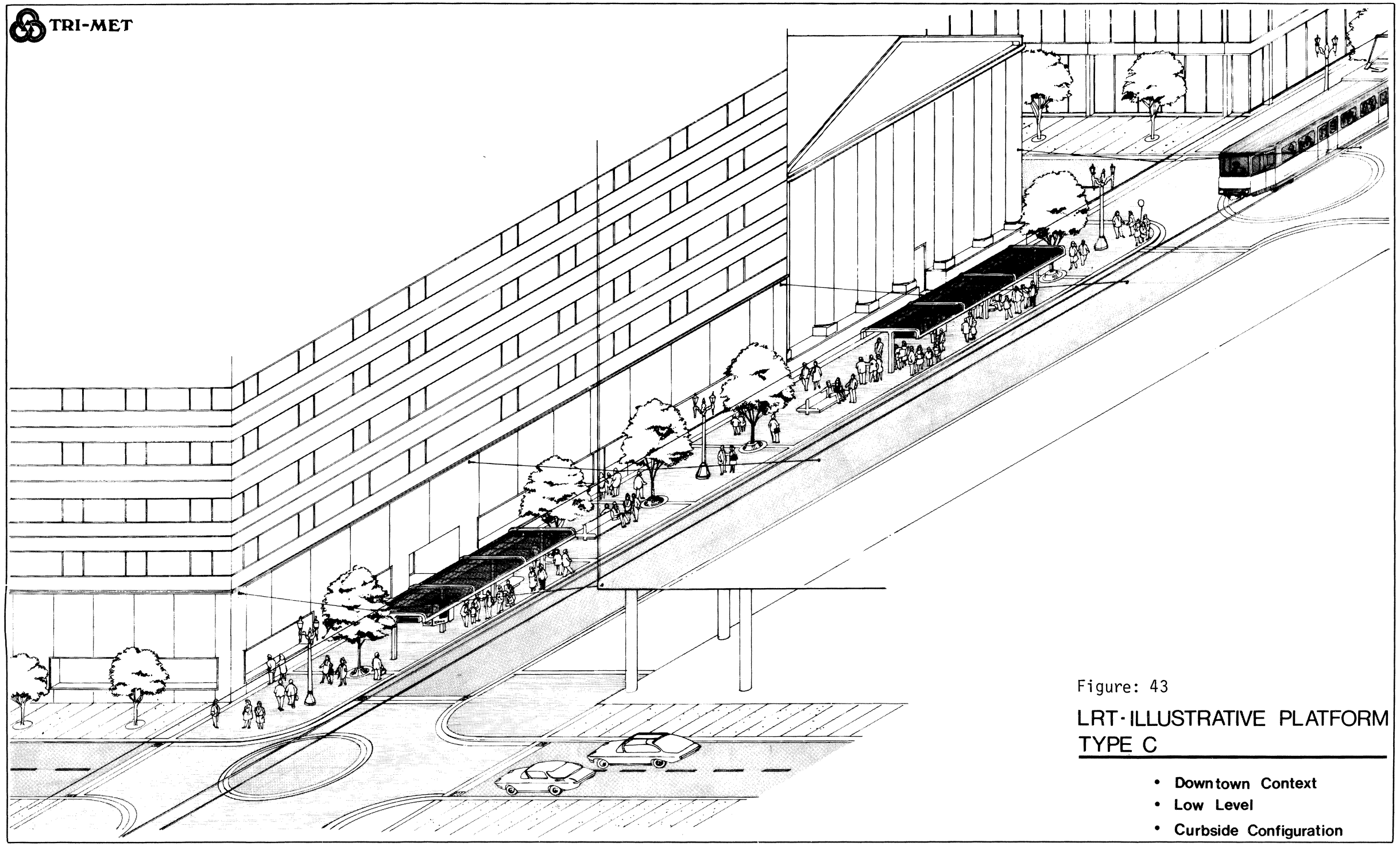


Figure: 43

LRT - ILLUSTRATIVE PLATFORM TYPE C

- Downtown Context
- Low Level
- Curbside Configuration

9. STATION ZONE ACTION PLANS

9.1 INTRODUCTION

Previous sections of this report have dealt with the locational rationale for station zones; a description of possible transit generated activity within station zones; and formulation of planning principles as guidelines for station zone development. This section describes the interrelated set of actions which would be required to establish efficient, safe and environmentally attractive station zones. The discussion is organized by station zone components (ref. Section 3: Study Approach). Within each component, the anticipated conditions, actions necessary to achieve these conditions, and responsible agencies are described.

The Land Use report (an LRT document accompanying this report) lists techniques, such as the formation of Transit Station Development Districts (TSDD) or a Transit Corridor Development Corporation (TCDC) as means to coordinate the anticipated development of transit facilities and the redevelopment of community areas around LRT platforms. Since TSDD/TCDC's remain an issue to be resolved, the following discussions allocate responsibilities to authorities which currently have jurisdictions in station zones. Without a singular transit development entity, a close working relationship between these authorities would have to be established to optimize LRT developments.

Station zones would function as pedestrian-oriented transit precincts. Priority would be given to the movement of pedestrians between transit boarding areas, kiss & ride, park & ride and nearby community activities. Second priority would be given to the movement of transit vehicles, which would be highly coordinated with pedestrian movements. Third priority would be given to the other types of traffic occurring within station zones, e.g., automobiles, taxis, and trucks. In many instances along the LRT alignment, such a hierarchy presents a challenge to decision-makers and designers because LRT station zones would be located at the intersection of heavily traveled arterial streets.

9.2 PLATFORMS

AREA ANALYSIS AND SITING

Platform locations have been indicated along each of the LRT alignments (Sections 4,5,6 and 7). Further investigations would be necessary within each station zone to evaluate the opportunities for, and constraints upon precise positions for the selected type of platforms. Such work would be undertaken during forthcoming stages of design.

DECISION ON CONFIGURATION

Three platform shapes are currently being considered: (1) island, (2) split, (3) curbside. Each shape has operational, construction, and cost advantages. Final platform shape decisions would be made for each station zone based on systemwide operational characteristics, e.g., type of LRT vehicle and whether doors would be on one side or both sides, and on characteristics of the local context within each station zone, e.g., if the LRT were placed on the CBD Transit Mall, curbside platforms would optimize existing physical developments. Tri-Met would have the primary responsibility for these decisions.

DECISION ON PLATFORM HEIGHT

A second issue to be resolved involves the height of platform surfaces above the track. High-level platforms (+3.3 feet) would directly accommodate the needs of the handicapped and elderly in using the LRT system, and would provide operational efficiencies for boarding and alighting passengers. High-level platforms would, however, be more expensive to construct and could be more visually obtrusive than low-level platforms (+.75 foot). A third alternative under consideration would be a platform with part high and part low-level sections to capture the benefits of both heights. Platform height decisions based on operational, environmental and economic factors would be the primary responsibility of Tri-Met with the assistance of local jurisdictions.

FACILITIES PROGRAMS

Transit patron necessities and conveniences would be provided within platforms (and throughout each station zone). This report has referred to these facilities only in general terms. Specific decisions would be made on which facilities should be placed within each platform (and within each station zone). A facilities program would include access and circulation provisions, protective cover, screens for climatic protection and safety, personal conveniences, e.g., water fountains, benches, waste receptacles, lighting, heating/ventilation, acoustic treatments, signage/graphics/advertising and landscaping. Programming would be a jointly shared responsibility between Tri-Met and local jurisdictions.

DESIGN AND CONSTRUCTION

Platforms should be treated by the design team as a separate feature of the system, subject to specific operational, physical, social,economic and environmental criteria. Current preliminary design findings were indicated in the previous section of this report. Tri-Met would take the lead role in the design of and specifications for LRT platforms.

9.3 PEDESTRIAN AND CYCLIST CIRCULATION

AREA PATTERN

The predominance of automobile-oriented commercial, office and residential activities within most station zones has restricted pedestrian circulation to sidewalks on the periphery of city blocks and has generally obligated cyclists to travel in mixed traffic in the streets. Some mid-block circulation is possible, but these are generally improvised routes through car parking lots or alleys. Pedestrian and bicyclists street crossings are limited to sidewalks at street intersections. Restructuring of station zone circulation patterns to favor pedestrian and cyclists would be required. Responsibility for the restructuring would fall to the City of Portland, Multnomah County and the City of Gresham (hereafter referred to singularly, or as a group as Local Jurisdictions).

SIDEWALK CHARACTERISTICS

Existing sidewalks in the designated station zones are generally of concrete, 4' to 10' in width and have been provided as a matter of convenience by local authorities and developers. Landscaping within public rights-of-way is infrequent. A similar condition exists in many cases along the private edge of sidewalks except in residential areas and in areas where newer development controls have required screening, such as along parking lots in the Lloyd Center area. Very few seating areas, drinking fountains, waste receptacles or other pedestrian-oriented "street furniture" have been provided for pedestrians and works of art are non-existent except in the Downtown Mall. Though a regional bicycle path system is slowly emerging, in general, bicycle lanes do not exist in station zones, nor have other provisions been made for bicycle users. Street lighting in station zones is generally good, but of the higher intensity type mounted far above the street best suited to motorists. A program of sidewalk and bikeway improvements would be required in each station zone in conjunction with programs to provide facilities at transit-related developments. Responsibility for improvement programs would rest with the Local Jurisdiction.

INFORMATIONAL AND DIRECTIONAL SIGNAGE

Signs along sidewalks are prevalent, but these are primarily intended to supply information and directions to motorists on the streets. Local advertising occurs on buildings and billboards. Though of occasional interest to pedestrians, these do not generally enhance the pedestrian qualities of sidewalks nor provide clarity of directions for pedestrians. To create a pedestrian precinct in station zones, the informational and human needs of pedestrians and cyclists would be accommodated by infor-

mational and directional signage pertinent to their needs and installed low enough to be comfortably read by standing adults. The Local Jurisdictions would be the lead agencies in coordinating the separate efforts of the City, County and State in a station zone signage program.

SIGNALIZATION

Where pedestrian signalization at street crosswalks occurs, it is presently limited to "walk/wait" indicators actuated in phase with traffic signals. Preference is given to the vehicular flow on streets--pedestrian movements are at the convenience of the street traffic. A better balance would have to be established between traffic priorities and pedestrian priorities if a pedestrian precinct is to be established in station zones. This is particularly true because of the frequencies, volumes, multiple directions of movements, and willingness to cross traffic to "catch the train" anticipated for pedestrians in station zones. Pedestrian priority signalization programs would be the responsibility of the Local Jurisdictions or ODOT, depending on location.

9.4 TRAFFIC CIRCULATION

TRAFFIC FLOWS

The station zone locational criteria to generally establish platforms at high access arterial intersections would probably result in increased traffic conflicts at these intersections due to the localized traffic activity around platforms. The operational through-traffic capacities of intersections should be maintained at the highest level possible, while recognizing the transit and pedestrian priorities in station zones. If required, alternative by-pass traffic routings should be considered to relieve potential traffic congestion at platform-associated intersections. Depending on the street classification, the Local Jurisdictions or the State Highway Department would be responsible for monitoring traffic conditions at these intersections and instituting efficiency measures as required.

TURNING MOVEMENTS

The presence of LRT activities generally within the street right-of-way would complicate traffic movements at intersections. Two objectives should be sought for intersectional turning movements; (1) to place the movements and required stacking space out of the predominent through-flow of arterial traffic, and (2) to assure that turning movements are completed and that redirecting traffic travels away from the arterial intersection before becoming involved with station zone activities. Physical reconstruction of intersections including channelization may be required to accomplish these objectives. Responsibility for redesign/reconstruction activities and traffic movement programs would fall to the Local Jurisdictions and/or the Oregon Department of Transportation.

SIGNAGE AND SIGNALIZATION

In addition to measures instituted to assure efficient operation of arterial intersections at station zones, additional programs would be required to properly guide traffic to or around LRT generated activities, such as park & ride lots, kiss & ride waiting spaces, and feeder bus stops. These programs should address the frequency needs of LRT generated traffic volumes and directionalities particularly during the a.m. and p.m. peak periods of LRT loadings and unloadings. The Local Jurisdictions and/or the State Highway Department would assume responsibility for these programs.

9.5 PARKING AREAS

TYPE, LOCATION AND SIZE

LRT parking facilities would consist of (1) park & ride parking spaces for long-term users (all day), and short-term users (mid and partial day), and (2) interim automobile waiting spaces for kiss & ride activities. Both types of facilities would make provision for the handicapped. The size of these facilities provided at any one station zone would be dependent on a balanced systemwide strategy to provide such facilities and on the ability of any one zone to accommodate such activities. Location of parking facilities would be dependent on the local land use characteristics and accessibility opportunities within each zone (refer to Sections: 5, 6 and 7). Responsibility for the final designation of these facilities would be taken by the transit planning agency, Tri-Met.

LAND ACQUISITION

The park & ride facilities would probably be located outside the right-of-way of the arterial streets in which the LRT is aligned. Funds for additional land acquisition are expected to be made available from the overall LRT development funding. Tri-Met with the assistance of other regional agencies with experience in public project land acquisition procedures would be responsible for acquiring the required land and access easements.

DESIGN AND CONSTRUCTION

The optimum utilization of the acquired land would be sought subject to the zoning regulations in force and appropriate design treatments necessitated by the predominent character of the area. Durability, cost and suitability would be criteria used to specify materials. Construction should proceed in phase with the overall development of the LRT system and would emphasize expediency and minimize community disruption. The responsibility for the design of these facilities would fall to Tri-Met.

OPERATION

Tri-Met, as the transit operating agency, would take overall responsibility for maintenance and supervision of these facilities. Local Jurisdiction may be requested to provide police surveillance for security if a separate transit security force is not established.

9.6 BUS FACILITIES

CIRCULATION

The feeder bus system will represent an integral part of the East Side LRT transit strategy. Coordinated operations of the bus system will be crucial to the overall perceived and actual service levels to many LRT users. Buses must be able to travel through or remain parked within station zones during different periods of the day without undue interference from other traffic. Sufficient numbers of directional lanes and preferential traffic signalization should be provided at street intersections to assure unimpeded movement of feeder buses. The Local Jurisdictions would be responsible for these improvements.

TURNOUTS AND LAYOVERS

Feeder buses would load and unload using "farside" stops on arterial streets running perpendicular to the LRT alignment on Burnside, perpendicular and parallel on Division and off-street along I-205. At on-street stop locations, widening of the street may be necessary to permit buses to stop along the curb out of the flow of street traffic. Traffic diversions would be required at farside corners to preclude conflicts between right turning vehicles and feeder buses turning into the curb. In many cases, the spaces provided along the curb would have to be extended to permit one or two buses to "layover" or wait in the station zone to coordinate their departure with the arrival of the LRT vehicles. Responsibility for creating bus turnouts, layover areas and appropriate traffic diversions in the Burnside and Division alternatives would be assigned to Local Jurisdictions.

BOARDING/ALIGHTING AREAS

These feeder bus patron areas adjacent to the turnouts need not, in general, be extensive, but should be distinctive and pleasant environments. Optimally, these areas should lie to the side of sidewalks, should have special paving patterns similar to that of platforms, landscaping as appropriate and simple shelters with transit information pertaining to the disposition of facilities within a particular station zone and to the systemwide transit opportunities. Tri-Met would take responsibility for design of these facilities, which would probably be constructed as part of the LRT project.

9.7 INTERRELATED LAND USE/ACTIVITY

APPROPRIATE TYPES

Station zones should be enriched by establishing transit-supportive activities, e.g., those types of activities which are either major origins or destinations for transit users, or transit-supporting activities, e.g., those types of activities which would benefit greatly from the high accessibility afforded by the coordinated transit movements in station zones. Such activities may be either permanent, e.g., mid-rise residential development, or temporary, e.g., a weekend exhibit, with either a public or

private purpose. The Local Jurisdictions as the responsible agencies for land use control should carefully balance station zone programs to include service facilities, generators and benefitors.

LOCATION

The placement of these land uses/activities in station zones would depend on a plethora of factors concerning the type of activity (as described above), as well as legal, political, economic and social concerns. The primary location for these activities would be within LRT platform areas. Confinement of narrow platforms with street right-of-ways in two of the alternatives may preclude the placement of these activities on or immediately next to platforms in many instances. The second priority location would be along pedestrian linkages on either side of the street immediately adjacent to platforms on Burnside or Division, or within station zones and nearby excess right-of-way parcels on I-205. Other locations should be considered if they are directly accessible from the predominant pedestrian circulation pattern in the station zone. The responsibility for locating these types of activities would fall to the transit agency and Local Jurisdictions as described below.

IMPLEMENTATION

To establish these types of activities, the transit agency, Tri-Met, should consider user and operational needs and development opportunities within the areas of their jurisdiction. Establishment of these activities in primary locations, e.g., on or adjacent to platforms, would appear most probable in special situations along alignments, such as in downtown, Gateway and Gresham. Further opportunities could arise as the District is obligated to extend its jurisdiction outside street right-of-ways to develop supportive facilities, such as park & ride lots. The Local Jurisdiction would have control over most of the redevelopment in zones outside street right-of-ways. Local authority support for these activities should come by way of development controls, e.g., zoning, comprehensive plan and subdivision ordinance, economic incentives and political programs.

9.8 CONCLUSION

The preceding descriptions of anticipated actions and responsibilities in station zones present an indication of the coordinated programs which would be required to develop transit facilities for the LRT. The descriptions are intended to illustrate that there will be many interdependent "actors" involved with station zones--recognizing that station zones would be only part of the LRT development program. A central managing entity similar to that described in the LRT Land Use report would appear of benefit to such a complex program.

If the LRT system and support systems are to properly serve the needs of Eastside residents and optimize ridership potential in 1990 and beyond, the pedestrian bias in station zones must influence decisions and choices. Under this influence, each station zone may represent a set of diverse issues as automobile dominated environments are retrofitted to pedestrian precincts. Such retrofitting would require not only changes in design approaches, but in the same instances, changes in attitudes.