WESTSIDE CORRIDOR PROJECT

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

ALTERNATIVES ANALYSIS

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION

March, 1982

ALTERNATIVES ANALYSIS/DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE

WESTSIDE CORRIDOR

IN

MULTNOMAH AND WASHINGTON COUNTIES, OREGON

PREPARED BY

U.S. DEPARTMENT OF TRANSPORTATION

URBAN MASS TRANSPORTATION ADMINISTRATION

IN COOPERATION WITH

METROPOLITAN SERVICE DISTRICT

TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT

OREGON DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

PURSUANT TO SECTION 102(2)(C), PUBLIC

LAW 91-190, and 49 USC 1610

DATE: March 23, 1982 FOR UMTA: Robert H McManus

Robert H. McManus
Associate Administrator for
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FOR METRO: Rick Gustafson

Rick Gustafson
Executive Officer

COVER SHEET

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
DRAFT ENVIRONMENTAL IMPACT STATEMENT (NEPA)
ALTERNATIVES ANALYSIS

Pursuant to Section 102(2)(c), of the National Environmental Policy Act of 1969 Section 14 of the Urban Mass Transportation Act of 1964, and Section 4(f) of the Department of Transportation Act of 1966.

LEAD AGENCY

Urban Mass Transportation Administration (UMTA)

COOPERATING AGENCIES

Metropolitan Service District (METRO), Federal Highway Administration (FHWA), Oregon Department of Transportation (ODOT), Tri-County Metropolitan Transportation District (TRI-MET)

OTHER PARTICIPATING AGENCIES

Multnomah County, Washington County, Portland, Beaverton, and Hillsboro

TITLE OF PROPOSED ACTION

Westside Corridor Alternatives Analysis

ABSTRACT

This report documents the environmental impacts of five alternatives for a major transportation improvement project in the Westside Corridor in the Cities of Portland, Beaverton and Hillsboro, in Multnomah and Washington Counties, Oregon. The five alternatives are: 1, No Build, maintenance of existing improvements through the target year 1995; 2, Bus Service Expansion, provision of improved and expanded bus service, limited facilities construction and roadway improvements throughout the corridor; 3, Sunset Busway, construction of an exclusive bus roadway and support facilities along the Sunset alignment between Portland and Beaverton; 4, Sunset Light Rail Transit (LRT), construction of a light rail transitway and support facilities along the entire length of the Sunset alignment (Portland to S.W. 185th Avenue); and 5, Multnomah LRT, construction of a light rail transitway and associated support facilities along the Multnomah alignment (Portland to 185th Avenue). Bus service and roadway improvements throughout the corridor are also included in the Busway and LRT Alternatives.

COMMENTS ON THE DRAFT EIS

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Date

FEDERAL NOTE

Current Federal policy is to defer financial participation in new rail transit systems and system extensions at least until the economic situation and the condition of the Federal budget improve. An exception is made in the case of rail projects funded under the Interstate Transfer program, provided such projects are cost-effective and can be fully funded from existing Interstate Transfer and non-Federal resources.

Rail alternatives have been included in this draft EIS in the interest of presenting a broad range of potentially feasible options and their impacts, to help define the issues, and to provide a clear basis for local decisionmaking. If a rail alternative is chosen as the locally preferred alternative, it will be with the understanding that Urban Mass Transportation Administration funding for preliminary engineering, final design, and construction is unavailable at this time. Further rail project development activities would thus be deferred or funded exclusively by State and/or local governments (UMTA, 1981).

READER'S GUIDE TO THE ENVIRONMENTAL IMPACT STATEMENT

The Draft Environmental Impact Statement (DEIS) documents the environmental effects of the five alternatives analyzed during this study. The reader choosing to get an overview of the issues is referred to two summaries: a general summary presented in the front of the DEIS and entitled Summary and a detailed summary presented in Section 2.3, entitled Comparative Summary of Alternatives. Section 1 of this document describes the need for a major transportation investment in the corridor and presents the objectives and evaluation methods of the study. Section 2 defines the alternatives evaluated and summarizes their environmental impacts. The analysis in Section 2.3 provides an overview comparison of key transportation, economic, and environmental effects of each alternative. Sections 3 and 4 present a more detailed discussion of major impacts to support the findings of the analysis. A topical index and glossary are presented at the end of this DEIS.

This document has been prepared specifically to provide the interested public, reviewing agencies, and the decision-makers within the Metropolitan Service District (METRO) information necessary to make an informed choice as to the transportation investment most appropriate for the Westside Corridor. After the public circulation of this document, the Westside Corridor Steering Group, a policy-making body composed of representatives from affected agencies and local jurisdictions (members are listed on the cover sheet), will hold a series of public hearings to receive public comments and make a recommendation for the preferred alternative for the corridor. This recommendation will be presented to the Metropolitan Service District Council, the Oregon Transportation Commission, the Tri-County Metropolitan Transportation District Board of Directors, the Board Commissioners of Multnomah and Washington Counties, and the City Councils of Portland, Beaverton, and Hillsboro. Following the concurrence of local officials, approval will be sought from the federal lead agency, the Urban Mass Transportation Administration of the U.S. Department of Transportation.

If the United States Department of Transportation agrees that the locally preferred alternative is a cost-effective project, a Final EIS will be prepared presenting the environmental effects of the preferred transportation alternative for the Westside Corridor. Comments received from the public on this EIS and responses to significant environmental issues raised will be incorporated into the Final EIS. Certification of the Final EIS on the preferred alternative will provide necessary environmental clearance to proceed. It is noted that if the Bus Service Expansion Alternative is selected, a Final EIS may not be required and a Finding of No Significant Impact (FONSI) may be determined.

SUMMARY

MAJOR CONCLUSIONS

DEVELOPMENT OF ALTERNATIVES

In 1979, the Metropolitan Service District (METRO) in cooperation with the Tri-County Metropolitan Transportation District (TRI-MET) and other local jurisdictions in the Portland, Oregon region completed an extensive systems analysis of existing and future conditions in all of the major regional transportation corridors. This analysis culminated in the designation of the Westside Corridor as a priority corridor for major transit investment.

A two-phased study, known as the UMTA Alternatives Analysis, was initiated in July 1979, to develop transportation options that might address the problems facing the Westside Corridor. Phase I of the UMTA Alternatives Analysis examined broad ranging options for various bus and transitway route possibilities on the Westside. After examination of the general performance, costs and potential impacts of the 16 options, the range of promising alternatives was reduced to five, including a No Build Alternative, for further examination and comparison in the Phase II analysis. These five options were formally accepted by all participating jurisdictions and agencies following a series of public meetings. Included in the four build alternatives is a set of highway-related improvements.

DESCRIPTION OF ALTERNATIVES

ALTERNATIVE 1: NO BUILD

1. Description

This alternative is a base case illustrating the consequences of undertaking no major transportation development in the Westside Corridor. It assumes a continuation of present TRI-MET bus operations in mixed traffic on the Westside and the implementation of TRI-MET's Five Year Transit Development Plan (TDP) in the remainder of the region.

2. Estimated Cost

No capital costs are associated with the No Build Alternative. Operating costs in 1995 (estimated in 1980 dollars) are $18.9 million annually.

3. Summary of Effects

a. Long-Term Beneficial Effects

The No Build Alternative would require no displacement of residences or businesses, no use of Section 4(f) parklands, no construction in floodplain areas or disturbance of historical sites or natural habitat. There are no transportation or land use benefits associated with this alternative.

b. Long-term Adverse Effects

The No Build would not provide the transportation infrastructure required to support the land use development plans of Downtown Portland, Central Beaverton or the urbanizing portion of western Washington County. The inability to develop to planned densities could contribute to increased sprawl and place development pressures on the urban growth boundary. There would be a long-term trend toward decreased service levels on the highways and arterials in the corridor. There would also be increases in regional auto traffic using neighborhood streets.

c. Short-Term Construction Impacts

The No Build Alternative requires no transportation facility construction and, therefore, no construction impacts are expected.

ALTERNATIVE 2: BUS SERVICE EXPANSION

1. Description

This alternative would provide a relatively low-cost transit development strategy which would double bus service in the Westside through a combination of additional routes and higher service levels. Other than individaul transit centers and park-and-ride lots, no major transit construction would be undertaken. Buses would still operate in mixed traffic, but low-cost traffic management improvements would be made to allow buses to bypass congestion. The alternative would also include the construction of a climbing lane on the Sunset Highway from the Vista Tunnel to the Sylvan Crest and ramp metering on the Sunset Highway and Highway 217.

2. Estimated Cost

Capital cost estimates for the Bus Service Expansion Alternative range from $80.3 to $90.7 million. Operating costs in 1995 are $33.8 million annually.

3. Summary of Effects

a. Long-Term Beneficial Effects

The Bus Service Expansion Alternative would provide needed transportation capacity to the developing area in Washington County. It also would provide the transit service required to facilitate reasonable access between Downtown Portland and its Westside market area. Transit coverage and service levels will be significantly increased in Washington County and Beaverton, and transit patronage would be significantly increased relative to the No Build. The basic infrastructure would be in place to respond to demands for future expansion of the transit system. Transit reliability would be increased although sporadic delays would still be expected. Increases in long-term highway and arterial congestion would be significantly reduced. The potential for regional traffic to use neighborhood streets would also be reduced.

b. Long-term Adverse Effects

The Bus Service Expansion Alternative may not provide the service levels or schedule reliability necessary to meet long-term (post 1995) development needs. It would require the highest on-street bus volumes of the alternatives. Only limited space would exist in Downtown Portland and Beaverton for future service expansion. Increased bus volumes could be expected to produce higher noise levels, particularly in Downtown Portland and in the vicinity of transit centers. The noise levels, however, would be within federal standards. As transit demand increases, the Bus Service Expansion Alternative would become less efficient to operate relative to the other build alternatives. Three acres of natural habitat and two businesses with 22 jobs would be displaced by the Bus Service Expansion Alternative.

c. Short-term Construction Impacts

Slide risks may be encountered at the site for the Burlingame Transit Center and along Sunset Highway between the Vista Ridge Tunnel and the Sylvan area. Minor increases in local particulate emissions and short-term noise impacts would occur at transit center construction sites. Some off-peak construction work on Sunset Highway may cause delays.

ALTERNATIVE 3: SUNSET BUSWAY

1. Description

The Sunset Busway Alternative involves the construction of a 7.2 mile, two-lane transitway, separated from existing roadways, between Downtown Portland and Central Beaverton. The busway would follow the Sunset Highway west from Portland and south along Highway 217 into Beaverton where it would terminate at a transit center. There are several routing and transit center options in Beaverton. Transit center locations, traffic management improvements, highway-related improvements and bus service orientation would be identical to improvements associated with the Bus Service Expansion Alternative.

2. Estimated Cost

Capital costs incurred by the construction of the Sunset Busway Alternative would range from $146.1 to $157.0 million. Operating costs are estimated at $32.7 million annually.

3. Summary of Effects

a. Long-Term Beneficial Effects

The beneficial impacts of the Sunset Busway Alternative are similar to those described for the Bus Service Expansion case, with several exceptions. Most important would be the improved service levels and schedule reliability derived from the separation of buses from general traffic flow along Sunset Highway and Highway 217. This improvement would lead to slightly higher patronage and lower operating costs than the Bus Service Expansion Alternative. The exclusive facility for buses in Beaverton would improve local traffic circulation and, therefore, enhance development prospects.

b. Long-Term Adverse Effects

Approximately two acres of wetlands, nine to 18 residences, and 10 to 16 businesses would be displaced by this alternative. Direct use of land on 4(f) recreational property and indirect adverse impacts to five historical landmarks would occur. Two transit station facilities along with portions of the busway would be constructed within the Beaverton Creek floodplain. Operational noise levels would be increased above federal standards in the vicinity of 116th Avenue and Fairfield Streets in Beaverton.

c. Short-Term Construction Impacts

Noise disturbance would occur at six sensitive receptors along the busway during construction. Local particulate levels and soil erosion would temporarily increase in construction areas, particularly at major cut and fill sites. Unstable soils and slide risks would be encountered during construction along the Susnet Highway between the Vista Ridge Tunnel and the Sylvan area, between 78th and 79th Avenues, at the crossing of Golf Creek, at the Sylvan and Zoo/OMSI stations and at the Burlingame Transit Center. Some delays to off-peak traffic on the Sunset Highway would be expected during the construction period.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

1. Description

The Sunset LRT Alternative encompasses many of the same bus service, traffic management and highway-related improvements as outlined for the Bus Service Expansion and Sunset Busway Alternatives. Additionally, a 12.2 mile two-track light rail line would be constructed from Downtown Portland to Central Beaverton via the Sunset alignment, then west to S.W. 158th Avenue along the Burlington Northern Railroad line, then finally veering north and terminating at N.W. 185th Avenue near Holly Street. Construction of the LRT line would be associated with the development of stations, park-and-ride lots, transit centers and other support facilities along the length of the alignment. There are several routing options in Downtown Portland and Beaverton.

2. Estimated Costs

Capital cost estimates for the Sunset LRT Alternative range from $227.2 to $236.7 million. Operating costs in 1995 would be $30.9 million annually.

3. Summary of Effects

a. Long-Term Beneficial Effects

The Sunset LRT Alternative would provide higher speeds and better schedule reliability for transit between 185th Avenue and Downtown Portland than the Sunset Busway. These attributes would lead to higher transit patronage than the bus alternatives over the long-term. The Sunset LRT Alternative would be the least expensive option to operate. At some point the operating savings would more than compensate for the higher construction costs of the LRT. It would reduce the problem of high bus volumes in Downtown Portland and Central Beaverton. The transit capacity and service levels supplied by the Sunset LRT option would be capable of meeting the corridor's long-term development plans. The rail alignment would support Downtown Portland's high density commercial spine. The Sunset LRT option would implement local policies which allow for increased densities in the urbanizing portion of western Washington County. The tendency for long-term urban sprawl would be reduced in comparison to the bus options. The transit ridership gains would be reflected by proportionate reductions in traffic congestion on highways and arterials, as well as regional traffic through neighborhoods.

b. Long-Term Adverse Effects

Under the Sunset LRT Alternative, 2.5 acres of wetlands would be lost. One National Register historic site would be indirectly disturbed and eight local historic landmarks would be impacted -- one directly. Land in one Section 4(f) park would be used. Between seven and 101 dwelling units and between eight and 16 businesses would be displaced. Three station facilities along with portions of the transitway would be constructed within the Beaverton Creek 100-year floodplain.

c. Short-Term Construction Impacts

Noise levels would temporarily increase at seven sensitive receptors along the alignment during construction. Levels of construction-related dust will temporarily increase along the entire alignment and at station areas, particularly at major cut and fill sites. Some erosion may occur at sites requiring extensive earthwork and at stream crossings in the Beaverton Creek drainage area. Unstable slopes and slide hazards would be encountered at several sites during construction of the transitway and associated facilities. These include areas along Sunset Highway between the Vista Ridge Tunnel and Sylvan, between 78th and 79th Avenues and at the crossing of Golf Creek, the Sylvan and Zoo/OMSI stations, and the Burlingame Transit Center. Some delay to off-peak traffic on the Sunset Highway would be expected during construction.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

1. Description

The Multnomah LRT is similar in concept to the Sunset LRT, but addresses a different service area in the Westside Corridor. The Multnomah LRT would exit Downtown Portland at a southern point along the Southern Pacific Railroad line and parallel Macadam Avenue to Taylor's Ferry Road. The alignment would turn west to Interstate 5 and follow the freeway to Multnomah Boulevard, where it would operate in the center of Multnomah Boulevard. The alignment would veer off of Multnomah Boulevard and follow the abandoned Oregon Electric right-of-way into Central Beaverton. There are several routing and transit center options in Beaverton. West of Beaverton, the alignment would be identical to the one described for the Sunset LRT Alternative. Transit centers and stations, park-and-ride lots and other support facilities would be constructed along the length of the 15.5 mile LRT alignment. Bus service, traffic management and highway-related improvements would be similar to those provided in all the build alternatives.

2. Estimated Cost

Capital costs for the Multnomah LRT range from $300.5 to $307.2 million. Operating and maintenance costs are estimated to be $33.7 million annually.

3. Summary of Effects

a. Long-Term Beneficial Effects

The long-term benefits of the Multnomah LRT Alternative would be similar to those of the Sunset LRT option, with a few exceptions. Transit travel times would be slower between Washington County and Downtown Portland, reducing transit patronage between these areas. However, transit service to the southwest Portland neighborhoods would be better -- the increased transit use in this area would offset the loses in commuter patronage. In total, there would be little discernible difference in corridor-wide transit patronage among the light rail alternatives. The higher operating costs of the Multnomah LRT option would make it less cost-efficient than the Sunset LRT Alternative over the long-term. The Multnomah LRT option would enhance Downtown Portland development opportunities, in particular the South Waterfront District. It would also provide a better connection between Beaverton and the southwest residential areas, possibly enhancing the development potential of Central Beaverton. The Multnomah LRT Alternative would be expected to focus development towards the center of the region, thereby minimizing urban sprawl.

b. Long-Term Adverse Effects

Implementation of this alternative would result in the displacement of 25 businesses and between 17 and 88 dwelling units. Three historic sites listed on the National Register would be indirectly adversely affected. Five local historic landmarks will be directly impacted. Property in one Section 4(f) park would be directly taken. Less than one-half acre of wetland would be lost. Two or three station facilities along with portions of the transitway would be constructed within the 100-year floodplain of Beaverton Creek. This alternative would also disrupt the Vista Brook neighborhood as a result of transitway operations along the abandoned Oregon Electric right-of-way.

c. Short-Term Construction Impacts

Noise levels would temporarily increase at seven sensitive receptors during construction. Temporary increases in construction-related dust would occur along the length of the alignment and at station areas, particularly at cut and fill sites. Erosion may occur at sites requiring major earthwork and at stream crossings. Slide hazards would be moderate to severe during construction of the Burlingame Transit Center and the portion of the transitway through Stephen's Gulch. Some delay to off-peak traffic on the Sunset Highway would be expected during construction of the climbing lane.

AREAS OF CONTROVERSY

This Draft EIS is being circulated for the purpose of obtaining comments on its contents and identifying areas of controversy. The major areas of controversy that have been indicated to date include impacts of the Multnomah

LRT Alternative on the Vista Brook neighborhood and the impacts of the Walker Road Station of the Sunset LRT and Sunset Busway Alternatives on the adjacent neighborhood.

ISSUES TO BE RESOLVED

There are two major issues to be resolved. First is the selection of a mutually acceptable alternative by the Oregon Department of Transportation, the Metropolitan Service District, the Tri-County Metropolitan Transportation District (TRI-MET), Multnomah and Washington Counties, and the Cities of Beaverton, Hillsboro and Portland. Second, the method of financing must be resolved. There is currently enough revenue reserved to construct the Bus Service Expansion Alternative. The remaining alternatives would require additional capital revenues. Currently, UMTA policy is to defer the funding of transitway projects at least until the conditions of the federal budget and the economy improve.

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PURPOSE AND NEED FOR ACTION

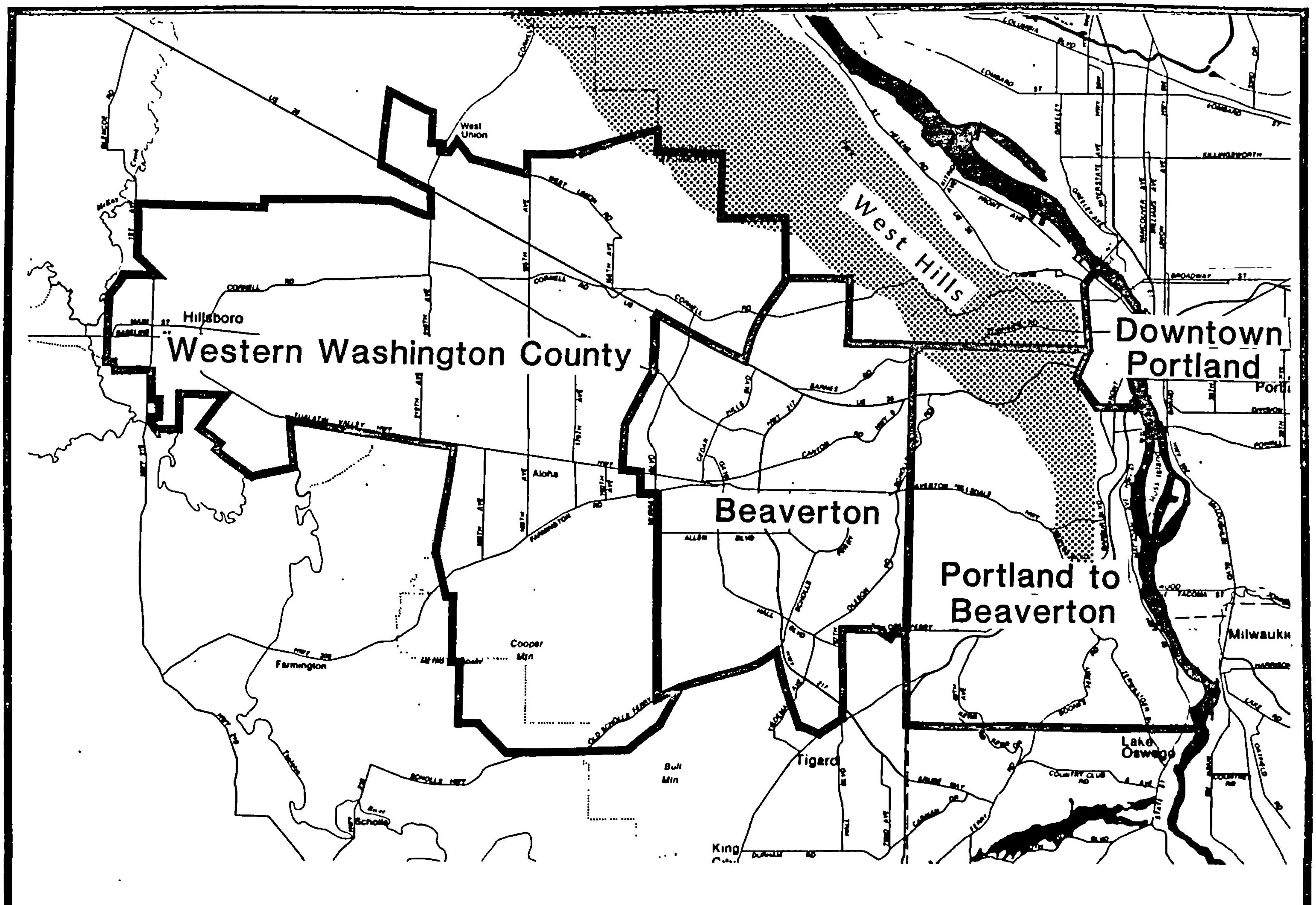
1.1 STUDY AREA

The Westside Corridor study area is a part of the expanding Portland, Oregon metropolitan area. It originates in Downtown Portland and generally encompasses developed and developing urban areas west of the Willamette River and north of Clackamas County. Portions of both Multnomah and Washington Counties are included, as well as the Cities of Portland (southwest and downtown), Beaverton and Hillsboro. Unincorporated areas such as Sylvan, Raleigh Hills, Garden Home, Cedar Hills, Rock Creek and Aloha are also included. The study area encompasses approximately 179 square miles entirely within the regional Urban Growth Boundary (UGB) established for the Portland metropolitan area. Within this area are major residential, commercial and industrial developments, as well as the largest tracts of land destined for future urban development in the Portland region. For purposes of this Draft Environmental Impact Statement (DEIS), the Westside Corridor has been divided into four segments (Figure 1.1-1). Chapter 3 uses these segments to format the discussion of the impacts of the alternatives.

While the study area is relatively flat, the West Hills create a formidable barrier which separates the Westside from Downtown Portland and easterly parts of the metropolitan area. The West Hills constrict travel to transportation routes such as Sunset Highway/Canyon Road (U.S. Highway 26) and Beaverton-Hillsdale Highway. Thus, as the Westside has grown, the capacity of its roadway system has remained relatively constant. This has led to increasing levels of congestion in recent years.

The highest concentrations of population and employment growth in the Portland metropolitan region over the past 20 years have occurred on the Westside. Washington County's employment and population have consistently grown at a rate two to three times greater than that of the Standard Metropolitan Statistical Area (SMSA). Between 1950 and 1970, Washington County captured one half of the metropolitan area's growth. Looking ahead, Washington County has more than half of the remaining vacant developable land within the region's year 2000 growth boundary.

A vital component of both the Westside and regional economies is the Portland Central Business District (CBD) which has maintained a significant and relatively steady share of the regional office growth. Portland's Downtown is a fully diversified economic environment. Its position as the economic center of the region is strengthened by geographic features (Willamette River on the east, the West Hills on the west) which have tended to prevent the continuous sprawl of commercial development from the core.



WESTSIDE CORRIDOR

FIGURE 1.1-1

WESTSIDE CORRIDOR STUDY AREAS

1.2 NEED FOR TRANSPORTATION CAPACITY IN THE WESTSIDE CORRIDOR

This DEIS proposes alternatives that respond to one basic need: the need for transportation capacity in the Westside Corridor. This need impacts the Corridor and the Portland region in ways that affect their livability and prospects for economic development as follows:

A. The Westside Corridor does not have sufficient capacity to provide adequate service levels to corridor residents and business.

The transportation system serving the Westside Corridor consists of a network of state highways, arterials and local streets and transit routes providing express and local bus services. Highways and major arterials are already experiencing congestion during peak periods and TRI-MET buses are overcrowded on certain Westside routes. During the next 15 years, population on the Westside will grow by about 40 percent, employment by 60 percent. Both of these growth rates are about 50 percent greater than for the region as a whole. The residential and economic development will generate increased demand for travel. The demand for transit will outstrip its supply resulting in a 50 percent increase in auto vehicle trips in the Corridor. The present transportation system will not be able to accommodate this demand. While short term, low cost improvements will temporarily relieve some localized traffic congestion and transit deficiencies, the available capacity to transport people through and beyond 1995 will be severely inadequate without a major investment in the transportation system. By 1995, one half of the Corridor's highway system (19.1 lane miles) and one half of its major arterials (33.2 lane miles) will not provide levels of service which meet regional standards (Level of Service D), if the transportation system is not expanded. Regional traffic, seeking to bypass bottlenecks, will be diverted to the neighborhood streets in southwest and northwest Portland, Washington County and Beaverton.

A major restructuring of Westside bus service occurred in June, 1979 when TRI-MET introduced a timed transfer system to the Westside Corridor which involved four elements:

1. construction of two transit centers where buses in the area would meet at regular intervals;
2. realignment of routes into feeders and trunklines;
3. establishment of a "pulse" scheduling system; and
4. expansion of routes into previously unserved areas.

The results of this change in transit service have exceeded original expectations. During the year following implementation, ridership in the Westside increased by 40 percent, five times more than the eight percent increase experienced on the TRI-MET system as a whole during the same period. The success of this limited application of timed transfer service improvements has led to increasing ridership on the trunklines (about one third of which exceed peak hour capacity) and the need to consider ways of expanding the capacity of the system in the most efficient manner.

The improvements being pursued by TRI-MET are outlined in the agency's five year Transit Development Plan, which establishes guidelines for improving both transportation policy and service through 1985. Most service improvements in the Transit Development Plan are focused on areas in the region other than the Westside. The results of the analyses leading to this Draft Environmental Impact Statement will form the basis for an eventual Westside Corridor component of the Five Year Transit Development Plan.

B. Capacity deficiencies in the Westside Corridor may jeopardize the regional urban growth boundary (UGB).

To comply with the State Goal for Urbanization, METRO has adopted a regional UGB that circumscribes the area in which urban development and urban investment will occur over the next 20 years. The containment line is required to be drawn to accommodate the 20 year growth projections, no more and no less. METRO monitors development on both sides of the UGB and rigorously enforces its policies that prohibit development outside the UGB.

Washington County and the region have chosen to expand to the west; and public policies encouraging this expansion have been developed over an eight year history. One third of the vacant buildable land inside the METRO UGB is in the Westside Corridor. Washington County policy and current market demand for the area between Hillsboro and Beaverton make the Westside Corridor the immediate prime developable land in the region.

Three urban services are critical for urban development: water, sewer and transportation. Little, if any, vacant land in the Westside Corridor is constrained from development for lack of water or sewer service. However, transportation deficiencies in design, capacity and structural integrity seriously detract from the Corridor's development prospects.

This service deficiency is likely to discourage Westside Corridor growth and encourage more growth in the Southwest and Northern (Clark County, Washington) Corridors of the region and at the fringes of the Westside Corridor than is desired or anticipated by the planning process. The growth boundary would likely require a major revision which might break the fragile compromises required for regional consensus. Since the urbanization objectives and implementation strategies for the other corridors do not contemplate the urban service constraint in the Westside Corridor, these areas will not easily accommodate the accelerated growth demands. New definitions of community expectations and urban service requirements would have to be developed. Many significant private investment strategies would have to be modified.

C. The Westside Corridor's capacity deficiency may jeopardize downtown Portland's economic development prospects.

There is an adequate supply of land in Downtown Portland to meet the high projected demand for commercial space beyond 1995. However, regional access constraints may limit future development by 25 percent of what is called for in the Downtown Plan. By 1995, the demand for auto access into Downtown Portland will exceed its supply by 30 percent. If transit expansion is limited to the current system, plus the Banfield LRT project, then it too will be at capacity by 1995.

There are two primary Westside constraints to providing the additional transportation capacity needed to accommodate Downtown Portland's development demand. First, the West Hills form a major topographic barrier between Washington County and Portland. Since existing transportation facilities have already used the few natural routes available through these hills, only costly man-made alternatives remain. Secondly, the capacity of the downtown grid to easily accommodate increased transit capacity is quickly diminishing, the Portland transit mall is operating at 85 percent of its capacity.

D. Westside Corridor congestion may jeopardize central Beaverton economic development prospects.

The market demand pressures make Beaverton the likely civic, financial and commercial center of the western suburban region. The Central Beaverton Plan calls for graduated development between its downtown (low density), transition (middle density) and uptown (high density) districts. Every major east/west arterial in Washington County intersects or bisects these districts at acute angles. Additionally, the two major railroad lines serving the Westside cross in the central area causing a pattern of irregularly shaped development parcels surrounded by a congested, non-pedestrian oriented traffic network. The expected intensive development of the uptown district will generate significant increases in north/south traffic. This traffic will cut across and take green time away from the major east/west arterials which are already suffering from unstable flow (Level of Service E). Poor regional access in tandem with a poor pedestrian environment diminish the opportunity for implementing the Central Beaverton Plan.

E. Capacity and structural deficiencies in the Westside Corridor may jeopardize economic development in the urban portions of western Washington County.

The urban designated portion of Washington County just west of Beaverton is the major area for immediate development in the region. However, since the last part of the 1970s, the inadequacy of the road system has slowed expansion.

Most roads in Washington County were never designed to accommodate the types and volumes of vehicles using them. They were built as farm to market roads and upgrading them to the standards required to support present use has not kept pace with the rapid urbanization of adjacent land. Significantly, 80 percent of the county roads within the urbanized area are substandard. Estimates to structurally upgrade just the arterial and collector portion of the urban road network are on the order of $150 million. Furthermore, forecasts of population growth and economic activity in urban Washington County indicate that a significant rate of growth will continue through the next decade and a half. This growth will be accompanied by a demand for increased mobility in the Corridor which the present roadway system cannot provide. Estimates to expand the Corridors highway system to meet long term traffic volumes are in the $200 to $500 million range.

1.3 NEED FOR EXPANDED PUBLIC TRANSPORTATION TO MEET THE CAPACITY NEEDS OF THE CORRIDOR

The Westside Corridor requires a major transportation investment to match today's needs and the requirements for orderly economic growth. The overall issue is to define an improvement program to meet these needs. The basic assumption is that this program will consist of some blend of highway and transit improvements. While this DEIS is aimed, for the most part, at selecting the transit element, the project options must be evaluated within an overall (highway and transit) system framework.

There are two primary constraints to providing the additional capacity needed to accommodate present and forecasted travel demand. First, existing transportation facilities have already used the few natural routes available through the West Hills; only costly man-made alternatives remain. Second, almost every major arterial in Washington County intersects in central Beaverton and is surrounded by substantial amounts of strip development. The roadway and land use patterns create a significant constraint for road capacity additions.

In the absence of major transit expansion, the highway improvements that would be necessary to reduce congestion to level of service D are costly and are felt locally to be neither politically viable or environmentally sound. In the Sunset Corridor, for example, highway capacity increases above and beyond those provided by committed highway projects (Table 1.3-1) would be needed to handle approximately 2100 additional peak hour trips. These new projects would likely include:

- Adding two lanes (six lane section) to the Sunset Highway from the Cedar Hills Interchange to the Sylvan Interchange. Two additional lanes plus a climbing lane (nine lane section) would be required between the Sylvan Interchange and the west tunnel portals.

- Providing a two-lane off-ramp eastbound on Jefferson Street from the Sunset Highway which would require a new set of structures across the portals of the Sunset tunnel.

- Reconstructing Jefferson Street into a six lane major arterial with raised median by adding two lanes and eliminating parking along Jefferson Street and Columbia Street.

- Adding parking in Downtown Portland by constructing three to five major parking garages.

As part of the Westside Corridor Study these projects were reconnaissance engineered and costed out at $100 million. The $100 million price tag for these projects is somewhat misleading in that within five to ten years after the study's planning horizon this revised highway system would be inadequate and a full additional highway link would be required, including another four to six lane highway tunnel and reconstruction of the Interstate 405 freeway ramps. While no such project has been engineered recently, an estimate for this type of improvement would be on the order of $500 million or more.

TABLE 1.3-1

COMMITTED WESTSIDE HIGHWAY IMPROVEMENT PROJECTS

Project Location	Project Description
Beaverton-Hillsdale Hwy.	
• Capitol Hwy. to Scholls Ferry	TSM improvements to respond to safety problems caused by left-turn movements, lack of signalization, poor transit accessibility and excessive speeds.
• Lombard to 91st	Signal interconnection.
• 107th	Signalization.
Farmington-Beaverton Hillsdale Extension	Farmington extended to connect with Beaverton-Hillsdale. Farmington improved to two lanes each direction with no left-turn refuge. Signalization at Farmington/Lombard; Farmington/ Beaverton-Hillsdale, and Beaverton-Hillsdale/Lombard. Vacate existing Lombard between Farmington/Beaverton-Hillsdale. Provide left-turn pocket from Lombard onto Farmington and at Lombard/Beaverton-Hillsdale for south to east movement.
Farmington	
• Murray to 185th	Widening and signalization at 185th and 160th and interconnected with 170th, Kinnaman, and Murray.
• Hocken	Signalization.
Tualatin Valley Hwy.	
• S.E. 21st to Oak	Widening the existing four-lane facility to include a continuous left-turn lane, upgrade existing signals and construct intertie.
Allen Blvd.	
• Murray to Hwy. 217	Widen Allen from two lanes to four lanes and install left-turn lanes at strategic intersections.
• Artic	Signalization.
Canyon Road	
• 108th	Signalization.
• 110th	Signalization.
• 108th to Hocken	Signal intertie system.

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COMMITTED WESTSIDE HIGHWAY IMPROVEMENT PROJECTS
(continued)

Project Location	Project Description
Highway 217	
• Highway 217 Southbound Ramps at Beaverton-Hillsdale Highway	Provide one-lane for each movement.
• Sunset Highway/Highway 217 Interchange	Reconstruct entire interchange to provide directional ramps for all movements and to accommodate future Barnes Road traffic.
Murray Blvd.	
• Jenkins to Sunset Highway	Widening to two lanes northbound and two lanes southbound with curbs/bikeway.
Jenkins	
• Murray to 158th	One-lane each direction plus two-way left-turn lane. In the immediate vicinity of the Jenkins/Murray intersection, provide two lanes westbound and one-lane eastbound.
158th Avenue	
• Jenkins to Baseline	Two northbound lanes, two southbound lanes plus median left-turn refuge at Jay Street and Jenkins Street.
• Baseline	Left-turn refuge on all intersection legs except the east leg plus signalization.
• Baseline to Walker	One-lane each direction plus raised median.
• Walker	Left-turn refuge on all intersection legs plus signalization.
• Walker to Cornell	One-lane each direction plus raised median with left-turn pockets.
185th Avenue	
• Sunset to Cornell	Two lanes northbound, one-lane southbound with raised median.
• Cornell	Signalization.
• Cornell to Walker	One-lane each direction, raised median, plus two way left-turn lane.
• Walker	Signalization.
• Tualatin Valley Highway	On all approaches, two lanes in each direction, median left-turn pocket and light phase signalization.

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TABLE 1.3-1

COMMITTED WESTSIDE HIGHWAY IMPROVEMENT PROJECTS
(continued)

Project Location	Project Description
Cornell Road	
• 158th to 185th	One-lane each direction plus median available for left-turn refuge. Forty-feet wide with shoulders as an interim configuration.
• E. Main to 216th	Two lanes each direction, turn lanes at intersections, bike lane and signals at strategic intersections.
Scholls Highway to Hall Blvd. Connection	Signalization at intersections with Hall and Scholls Ferry. Connection facility consists of 44-foot, curb to curb, two lanes with three at intersections.
Sorrento Road Extension to Hall Blvd.	One-lane each direction, limited access, left-turn refuge at intersections.
Hall Blvd.	
• Hart	Signal improvement plus left-turn pocket for Hall to Hart traffic.
• Denny	Signal improvement plus left-turn pocket for hall to Denny traffic.
Broadway/Watson	Signalization.
Center	
• Hall Blvd. to 114th	One lane each direction plus two-way left-turn lane.
Cedar Hills Blvd.	
• Butner	Signalization.
• Walker	Left-turn lane on the east intersection leg for westbound traffic.
Burlington Northern Railroad tracks intersection with 5th Street to Tektronix	Eliminate existing tracks. Burlington Northern will follow Southern Pacific alignment (along Tualatin Valley Highway) to 160th Avenue where it will turn northward and reconnect with the old Burlington Northern alignment near the 158th/Merlo intersection.
160th/Tualatin Valley Highway	Add left-turn lane on 160th Avenue.

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COMMITTED WESTSIDE HIGHWAY IMPROVEMENT PROJECTS
(continued)

Project Location	Project Description
Barnes Road	
• Highway 217 to St. Vincents Hospital	Two lanes each direction plus two-way left-turn lane.
• St. Vincents Hospital to Leahy Avenue	One-lane each direction plus two-way left-turn lane.
Barbur/Terwilliger	Series of improvements focused around the Terwilliger Bridge, I-5 access ramps and the Barbur/Terwilliger intersection.
Macadam Avenue	
• Bancroft to Virginia	Two full lane widths in each direction, raised median, and left-turn bays at major intersections. Signal installation and interconnection.

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Similarly, major highway expansion projects above and beyond committed improvements would be required in the Tualatin Valley (TV) Highway Corridor, if no further increases in transit were made. Projects that would probably be necessary to maintain level of service D include:

- Widening the TV Highway to six lanes with a raised median and U turn capabilities from S.W. 206th through Beaverton to Highway 217.

- Providing a grade separation on the TV Highway at Murray Boulevard.

- Adding two lanes (six lane section) to the Beaverton-Hillsdale Highway with a raised median and U turn capabilities between Highway 217 and the Scholls Highway.

- Providing six lanes on the portion of Capitol Highway from Bertha Boulevard to Barbur Boulevard.

The additional lanes along TV Highway from 206th Street to Highway 217 would require the displacement of all businesses abutting the northside of TV Highway through central Beaverton. The effects of this on Beaverton's economy would be enormous. Roughly $75 million in highway improvements would be required (excluding Barbur Boulevard and Interstate 5 which are being examined as part of a separate study of the Southwest corridor).

The massive scale and impact of such projects has led local officials to reject an all highway approach and to give regional priority to a significant expansion of transit service in the Westside.

1.4 COMMUNITY PARTICIPATION

The Westside Corridor Study has included a major community participation program to ensure that the alternative ultimately selected conforms to the wide variety of needs in the Corridor. The community involvement program consists of four major elements:

1. Policy Steering Group: The Westside Corridor study cuts across the authorities and responsiblities of eight major governmental units--the Cities of Portland, Beaverton and Hillsboro; Multnomah and Washington Counties; TRI-MET, the Oregon Department of Transportation (ODOT); and the Metropolitan Service District (METRO). The Westside Corridor Study Steering Group was established to ensure coordination of these units at the policy level. The Steering Group consists of one member of the governing body of each of the affected governmental units. The Steering Group has met at each of the major policy milestones to ensure a consensus existed before the project proceeded into its next phase. This Group does not make any formal decisions - decision responsiblity rests with the full Councils or Boards of Commissioners of the eight participating units. Rather, the Steering Group coordinates decisions and provides policy level liaison to the full political process.

2. Citizens' Advisory Group: At its inception, the Policy Steering Group appointed a 19 member Corridor-wide Citizens' Advisory Group. Members of the Group were selected to ensure that neighborhood, business, development and environmental interests from throughout the Corridor had a voice in project development. The Advisory Group met once a month and reported to the Steering Group on all aspects of the study, including the responsiveness of the technical process to community concerns.

The Beaverton City Council appointed its own citizen group, the Beaverton Transitway Advisory Committee, to examine the details of the study within its jurisdiction. This group has met regularly and has coordinated its efforts with the Corridor-wide Citizens' Advisory Group.

3. Neighborhood Outreach Program: The Neighborhood Outreach Program has been conducted by a full time Public Involvement Coordinator under the direction of the Project Manager. The purpose of the program is to maintain a continuing, working relationship with all neighborhood and business groups in the Corridor. The full program consists of six major rounds of community meetings, five of which were performed prior to the public hearings on the DEIS. In total, over 100 community meetings were held. Round 6 will be conducted after the public hearing and will focus on the selection of a preferred alternative.

4. Newsletter and Media. A bimonthly project newsletter is used to provide technical updates and to announce upcoming community meetings. The newsletter is mailed to roughly 2500 households. TV, radio and newspapers have been used to gain a wider coverage of the study's progress. In total, roughly 100 media contacts will have been made prior to the hearings on the DEIS.

Generally, the community involvement program has affirmed the importance of transportation to the future of the Westside and has been supportive of the major role described for transit. Noise (Humphrey Park, Vista Brook and Multnomah communities) and auto traffic around transit stations (Royal

Woodlands, Sylvan and Walker Road communities) are the two most frequently voiced concerns. Merchants in downtown Beaverton have expressed concerns about lost business during construction. While individual neighborhoods have expressed specific concerns regarding design elements of the alternatives (these concerns are addressed throughout the DEIS), strong community support is anticipated for the ultimate decision.

Chapter 2
TRANSPORTATION ALTERNATIVES CONSIDERED

2.1 DEVELOPMENT OF ALTERNATIVES

2.1.1 TRANSIT SERVICE IN PORTLAND'S WESTSIDE

The bus lines first established in the Westside by TRI-MET and its predecessors had one principal objective: to provide no-transfer, radial service from the suburbs to Downtown Portland. While such service responded well to the travel demand of one market, that of the peak hour downtown commuter, it involved inherent operating inefficiencies and ignored the travel needs of other potential riders. For example, the radial route structure was not conducive to intrasuburban travel. A trip from a Westside home to a Westside workplace could involve a frustrating journey on several bus routes in which schedules were not coordinated and transfer points not clearly delineated.

Since few roadways breach the West Hills, several bus lines had to be channeled onto a few streets to reach Downtown Portland. This was especially inefficient during off-peak hours, when more bus service was provided along these streets than warranted by ridership levels. Conversely, increases in service required during peak hours along one portion of a route had to be provided along the entire route. These characteristics of the service pattern resulted in unnecessary operating costs, as well as a poor match between transit capacity and ridership.

For these reasons, a major restructuring of Westside bus service occurred on June 17,1979 when TRI-MET introduced a "timed transfer" system to the study area. This system involved four elements: (1) construction of two transit centers where buses in the area would meet at regular intervals; (2) realignment of routes into feeders and trunklines; (3) establishment of a "pulse" scheduling system; and (4) expansion of routes into previously unserved areas.

The transit centers, one in central Beaverton, the other at the Cedar Hills Shopping Center, are the focus of the "timed transfer" system. Both facilities are simply constructed and provide passenger shelters and transit information displays. The route structure has been realigned so that most bus lines in the area operate to one (or both) of these centers. Certain routes operate only within the Westside, and these are designated as feeders. Other routes, trunklines, operate to Downtown Portland or to other major destinations outside the Westside. Buses on all routes converge at the transit centers simultaneously, resulting in a "pulse" of service at regular intervals.

The results of this change in transit service have exceeded original expectations. During the year following its implementation, ridership in the Westside increased by 40 percent, five times more than the eight percent increase experienced on the TRI-MET system as a whole during the same time period. Of particular interest is the fact that local travel, non-work travel, and non-peak travel, all traditionally difficult markets for transit to attract, grew significantly. Local travel, for example, increased by 1100 daily trips, a 138 percent increase over 1977 levels. Total ridership in the Washington County portion of the Westside Corridor as of spring, 1980, was 24,400 daily trips, 8,200 trips greater than the previous year, and approximately 15 percent of the TRI-MET system as a whole.

The success of this application has led to increasing ridership on the trunklines to Portland and the need to consider ways of expanding the capacity of the system in the coming years. Also needed are methods to remove transit from the congestion which is increasingly encountered on critical segments of the Westside road network. A third necessity is an improvement in productivity so that more service can be provided at a cost which is affordable by the community. These are the changes that the Westside Corridor alternatives must address.

The Westside study area is, of course, only one component of the total TRI-MET service area. In addition to Washington County, transit service is also provided in the urbanized portions of Multnomah and Clackamas Counties. This area with the City of Portland at its geographical center, encompasses some 700,000 people in about 1000 square miles of the region. In the next 15 years, the population of the service area is expected to increase by 25 percent over current levels.

The routes serving Downtown Portland focus upon the Portland Mall. This facility consists of exclusive lanes for buses on two parallel streets in the heart of the downtown area, supplemented by passenger shelters and transit information. The mall was opened in December of 1977 and allows buses rapid passage through this congested district. Several other facilities have been provided to expedite the flow of buses. Southwest Portland is served by a median reversible bus lane on a two mile segment of Barbur Boulevard. Further south on Barbur Boulevard is a major transit station and a 300 car park-and-ride lot. On the eastside, the center lanes of the Banfield Freeway are reserved for buses and carpools during peak hours. To the north, a ramp metering system in Interstate 5 was recently installed with lanes which allow buses and carpools to bypass the meters.

Due to the dispersal of the population throughout the Portland metropolitan area and the wide diversity of travel patterns which have emerged, TRI-MET's present radial system is gradually giving way to other network design concepts. The purpose of this network restructuring is to develop a transit service pattern that is better able to provide an alternative to the car for a large portion of the area's trips. Based upon the success of the Westside timed-transfer system, similar applications are planned for southern and southwestern suburban areas and for East Multnomah County. In the more heavily urbanized neighborhoods in the City of Portland, service is being revised into a grid pattern of frequently served north/south and east/west lines.

These changes are outlined in TRI-MET's five year Transit Development Plan (TDP), which established guidelines for improving both transportation policy and service through 1985. A ridership goal of 230,000 average weekday passenger trips has been set for 1985. A fleet of over 900 vehicles is envisioned by TRI-MET to meet this goal, including 117 articulated buses. Future plans for the Westside are not currently finalized in the TDP. Westside service amendments to the TDP will occur following the outcome of this study.

The TDP is closely related to the Banfield Transitway Project which involves construction of a 15 mile light rail line between Downtown Portland and the City of Gresham. Light rail construction is scheduled to begin later this year, and the system should be in operation by 1985. Light rail transit is also being considered for other corridors in the Portland area, and is included as a key element in two of the five Westside Corridor alternatives.

Chapter 1 explained the need to expand Westside transit service. The success of the Westside timed-transfer system to date indicates that a timed transfer system should serve as the basis for the next stage of corridor service expansion. Two basic questions remain regarding the next step: (1) should it include a major separated facility for the transit trunkline? and (2) what mode and route should that exclusive trunkline utilize? The alternatives examined in this DEIS were developed to provide a sufficient range of choice to answer these questions. Subsequent to the selection of the preferred alternative a year-by-year implementation program will be prepared. The first five years of this program will become an integral part of TRI-MET's TDP.

2.1.2 HISTORY OF WESTSIDE CORRIDOR PLANNING

Regional transportation planning has changed drastically since local efforts began in 1959. These changes can be characterized as a dramatic shift in emphasis from catering to the automobile (and the resulting auto-oriented land development patterns) to emphasizing a balanced approach aimed at maximizing the efficiency of the transportation and land use system.

The major shift in regional transportation planning priorities occurred on May 3, 1976, when the U.S. Department of Transportation formally approved the withdrawal of the proposed Mt. Hood Freeway from the Interstate System. This action made approximately $203 million available to the urban portion of the Portland-Vancouver SMSA for substitute transportation projects. On May 10, 1976, the Governor sent a letter to the Columbia Region Association of Governments (CRAG) Chairman which requested the Board's assistance in allocating the funds and prioritized "Regional Transit Corridor Projects" for the use of the funds.

In November, 1976, the CRAG Board reserved $152,750,000 for regional transit corridor investments in the Eastern, Western, and Southern Corridors. Separate reserves were established for each corridor and funds allocated to the reserves in the following manner:

Banfield (Eastern) Corridor Reserve	$69,875,000
Oregon (Southern) City Corridor Reserve	56,000,000
Sunset (Westside) Corridor Reserve	26,875,000

Technical studies formally established the Banfield Corridor as the region's priority corridor in 1977. Work in the Banfield Corridor resulted in a combined highway/transit (LRT) project for the corridor in 1980.

The Regional Transportation System Planning Program, conducted during 1978, reexamined the relative priority of the Southern and Western Corridors. On July 26, 1979, the Metropolitan Service District Council adopted the <u>Regional Transportation Corridor Improvement Strategy</u> (Resolution No. 79-65) which designated the Westside Corridor as the next priority corridor for a major transit investment. These findings indicated that the Westside Corridor ranked sufficiently high in terms of both system need and transit market potential to merit transit investment priority. The transit investment was to be viewed as part of a larger improvement program aimed at meeting comprehensive transportation <u>system</u> objectives for the Corridor. This determination led to the major regional policy action which shifted approximately $30 million from the Oregon City (Southern) Corridor Reserve to the Sunset (Westside) Corridor Reserve.

Since the initial priority, a full spectrum of mode and route possibilities in the Westside Corridor has been developed and examined. Natural constraints presented by the West Hills limited Phase I transportation alternatives to three practical routes between Downtown Portland and Beaverton:

- Sunset Highway/Canyon Road

- Beaverton/Hillsdale Highway

- Multnomah Boulevard

The range of practical service options for each of these route alternatives was evaluated in the Phase I Alternatives Analysis. In total, 16 options were examined for the Westside:

a. No Build: no improvements
b. Bus Service Expansion, no transitway construction
c. Beaverton/Hillsdale Reversible Bus Lane
d. Beaverton/Hillsdale Two Way Bus Lane
e. Beaverton/Hillsdale LRT
f. Sunset Bus Lane
g. Sunset Busway
h. Sunset LRT to Tigard and Hillsboro
i. Sunset LRT to Tigard
j. Sunset LRT to Hillsboro
k. Sunset LRT to Beaverton
l. Multnomah Bus Lane
m. Multnomah LRT to Tigard and Hillsboro
n. Multnomah LRT to Tigard
o. Multnomah LRT to Hillsboro
p. Multnomah LRT to Beaverton

These 16 options were examined in terms of performance, costs, and potential impacts (METRO, 1979). The range of promising alternatives was reduced to five requiring further examination (Phase II analysis) based on their ability to:

1. Promote efficient land use patterns in the high growth areas on the Westside.

2. Improve transportation service levels.

3. Minimize the intrusion of regional traffic into residential neighborhoods.

4. Reduce regional hydrocarbon emission levels.

5. Maintain reasonable levels of employment opportunities for residents of the corridor.

6. Improve traffic circulation in Washington County.

7. Conserve fossil fuels.

8. Promote transit operating efficiencies.

These five basic options for the Westside Corridor, which are evaluated in this DEIS, are detailed in the next section.

2.2 DESCRIPTION OF ALTERNATIVES

This section will describe in detail the various transit alternatives examined in this DEIS. In developing the alternatives, it became evident that there were several possible alignments for the Portland to Beaverton traverse and many options for connections within Downtown Portland and Central Beaverton. To display all of these various combinations as unique alternatives would require an almost endless and very repetitive set of descriptions. For these reasons, the DEIS describes the five alternatives and their suboptions on a geographic basis as follows:

- Systemwide Characteristics
- Downtown Portland
- Portland to Beaverton
- Beaverton
- Western Washington County

2.2.1 ALTERNATIVE 1: NO BUILD

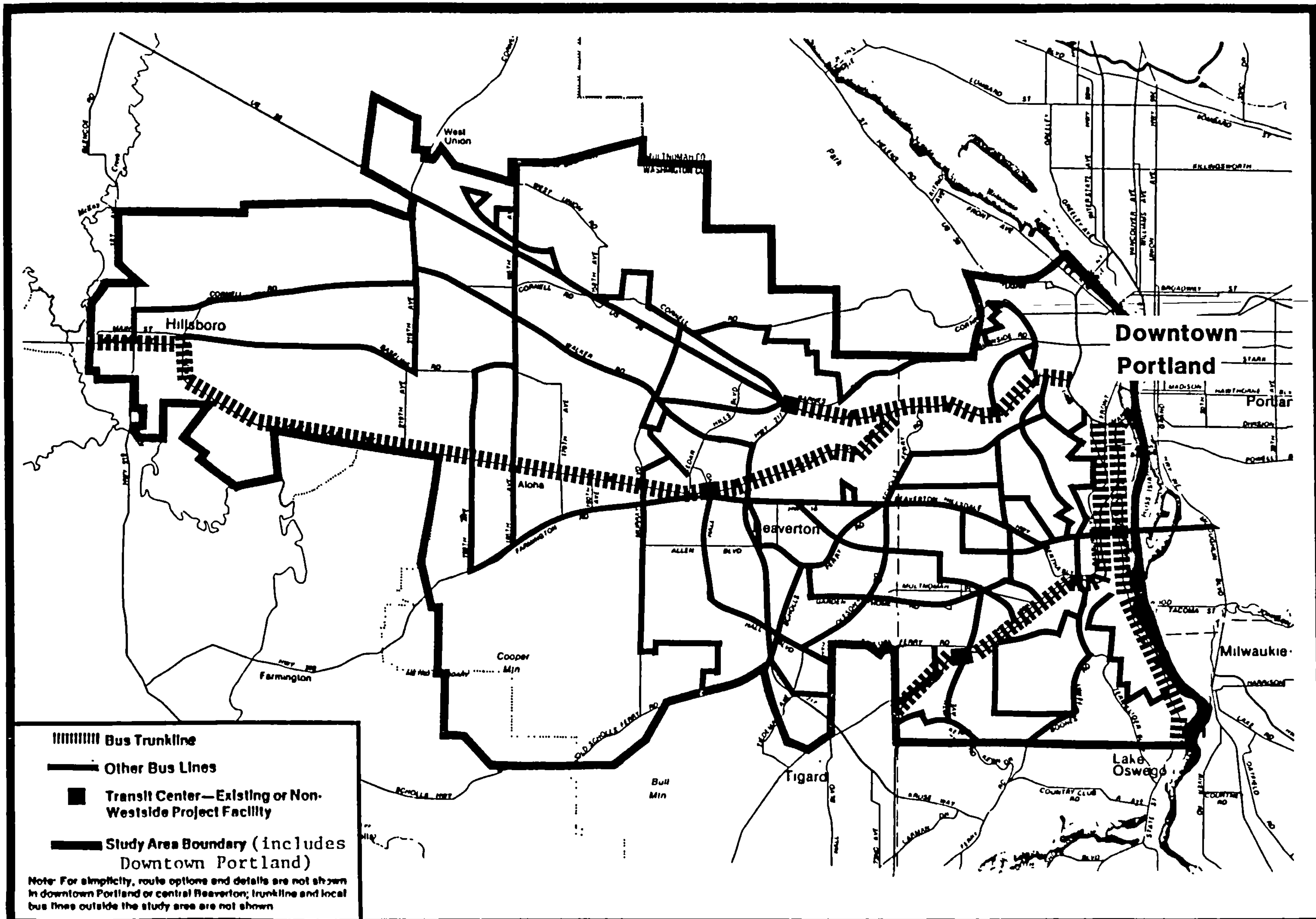
SYSTEMWIDE. The No Build Alternative illustrates the consequences in 1995 of making no additional transit highway or investment in the Westside beyond what is committed today. Thus, the Westside route structure and service frequencies are very similar to those of the present (1980) system. The route structure for the remainder of the region reflects service improvements committed to in TRI-MET's five year TDP. As such, the No Build Alternative serves as a basis of comparison with the four build alternatives.

Bus lines in the Westside would continue to focus upon the timed-transfer stations in Beaverton and Cedar Hills, and trunklines to Downtown Portland would follow the two present routings (see Figure 2.2-1):

- From Cedar Hills via the Sunset Highway
- From Forest Grove, Hillsboro, and Beaverton via the Tualatin Valley Highway, Canyon Road, and the Sunset Highway.

In addition, existing bus trunklines on Barbur Boulevard and Macadam Avenue would be utilized by expanded bus service in the southwest, largely outside the Westside study area.

Bus service in the No Build Alternative would traverse 235 miles of streets in the Westside. Peak period service would be provided at 15 to 30 minute intervals with few exceptions. Off peak service would vary from 30 to 60 minute headways. In total, these service levels are represented by the operating statistics listed in Table 2.2-1. A significant proportion of the 1980-1995 revenue hour increase in the corridor is attributable to slower bus operations caused by increased congestion. The vehicle miles statistics more clearly demonstrate the very constrained expansion of Westside Corridor transit service. If a No Build alternative is selected, Westside transit expansion will be one-fourth that of the remainder of the region.



WESTSIDE CORRIDOR

FIGURE 2.2-1 NO BUILD SYSTEM CONCEPT (1995)

TABLE 2.2-1. TRANSIT OPERATING STATISTICS: NO BUILD ALTERNATIVE

	WESTSIDE CORRIDOR			REGION		
	1980 EXISTING	1995 NO BUILD	% CHANGE FROM EXISTING	1980 EXISTING	1995 NO BUILD	% CHANGE FROM EXISTING
Revenue Vehicle Hours						
Bus - Peak	98	130	33%	360	545	51%
- Daily	1,428	1,730	21%	5,294	7,546	43%
Revenue Train Hours						
LRT - Peak	-	-	-	-	26	(new)
- Daily	-	-	-	-	222	(new)
Revenue Vehicle Miles						
Bus - Peak	1,759	2,132	21%	6,087	8,929	47%
- Daily	19,997	22,871	14%	71,312	101,598	42%
LRT - Peak	-	-	-	-	1,000	(new)
- Daily	-	-	-	-	9,367	(new)
Fleet Size (with spares)						
Standard Buses	140	146	4%	538	562	4%
Articulated Buses	-	44	(new)	-	252	(new)
Light Rail Vehicles	-	-	-	-	69	(new)

TRI-MET presently maintains a zone fare structure on its regional bus network. It is assumed that this practice would continue. No increase in fare is necessitated by the alternative, although the TRI-MET Board will increase fares as a matter of general course to keep pace with inflation and other policies it may establish. Fare collection would be accomplished by a barrier-free, self-service proof-of-payment method. Passengers would be responsible for paying for their trip in some fashion prior to boarding vehicles and retain in their possession some proof of fare payment while riding. Inspectors would be employed to circulate among transit cars on a random basis to check for fare payment. Failure by passengers to produce some valid receipt, such as a pass, ticket or transfer, would result in the levy of a "premium fare" or surcharge administered in summons form similar to a parking ticket. This fare structure and collection practice is assumed in all of the alternatives for both bus and rail trips.

DOWNTOWN PORTLAND. Buses would continue to enter the downtown area via the major trunkline routes and local routes illustrated in Figure 2.2-1. The Transit Mall, which is currently nearing capacity, would not be expanded or modified. Even without an increase in Westside Service, the No Build includes increased bus volumes to Downtown Portland (from other corridors as committed to in the TDP). These additional bus volumes will cause the capacity of the Transit Mall to be exceeded.

PORTLAND TO BEAVERTON. Existing routes between Portland and Beaverton would be maintained at existing levels. Sunset Highway would remain as the major trunkline to the west. Travel times for transit would be increased due to the added congestion on arterials and highways. The Cedar Hills transit center would continue as the timed-transfer location in this segment, serving six of the 29 peak hour trunkline buses in the Sunset Corridor.

BEAVERTON. Beaverton would continue as the center of Westside Corridor transit service. The 10-bay Beaverton timed-transfer center would continue to use the stub end of Beaverton-Hillsdale Highway and one-way auto traffic would continue to pass through the middle of the center.

WESTERN WASHINGTON COUNTY. The Tualatin Valley Highway would continue to operate as the major east/west transit route between Hillsboro and Beaverton. No additional transit service would serve the new residential areas in the county. Tanasbourne would continue to be a major transfer point. There would be four express buses between Tanasbourne and Portland on the Sunset Highway during the peak.

2.2.2 ALTERNATIVE 2: BUS SERVICE EXPANSION (BSE)

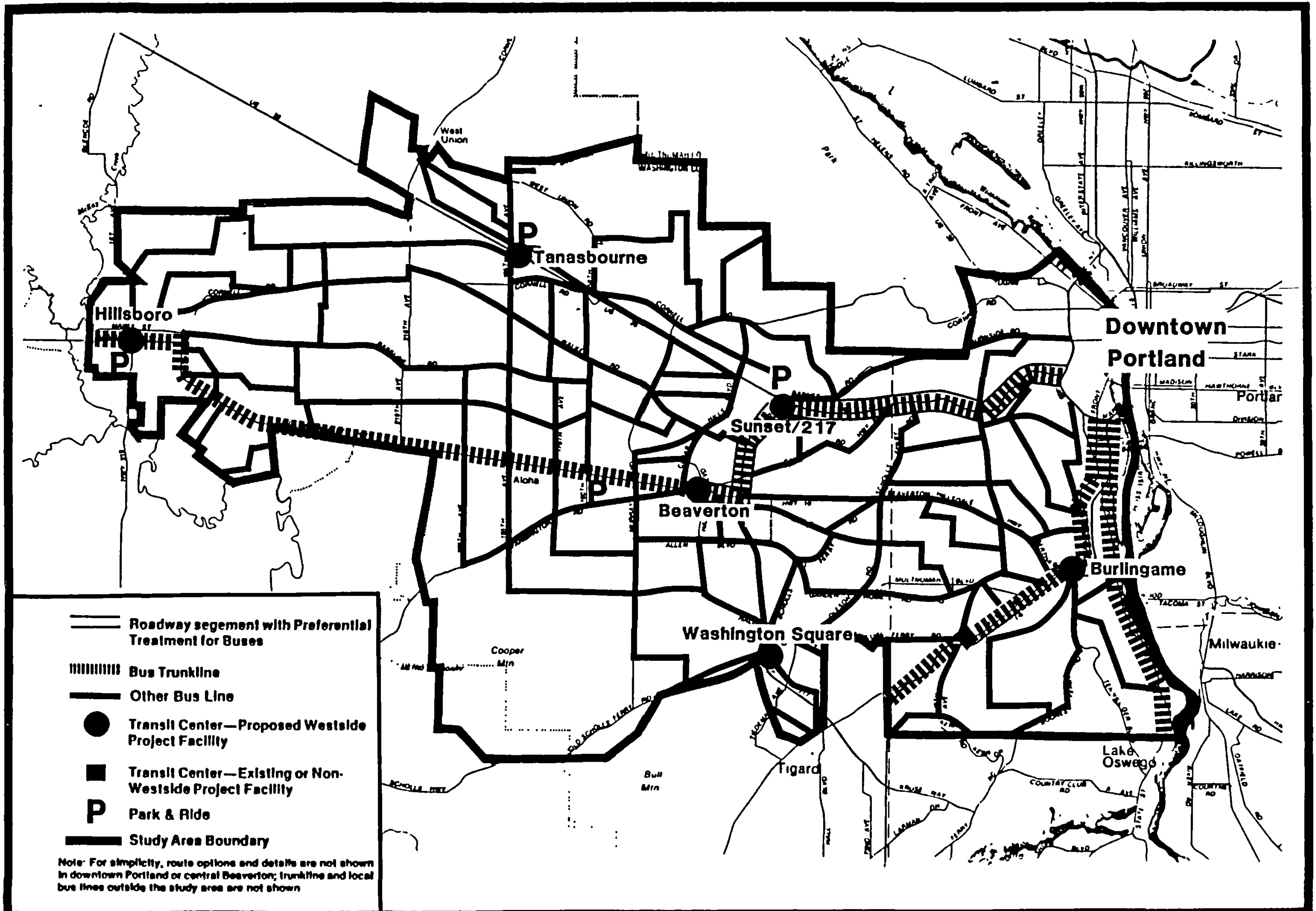
SYSTEMWIDE. The Bus Service Expansion (BSE) Alternative is a package of relatively easy to implement and affordable improvements. The Bus Service Expansion Alternative is viewed as the minimum transit capacity enhancement necessary to address the anticipated transportation problem in the Westside (no major new construction). If selected for implementation, this alternative could be expanded to include exclusive transit operations (such as a busway or a light rail transit) at a later date. The BSE Alternative proposes an increase in the capacity, coverage and frequency of bus service to the Westside. This would be supplemented by a series of relatively low-cost capital improvements designed to increase the reliability and efficiency of Westside Transit service. Proposed improvements include: additional timed-transfer bus stations at major activity points; extensive use of articulated buses on trunkline routes; and street and traffic control modifications giving preference to transit traffic at normally congested locations.

Several principles and guidelines govern the development of the BSE Alternative. The first is that the alternative need not be viewed as an end in itself. Its purpose may be to satisfy the corridor's interim need prior to the development of a more capital intensive alternative. Therefore, the physical improvements that have been developed, such as transit centers, are intended to be complementary to future transitway development. Second, the alternative meets the transit capacity needs in the corridor for the next 15 years. Third, the BSE Alternative complies with the service expansion objectives of TRI-MET's Transit Development Plan. Fourth, the BSE Alternative can, as a package, be easily implemented (minimal lead time in engineering, right-of-way acquisition, and construction) and is affordable (minimal capital intensive improvements that are within the range of funds available to the region). Finally, while the BSE Alternative offers a somewhat lower quality of service to Downtown Portland (in terms of slower travel times) than the other build alternatives, it provides equal levels of local service.

The basic service concept of the Bus Service Expansion Alternative is an expansion of the existing timed-transfer system. As shown in Figure 2.2-2, bus service under the BSE Alternative has two basic levels. The first is primarily radially oriented to Downtown Portland along the major trunk facilities. The Sunset Highway and Highway 217 would function as the major trunklines between the Westside and Downtown Portland in conjunction with specific traffic improvements including ramp metering and a climbing lane. These improvements, which are a component of all of the build alternatives, are especially critical for the BSE alternative for they provide for the most stable traffic flow on the transit trunkline.

The Sunset Highway would serve as major trunkline between Portland and Beaverton. During a peak hour, 21 bus routes would make 68 peak direction trips along this facility. Eight of these trips would be express to Beaverton, 34 express to the Sunset Highway/Highway 217 transit center and four express to Sylvan. The remainder would be making multiple stops. During a base hour, six routes would be making 12 trips, none of which are express to Beaverton. The second level of BSE service is a system of local/collector bus routes that serve the trunklines as well as provide service to the transit centers. The local/collector routes would operate on a pulsed system at the transit centers and connect the communities of the Westside together in a network of north/south and east/west service.

Bus routes would operate over 321 miles of streets in the Corridor. Nearly half of these routes would operate at 7.5 to 15 minute frequencies during peak periods, while the remainder would operate at 30 minute intervals. Off-peak service would be provided every 30 minutes with several exceptions. Table 2.2-2 lists the 1995 operating statistics representative of the service levels for this alternative and compares them to the No Build case. As shown, peak period revenue bus hours and bus miles would increase 62 percent and 72 percent respectively over the No Build, while the number of articulated buses would quadruple.



WESTSIDE CORRIDOR

FIGURE 2.2-2 BUS SERVICE EXPANSION SYSTEM CONCEPT (1995)

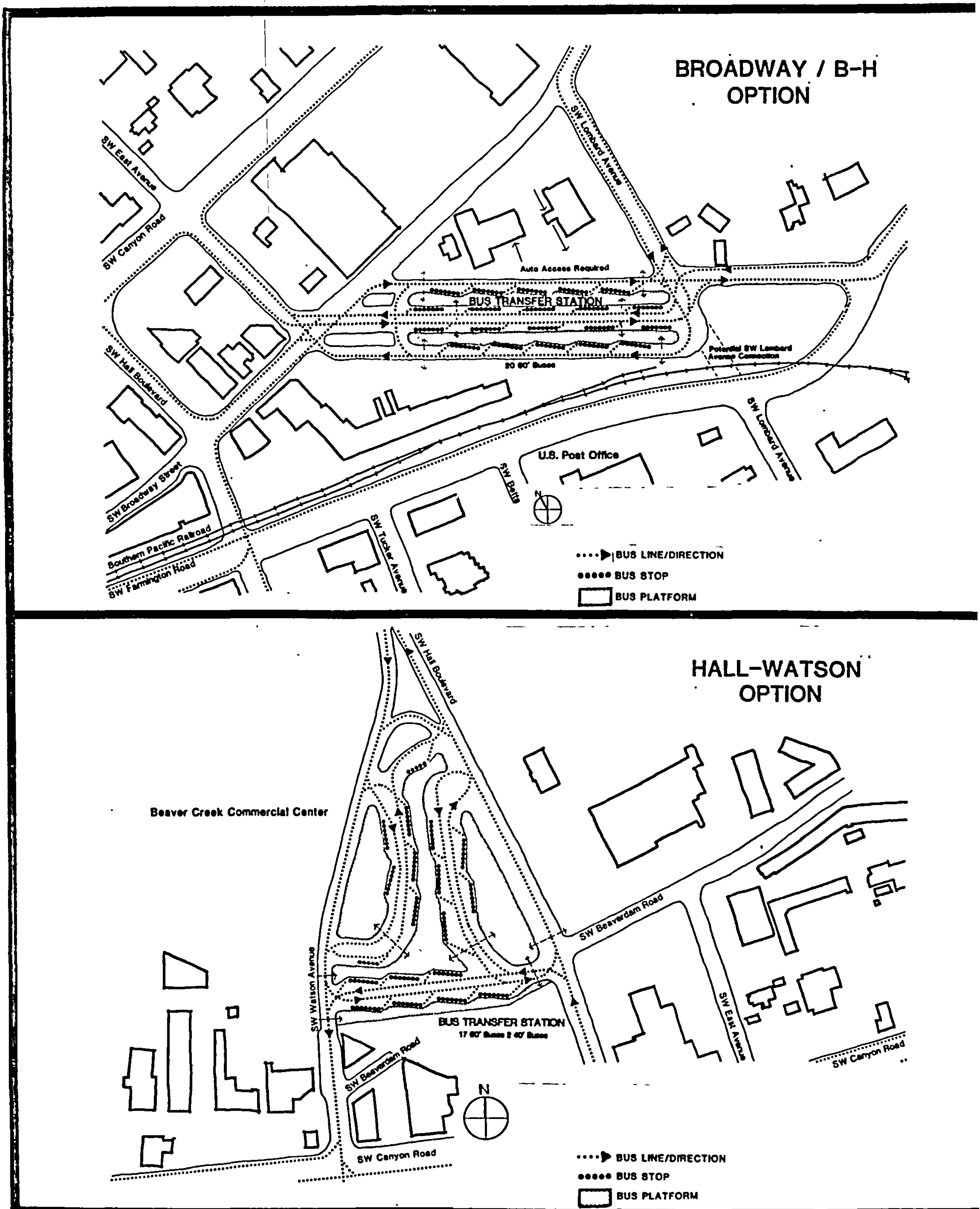
TABLE 2.2-2 1995 TRANSIT OPERATING STATISTICS: BUS SERVICE EXPANSION ALTERNATIVE

	WESTSIDE CORRIDOR	% CHANGE FROM NO BUILD	REGION	% CHANGE FROM NO BUILD
Revenue Vehicles Hours				
Bus - Peak	211	62%	630	16%
- Daily	2,692	56%	8,564	13%
Revenue Train Hours				
LRT - Peak	-	-	26	0
- Daily	-	-	222	0
Revenue Vehicle Miles				
Bus - Peak	3,668	72%	10,570	18%
Daily	38,625	69%	118,481	17%
LRT - Peak	-	-	1,000	0
Daily	-	-	9,367	0
Fleet Size (with spares)				
Standard Buses	136	-7%	549	-2%
Articulated Buses	176	300%	393	56%
Light Rail Vehicles	-	-	69	0

Under the BSE Alternative there are six transit center locations in the Westside Corridor. Three of the transit centers are existing Beaverton, Tanasbourne, and Washington Square--but would be expanded and modified under this alternative. (The existing Barbur Transit Center in West Portland is not directly affected by any of the Westside alternatives and has been excluded as a project-related facility in this study.) The other three transit centers, Burlingame, Sunset/217 (replaces the existing Cedar Hills Transit Center), and Hillsboro are new facilities.

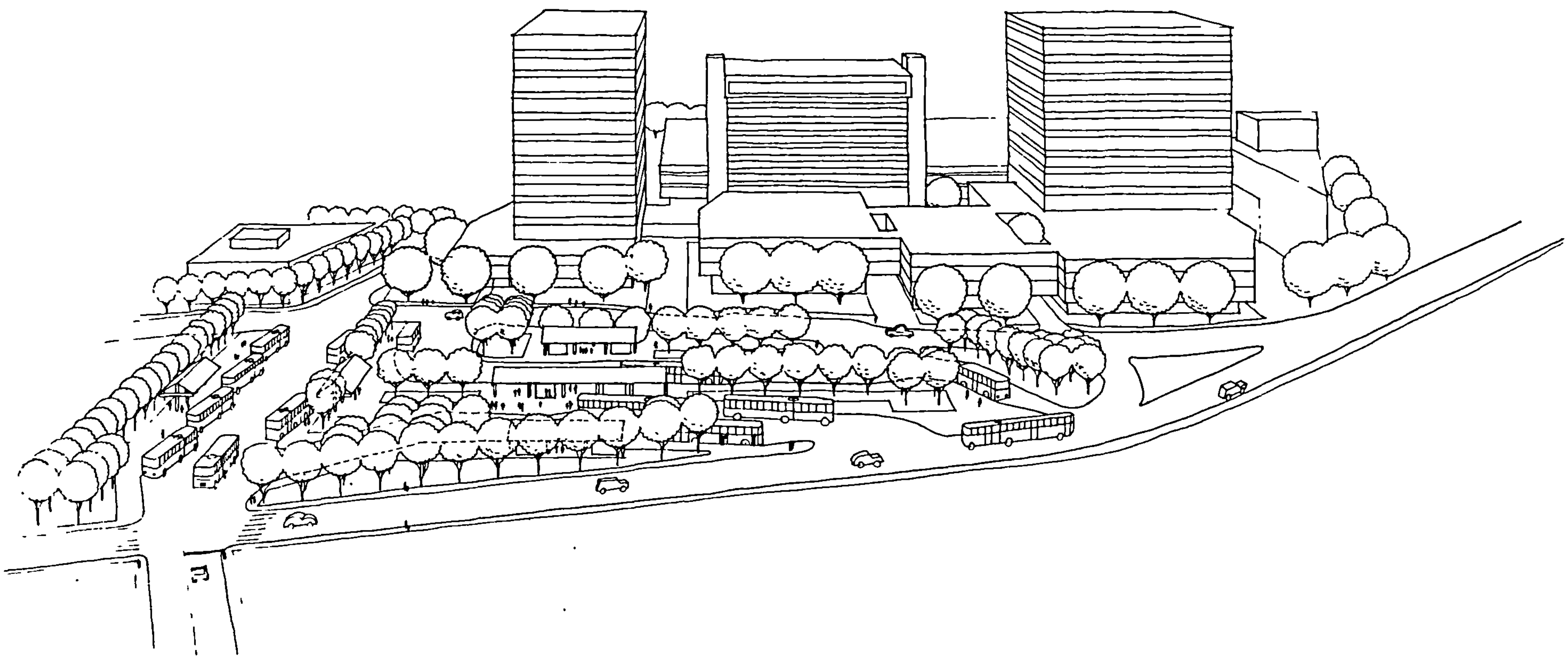
There are two alternative sites under consideration for the Beaverton Transit Center, both of which are located to accommodate possible conversion to either a busway terminal or LRT station (Figure 2.2-3). The first is the existing Beaverton Transit Center site, located between S.W. Broadway and Lombard Avenue, and north of S.W. Farmington Road. The center consists of two platforms capable of handling ten buses each. The second site is north of S.W. Canyon Road, adjacent to the proposed Beaver Creek Centre development, on the triangular site formed by S.W. Watson Avenue, S.W. Hall Boulevard, and S.W. Beaverdam Road. The center would include four sawtooth platforms capable of handling nineteen buses. Figure 2.2-4 provides an artist's conception of the Hall/Watson Transit Center.

The Burlingame Transit Center is located between an Interstate 5 off ramp and S.W. Barbur Boulevard, just west of the S.W. Terwilliger Boulevard Bridge. The transit center consists of a center platform of a sawtooth configuration able to accommodate twelve buses, and a linear platform with three bus spaces (Figure 2.2-5).



WESTSIDE CORRIDOR

FIGURE 2.2-3 CONCEPT PLANS FOR BEAVERTON TRANSIT CENTER OPTION



WESTSIDE CORRIDOR

FIGURE 2.2-4 VIEW OF BEAVERTON TRANSIT CENTER: HALL/WATSON
looking east towards proposed Beaver Creek Centre

The Sunset/217 Transit Center would replace the existing transit center operation at the Cedar Hills Shopping Center. The center is located in the northwest quadrant of the proposed new Sunset Highway/Highway 217 interchange being designed by ODOT. The site would have an adjacent park-and-ride lot capable of handling approximately 600 automobiles (Figure 2.2-6).

The Tanasbourne Transit Center would be modified to a center platform configuration capable of handling twelve buses at one time (Figure 2.2-7). The new design would eliminate a number of retail parking spaces but would not affect any of the existing structures. The existing park-and-ride lot of 180 stalls would remain at its present location.

Under the BSE Alternative, the two existing linear platforms at the enlarged Washington Square Transit Center would be replaced by a center platform which can accommodate up to ten buses.

The Hillsboro Transit Center would be located between S.W. Washington Street and S.W. Baseline Road, just west of Adams Avenue and the Southern Pacific Railroad tracks. The transit center would have a sawtooth center platform capable of handling nine buses with space west of the center for a 200-300 stall park-and-ride lot (Figure 2.2-8).

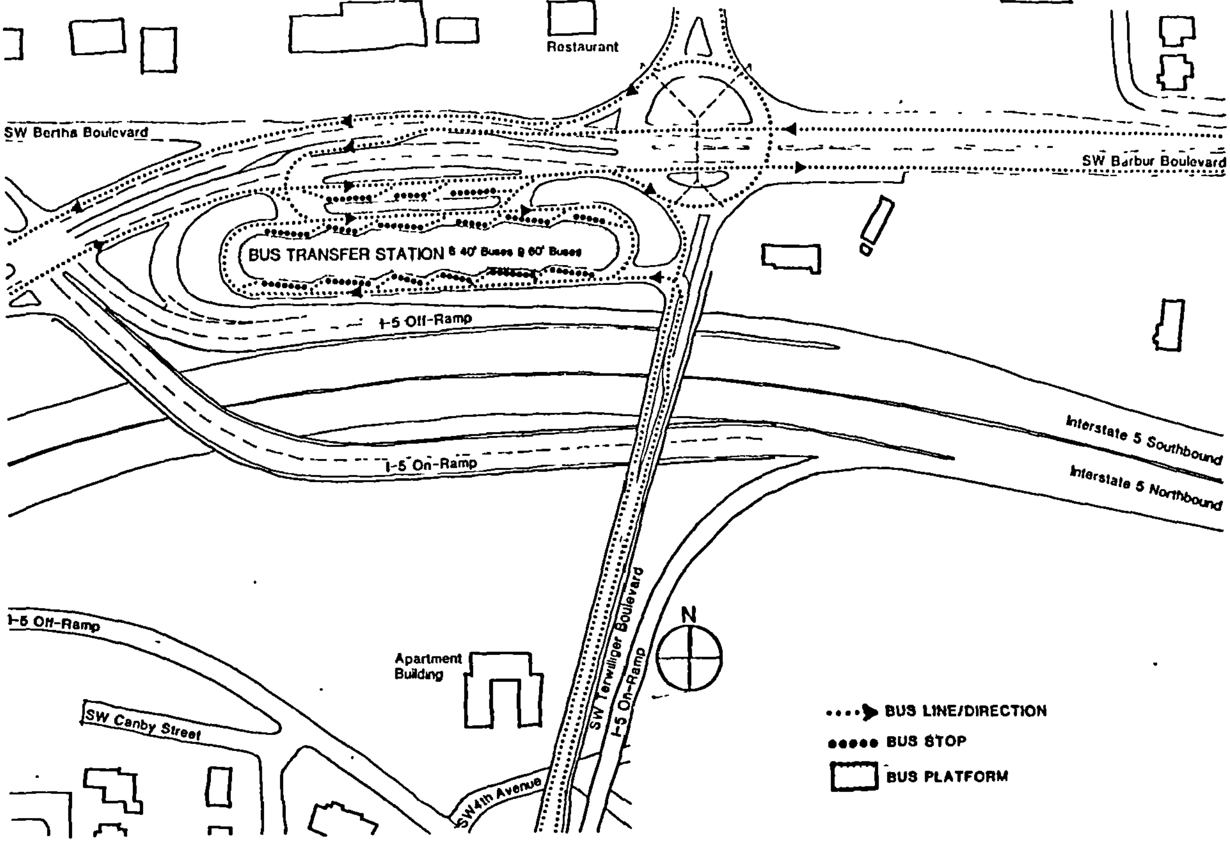
There are a number of local traffic related management improvements included in this alternative. These are discussed in specific segment descriptions to follow. This and all the build alternatives include a highway-related traffic management program consisting of the following elements:

Sunset Highway Climbing Lane. The Sunset Highway climbing lane responds to a capacity imbalance of 1,100 vehicles per hour in the (p.m. peak) westbound direction caused by the six percent uphill grade. An additional westbound traffic lane, built to federal standards, in the six percent grade segment between Washington Park and Sylvan is included in each of the build alternatives. This lane addition would balance the westbound and eastbound auto carrying capacities of the Sunset Highway.

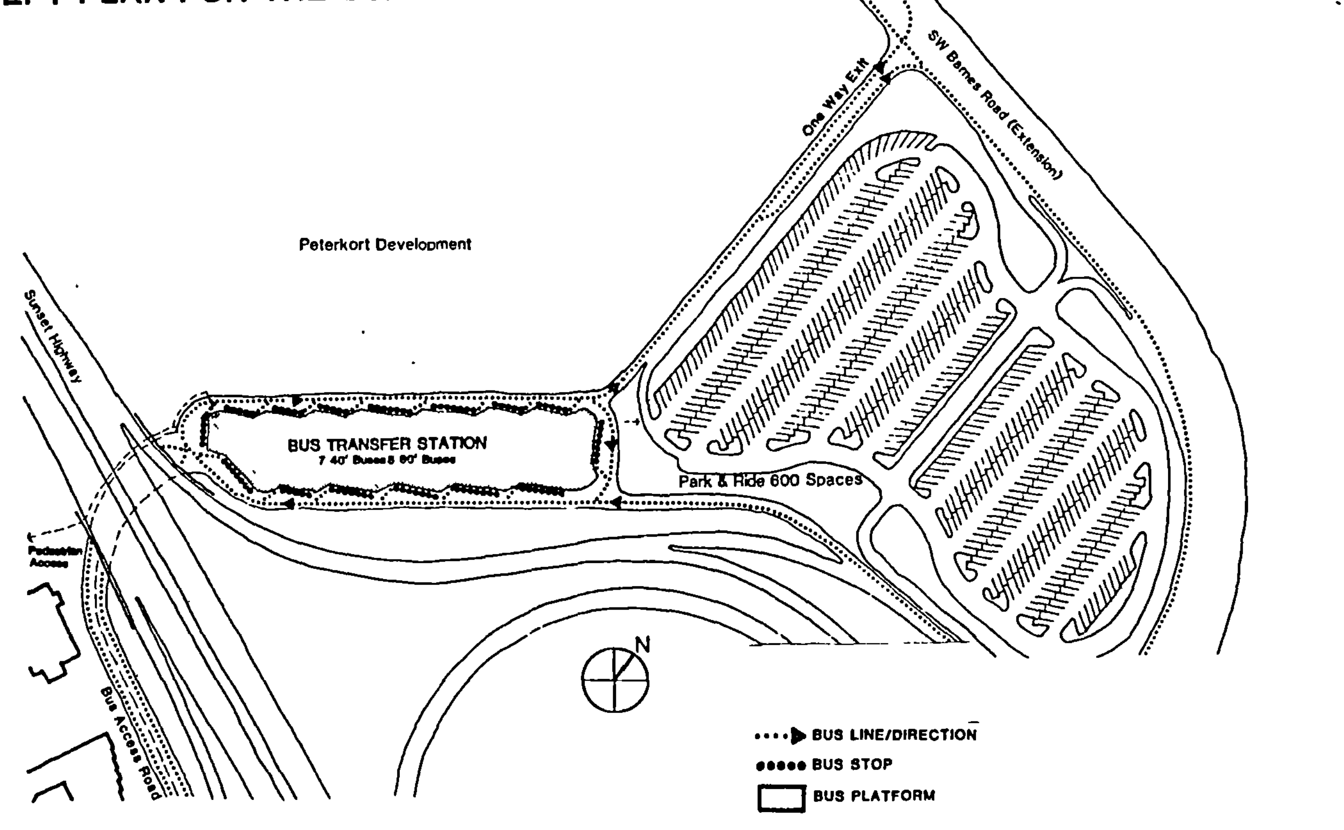
Sunset Highway Ramp Metering. Ramp metering is included in all the build alternatives to improve the operating characteristics of the Sunset Highway and Highway 217. On ramps between Jefferson Street and Cornelius Pass Road would be metered on the Sunset Highway and between the Sunset Highway/Highway 217 interchange and Scholl's Ferry Road on Highway 217. The ramps would consist of one metered lane for traffic and one bypass lane for buses and carpools. Meters would be timed to allow stable traffic flow on the Sunset Highway of 35 mph.

Sylvan Interchange Ramp Improvement. With the projected traffic volumes, the westbound ramp terminal would not operate at an acceptable service level with the existing lane configuration. This service level would result in delays to buses in and around the transit station, causing vehicles to backup on the off ramp and interfere with traffic on the freeway. The Sylvan interchange element of the alternatives calls for restriping and signalization to reduce turn and storage conflicts.

CONCEPT PLAN FOR BURLINGAME TRANSIT CENTER FOR THE BSE ALTERNATIVE



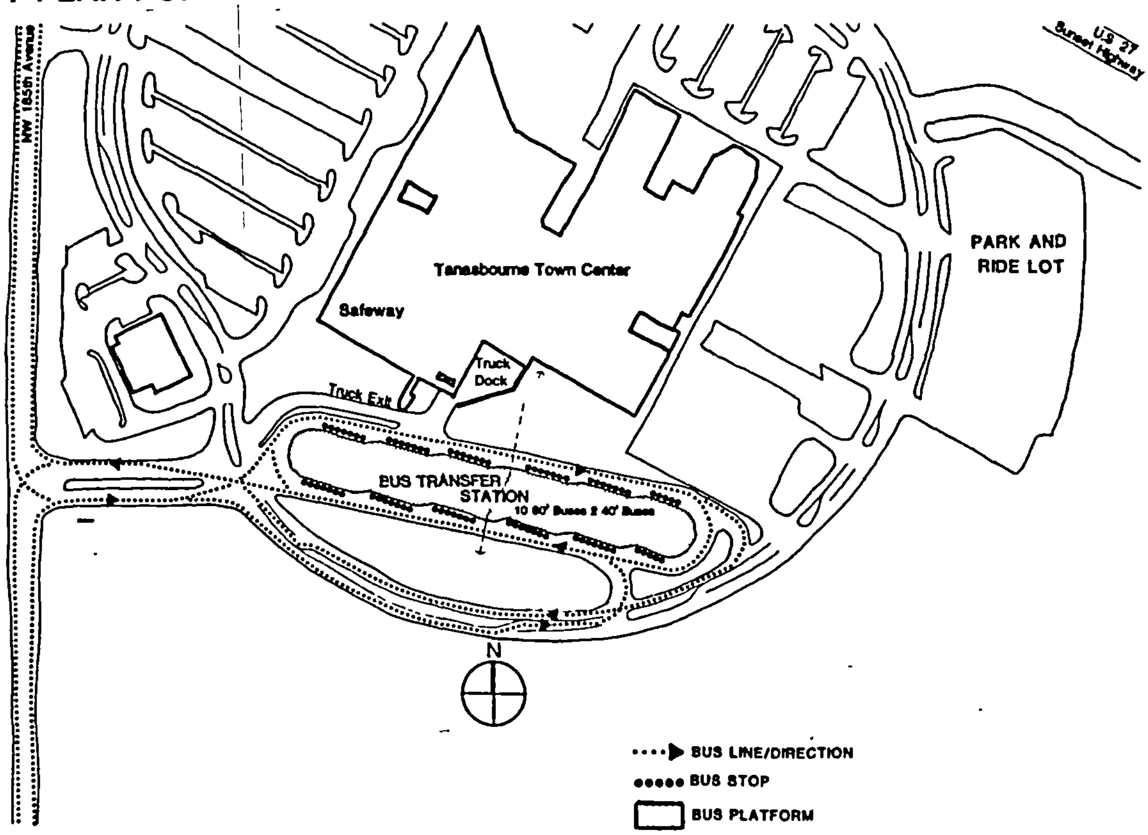
CONCEPT PLAN FOR THE SUNSET/217 TRANSIT CENTER FOR THE BSE ALTERNATIVE



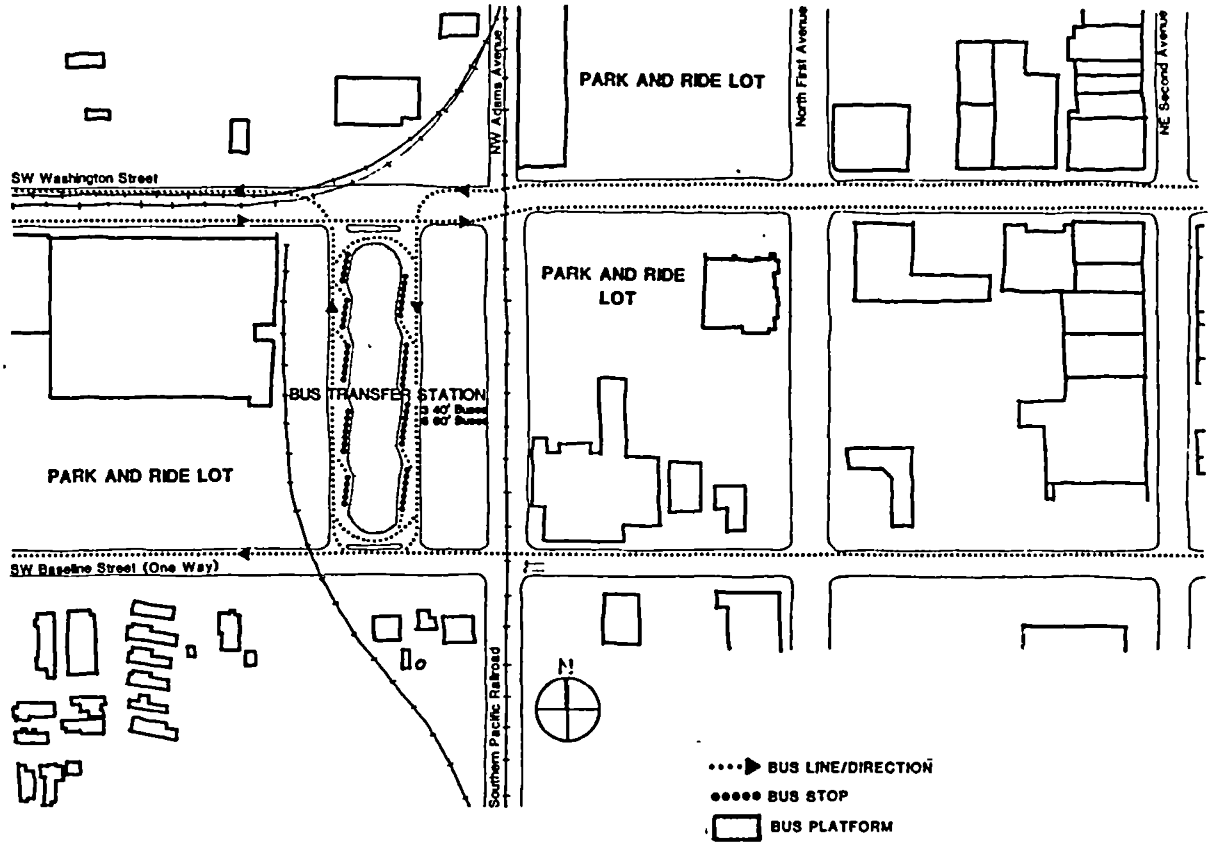
WESTSIDE CORRIDOR

FIGURE 2.2-5 CONCEPT PLAN FOR BURLINGAME TRANSIT CENTER FOR THE BSE ALTERNATIVE
FIGURE 2.2-6 CONCEPT PLAN FOR THE SUNSET/217 TRANSIT CENTER FOR THE BSE ALTERNATIVE

CONCEPT PLAN FOR THE TANASBOURNE TRANSIT CENTER FOR THE BSE ALTERNATIVE



CONCEPT PLAN FOR THE HILLSBORO TRANSIT CENTER FOR THE BSE ALTERNATIVE



WESTSIDE CORRIDOR

FIGURE 2.2-7 CONCEPT PLAN FOR THE TANASBOURNE TRANSIT CENTER FOR THE BSE ALTERNATIVE

FIGURE 2.2-8 CONCEPT PLAN FOR THE HILLSBORO TRANSIT CENTER FOR THE BSE ALTERNATIVE

Four park-and-ride lots are included in the BSE Alternative, three of which are located at transit centers. The location and number of stalls are as follows:

Location	Number of Stalls
Sunset/217 Transit Center	600
Tanasbourne Town Center (existing)	181
Hillsboro Transit Center	200-300
West Beaverton (S.W. 160th Avenue and Tualatin Valley Highway)	300
TOTAL	1281-1381

The West Beaverton site would be on the northern side of Tualatin Valley Highway at 160th Street (if it were to be extended across Tualatin Valley Highway). The site would be approximately four acres, beginning 200 feet from Tualatin Valley Highway. The vicinity is currently undeveloped, and the final site specification could be adjusted to conform with parcel development plans.

The BSE Alternative would require a Westside bus fleet of approximately 312 vehicles, an increase of about 170 over today's level. The current Westside bus maintenance facility at S.W. Merlo Road and 158th Avenue, can accommodate approximately 125 buses. By 1995, this facility will have been expanded to handle approximately 265 standard and articulated buses. In the BSE and the Sunset Busway Alternatives, an additional bus maintenance facility would be needed to serve the Westside.

The additional bus maintenance facility would be located at an undetermined site in the Tigard area. It would be designed to accommodate 250-300 standard and articulated buses. The facility would accommodate approximately 60 buses from the Westside Corridor, as well as buses from the Southwest outside the corridor. Environmental impact work on the additional bus maintenance facility would be covered in a subsequent DEIS or environmental assessment.

DOWNTOWN PORTLAND. An analysis of the increased downtown bus volumes expected by 1995 indicated that a number of streets would be operating over capacity during peak hours because of the bus volumes required to handle projected patronage. To alleviate this condition, the BSE Alternative includes the following special treatments:

- Transit Mall Extension, 5th and 6th Avenues North of Burnside. The project includes the restriping and signing of the existing 36-foot wide pavements between Burnside and N.W. Hoyt. 5th and 6th Avenues operate with two exclusive bus lanes and one lane of local access traffic. The 12-foot sidewalks on both sides of the streets are to remain. In addition, a 10-foot future building setback is being recommended at street level to ultimately provide a 22-foot sidewalk on the bus side of the Transit Mall (i.e,. the east side of 6th Avenue and the west side of 5th Avenue). Bus stops along both streets would be improved to include an upgraded version of the TRI-MET Type A or B shelters (which would be less elaborate than the existing Transit Mall shelters). Signalization would be provided at eight intersections with this project.

Two options are under examination. One is for the above mentioned project description, which basically provides for the minimum costs to implement the operational changes on 5th and 6th Avenues. The other includes the structural improvement of the pavement and the addition of Transit Mall amenities such as street lighting, street trees with city standard grates, new sidewalks and additional signalization. A soils and pavement analysis must be undertaken to determine which project is required.

- Transit Mall Extension, 5th and 6th Avenues between Madison and Columbia. The project includes the extension of the Transit Mall operational characteristics from the existing terminus at Madison to Columbia. An estimated project cost has been developed for two improvement options. These two options represent the low and high ranges of the construction cost needed to implement the required measures.

  The first option includes the widening of the sidewalks on the bus operation side of each street, a new pavement section (1/2 street), bus shelters, signing and striping. The other project option includes the construction of the full Downtown Transit Mall treatment for an additional two blocks. This improvement would provide the visual and physical continuity of the Transit Mall to the limits of its downtown core operations between Burnside and Columbia. The exising pavement, curbs and sidewalks would be removed and replaced with a 36-foot wide pavement (two bus lanes and one local access lane), granite curb and gutters, brick paver block sidewalks and crosswalks. The bus shelters, landscaping, pedestrian furniture, street lighting and signalization would be consistent with the existing amenities found on the Transit Mall.

- Exclusive Bus Lanes. The project includes the restriping of the streets listed below. An exclusive bus lane would be operated in the right lane of each street during the peak hours, 7 to 9 a.m. and 4 to 6 p.m. Parking would be removed from both sides of the streets during the peak hours, but would be restored in non-bus stop areas with two hour meters during non-peak hours. Bus stops along each street in the downtown area would be upgraded to include bus shelters. Two ranges of limits for these improvements have been established. One is for a project not requiring any pavement modifications. The other includes the structural improvement to the exclusive bus lane portion of the pavement and grade modifications at the intersections. The following streets would be included for development of bus lanes described above:

  a. Columbia Street between 6th and 18th Avenues
  b. Jefferson Street between 6th and 18th Avenues
  c. 6th Avenue between Columbia and Hall
  d. 5th Avenue between Columbia and Harrison

- Morrison Street/Taylor Street Bus Operations. Morrison Street and Taylor Street are alternative west-bound streets for downtown bus operations. Yamhill Street would operate east-bound buses. The project would include sidewalk widening and street modifications described below and will include bus shelters, an information kiosk, benches and signs. The Taylor Street option would include a widening

Front Avenue by six-feet for a right turn lane between Morrison Street and Taylor Street. This would include removing the existing landscaping, pavement widening, new curbs, signs, striping, and signal modifications.

- Morrison/Yamhill Auto Operations. The project includes curbs, signs, and striping to close Morrison Street to auto traffic at 3rd Avenue and Park Avenue. One of the following options would also be implemented:

  Option 1 - Prohibit left turns on Morrison and Yamhill to include signs and striping.

  Option 2 - Allow left turns on Morrison and Yamhill to include signs, striping, and signal modifications.

- Sidewalk Capacity - Morrison or Taylor and Yamhill. This project would widen sidewalks along the north side of Morrison or Taylor and along the south side of Yamhill from the current 12-feet to 18-feet in the bus stop blocks. On Yamhill Street, these include the blocks between 4th/5th, 6th/Broadway, 9th/10th, and 11th/12th. On Morrison Street or Taylor Street, the blocks would be the same but with an additional bus stop between S.W. 2nd/S.W. 3rd Avenue. The sidewalk would be widened into the existing roadway.

  An 18-foot pavement section would be removed and replaced with 12-feet of regraded pavement and six feet of concrete sidewalk. Catch basins along the south edge of Yamhill and north edge of Morrison or Taylor would be relocated to the new curb and gutter section.

PORTLAND TO BEAVERTON. The BSE Alternative includes several of the improvements mentioned earlier under the systemwide characteristics for that portion of the alignment from Portland to Beaverton. Specifically, they include:

- Sunset Highway ramp metering
- Cedar Hills Transit Center relocated to Highway 217/Sunset Highway interchange
- Sylvan interchange improvements
- Sunset Highway climbing lane
- Highway 217 ramp metering
- Highway 217 bus queue bypasses at Beaverton Hillsdale/Canyon Road ramps

BEAVERTON. In addition to the transit center, improvements would have to be made on Beaverton roads to accommodate buses operating in mixed traffic in Beaverton. The type and location of these transit-related road improvements depend on which transit center option is selected.

Assuming Use of Broadway/Beaverton Hillsdale Center

- Farmington/Hockens curb improvement
- Tualatin Valley at Hockens queue bypass lane for buses (approximately 75 feet, subject to final engineering)
- Bus actuated signal at Farmington/Lombard

Assuming Use of Hall/Watson Transit Center

- Bus actuated signal at Farmington/Lombard
- Bus actuated signal at Broadway/Beaverton Hillsdale
- Canyon at East signal
- East/Beaverdam curb improvement
- East Avenue signing and striping
- Hall at Beaverdam signal
- Two direction bus queue bypasses at Cedar Hills/Canyon (approximately 75 feet, subject to final engineering)
- Two direction queue bypasses at Hockens/Canyon (approximately 75 feet, subject to final engineering.

<u>WESTERN WASHINGTON COUNTY</u>. BSE improvements west of Beaverton include the transit centers and maintenance facility, mentioned previously, and specific elements including:

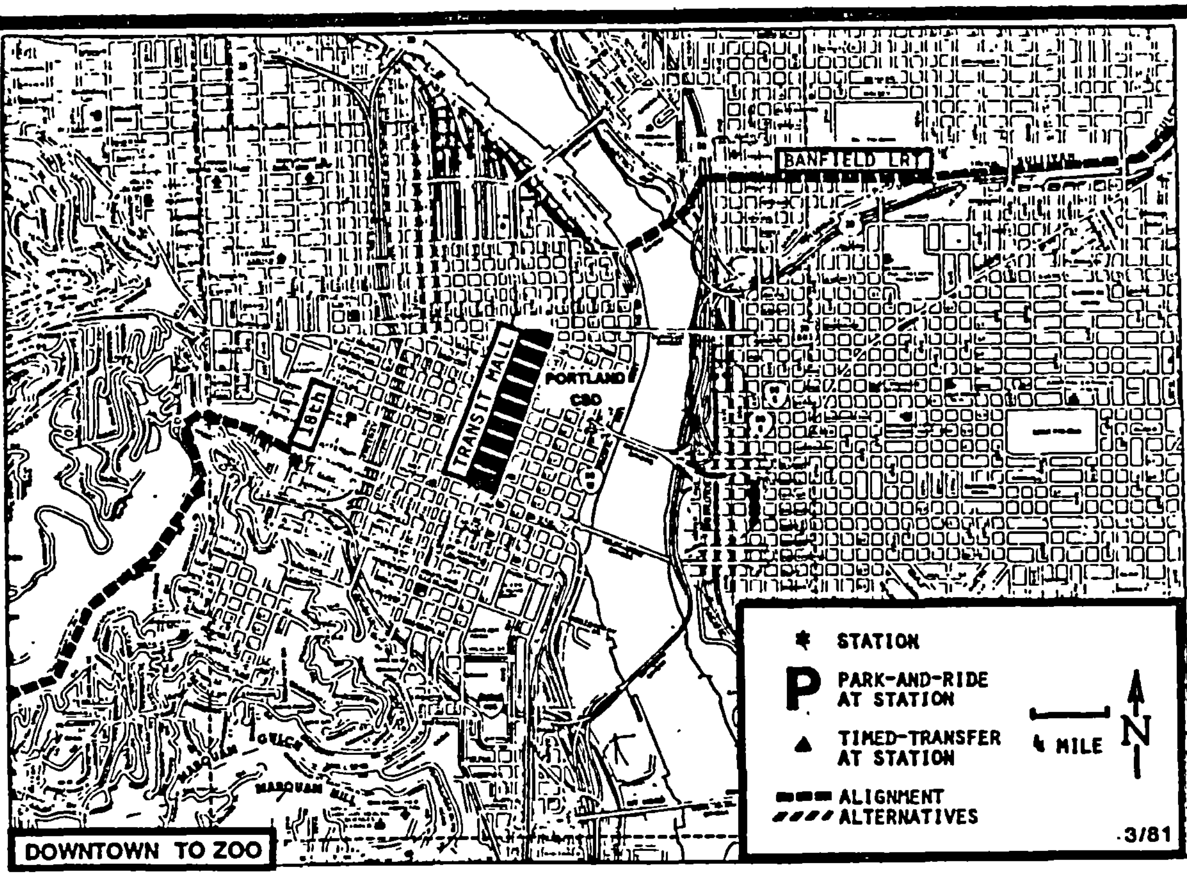
- Tualatin Valley Highway at Murray - east/west two direction bus queue bypasses (approximately 75 feet, subject to final engineering)
- Tualatin Valley Highway at 170th - east/west two direction bus queue bypasses (approximately 75 feet, subject to final engineering)
- Signalization and some geometric improvements at selected intersections and pullouts
- Bus pads
- Other transit related improvements (systemwide also)
  a. Bus shelters
  b. Signs/kiosks
  c. Other minor bus preferential improvements.

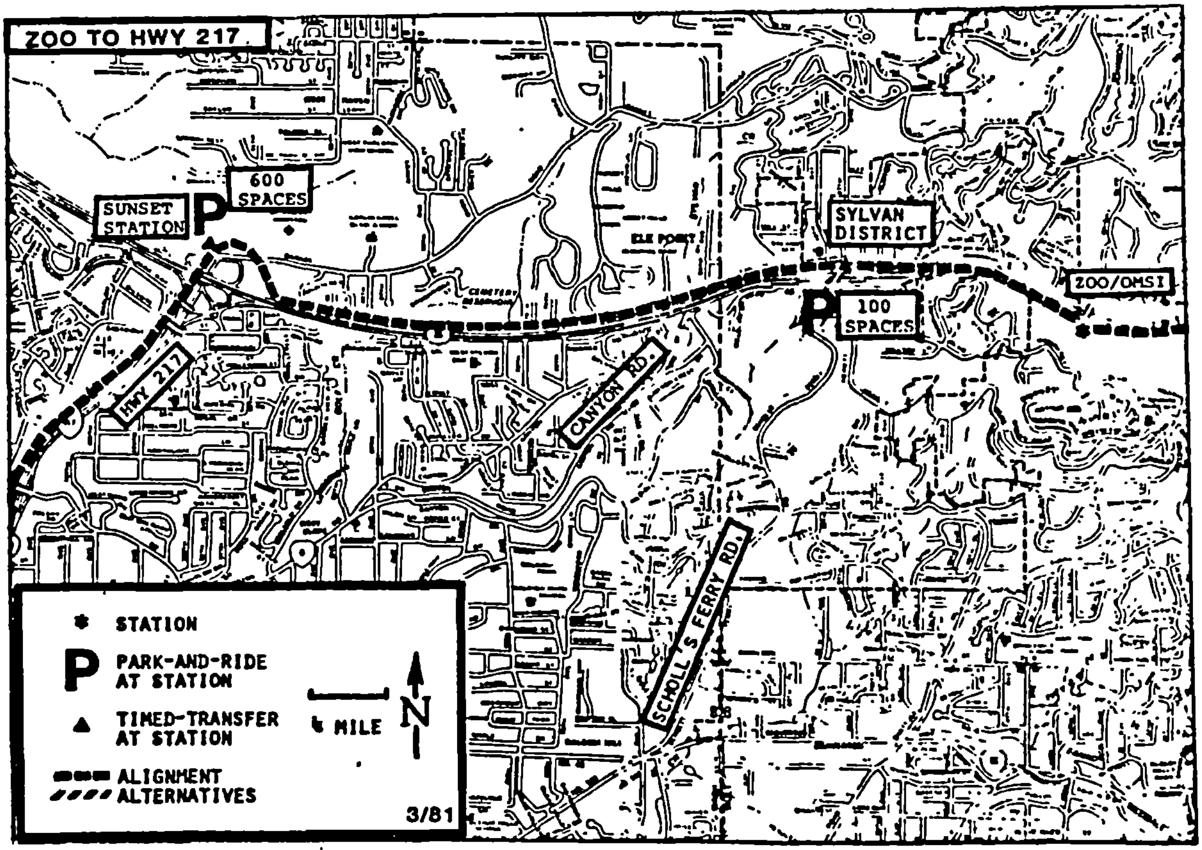
2.2.3 ALTERNATIVE 3: SUNSET BUSWAY

SYSTEMWIDE. The Sunset Busway Alternative offers a more capital-intensive strategy for improving Westside transit service; it represents the next level of capital improvements beyond those suggested for the Bus Service Expansion Alternative. With the Sunset Busway Alternative, the same expanded bus service network, timed-transfer stations, park-and-ride lots and highway traffic management improvements would be constructed as in the Bus Service Expansion Alternative. The Sunset Highway/Highway 217 corridor would also be retained as the major trunk route for Westside to Downtown Portland transit operations and would provide the same service frequency and network as described for the Bus Service Expansion alternative. The only difference between the two alternatives is a bus-only facility between Downtown Portland and Beaverton. Buses would no longer run in mixed traffic on Westside highways but would have their own separate roadway paralleling the Sunset Highway and Highway 217, allowing higher line haul operating speeds and more reliable schedules. The 7.2 mile busway would be two lanes wide (30 foot total width) and would traverse slightly higher elevations (3 to 10 feet) in the canyon than the Sunset Highway. The busway will provide for two directional use.

The busway would start at the traffic circle at S.W. 18th Avenue/Jefferson Street, follow the south side of Jefferson around Vista Ridge and cross the Sunset Highway on structure near the west portals of the existing highway tunnels. The busway would then follow the Sunset Highway on its south side to the vicinity of Sylvan, where it would again cross over on structure and continue along the north side to the Highway 217 interchange. At this point the busway would turn south and follow Highway 217 on a west side alignment to Central Beaverton. The busway includes a train-type signal system and wayside telephones. In addition, each of the stations along the busway would have the capability of allowing inbound and outbound buses to exit at the stations to avoid a blockage on the busway. The same on and off ramps and emergency exit points at the stations will be used by buses to exit and enter the busway and by emergency or maintenance vehicles to access the busway. Figure 2.2-9 shows the Sunset Busway alignment and station locations. Buses that would have traveled on the Sunset Highway and Highway 217 under the BSE Alternative would now use the busway. Under this alternative, the Tualatin Valley Highway from Beaverton to Hillsboro would continue to carry a high volume of buses. A system of local/collector bus routes would feed the busway facility and provide service to the communities throughout the Westside, using a system of transit centers almost identical to those in the BSE Alternative. The 1995 operating statistics representing this service, which are listed in Table 2.2-3, nearly replicate those of the Bus Service Expansion Alternative. As indicated, peak period revenue bus hours and bus miles would increase 62 percent and 71 percent respectively over the No Build Alternative, while the number of articulated buses would similarly quadruple.

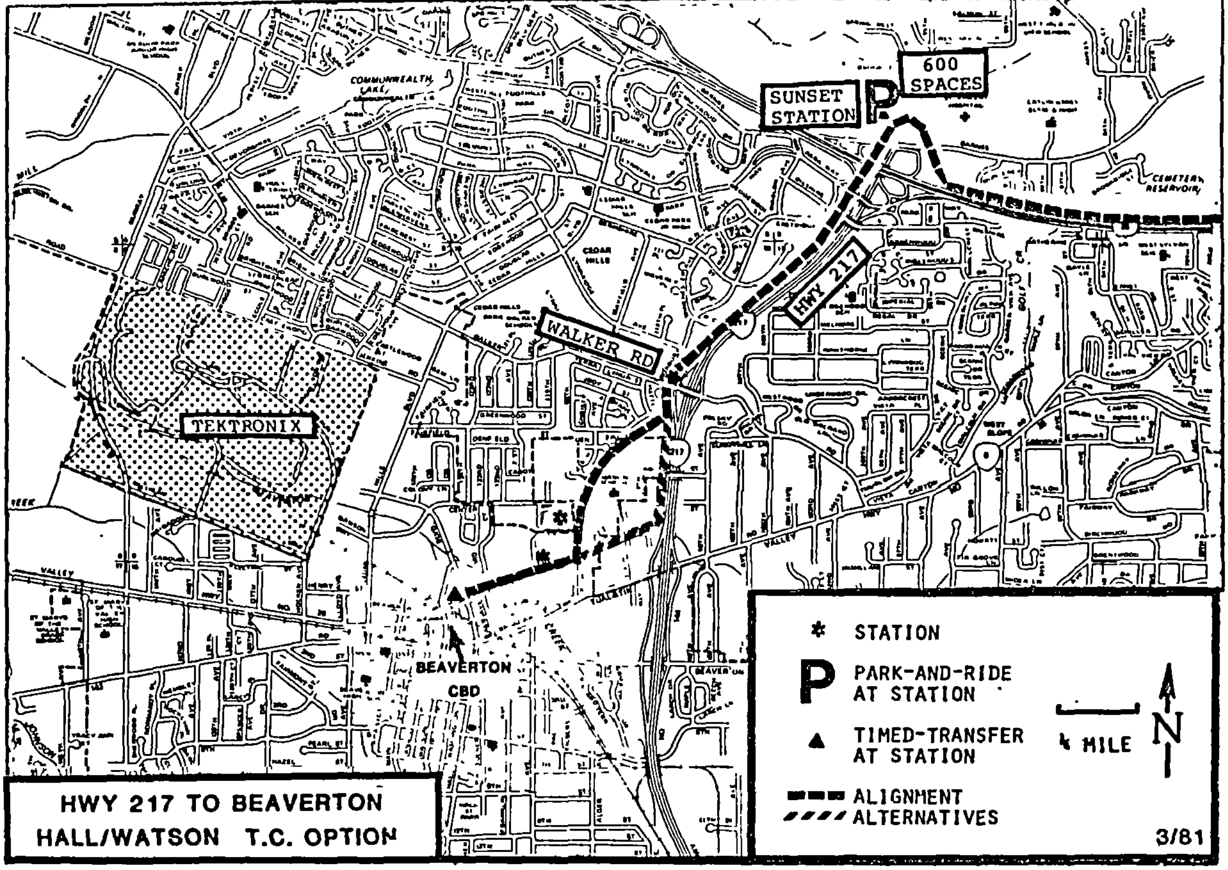
As in the BSE Alternative, the Sunset Busway Alternative includes a package of capital components. The most important is the busway facility, as described above, which includes six busway stations located along its length. These stations are located in the vicinity of Zoo/OMSI, Sylvan, the Sunset Highway/217 interchange, S.W. Walker Road/Highway 217, and two in Central Beaverton. The second capital component consists of a system of transit centers, some of which are existing and would be expanded or modified, and others which would be newly constructed. The transit centers are located at the same



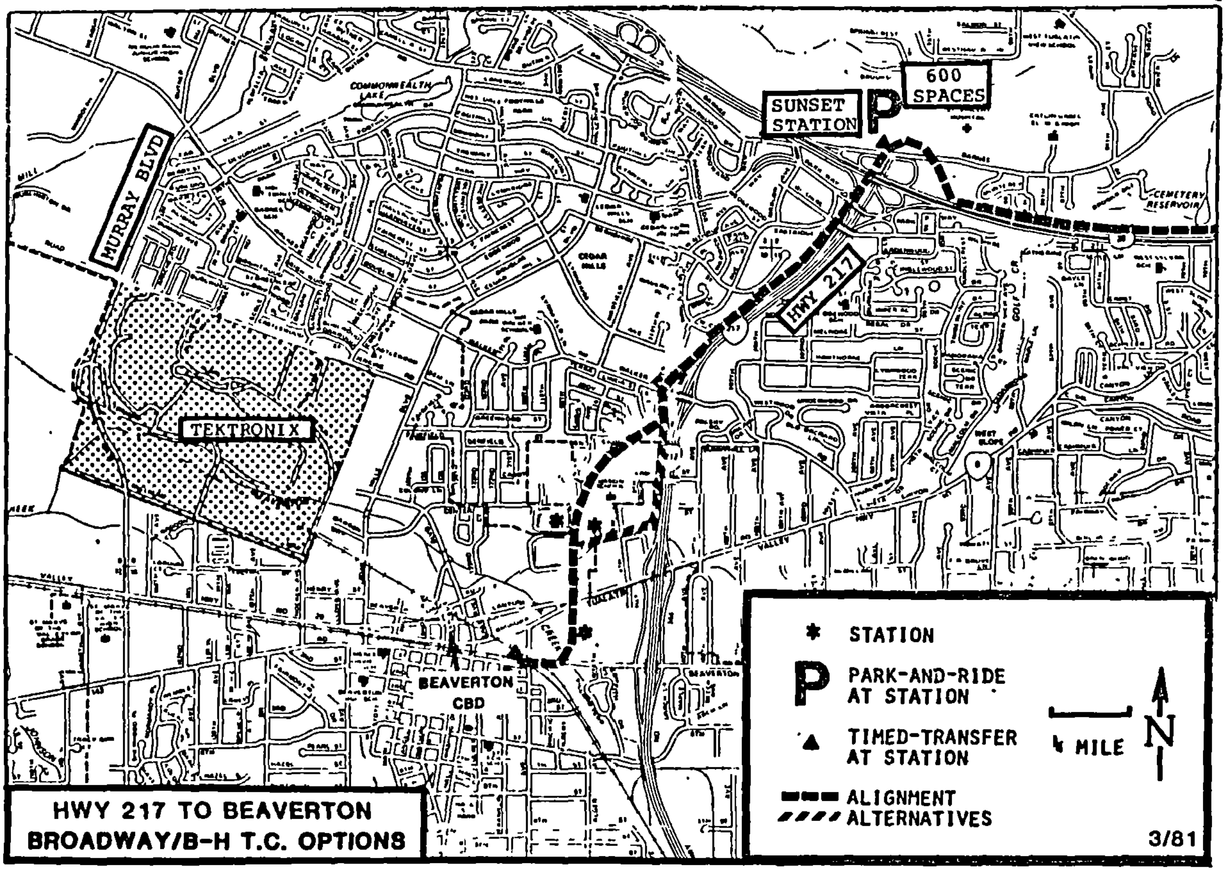


WESTSIDE CORRIDOR

FIGURE 2.2-9
SUNSET BUSWAY ALTERNATIVE ALIGNMENT



HWY 217 TO BEAVERTON
HALL/WATSON T.C. OPTION



HWY 217 TO BEAVERTON
BROADWAY/B-H T.C. OPTIONS

WESTSIDE CORRIDOR

FIGURE 2.2-9 (Continued)
SUNSET BUSWAY ALTERNATIVE ALIGNMENT

locations as in the BSE Alternative and in the same general configuration. Park-and-ride lots, the third capital component, are the same size and in the same locations as in the BSE alternative. A 109 car park-and-ride lot is included at the Sylvan Station. The Sunset Busway Alternative also includes a set of network support facilities including transit shelters, information kiosks/signs, and maintenance facilities to serve the expanded bus fleet. The Sunset Busway Alternative includes the same highway related improvements included in the BSE Alternative. Finally, this alternative requires new buses to both expand service and replace older buses now operating in the Westside.

TABLE 2.2-3. 1995 TRANSIT OPERATING STATISTICS: SUNSET BUSWAY ALTERNATIVE

	WESTSIDE CORRIDOR	% CHANGE FROM NO BUILD	REGION	% CHANGE FROM NO BUILD
Revenue Vehicle Hours				
Bus - Peak	210	62%	627	15%
- Daily	2,682	55%	8,535	13%
Revenue Train Hours				
LRT - Peak	-	-	26	0
- Daily	-	-	222	0
Revenue Vehicle Miles				
Bus - Peak	3,642	71%	10,560	18%
- Daily	38,367	68%	118,245	16%
LRT - Peak	-	-	1,000	0
- Daily	-	-	9,367	0
Fleet Size (with spares)				
Standard Buses	136	-7%	549	-2%
Articulated Buses	173	293%	388	54%
Light Rail Vehicles	-	-	69	0

DOWNTOWN PORTLAND. Physical improvements to Downtown Portland included in this alternative are identical to those listed in the discussion of the BSE Alternative.

PORTLAND TO BEAVERTON. The alignment of this segment of the busway begins at the traffic circle (Collins Circle) at S.W. 18th Avenue and Jefferson/Columbia Streets. The busway would follow the south side of Jefferson Street around Vista Ridge. Jefferson Street becomes Canyon Road in this segment. West of 18th, the surface alignment, valid for both busway and LRT alternatives, begins climbing at a 6 percent grade immediately, in order to gain the necessary elevation to cross over the Sunset Highway just west of the existing west portals of the highway tunnels. That crossing, on structure, is necessary to avoid active slides on the north side of the Sunset Highway in this area. The transitway continues parallel to the Sunset Highway to a station located at the elevation of the Washington Park Zoo/OMSI overpass road.

The next segment is from the Zoo/OMSI Station to the Sylvan Station and passes over the Sunset Highway about 1,500 feet east of the Sylvan interchange. The Sylvan Station is in the northeast quadrant of the interchange area. The station would be at highway level requiring vertical connections for the users of local buses to access the station.

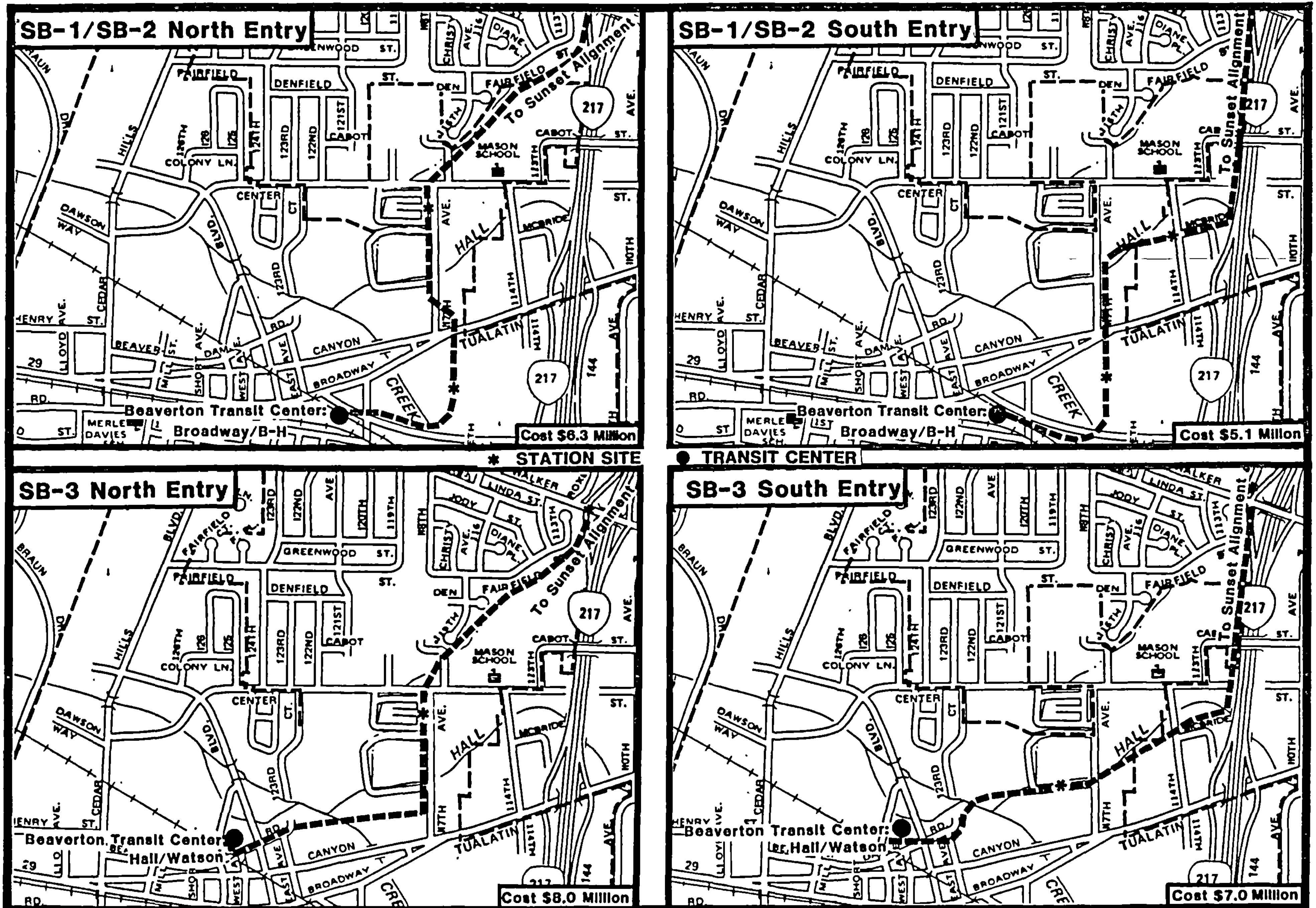
In the following segment, the transitway would pass beneath S.W. Skyline Boulevard, maintaining an acceptable grade while avoiding traffic conflicts with ramps at the Sylvan interchange. It would continue on the north side of the Sunset Highway minimizing potential costs and negative community impacts while following the most direct route to tie in with a station at the Sunset Highway/Highway 217 interchange. The alignment assumes the ODOT interchange design currently under development, with a station in the northwest quadrant of the interchange. The interchange design involves a major rebuilding of the interchange and its connection to S.W. Barnes Road. Currently, a Final Environmental Impact Statement is being prepared by ODOT for the interchange. A station in this location allows the opportunity to develop a major park-and-ride facility (the largest under consideration for any of the transitway alternatives) in currently open land and at the same time serve two important activity points: the proposed Peterkort development and the Cedar Hills Shopping Center.

The transitway alignment includes a structure over the S.W. Barnes Road/Highway 217 ramps. It would pass under the on ramp to Sunset Highway west to the combination transitway station and timed-transfer center. From the station, the transitway passes under Sunset Highway, travels southward under S.W. Park Way, and follows the west side of Highway 217 to S.W. Walker Road.

The transitway alignment is on the west side of Highway 217, south of the Cedar Hills Shopping Center. It remains within the Highway 217 right-of-way and grade to S.W. Walker Road. An at-grade station would be located at S.W. Walker Road, providing good accessibility for the neighboring community and for local buses serving the station.

BEAVERTON. The Sunset Busway options in Beaverton, Figure 2.2-10, all have a common approach point from the proposed Walker Road station on the west side of Highway 217. There are two "north entry" options and two "south entry" options from this point. With the north entry, the busway turns west of Highway 217, just south of S.W. Walker Road and follows a natural drainage channel to S.W. Center Street and S.W. 117th Avenue, where it continues south. With the south entry, the busway passes under the existing S.W. Cabot Street overpass of Highway 217 (which will be relocated to Center Street) and turns west into Beaverton. This option also follows the natural drainage channel to S.W. 117th Avenue about 500 feet north of S.W. Canyon Road. From S.W. 117th Avenue, the busway either runs south and west to a terminus at the existing location of the Beaverton Transit Center, (Broadway/Beaverton Hillsdale (B-H)), or runs west to a terminus at the Hall/Watson Transit Center. The busway will be at-grade throughout the Central Beaverton area, but will be separated from auto traffic.

The busway stations at S.W. 114th Avenue, S.W. 117th Avenue, S.W. Center Street, and between S.W. Canyon Road and Beaverton-Hillsdale Highway would all be typical side platform busway stations. The busway terminal stations at the Beaverton Transit Center would be considerably more elaborate. Both of the



WESTSIDE CORRIDOR

FIGURE 2.2-10

SUNSET BUSWAY OPTIONS IN CENTRAL BEAVERTON options, Hall/Watson Transit Center and the Broadway/Beaverton-Hillsdale Transit Center, would accommodate 19 buses, including buses entering or exiting the busway and local buses using the transit center as a timed transfer location (Figure 2.2-3).

<u>WESTERN WASHINGTON COUNTY</u>. The Sunset Busway terminates in Central Beaverton. Improved bus service west of Beaverton is identical to that of the BSE option, and includes the same physical facility improvements.

2.2.4 ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT (LRT)

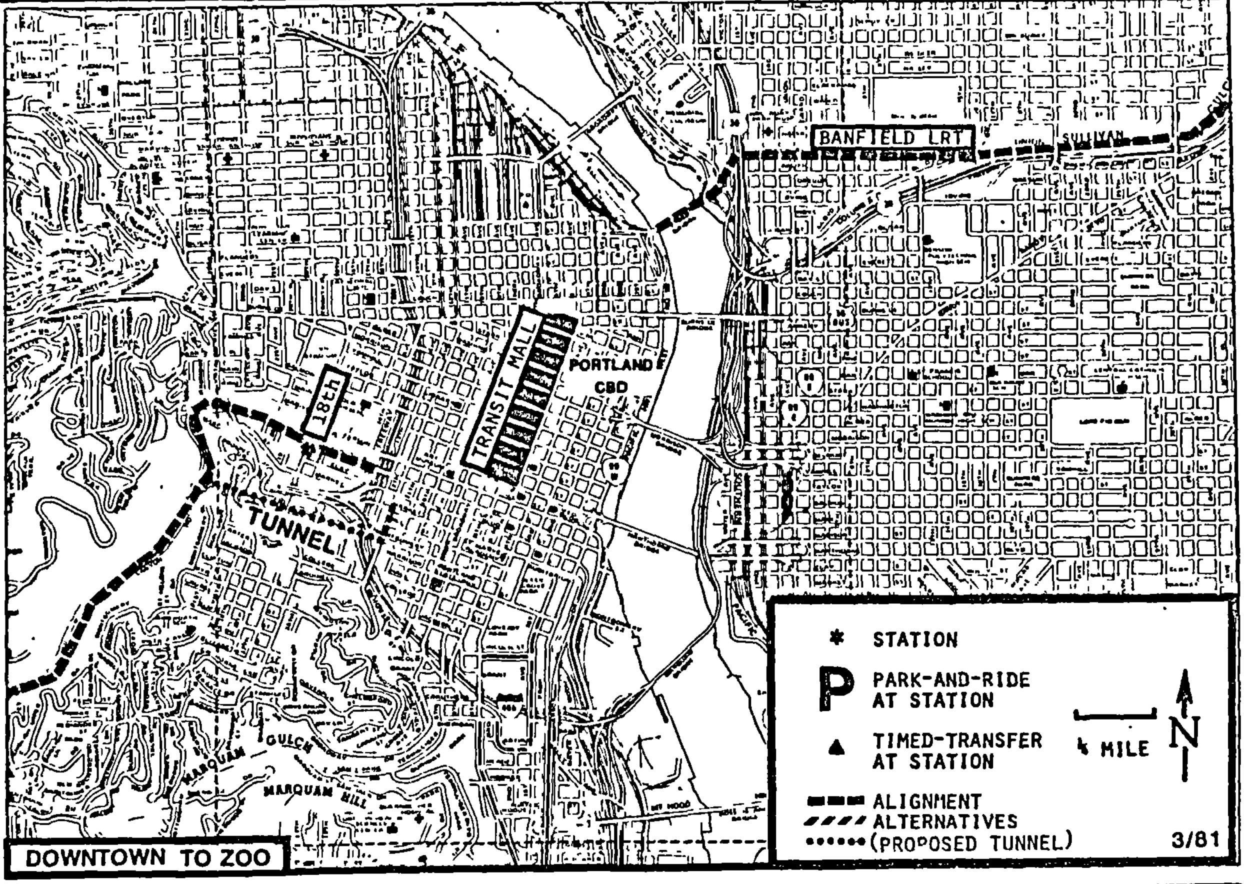
SYSTEMWIDE. The Sunset LRT Alternative is similar to the Sunset Busway and would provide high speed, high capacity transit except that the separated facility between Downtown Portland and Beaverton would be a two-track LRT line rather than a roadway. The Sunset LRT follows the same alignment as the Sunset Busway from the Vista Ridge area to Central Beaverton. Unlike the busway, which ends in Beaverton, the LRT alignment would extend west of Beaverton to N.W. 185th Avenue at a point just south of N.W. Walker Road. LRT stations would be located in the same locations as the busway stations between Downtown Portland and Beaverton, with five additional LRT stations sited along the segment west of Beaverton. Figure 2.2.11 illustrates the alignment and station locations associated with the Sunset LRT.

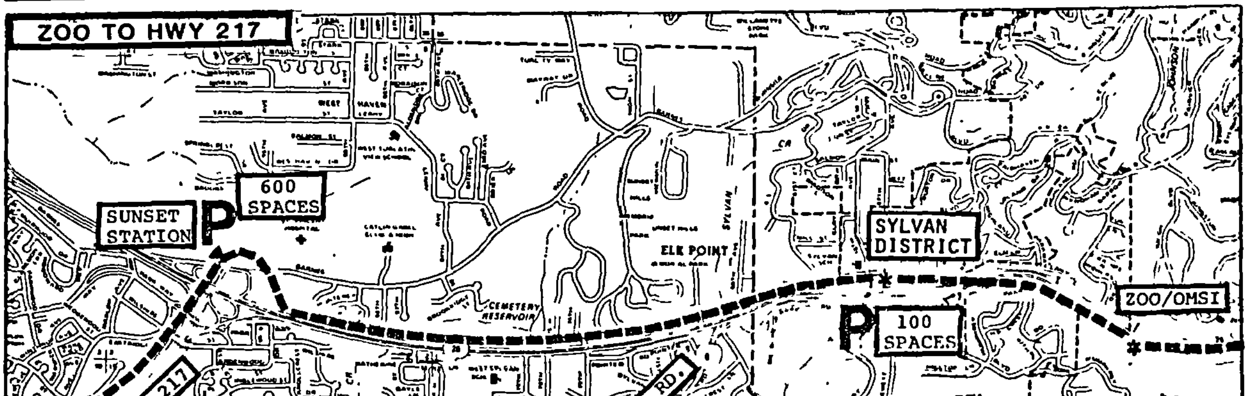
The Sunset LRT Alternative includes many of the capital components identified in the BSE and Sunset Busway Alternatives: a system of transit centers, network support facilities, park-and-ride lots and highway-related traffic management improvements. The existing Tanasbourne transit facility and park-and-ride lot would remain in its present form, with the timed-transfer functions moved to the N.W. 185th Avenue LRT station. In addition, an LRT maintenance base and storage facility would be constructed between the S.W. 158th Avenue/Merlo Road and S.W. 170th/Baseline Road LRT stations. Finally, the vehicle requirements of this alternative include light rail cars as well as new buses.

The light rail cars selected for this analysis replicate the Banfield design bids. The Banfield car is an articulated light rail vehicle with control cabs at each end and doors on both sides. Power is collected through a pantograph in contact with overhead wires which are fed from a 750 VDC supply. The car has an initial acceleration rate of approximately three miles per hour per second and a maximum speed approaching 55 mph. With a length of 88-93 feet, the car can accommodate a minimum of 160 seated and standing passengers based on a standing density of 3.5 passengers per square meter of available floor space. The cars, which can be coupled in trains of up to four cars, are designed for one-person train operation.

Light rail cars would be designed to operate at full performance within a range of 525 to 900 VDC. Electric power would be supplied to rail cars through an overhead distribution system. In downtown areas, trolley wires would be simply supported from brackets mounted on poles or suspended from span wire. On other portions of each alignment, where higher speeds are planned and curvature is less frequent, a catenary structure would be used. Poles would be spaced on approximately 100-foot to 200-foot centers. Constant tensioning devices would be used to control wire sag under various atmospheric and live load conditions. Power would be supplied to the distribution network at 750 VDC from substations located generally at all passenger stations. Substations have been sized at 1500 KW continuous capacity.

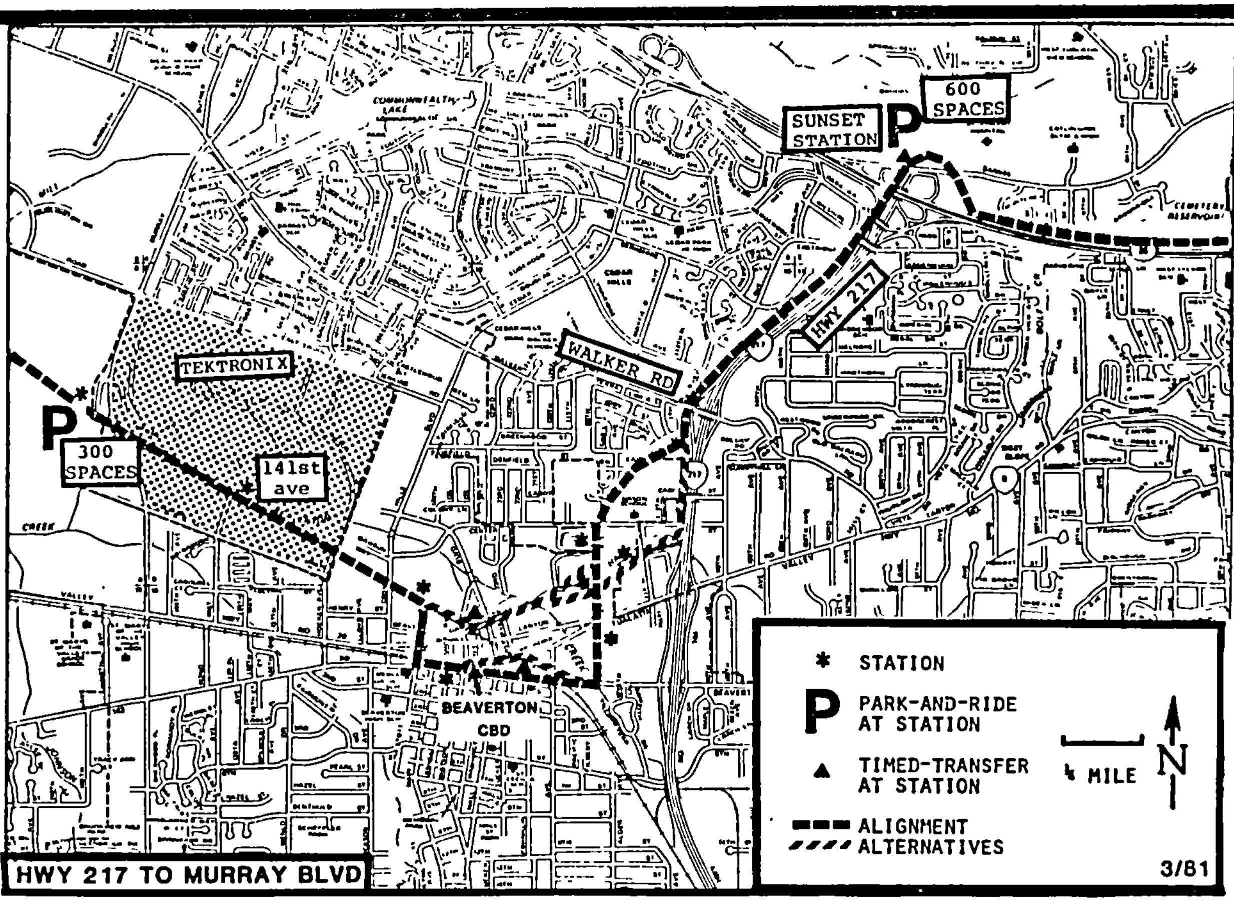
The light rail line would be supplemented by a timed-transfer bus system operating on routes similar to those in the other build alternatives described previously. Fare collection would be similar to that of the BSE Alternative and no premium would be expected of LRT users. One principal departure from these all-bus alternatives is that most Westside buses would act as feeders to light rail stations at all times. With the exception of a local route on the



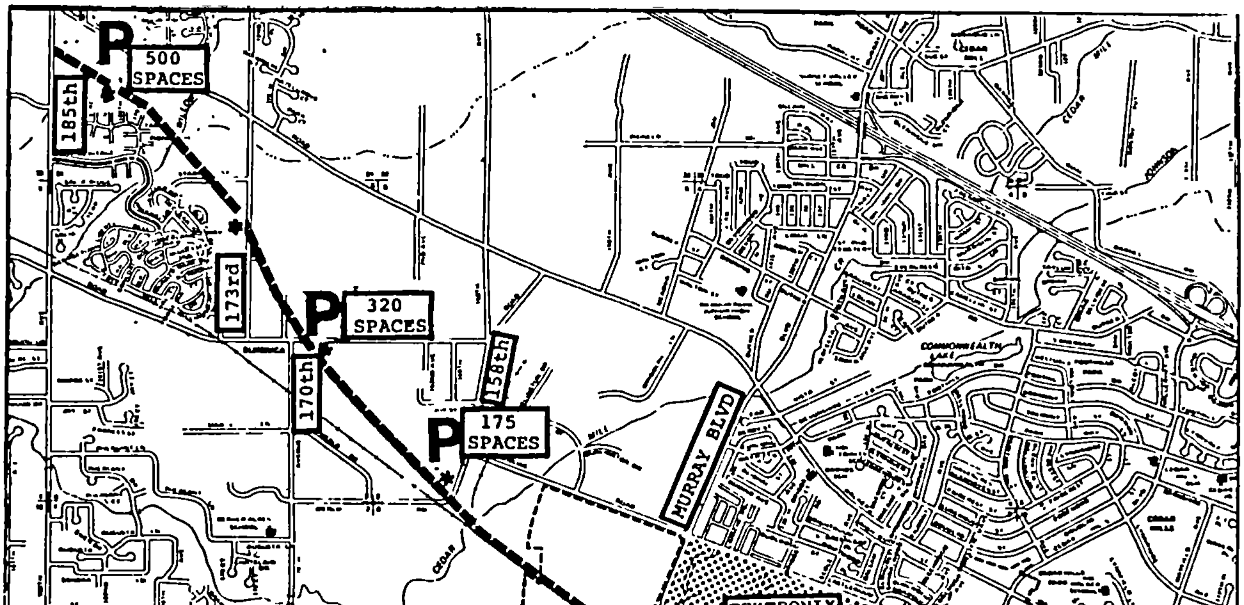


WESTSIDE CORRIDOR

FIGURE 2.2-11
SUNSET LRT ALTERNATIVE ALIGNMENT



HWY 217 TO MURRAY BLVD



MURRAY BLVD TO 185th

WESTSIDE CORRIDOR

FIGURE 2.2-11 (Continued)
SUNSET LRT ALTERNATIVE

Beaverton-Hillsdale Highway, no buses would provide through service to Downtown Portland from the area west of Highway 217. Although this requires downtown passengers to transfer to LRT, it shortens significantly the bus mileage required. It also reduces the volume of buses which must circulate in Downtown Portland. Another departure from the other two all-bus alternatives is that the bus line on the Tualatin Valley Highway would be lessened in importance to a local route feeding the LRT station at Central Beaverton. In its place, service would be intensified on a new bus route extending the trunkline service of LRT westward from the 185th Avenue rail terminal to Hillsboro and Forest Grove via Cornell Road and Route 8. Service along Multnomah Boulevard will be identical to that described for the Bus Service Expansion Alternative (Figure 2.2-2).

Thus, the Sunset Light Rail Transit Alternative would concentrate radial travel on the rail facility, limiting buses on the Westside to predominantly rail feeder and local circulation service. In total, buses would provide service to over 309 miles of Westside streets while the light rail facility would extend for 12.2 miles.

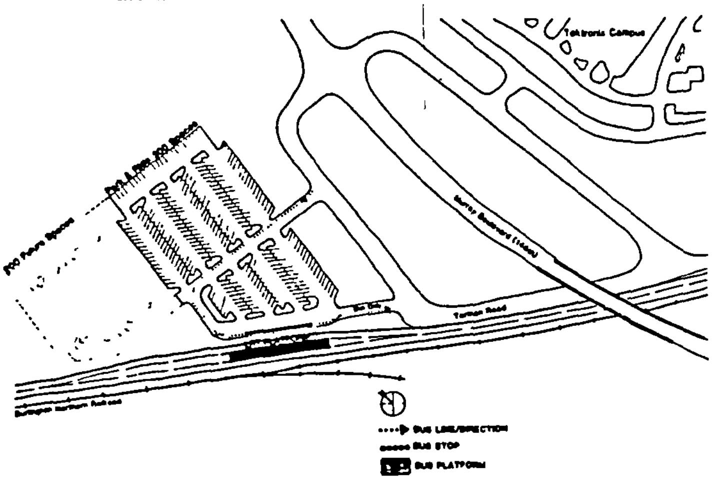
Rail transit service would be operated by two-car trains and would be through-routed with the Banfield LRT in the Eastside. By 1995, peak hour frequencies averaging three minutes would be maintained between Downtown Portland and Central Beaverton and six minutes west of Beaverton. Frequencies of five to 7.5 minutes would be operated midday and headways would not exceed 30 minutes during other off-peak times. Nearly half of the buses serving the corridor would operate at 15 minute intervals during the peak period, while the remainder would run every 30 minutes. No buses would travel on the Sunset Highway. Off-peak bus service would operate every 30 minutes on most routes. The Sunset LRT Alternative includes approximately 800 more park-and-ride spaces than the all-bus alternatives. These spaces would be provided in the location and general configuration shown in Figure 2.2-12.

Representative 1995 operating statistics for this alternative are shown in Table 2.2-4. The bus component of this service alone would be greater than that provided by the No Build, exceeding peak period revenue bus hours and bus miles for the No Build by 17 percent and 15 percent respectively. The articulated bus fleet for this alternative would be 57 percent larger. The rail service in the Westside does not have a counterpart in the No Build for comparison.

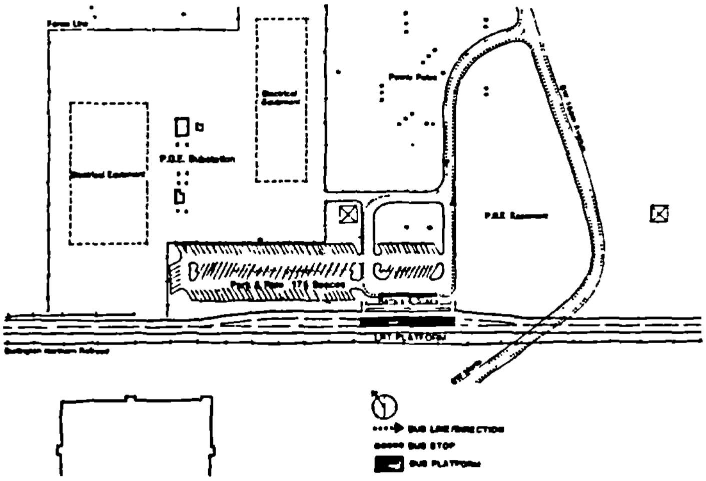
DOWNTOWN PORTLAND. Based on two 1995 radial LRT corridors (Banfield and Sunset) and current City of Portland street classification designation, there are six LRT options identified in Figure 2.2-13. Assuming the cross mall Banfield LRT alignment to be in place, the Sunset connection from the Vista Ridge tunnel option or the 18th Jefferson location could be via S.W. Columbia or S.W. Montgomery and S.W. 12th, as shown, with a second downtown alignment located on either 5th and 6th or 4th and 5th Avenues. The connection to the Banfield LRT would be via N.W. Glisan for all downtown options. As an alternative, the Sunset alignment which utilizes Columbia Street could acccess the cross mall connection via S.W. 18th. This would necessitate the extension of the east-west Banifeld alignment westerly to S.W. 18th.

The portion of downtown streets occupied by LRT tracks will be reserved for light rail vehicles, except at intersections (Figure 2.2-14). There are a number of combinations of possible CBD street widths/right-of-way widths and

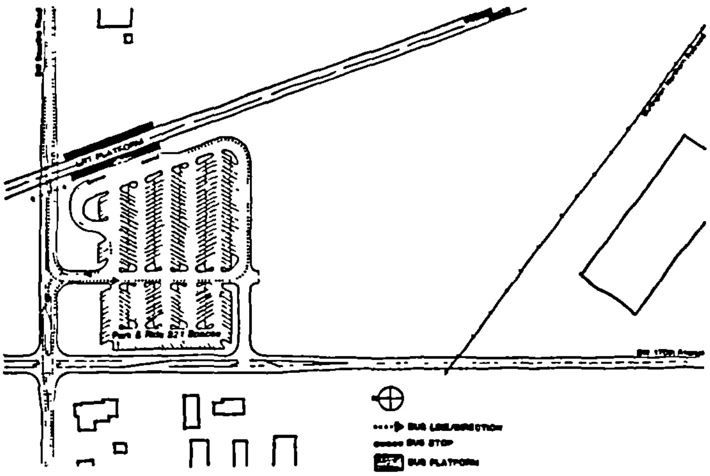
MURRAY BLVD. PARK AND RIDE STATION



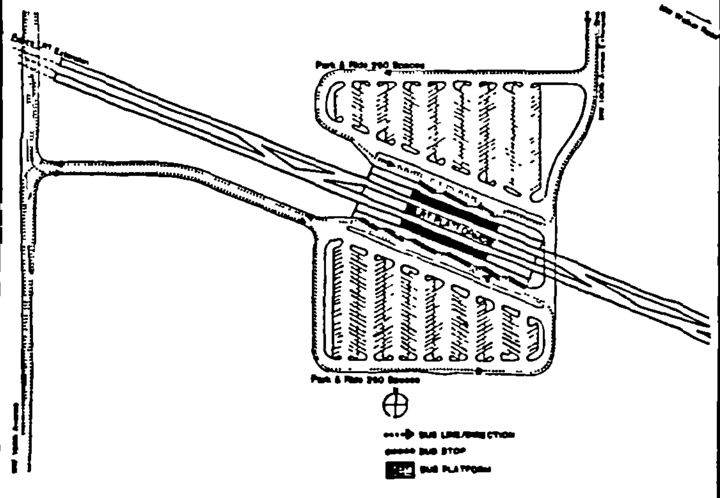
158th PARK AND RIDE STATION



170th PARK AND RIDE STATION



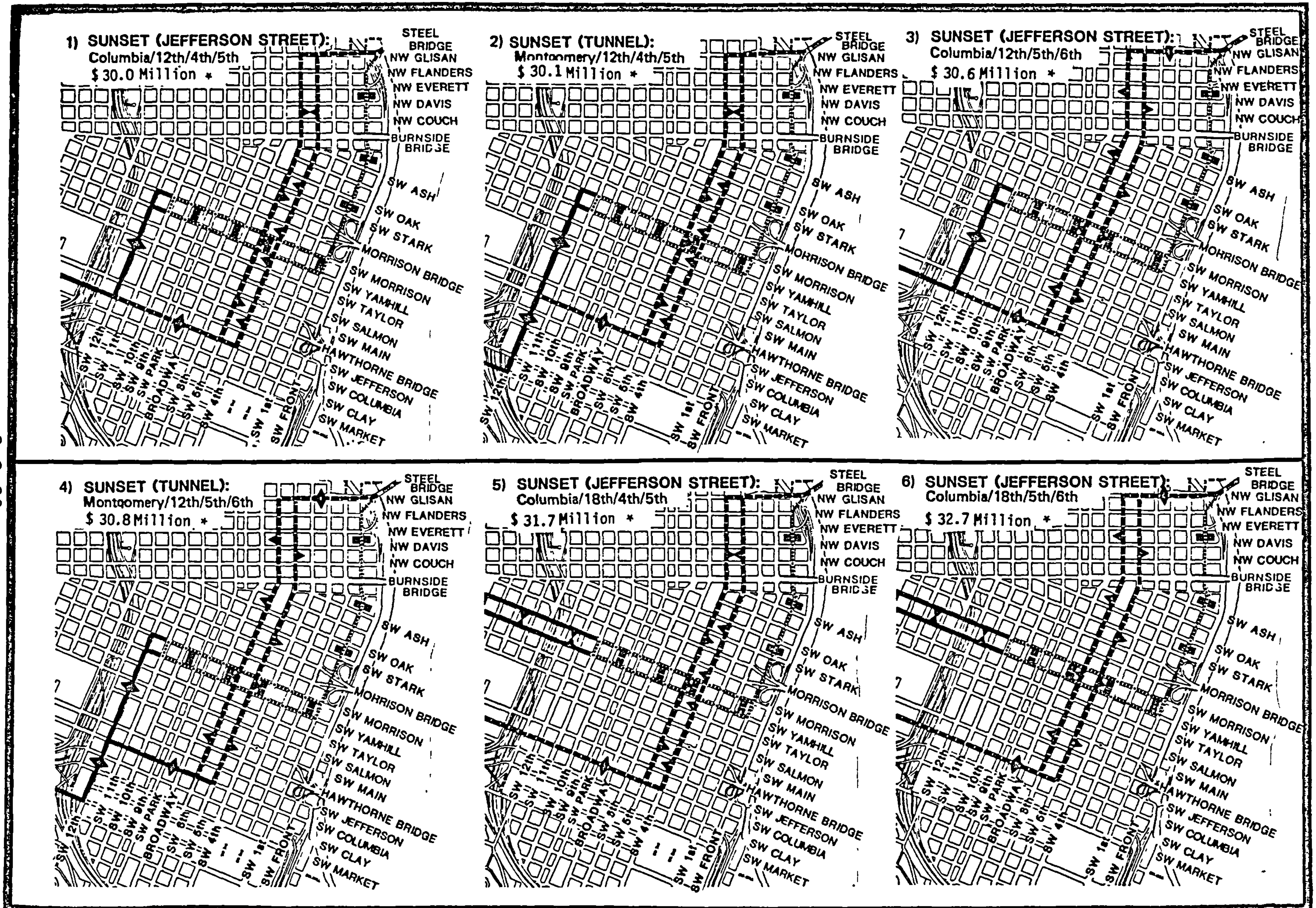
185th PARK AND RIDE STATION



WESTSIDE CORRIDOR

FIGURE 2.2-12

ADDITIONAL PARK AND RIDE LOCATIONS FOR THE SUNSET LRT ALTERNATIVE (& MULTNOMAH LRT ALTERNATIVE)



WESTSIDE CORRIDOR

FIGURE 2.2-13

ALTERNATIVE SUNSET LRT ALIGNMENTS FOR DOWNTOWN PORTLAND

- Banfield LRT Stations
- Stations Added in Westside LRT Construction
- Banfield LRT Alignment
- Westside LRT Cross Mall Connection to Banfield
- Westside LRT North-South Connection to Banfield

LRT trackage configurations when considering the presence of stations within a typical block. In downtown, each single line of trackage will occupy about 12 feet of street width. Where a double track is proposed as on Columbia, 18th, or 12th, 24 feet of street would be reserved for LRT.

TABLE 2.2-4. 1995 TRANSIT OPERATING STATISTICS: SUNSET LIGHT RAIL TRANSIT ALTERNATIVE

	WESTSIDE CORRIDOR	% CHANGE FROM NO BUILD	REGION	% CHANGE FROM NO BUILD
Revenue Vehicle Hours				
Bus - Peak	152	17%	571	5%
- Daily	2,041	18%	7,904	5%
Revenue Train Hours				
LRT - Peak	19	(new)	45	73%
- Daily	166	(new)	388	75%
Revenue Vehicle Miles				
Bus - Peak	2,462	15%	9,348	5%
- Daily	28,035	23%	107,679	6%
LRT - Peak	821	(new)	1,821	82%
- Daily	7,691	(new)	17,058	82%
Fleet Size (with spares)				
Standard Buses	154	5%	580	3%
Articulated Buses	69	57%	273	8%
Light Rail Vehicles	52	(new)	121	75%

For those options in which light rail operations are proposed for the existing transit mall, a single track would occupy the left-hand auto lane, resulting in the displacement of local auto circulation where presently allowed. In addition, the on-mall LRT alignment would result in the removal of sidewalk area and fountains in the typical blocks where there are two bus lanes.

Impacts to street capacity downtown are not only affected by light rail operations, but also by further bus service increases. Bus volumes in downtown will not be as high with the light rail alternatives as with the all-bus alternatives, but they will still require some special treatments.

The following treatments are included in the Sunset LRT Alternative which were explained for the Bus Service Expansion Alternative:

(1) Exclusive bus lanes on S.W. 6th from Madison to Hall and on S.W. 5th from Madison to Harrison

(2) Taylor Street or Morrison Street bus operations

(3) Morrison/Yamhill auto operations

(4) Yamhill and Morrison or Yamhill sidewalk expansion

In addition, S.W. Jefferson would be designed to function as a two-way street between 3rd and 18th Avenues. In order to facilitate two-way traffic on Jefferson, the existing 36-foot pavement needs to be widened to 44 feet between 3rd and 10th Avenues. West of 10th Avenue, Jefferson Street's pavement is wide enough to accommodate the typical roadway section of four 11-foot travel lanes, two in each direction. An 8-foot sidewalk would be included on both sides of the street. The 8-foot sidewalk widths are not adequate for pedestrian use combined with bus stop usage to the east of the Transit Mall. Therefore, no bus stops would be designated on Jefferson between 5th and 3rd Avenues. The Jefferson Street widening project would also include new curbs, signalization for the two-way operation, landscaping, signing and striping.

PORTLAND TO BEAVERTON. The Jefferson Street option for the Sunset LRT operation would follow the same alignment and have the same station locations (Figure 2.2-15) as the Sunset Busway Alternative from the Vista Ridge area to Central Beaverton. A second option exists for the Sunset LRT, the tunnel option off of Montgomery Street (Figure 2.2-13, (2) and (4)). The tunnel would be approximately 2,000 feet in length, and would run from an east portal near S.W. 16th/S.W. Montgomery to a west portal several hundred feet west of the existing highway tunnel portals on the west side of Vista Ridge. The tunnel would probably require drill and blast construction methods through what preliminary geological investigations have suggested will be hard rock requiring only minimum support. As such, it may be less expensive than a surface alignment around Vista Ridge. Primarily, the benefits of a tunnel in this segment would be associated with better achievable grades, and a shorter alignment. The Engineering Reconnaissance study eliminated the tunnel option for the Sunset Busway due to the following additional cost requirements:

- Ventilation: Because of frequent diesel bus operation, permanent ventilation is required for a busway tunnel (not required for rail).

- Lighting: Continuous lighting would be required for the busway tunnel during the hours of its operation (not required for rail).

- Additional width: The busway tunnel would require froom 30 to 50 percent greater width than for rail in order to accommodate emergency operations with a reasonable degree of safety.

These additional requirements were felt to negate the potential benefits resulting from development of a Vista Tunnel for the busway alternative. It was therefore never considered in greater detail, and no comparable cost estimates were made.

BEAVERTON. Figure 2.2-16 shows the four Sunset LRT options through Central Beaverton. West of S.W. Cedar Hills Boulevard, all options take identical routes within, or adjacent to, the Burlington Northern Railroad right-of-way north of the existing tracks. There are two stations within the Central Beaverton area west of S.W. Cedar Hills Boulevard: the S.W. 141st Avenue station and a station just west of S.W. Murray Boulevard.

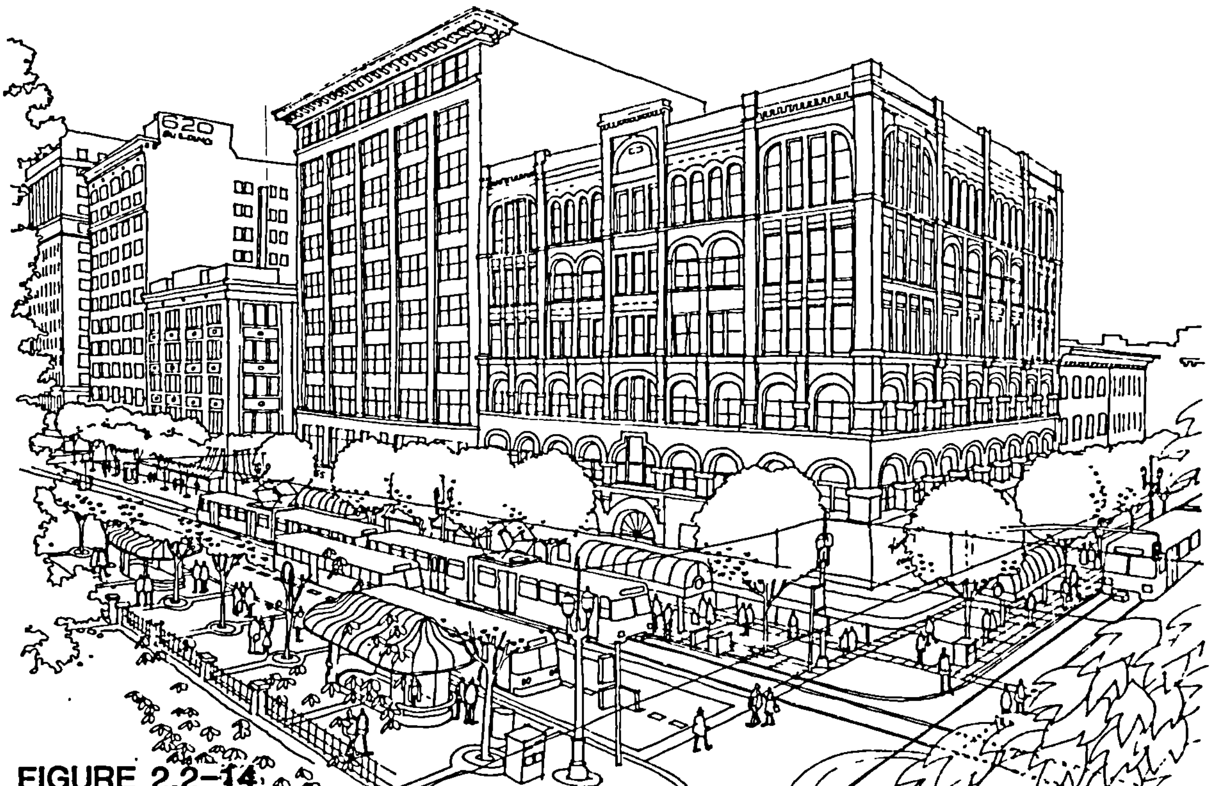


FIGURE 2.2-14
VIEW OF MALL LRT STATION
looking northeast on S.W. Fifth Avenue and Yamhill Street

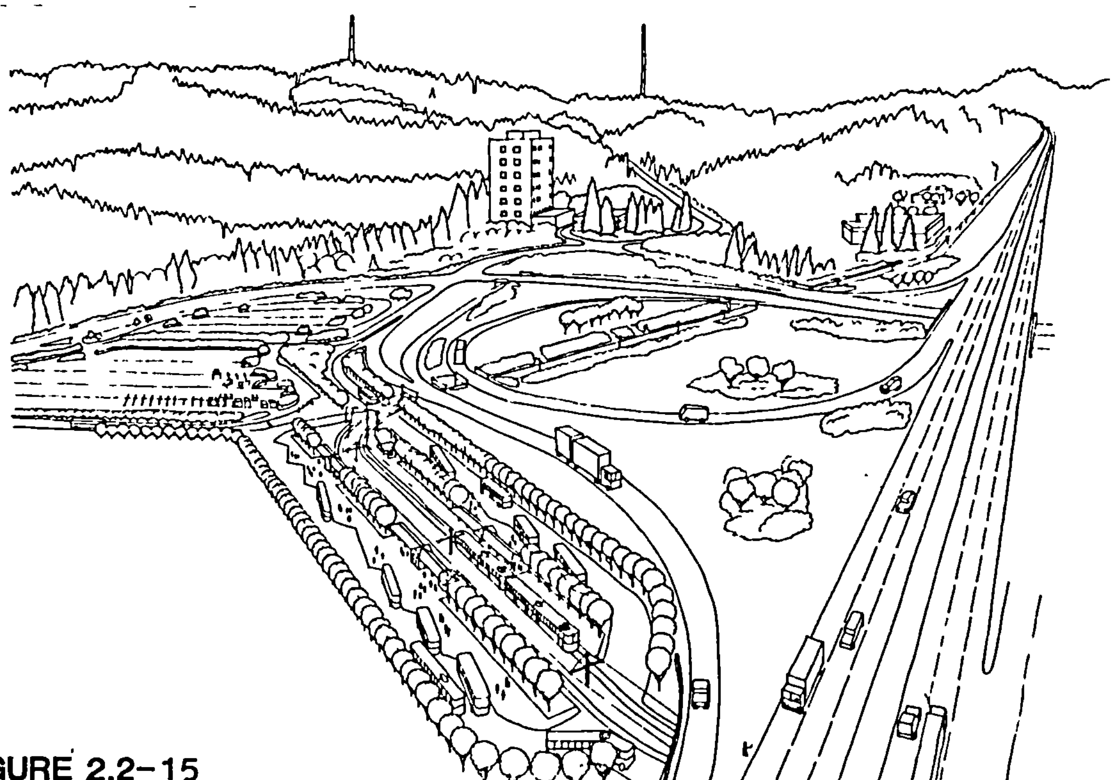
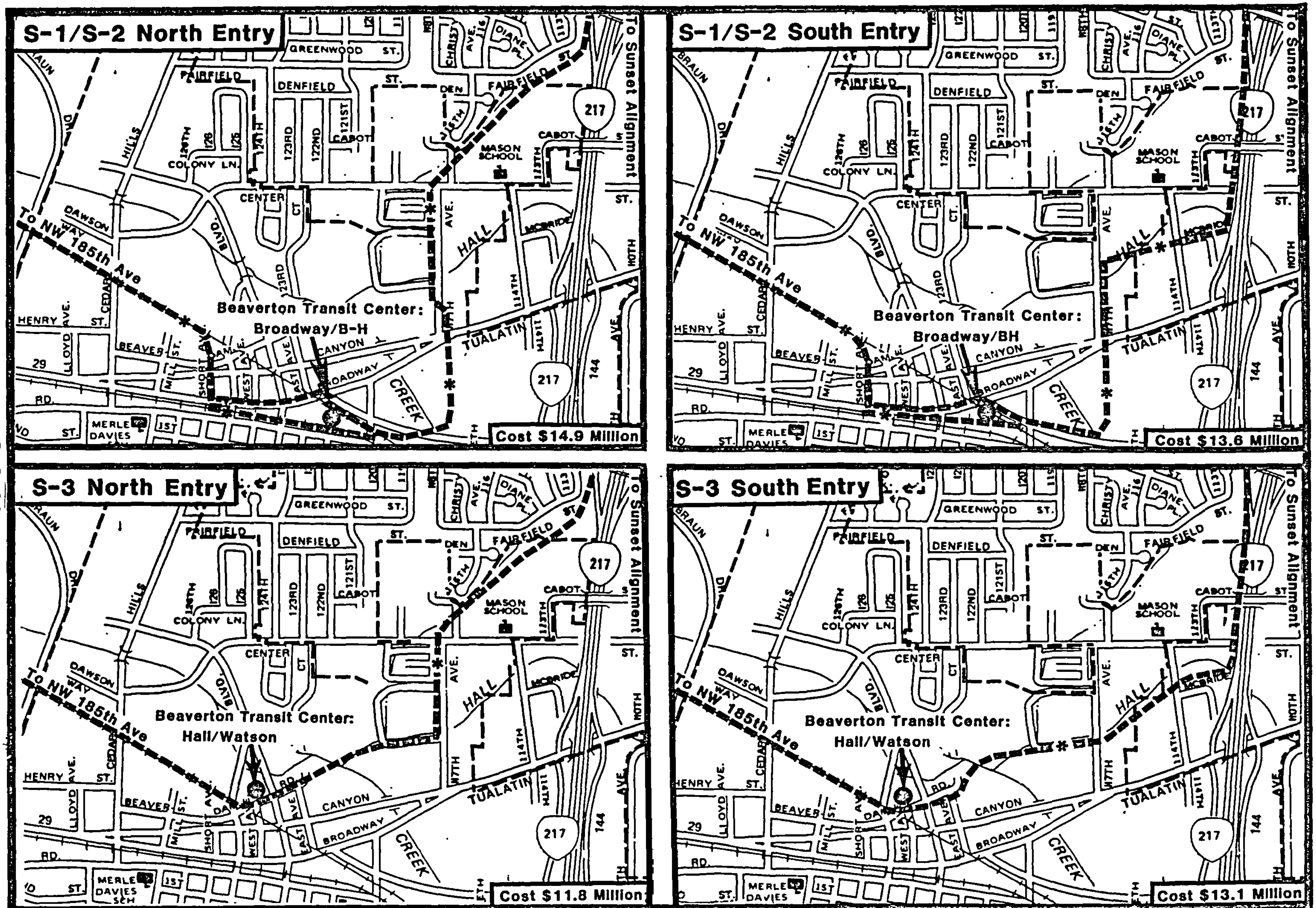


FIGURE 2.2-15
VIEW OF SUNSET/217 LRT STATION AND TRANSIT CENTER
looking northeast towards St.Vincent Hospital
and proposed rebuilt freeway interchange

	WESTSIDE CORRIDOR	FIGURE 2.2-14 VIEW OF LRT IN DOWNTOWN PORTLAND FIGURE 2.2-15 VIEW OF LRT INTERFACING WITH SUNSET/217 TRANSIT CENTER



WESTSIDE CORRIDOR

FIGURE 2.2-16

* STATION SITE ● TRANSIT CENTER

SUNSET LRT OPTIONS IN CENTRAL BEAVERTON

Two Sunset LRT options use the Broadway/Beaverton-Hillsdale Transit Center, the north entry or the south entry to Central Beaverton. The distinction between north entry and south entry was discussed earlier in reference to the Sunset Busway. From a common point along S.W. 117th Avenue, both options continue south on the east side of S.W. 117th Avenue across Canyon Road to a station north of Beaverton-Hillsdale Highway.

At the Transit Center, the LRT alignment divides: the outbound tracks continue west along Beaverton-Hillsdale Highway, turn and continue west in the northern half of Broadway to S.W. Watson Avenue; the inbound tracks are in the northern part of the Southern Pacific right-of-way from the Transit Center to S.W. Watson Avenue. From S. W. Watson Avenue, the two tracks rejoin and continue west in the Southern Pacific right-of-way to S. W. Mill Avenue, going through a station at S.W. Short Avenue. The alignment turns north along S.W. Mill Avenue, across S.W. Canyon Road, and turns northwest along the Burlington Northern right-of-way to a station between S.W. Mill Avenue and S.W. Cedar Hills Boulevard.

Two Sunset LRT options use the Hall/Watson Transit Center site: one uses the north entry and the other the south. From S.W. 117th Avenue, the two options are identical with the alignment going west through undeveloped land approximately along the alignment of an extended S.W. Beaverdam Road, across S.W. Hall Boulevard to a station at the Beaverton Transit Center. From the Transit Center, the alignment continues along the north side of the Burlington Northern right-of-way across S. W. Cedar Hills Boulevard.

WESTERN WASHINGTON COUNTY. The Sunset LRT alignment follows the Burlington Northern Railroad to N.W. 158th Avenue, then proceeds northwesterly across presently undeveloped land in a new alignment to N.W. 185th Avenue. Should the cost of land development phasing make this terminus less attractive in the short-term, it could be designated as part of a second-phase LRT extension and the initial increment of LRT development could terminate at a point further east, such as 158th Avenue. Eventually, however, it could be desirable to extend light rail all the way to Hillsboro via this designated alignment through the 185th development area.

The transitway is within and adjacent to the existing Burlington Northern Railroad right-of-way north of the existing tracks, as it proceeds to the west. The first station beyond Central Beaverton is just west of S.W. 158th Avenue as it turns to become S.W. Merlo Road. West of this station, the alignment leaves the Burlington Northern right-of-way and proceeds in a northwesterly direction toward N.W. Walker Road.

The next station is south of S.W. Baseline Road to the east of its intersection with S.W. 170th Avenue. Located between the S.W. 158th Avenue/S.W. Merlo Road and the S.W. Baseline Road stations, on the south side of the LRT tracks, would be an LRT storage yard and maintenance shop. The next station to the west would be immediately east of N.W. 173rd Avenue, north of its intersection with W. Stark Street.

The transitway proceeds west of N.W. 173rd Avenue to N.W. 185th Avenue, south of its intersection with N.W. Walker Road. The terminal station is located east of N.W. 185th Avenue. Trackage is provided at the station to allow trains to reverse direction and to accommodate train storage.

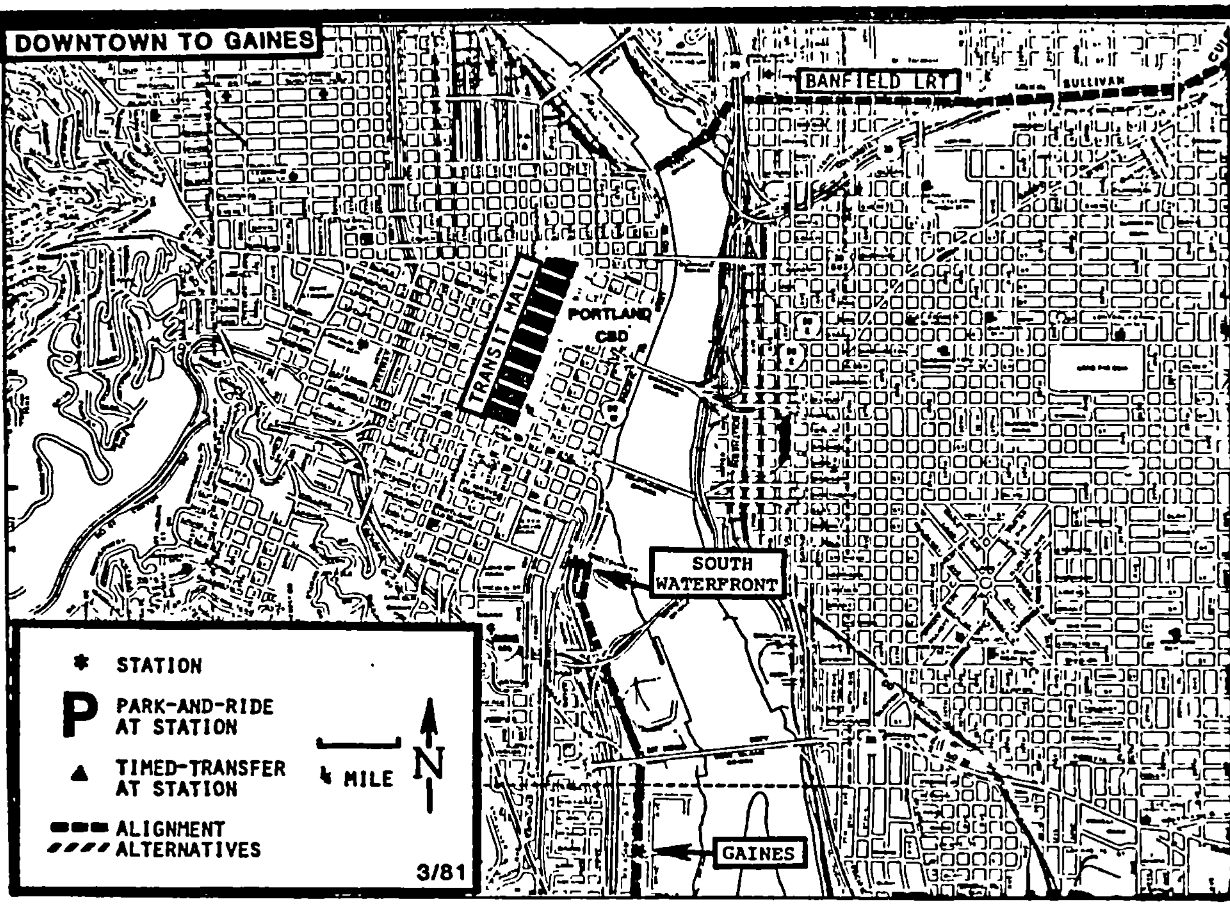
2.2.5 ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT (LRT)

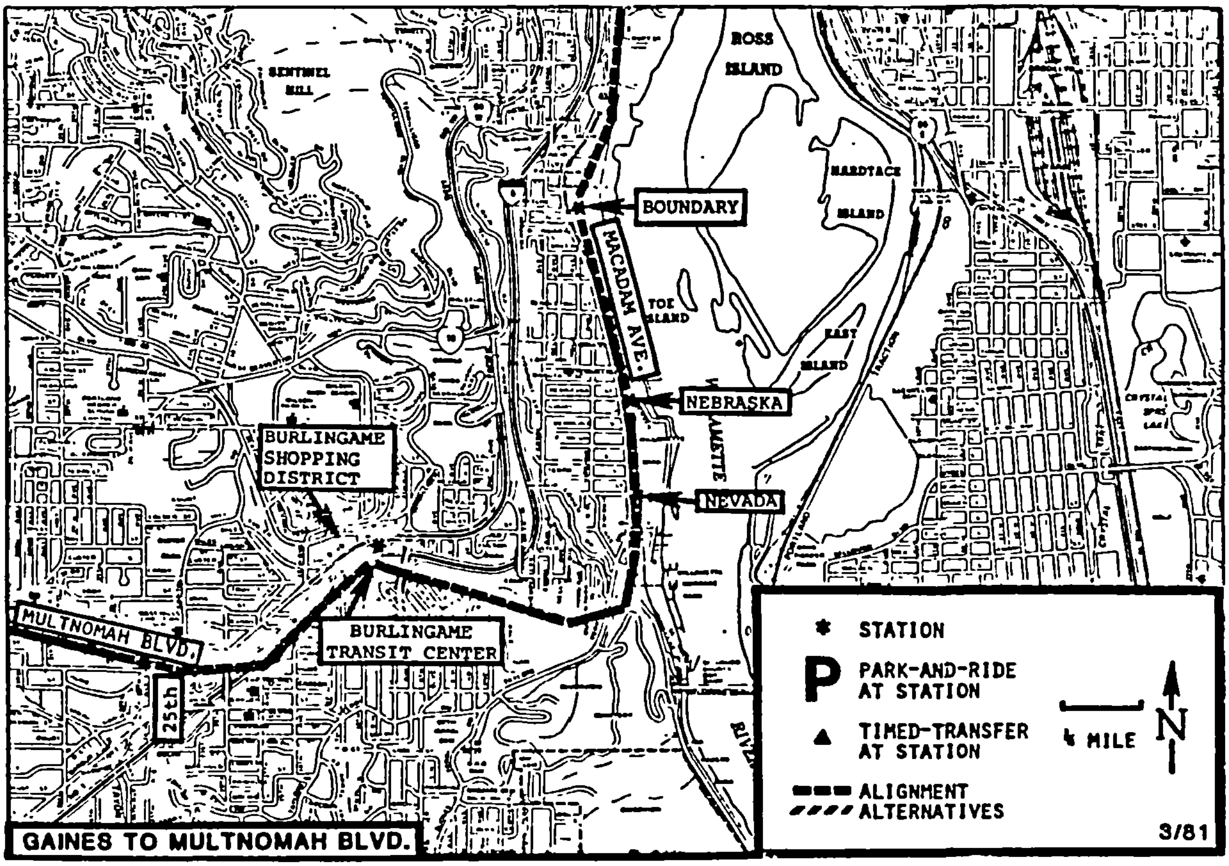
SYSTEMWIDE. The Sunset and Multnomah LRT Alternatives differ in their alignment between Downtown Portland and Beaverton. The Multnomah LRT extends from Downtown Portland along S.W. Macadam Avenue and the Southern Pacific railroad right-of-way passing through the John's Landing Redevelopment area, then turns west and follows S.W. Multnomah Blvd. to S.W. Oleson Road, finally turning northwest and following the old Oregon Electric Railway right-of-way to Beaverton. West of Beaverton the LRT tracks would follow the same alignment and serve the same LRT stations as identified in the Sunset LRT Alternative. Figure 2.2-17 shows the light rail alignment and station locations of the Multnomah LRT Alternative.

Like the Sunset LRT Alternative, the Multnomah Light Rail Transit Alternative would concentrate corridor travel on the rail facility, limiting buses on the Westside to predominantly rail feeder and local circulation service. The exception would be service to the Cedar Hills area and west which would be provided by buses operating in mixed traffic on the ramp metered Sunset Highway to Downtown Portland. During the peak hour, the Sunset Highway would be used by seven bus routes making 22 peak direction trips. Two peak hour trips would be express to Beaverton and 16 would be express to the Sunset/217 transit center. The remainder would make multiple stops. During the day base hour, three routes would make six trips. This trunkline service would be required since transferring to the rail line from this area for travel to Downtown Portland would result in a circuitous trip. In total, buses would operate over 319 miles of streets in the Westside, while the light rail facility would extend 15.5 miles, 3.3 miles longer than the Sunset LRT. Fare collection, timed-transfer center locations, maintenance facilities, network support facilities and highway related traffic management improvements are the same as the Sunset LRT.

Rail service on the Multnomah route would be the same as that provided on the Sunset. Frequencies of the respective bus routes would also be similar. Operating statistics representing these service levels for 1995 are listed in Table 2.2-5. The bus component would exceed the No Build alternative by 19 percent and 16 percent for peak hour revenue bus hours and bus miles respectively. In comparison to the Sunset Light Rail Transit Alternative, rail statistics are significantly greater for the Multnomah alternative because, even though the same level of service would be provided, it is a longer and slower rail route. The Multnomah LRT Alternative includes approximately 140 more park-and-ride spaces than the Sunset LRT Alternative. These spaces will be provided in the location and general configuration shown in Figure 2.2-18.

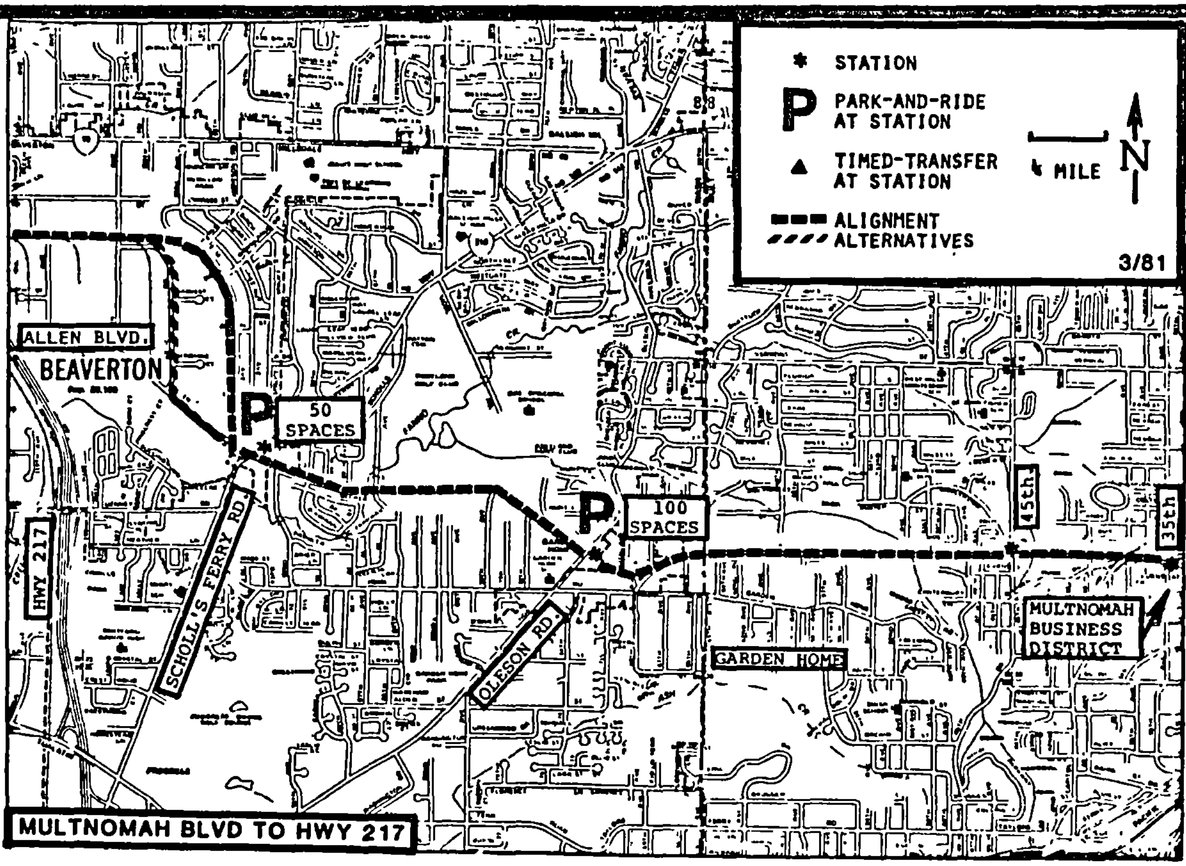
The Multnomah LRT Alternative differs from the Sunset LRT and the other three project alternatives in the nature of the service provided to different sections of the study area. The southerly location of the light rail line would provide southwest neighborhoods with a very rapid connection to Downtown Portland and central Beaverton which is lacking in the other alternatives. On the other hand, areas of Washington County west of Highway 217 would have higher travel times on light rail with the Multnomah versus Sunset routes. As such, the Multnomah LRT Alternative caters to a different market segment of the Westside, both in terms of geographical location and trip patterns and purposes, than the Sunset LRT.

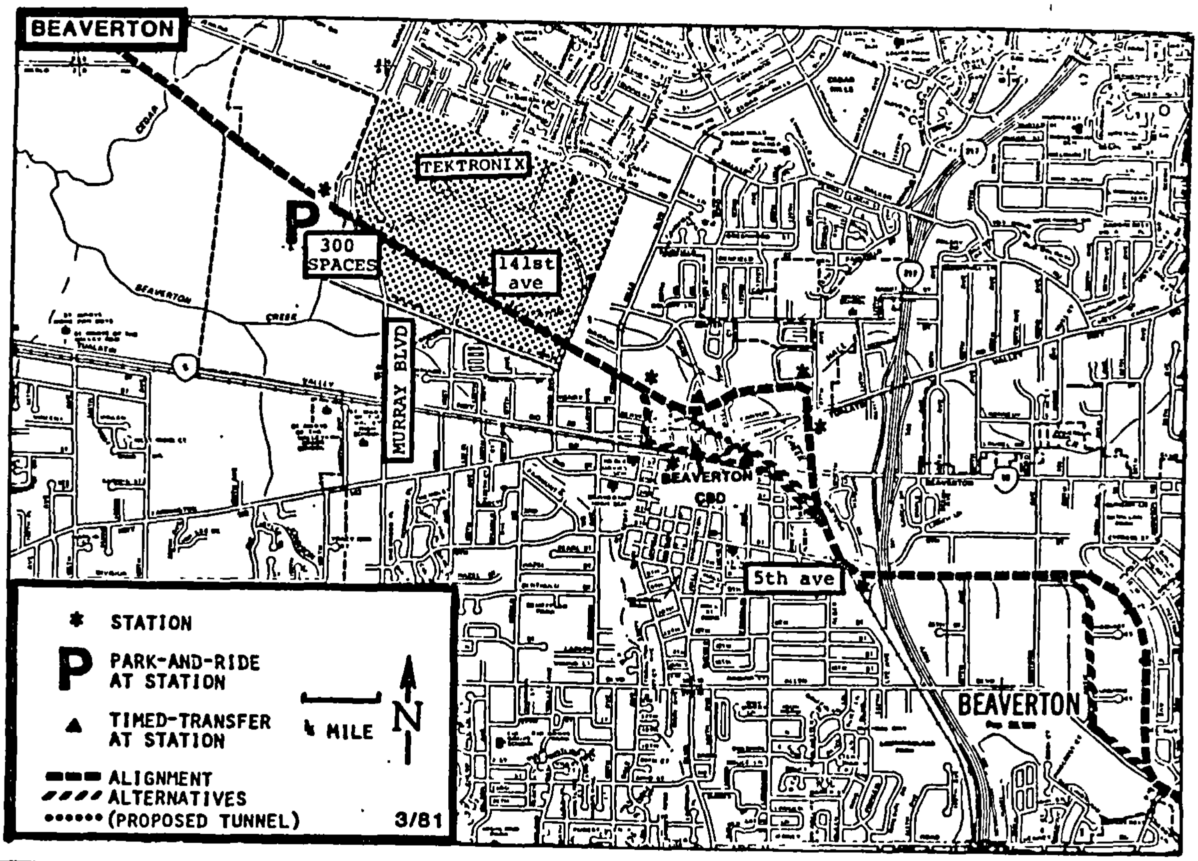




WESTSIDE CORRIDOR

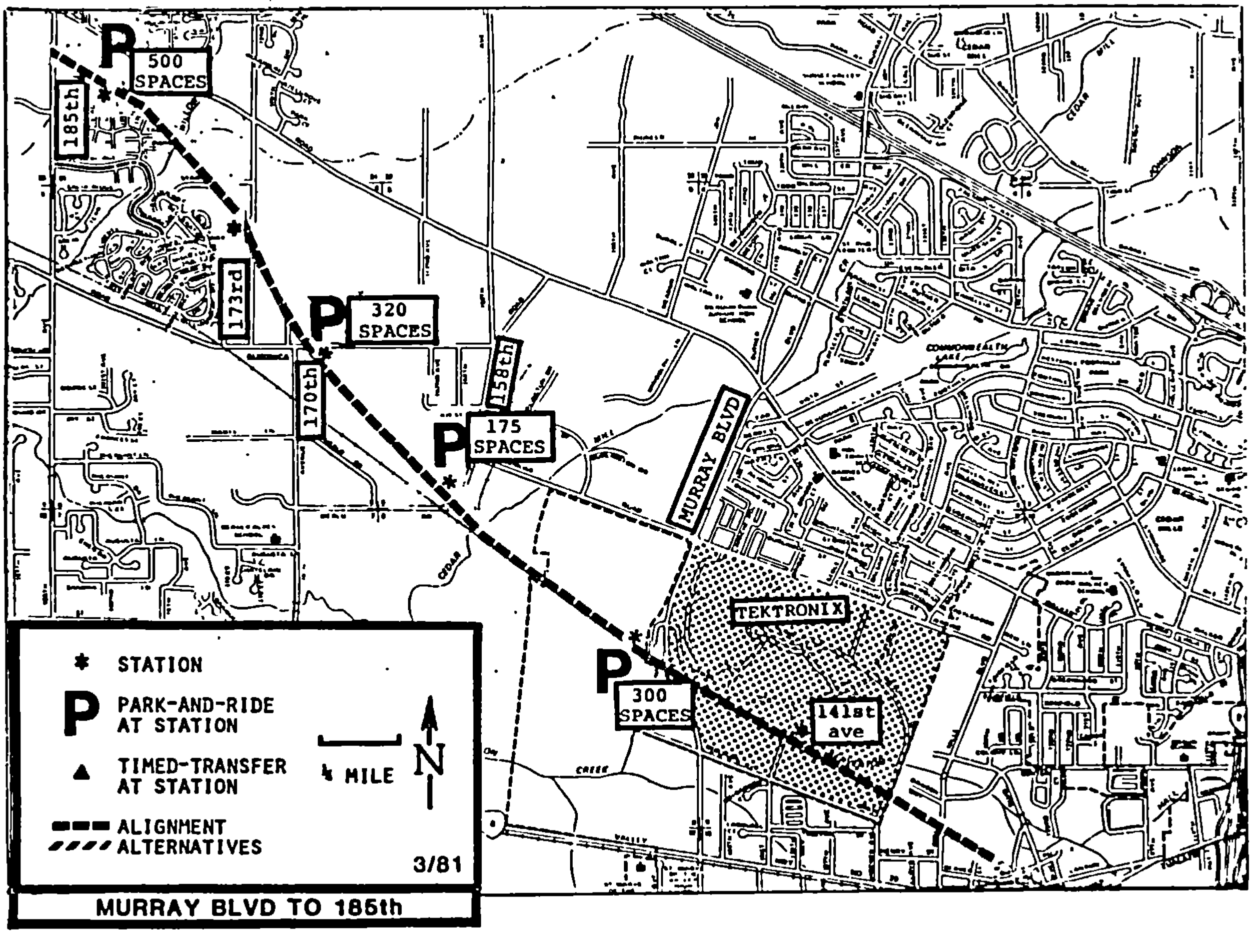
FIGURE 2.2-17
MULTNOMAH LRT ALTERNATIVE ALIGNMENT





WESTSIDE CORRIDOR

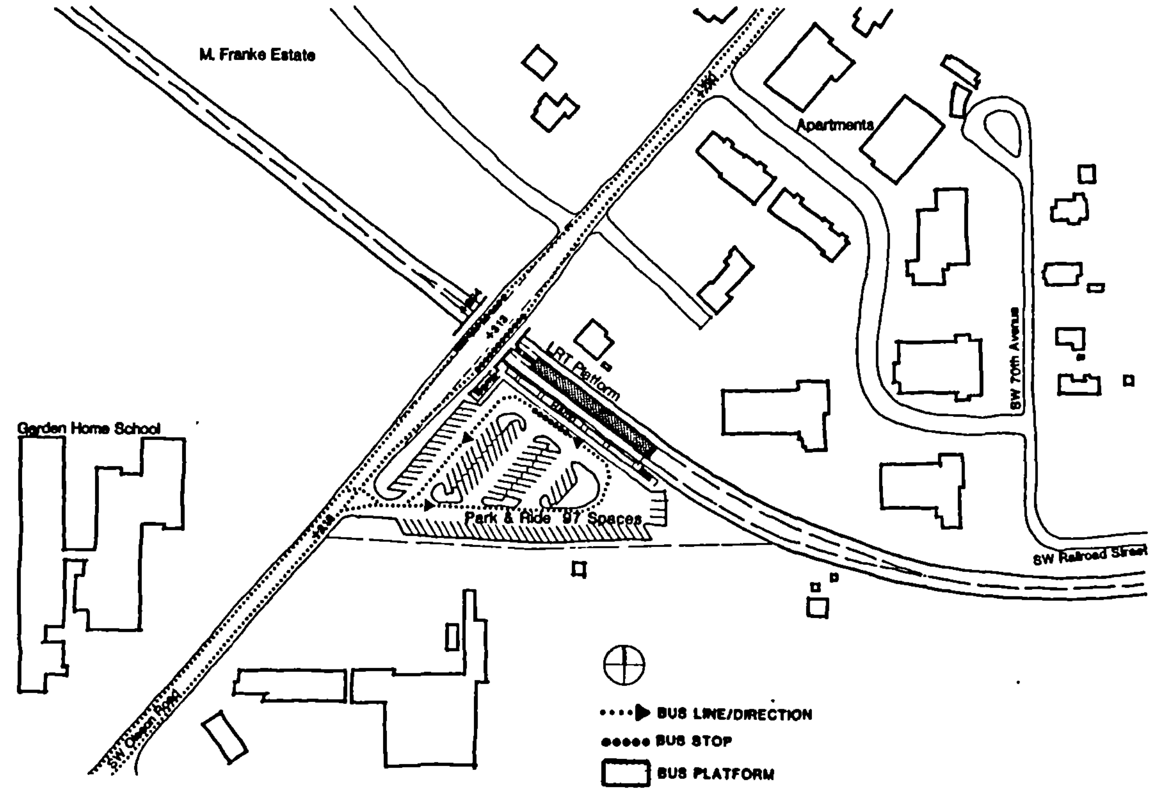
FIGURE 2.2-17 (Continued)
MULTNOMAH LRT ALTERNATIVE ALIGNMENT



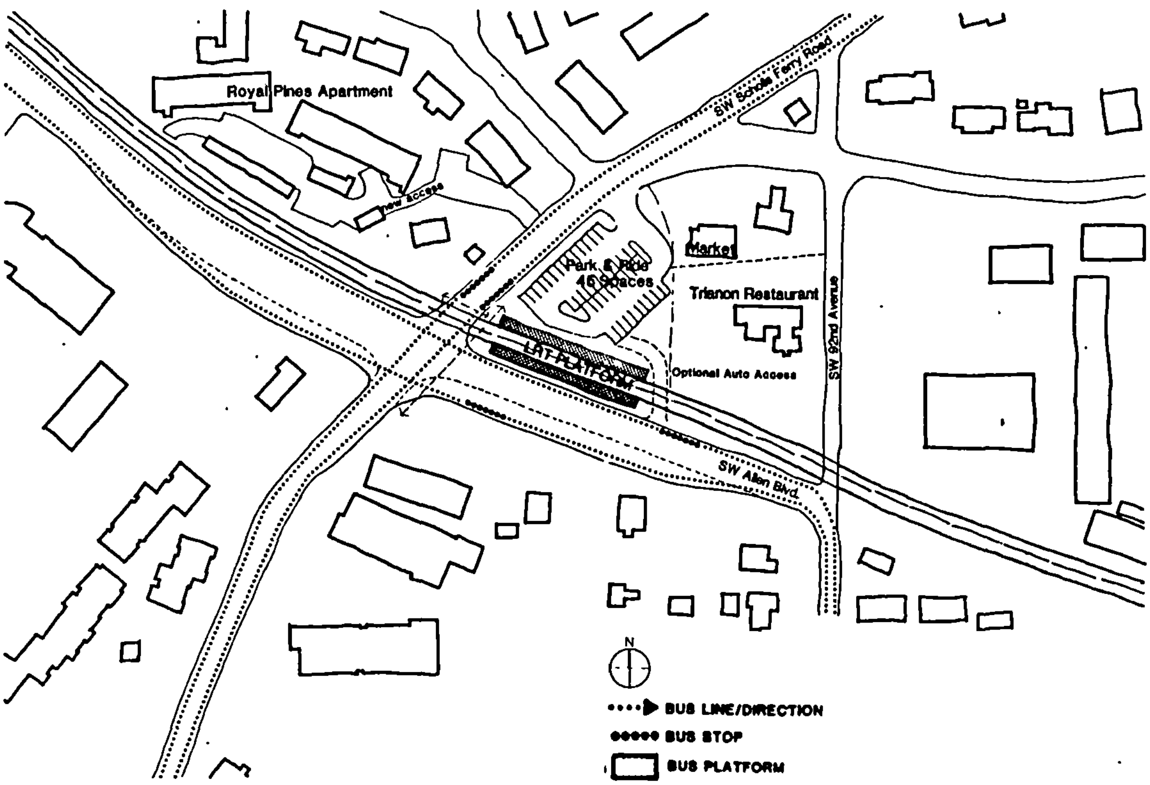
WESTSIDE CORRIDOR

FIGURE 2.2-17 (Continued)
MULTNOMAH LRT ALTERNATIVE ALIGNMENT

OLESON ROAD PARK AND RIDE STATION



SCHOLLS FERRY ROAD PARK AND RIDE STATION



WESTSIDE CORRIDOR

FIGURE 2.2-18

ADDITIONAL PARK AND RIDE LOCATIONS FOR THE MULTNOMAH LRT ALTERNATIVE

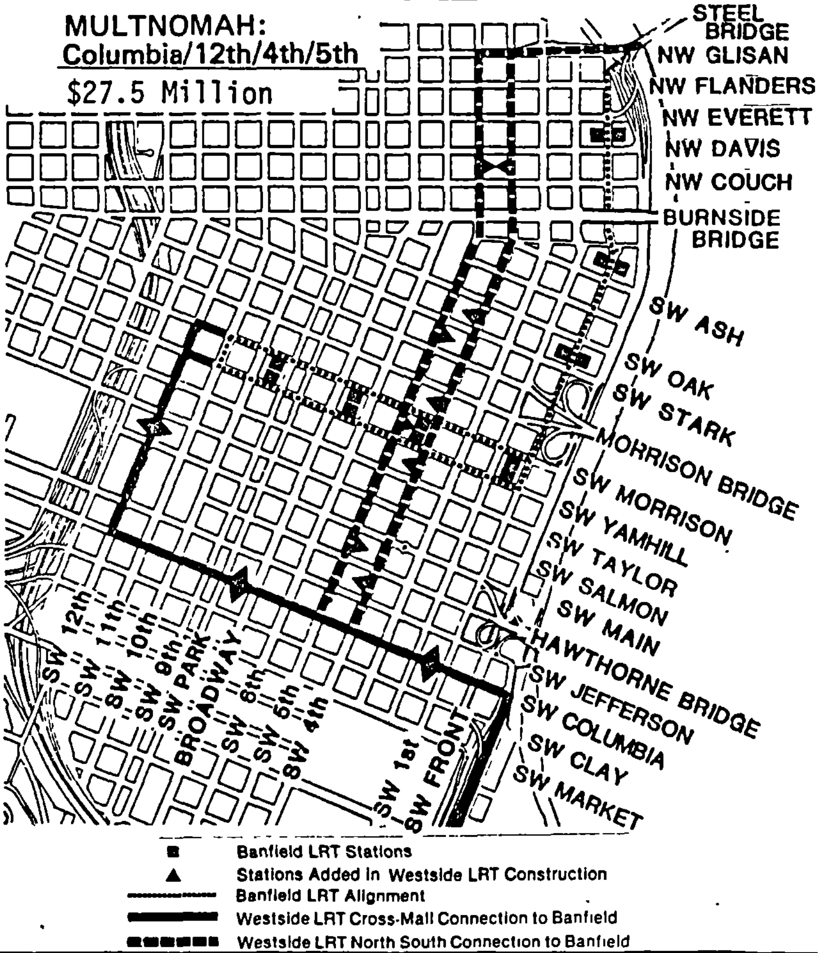
TABLE 2.2-5. 1995 TRANSIT OPERATING STATISTICS: MULTNOMAH LIGHT RAIL TRANSIT ALTERNATIVE

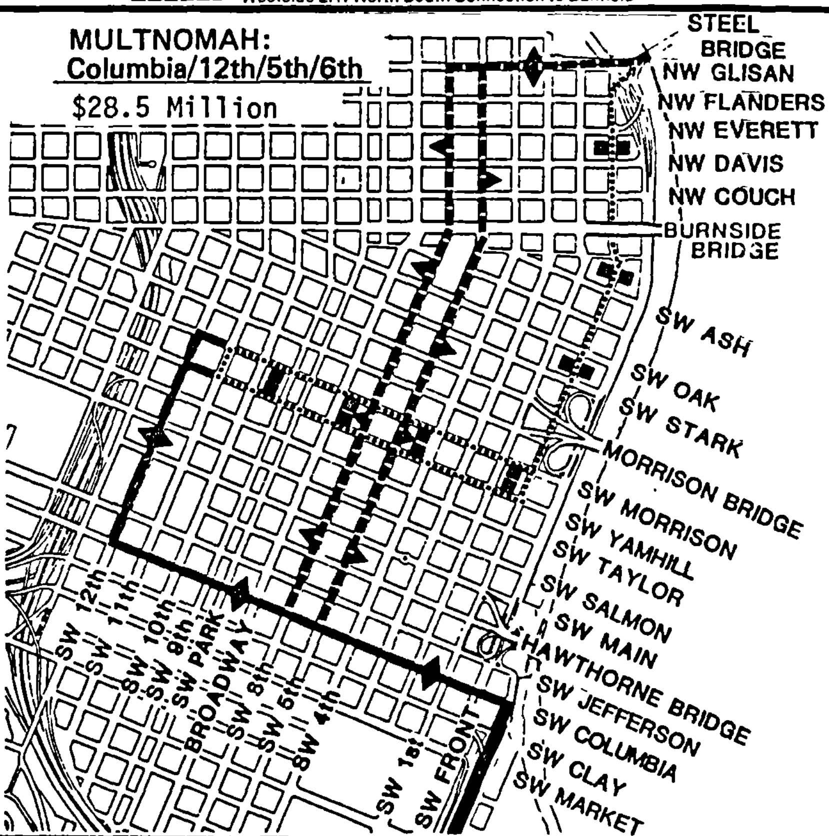
	WESTSIDE CORRIDOR	% CHANGE FROM NO BUILD	REGION	% CHANGE FROM NO BUILD
Revenue Vehicle Hours				
Bus - Peak	155	19%	575	6%
- Daily	2,086	21%	7,958	5%
Revenue Train Hours				
LRT - Peak	27	(new)	53	104%
- Daily	236	(new)	458	106%
Revenue Vehicle Miles				
Bus - Peak	2,480	16%	9,420	6%
- Daily	26,508	16%	108,669	7%
LRT - Peak	1,070	(new)	2,070	107%
- Daily	10,020	(new)	19,387	107%
Fleet Size (with spares)				
Standard Buses	174	19%	606	8%
Articulated Buses	54	23%	253	0
Light Rail Vehicles	74	(new)	143	107%

DOWNTOWN PORTLAND. There are two alternative alignments in Downtown Portland associated with the Multnomah LRT Alternative. Both enter Downtown Portland via Columbia Street. The north/south alignment options would use either the 4th/5th or 5th/6th Street couplets with stations located at the same site as the north/south Sunset LRT Alternatives. The Multnomah LRT connection to the cross mall alignment would be made via Columbia and 12th, as shown in Figure 2.2-19. This is a somewhat circuitous approach but allows for the through routing of trains with the Banfield operation. The Downtown Portland improvements associated with the Multnomah LRT Alternative are the same as the Sunset LRT Alternative with the exception of the Jefferson Street widening.

The Multnomah LRT Alternative includes two-way operations on S.W. Columbia between Front and 12th Avenues. As in the Sunset LRT alignment, only local access traffic would be permitted in non-station blocks. S.W. Jefferson has been proposed as a two-way traffic street between Front and 18th Avenues. The existing 36-foot pavement would require widening to 44 feet between Front and 10th Avenues. West of 10th, the pavement is wide enought to facilitate the typical roadway section of four 11-foot travel lanes, two in each direction. Between Front and 1st Avenues, an additional eastbound approach lane is needed in the p.m. peak hour to serve the predicted traffic volumes.

Two options have been developed to mitigate this capacity problem. The first is to have a reversible lane: the second lane from the north would serve eastbound traffic during the p.m. peak and westbound traffic at all other times. The other option is to widen the pavement to 50 feet with two westbound and three eastbound lanes at all times. This pavement widening will require





WESTSIDE CORRIDOR

FIGURE 2.2-19

ALTERNATIVE MULTNOMAH LRT ALIGNMENTS FOR DOWNTOWN PORTLAND the removal of the sidewalk on the north side, which is a very seldom used sidewalk with no open entrances to the existing building. The predicted 1995 traffic volumes on the two-way Jefferson require, as part of this improvement project, the restriping of S.W. Broadway between Madison and Mill Streets. The addition of a fourth approach lane on Broadway at Jefferson would eliminate the predicted congestion and improve the intersection level of service.

PORTLAND TO BEAVERTON. The Multnomah LRT alignment shown in Figure 2.2-17 exits Downtown Portland along S.W. Harbor Way through the South Downtown Waterfront Urban Renewal Area, with a station at S.W. Montgomery Street. This alignment serves the Waterfront Development Project and can be constructed without changes to the piers of either the Marquam or the Ross Island Bridges. The alignment would pass between the piers of the Marquam Bridge and proceed southward along the existing railroad line to the Ross Island Bridge. From the Ross Island Bridge, the alignment is located on the east side of S.W. Macadam Avenue, with a station just north of S.W. Gaines Street.

The transitway would continue along the east side of S.W. Macadam Avenue and connect to the Southern Pacific railroad right-of-way north of John's Landing, then run down a reserved transitway strip through John's Landing to S.W. Boundary Street. Rather than using the railroad right-of-way between S.W. Boundary and S.W. Iowa, the LRT alignment proceeds adjacent to the eastside curb of S.W. Macadam Avenue. At S.W. Iowa Street the alignment would once again follow the Southern Pacific right-of-way and continue south to S.W. Nevada Street. Stations would be located in the John's Landing parking area north of S.W. Boundary Street, at S.W. Nebraska Street, and at S.W. Nevada. The alignment requires joint use or abandonment of the railroad right-of-way, which Southern Pacific is believed to be interested in abandoning. (Another design option studied in this segment utilized the median of Macadam Avenue; it was rejected in favor of the alignment described above due to greater impacts on adjacent properties and potentially higher costs.)

In the next segment, the alignment turns westerly from the station south of S.W. Nevada Street and climbs up Stephen's Gulch to Barbur Blvd. This segment raises a number of potentially significant engineering construction and transit operational grade problems. The transitway first runs south along the Southern Pacific right-of-way, turning west along the northern boundary of the Riverview Cemetery and passes some 70 feet above S.W. Macadam Avenue and S.W. Taylors Ferry Road on substantial structures. The transitway would then touch down in the gulch, travel through Stephen's Gulch at-grade on the south side of Interstate 5 to the existing S.W. Multnomah Blvd. on ramp to Interstate 5, and cross Interstate 5 near S.W. Multnomah Blvd. on ramp which includes a structure over Interstate 5. This access would be replaced with new ramps at Bertha Boulevard, possibly being more compatible with the City of Portland's arterial street plan. A station would be located at-grade on the south side of Interstate 5 below the S.W. Terwilliger Blvd. Bridge, with a pedestrian overpass to the Burlingame Transit Center located on the north side of Interstate 5.

The following segment extends from Barbur Blvd. to S.W. 67th Avenue in the median of S.W. Multnomah Blvd. Construction along this segment would require the relocation of two existing waterlines from the center of S.W. Multnomah Blvd. and partial replacement of the S.W. Capitol Highway structure over S.W. Multnomah Blvd. Stations would be located at 25th, 35th, and 45th Avenues. Left turns would be allowed at station areas and two other locations.

The next segment extends from S.W. 67th Avenue to S.W. Scholls Ferry Road, and follows the old Oregon Electric railway right-of-way to a routing along the north side of S.W. Allen Blvd., with stations at S.W. Oleson Road (east side) and S.W. Scholls Ferry Road (northeast quadrant of S.W. Scholls Ferry Road and S.W. Allen Blvd.). The S.W. Oleson Road station would be grade separated, and have a 100 space park-and-ride. The Scholls Ferry Road station would have a 50 space park-and-ride lot.

At the S.W. Scholls Ferry Road station, the transitway would turn north and follow two possible alignment options before turning west along the Southern Pacific railroad right-of-way under Highway 217 to Central Beaverton. The first option follows the perimeter of the industrial park and the second option runs along S.W. Arctic Drive to the railroad right-of-way. The perimeter alignment offers the best opportunity to minimize conflicts with local arterial and industrial traffic, while the S.W. Arctic Drive option locates the light rail line further from a developed neighborhood.

BEAVERTON. There are three basic options for the Downtown Beaverton area. (Figure 2.2-20). The two Multnomah LRT options using the Broadway/B-H (Beaverton) Transit Center (M1/S2 and M2) approach the Transit Center along the Burlington Northern (BN) right-of-way crossing under Highway 217 at an existing underpass from the east to a station along S.W. 5th Street. For the M1/S2 option, the inbound and outbound tracks and diverge continue west in the same alignment as the Sunset LRT S1/S2 options. The tunnel option (M-2) passes through the Transit Center under Broadway, S.W. Canyon Road, S.W. Hall Blvd., S.W. Beaverdam Road, and S.W. Watson Avenue; the west tunnel portal would be located several hundred feet west of S.W. Watson Avenue. At-grade, the alignment would continue west across S.W. Cedar Hills Blvd. From that point the Multnomah LRT alignment is identical to the Sunset LRT.

The third option (M-3) enters Central Beaverton along the BN right-of-way under Highway 217 to a station along S.W. 5th Street, continues along the right-of-way to a point about 600 feet east of S.W. Lombard Avenue, turns north in an alignment parallel to a southerly extension of the S.W. 117th Avenue alignment across Beaverton-Hillsdale Highway to a station south of S.W. Canyon Road. From the station the alignment continues north across S.W. Canyon Road and turns west from the west side of S.W. 117th Avenue onto the Hall/Watson (Beaverdam) Transit Center. From that point the Multnomah LRT alignment is identical to the Sunset LRT.

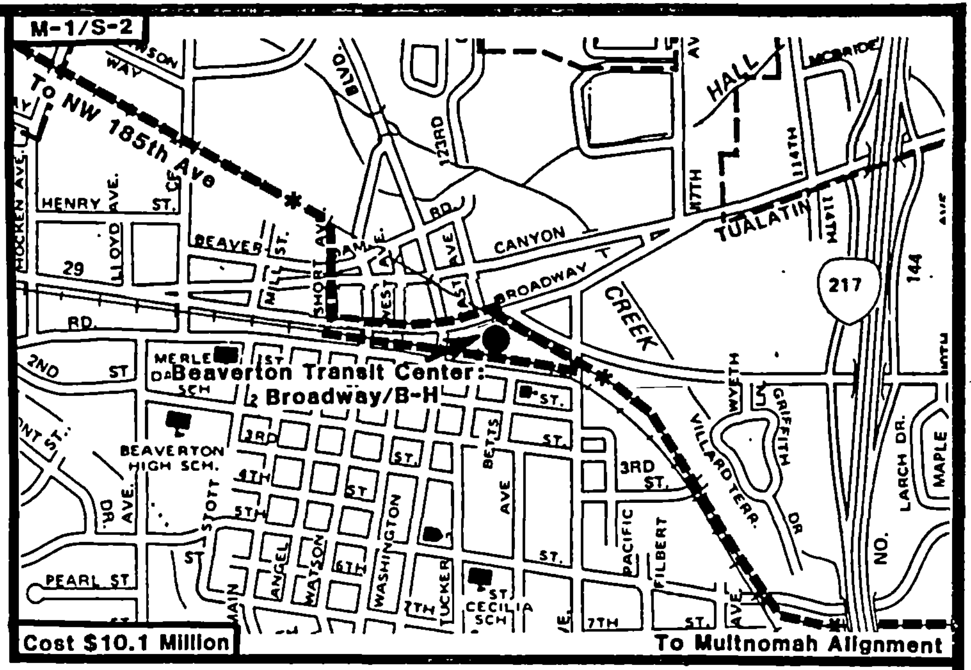
WESTERN WASHINGTON COUNTY. The Multnomah LRT alternative follows the identical alignment west of Beaverton as the Sunset LRT.

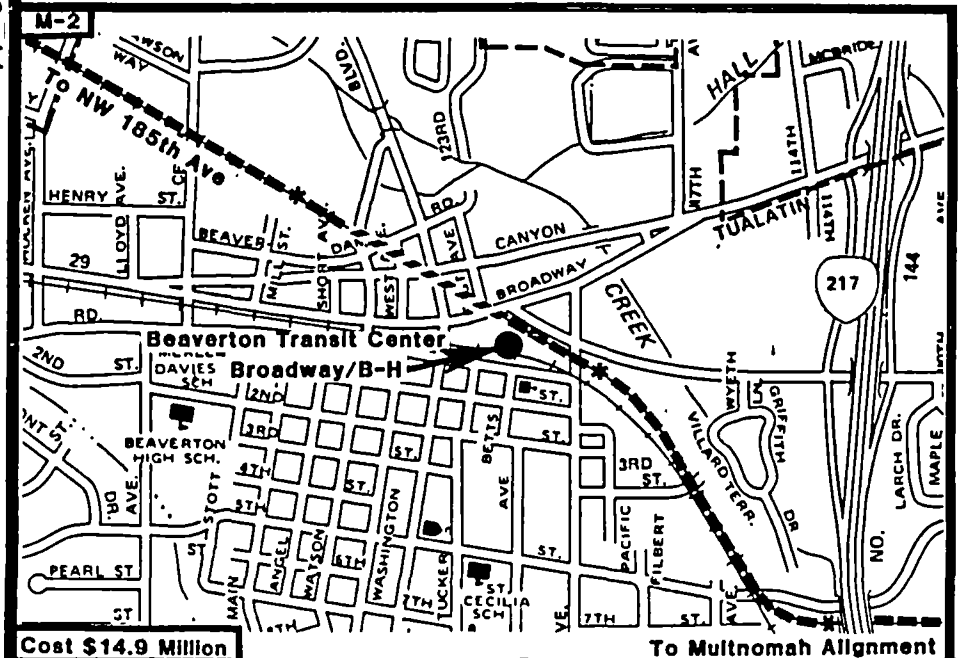
Legend:

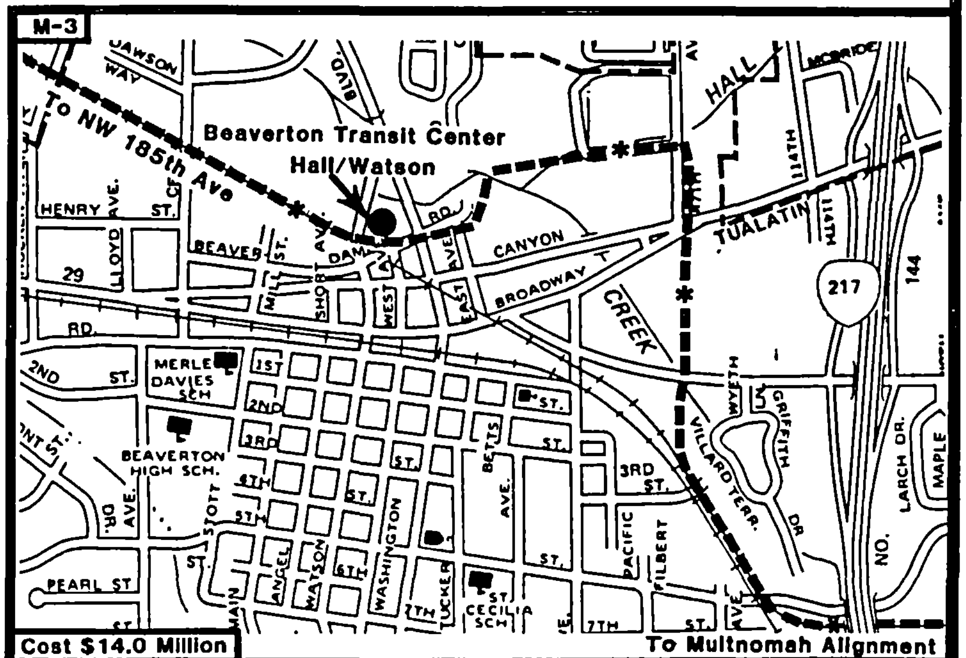
● Transit Center

* LRT Station

Tunnel







WESTSIDE CORRIDOR

FIGURE 2.2-20

MULTNOMAH LRT OPTIONS IN CENTRAL BEAVERTON

2.3 COMPARATIVE SUMMARY OF ALTERNATIVES

Transportation system analyses have determined that the Westside Corridor does not have sufficient capacity to provide adequate service levels and accessibility to corridor residents and businesses. The capacity limitations are anticipated to:

- jeopardize economic development prospects in Downtown Portland, Central Beaverton and the urban portion of the western Washington County;

- conflict with the regional urban growth management strategy;

- direct regional traffic, seeking to bypass bottlenecks on the regional system, to neighborhood streets in southwest and northwest Portland, Beaverton and the unincorporated eastern portion of Washington County;

- reduce operating efficiency; and

- degrade environmental quality.

The regional response to these problems is a major program of both highway and transit investments -- in the most part funded by the region's Interstate Transfer Program. Many of the highway/arterial improvements were developed and funded through previous studies. The Westside Corridor Study is aimed at determining the level and type of transit service needed to supplement the already committed highway/arterial investments to respond to the anticipated problems. In addition, the study will determine aditional highway improvements needed to meet long-term needs. The Westside Corridor Study will not fully solve the transportation capacity problem in the corridor; rather, it is a major integral part of the overall solution.

This section summarizes and interprets the impacts of each alternative examined during the Westside Corridor Study. It highlights the findings described in detail in Section 3 and Section 4 of this document, as well as numerous technical reports produced for the DEIS. Those wishing more detailed analyses than provided in the Summary should refer to appropriate parts of the main text of the DEIS or to supplementary reports.

<u>SYSTEM IMPROVEMENTS AND COSTS</u> - Table 2.3-1.

Table 2.3-1 describes the major improvements to the Westside transportation system attributable to each of the alternatives. The relative transit capacity of the alternatives can be compared in terms of <u>place miles</u>. A <u>place</u> is either a seat or room for one standee. <u>Place miles</u> are calculated by multiplying the number of <u>places</u> on a transit vehicle by its miles of service. This is done for each vehicle in the Westside Corridor and summed. As shown in the Summary Matrix, all of the build alternatives provide about the same capacity -- more than doubling the capacity of the No Build. The increase includes a significant expansion of off-peak, as well as peak service.

The alternatives differ in the types and number of vehicles (fleet mix) used to supply this capacity. The Bus Service Expansion and Sunset Busway Alternatives require generally the same fleet mix. This fleet mix includes a slight reduction in the number of standard buses relative to the No Build, but a four-fold increase in the number of articulated buses. The LRT alternatives utilize rail vehicles in lieu of articulated buses on most of their trunkline service. However, they require more standard buses than the bus alternatives

TABLE 2.3-1 COMPARATIVE SUMMARY OF ALTERNATIVES - WESTSIDE TRANSPORTATION SYSTEM IMPROVEMENTS AND CAPITAL COSTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
1995 Westside Annual Place Miles (millions)*	491.0	989.0	982.0	989.0	1,030.0
1995 Westside Transit Vehicles (Standard bus, articulated bus, light rail)	146/44/0	136/176/0	136/173/0	154/69/52	174/54/74
Miles of Transitway	0	0	7.2	12.2	15.5
Number of Transit Centers	2	6	6	6	6
Number of Park-and-Ride Spaces	181	1,381	1,381	2,175	2,317
Maintenance Facilities	1 bus maintenance yard	2 bus maintenance yards	2 bus maintenance yards	1 bus maintenance yard; 1 LRT maintenance yard	1 bus maintenance yard; 1 LRT maintenance yard

* A "place" is either a seat or room for one standee. Place miles are calculated by multiplying the number of places on a transit vehicle by its miles of service. This is done for each vehicle in the Westside fleet and summed for an annual total.

TABLE 2.3-1 COMPARATIVE SUMMARY OF ALTERNATIVES - WESTSIDE TRANSPORTATION SYSTEM IMPROVEMENTS AND CAPITAL COSTS (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Highway Capacity and Traffic Flow Improvements	None	Sunset Highway and Highway 217 ramp metered to maintain stable flow, climbing lane added to Sunset Highway to accommodate an additional 1000 cars per hour during the peak. Sylvan interchange area improved. Traffic flow improvements in Downtown Portland, Central Beaverton and on arterials in Central Washington County.	Sunset Highway and Highway 217 ramp metered to maintain stable flow, climbing lane added to Sunset Highway to accommodate an additional 1000 cars per hour during the peak. Sylvan interchange area improved. Traffic flow improvements in Downtown Portland, Central Beaverton and on arterials in Central Washington County.	Sunset Highway and Highway 217 ramp metered to maintain stable flow, climbing lane added to Sunset Highway to accommodate an additional 1000 cars per hour during the peak. Sylvan interchange area improved. Traffic flow improvements in Downtown Portland, Central Beaverton and on arterials in Central Washington County.	Sunset Highway and Highway 217 ramp metered to maintain stable flow, climbing lane added to Sunset Highway to accommodate an additional 1000 cars per hour during the peak. Sylvan interchange area improved. Traffic flow improvements in Downtown Portland, Central Beaverton and on arterials in Central Washington County.
Projected Capital Costs (in millions of 1980 dollars)	0	$80.3 - 90.7	$146.1 - 157.0	$227.2 - 236.7	$300.5 - 307.2

for feeder lines. While the Sunset LRT requires the fewest number of vehicles among the build alternatives, it has a fleet 45 percent greater than the No Build.

Likewise, transit facilities would be increased in the build alternatives. In the No Build, the only transit facilities on the Westside would be those existing today — including the bus maintenance yard at Merlo Road, existing transit centers at Beaverton and Cedar Hills, and a 181 space park-and-ride lot at the Tanasbourne Town Center. In contrast, all of the build alternatives include the construction (or expansion) of six major transit centers, an increase in park-and-ride lots to accommodate 1200 to 2100 more automobiles, and an additional maintenance depot for transit vehicles. The Bus Service Expansion involves the least amount of additional construction, as its service relies principally on low-cost bus priority facilities (such as exclusive bus lanes at intersections). The Sunset Busway Alternative would involve major construction, consisting of a 7.2 mile, two-lane busway with stations from the Portland CBD to Central Beaverton. The most extensive transit facilities are embodied in the two LRT alternatives, which would require a 12.2 mile (Sunset LRT) or a 15.5 mile (Multnomah LRT) light rail transit line from the Portland CBD to 185th Avenue.

In addition to transit investments, all of the alternatives include a program of highway improvements. As shown in the Summary Matrix, the major elements of the highway improvements are the same for all of the alternatives except the No Build. These improvements include adding 1000 cars-per-hour to the capacity of the Sunset Highway by constructing a westbound climbing lane (up the grade) and metering all of the on-ramps.

The capital costs for the build alternatives would range from a low of $80.3 million for the Bus Service Expansion Alternative to a high of $307.2 million for the Multnomah LRT Alternative in constant 1980 dollars. The Bus Service Expansion Alternative includes the construction of several transit centers and the purchase of bus equipment and facilities to support the service expansion. The Sunset Busway Alternative, at $146.1 million, represents the next level of capital expenditure, differing from the Bus Service Expansion Alternative primarily in the cost to construct a two-lane busway. The Sunset LRT Alternative, estimated to cost $227.2 million, would substitute a 12 mile light rail line for the busway and purchase a different fleet mix. The Multnomah LRT Rail Alternative would be similar in concept to the Sunset LRT, but woud be significantly more expensive to implement because it would be over three miles longer, would have 50 percent more stations and would require 22 more vehicles to provide the same level of service.

WESTSIDE TRANSIT RIDERSHIP AND OPERATING COSTS - Table 2.3-2

The combined effect of the service coverage, capacity and travel time differences of the alternatives are reflected in the ridership they attract. In the case of the No Build, transit capacity was not permitted to grow with demand. This operating policy curtailed ridership increases. The build alternatives would accommodate from 67 percent to 85 percent greater ridership than the No Build during the peak hour. Peak-hour ridership for both rail alternatives is approximately the same, about ten percent greater than the all

TABLE 2.3-2. COMPARATIVE SUMMARY OF ALTERNATIVES - TRANSIT RIDERSHIP AND OPEATING COSTS IMPACTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
1995 Westside Corridor Peak-Hour Riders (transitway/total)	0/9,300	0/15,500	8,000/15,900	9,300/17,200	8,100/17,100
1995 Westside Daily Riders (Transitway/Total)	0/65,400	0/96,100	45,900/97,800	51,400/104,900	48,700/106,400
Percent Using Transit: 1995 Peak Hour Westside	8.8%	14.7%	15.2%	16.3%	16.2%
Percent Using Transit: 1995 Daily Westside	6.2%	9.1%	9.3%	10.0%	10.2%
1995 Westside Transit Operating Costs (in millions of 1980 dollars)	$18.9	$33.8	$32.7	$30.9	$33.7

bus alternatives. The same basic relationships hold on an all-day basis. In all alternatives containing the exclusive transitway, slightly less than one-half of all Westside transit trips use the exclusive transit facility for at least some portion of the trip.

Operating costs are the day-to-day expenses of running and maintaining a transit system. These include such items as salaries of drivers, mechanics, and administrative staff; expenses for spare parts; the cost of diesel fuel, electricity and oil; and a variety of other charges for materials and services. The annual operating cost of the No Build transit system on the Westside is estimated to be $18.9 million in 1995 (expressed in 1980 dollars). In comparison, the build alternatives would significantly increase this expenditure. The Bus Service Expansion Alternative would have the highest 1995 operating and maintenance costs, totaling $33.8 million. The Sunset Busway Alternative would have associated Westside operating costs of $32.7 million by 1995. This is less than that for the Bus Service Expansion Alternative because the Busway would allow shorter travel times, and therefore lower labor costs of bus operation. The Sunset LRT Alternative would incur the least costs, requiring $30.9 million for Westside service. This is two to three million dollars less than the other build alternatives in 1995, in spite of carrying two to 2.6 million more passengers annually than the all bus options. The Multnomah LRT is more costly than the Sunset LRT Alternative because the same level of rail service would be maintained over a slower, longer route and additional buses would be maintained along the Sunset Highway.

It was earlier indicated that in comparison to the Bus Service Expansion Alternative, the Sunset LRT Alternative would save $2.9 million in 1995 operating costs. Additionally, the Sunset LRT Alternative would accommodate about nine percent more passengers. If the 1995 Bus Service Expansion Alternative were designed to accommodate the same demand as the Sunset LRT Alternative, it would likely cost about $5.4 million more than the Sunset LRT to operate and about $2.6 million more than the Multnomah LRT. The operating cost-efficiencies of the LRT alternatives relative to the all-bus alternatives would increase as corridor transit demand increased.

HIGHWAY-RELATED IMPACTS - Table 2.3-3

With no transit improvements on the Westside, daily auto travel would grow by 90 percent from 1980 to 1995. The consequence would be that over one-third of the highway and arterial facilities would be congested, operating at levels of service E or F during peak periods. This congestion is anticipated to result in delays for the commuter, increased traffic through neighborhoods and reduced opportunities for economic development. All of the build alternatives include the same basic improvement to the corridor's highway system -- ramp metering on the Sunset Highway and Highway 217, and the climbing lane on the Sunset Highway from the Vista Tunnel to the Sylvan crest. In addition to the previously discussed transit ridership gains, these improvements are necessary to obtain regionally acceptable service levels (level of service D or better) on the corridor's highway system.

In the No Build Alternative, 51.7 lane miles of Westside roads would be expected to be congested during the peak hour in 1995. All of the build alternatives result in an 80 percent reduction in congested lane miles. The Sunset LRT Alternative, with 9.9 lane miles of congested roads, would be

TABLE 2.3-3. COMPARATIVE SUMMARY OF ALTERNATIVES - HIGHWAY RELATED IMPACTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Lane Miles of Congestion (Level of Service E or F)	51.7	10.5	10.5	9.9	10.1
Local Traffic Impacts	Major increases in local traffic reflected by reductions in levels of service throughout corridor.	Elimination of access to Sunset Highway from several local streets between SW 70th and SW 86th. Some downtown Portland traffic and parking removed from transit streets. Traffic circulation around Hall/Watson in Beaverton may be impacted.	Elimination of access to Sunset Highway from several local streets between SW 70th and SW 86th. Some downtown Portland traffic and parking removed from transit streets. Traffic circulation around Hall/Watson in Beaverton may be impacted.	Similar to Bus Service Expansion. Additionally, Jefferson St. option would limit local access between SW 14th and SW 18th Aves. Tunnel option requires closure of SW 21st. The S1/S2 alignment in Beaverton eliminates one auto lane on Broadway between East and Mill. Both parking lanes eliminated on Broadway between Mill and Watson.	Similar to BSE. Additionally, access to Macadam Avenue lost or impeded for several properties. Re-alignment of I-5 northbound on-ramp at Multnomah would divert some traffic onto local streets. Reduced access to properties along Multnomah Boulevard. The M1/S2 option in Beaverton is similar to S1/S2 for Sunset LRT.

slightly more effective in this regard than the other build alternatives. The construction of new facilities in all of the build alternatives would cause some reduction in local access and parking. These impacts are outlined in the Summary Matrix. There are no major local traffic impacts in any of the build alternatives with the recommended mitigaton measures.

TRANSPORTATION SYSTEM COST-EFFICIENCY AND FISCAL FEASIBILITY - Table 2.3-4

The relative cost efficiencies of the alternatives is a complex issue to address. The most efficient alternative to operate may not be the most efficient to implement. The most efficient alternative to operate under one set of conditions may not be the most efficient in another set of circumstances. The most efficient alterantive in one time period may not be the most efficient in another. Clearly cost-efficiency cannot be adequately addressed by one simple measure. The Summary Matrix includes an array of measures which are compared under several different assumptions (Table 2.3-4). These are discussed in the paragraphs which follow. The overall cost effectiveness of the alternatives is determined in part by cost-efficiency, but the other impacts discussed in this summary must be considered as well.

Equivalent Uniform Annual Total Cost (EUAC) is a standard technique used by economists to compare projects which differ in terms of year-by-year capital and operating expenditures. EUAC annualizes all capital and operating expenditures at a given amortization rate (10 percent shown here) over the life of the project. It, in effect, represents the constant annuity which is required to pay off the construction and continuous (in perpetuity) operation of each of the alternatives.

The annual costs shown in the Summary Matrix assume that all of the alternatives are fully implemented by 1995, and that service does not ever increase after 1995. Thus, the EUAC assumes transit facilities would be continuously replaced but never expanded after 1995. The assumption also freezes patronage at 1995 levels. Under these assumptions, the No Build naturally exhibits the lowest Equivalent Uniform Cost, as it requires no capital costs beyond vehicle replacement and provides less than one-half of the service of the other alternatives. The rank order of the EUACs of the build alternatives mirrors the ranking of the capital costs of these alternatives.

While a straight comparison of total annualized costs answers the questions: "Which alternative is the most expensive?", it ignores important differences in capacity, service levels and patronage served. For example, earlier it was noted that the build alternatives supplied more than twice as much capacity as the No Build Alternative. In comparison, the EUACs of the build alternatives are only 43 to 88 percent greater than that of the No Build. Thus, the build alternatives are more efficient than the No Build in the sense that they provide more capacity per dollar of total annualized cost. The Summary Matrix shows the Equivalent Uniform Annual Costs per 1995 passenger for each of the alternatives. The Bus Service Expansion Alternative exhibits lower total annualized costs (EUAC) per 1995 passenger than the No Build. This is because the patronage of the Bus Service Expansion Alternative increased at a faster rate than total annualized costs relative to the No Build. The total annualized cost per 1995 passenger of the transitway alternatives are from 7 to 19 percent higher than the Bus Service Expansion Alternative. If Westside transit demand is not expected to increase beyond the 1995 levels, the Bus

TABLE 2.3-4. COMPARATIVE SUMMARY OF ALTERNATIVES - SYSTEM COST-EFFICIENCY AND FISCAL FEASIBILITY (1)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Equivalent Uniform Annual Cost at 10%, assuming no service increases after 1995	$ 23.8 million	$ 34.1 million	$ 37.3 million	$ 40.9 million	$ 44.9 million
Equivalent Uniform Annual Cost per 1995 passenger at 10%	$ 1.23	$ 1.20	$ 1.29	$ 1.32	$ 1.43
1995 Westside Operating Cost per passenger	$ 1.02	$ 1.21	$ 1.16	$ 1.02	$ 1.10
Percent of Operating Cost Paid out of farebox	46%	39%	41%	46%	43%
Increase in transit operating cost per new transit rider (relative to the No Build)	N/A	$ 1.68	$ 1.44	$ 1.03	$ 1.22
15-20 year Cost Reductions in Highway Improvements due to increased transit use	0	$ 150 million	$ 150 million	$ 150 million	$ 150 million

(1) All costs are in 1980 dollars.

TABLE 2.3-4. COMPARATIVE SUMMARY OF ALTERNATIVES - SYSTEM COST-EFFICIENCY AND FISCAL FEASIBILITY (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Efficiencies Achieved Through Phasing Implementation (Cost Per Rider)	Not applicable	Most efficient alternative in the short term. Construction of projects in BSE can be phased based on need. Major service expansion would proceed capital improvement.	Implementation can proceed in stages beginning with construction of BSE. Phased approach is more efficient than immediate busway construction. The operating savings of this program would not be great relative to additional capital costs of the busway.	Implementation can proceed in stages beginning with BSE. Phased approach would be most cost-efficient in short and long-term. Substantial operating savings relative to additional capital cost of the LRT.	Implementation can proceed in stages beginning with construction of BSE. Phased approach is more efficient than immediate light rail construction. The operating savings of this program would not be great relative to additional capital costs of the LRT.
Fiscal Feasibility	Expansion of Westside transit service does not occur until after 1995. Therefore, there are no increased capital or operating expenditures.	Construction revenue requirements can be met with available federal and local funds. If payroll tax increases at historic rates, 1995 operations will be fiscally feasible. Immediate expansion of service would require additional revenue beyond that projected until the mid-1980's.	To meet construction costs an additional $70-80 million would have to be obtained from federal and/or local sources. Operating cost feasibility is same as described for BSE.	To meet construction costs an additional $150-160 million would have to be obtained from federal and/or local sources. Obtainment of additional federal revenue hinges on federal policy change. Operating costs feasibility generally the same as BSE.	To meet construction costs an additional $225-235 million would have to be obtained from federal and/or local sources. Obtainment of additional federal revenue hinges on federal policy change. Operating costs feasibility generally the same as BSE.

Service Expansion Alternative would be the most efficient alternative. Under these circumstances, the additional capacity and operating efficiencies of the more capital intensive options which were untapped in 1995 would remain unused for the life of the project. Thus, the additional capital used to purchase this unused potential would clearly be an inefficient investment.

An efficiency assessment is not complete without some attention to potential longer term savings that are possible after 1995. This can be done by examining the relationship between operating costs and patronage.

It is not surprising that the No Build Alternative would exhibit the lowest operating cost per passenger. This system was allowed to carry its existing capacity and did not expand to meet the demands of new or larger markets. This operating policy would naturally enable the least expensive operations and the highest farebox recovery rate (i.e., percent of trip paid by fares). Implementation of the Sunset LRT Alternative would permit a 60 percent increase in trips at the same operating-cost-per-trip and farebox recovery rate as the No Build. This gives a strong indication of the long-term potential for LRT operating efficiencies in the corridor. The operating cost per trip for the light rail alternatives would be five to 15 percent less than all-bus alternatives. The operating cost efficiencies of the build alternative can be further assessed by comparing their increase in 1995 operating costs per additional 1995 passenger (i.e., how much more in operating costs did each passenger require?). The additional operating cost for each additional passenger in the light rail alternatives was from 15 to 40 percent less than for the all-bus alternatives. This has major implications for the relative long-term efficiencies of the alternatives. At some point in time after 1995, the lower operating costs per passenger with the LRT Alternatives would more than compensate for their higher capital costs.

Because the Bus Service Expansion and Sunset Busway Alternatives were designed to be convertible to the light rail alternatives, another possibility is raised -- integrating alternatives into a phased implementation program. For example, the Bus Service Expansion Alternative can be phased into the Sunset LRT Alternative. This can be accomplished in essentially three stages: (1) construct timed-transfer centers, park-and-rides, maintenance facilities and other bus facilities that would also be necessary as part of the Sunset LRT Alternative, (2) expand transit service towards 1995 levels and (3) construct the light rail facility when demand and cost efficiencies warrant it. The Bus Service Expansion Alternative can be phased into the Sunset Busway and Multnomah LRT Alternatives in a similar manner. If transit demand would continue to increase after 1995, the cost-efficiency measures indicate that a conversion from the Bus Service Expansion Alternative to light rail in the intermediate term could be the most cost efficient transit development strategy for the Westside Corridor over the long-term.

Associated with the issue of cost efficiency is the issue of fiscal feasibility -- What can this region afford to implement and operate? Regional policy, backed by federal funding commitments, reserved \$44.4 million in Urban Mass Transportation Administration (UMTA) discretionary (Section 3) funds and \$16.9 million in Interstate Transfer Funds for the construction of the selected Westside Corridor Alternative. Both of these federal revenue sources require local match, bringing the total of the reserve account to \$75.4 million (in 1980 dollars). Current estimates indicate that there are sufficient local funds to match the anticipated federal revenues.

Implementation of the Bus Service Alternative can be virtually fully-funded from these existing sources. Obviously, there are substantial capital revenue shortfalls for the transitway alternatives. These capital shortfalls can be overcome in one of two ways (or some combination of the two): (1) applying for and receiving additional UMTA discretionary (Section 3) funds or (2) raising the level of local financial participation. UMTA policy is not to participate in funding rail projects at least until the condition of the federal budget and the national economy improve. The availability of federal funding for these projects thus depends upon improvements in economic conditions and competing demands for federal assistance at that time. Increased local participation is not possible without the creation of an additional tax-based or private revenue source.

Revenues for operating and maintenance costs are primarily derived from two main sources: TRI-MET's payroll tax and farebox revenue. If the payroll tax were to increase at its historic rate (discounting the current recession), all of the alternatives would be affordable to operate in 1995. However, a major expansion of service between now and the mid-1980s is not fiscally feasible without additional revenue for operations, but some incremental expansion can take place during that period.

The importance of considering the phasing of alternatives is once again accentuated. Returning to the example given earlier, the initial construction of improved bus facilities over the next five to seven year period appears financially feasible. During this period some increased bus service in response to growing demand also appears feasible. A major expansion of the Westside transit system can be financially feasible beginning in the mid 1980s, if payroll taxes expand at historic rates or an additional revenue source is established. The availability of either federal or local funds to implement a transitway could be greater enhanced by the success of the first two phases. The exact timing requirements of moving from one phase to another would depend on future financial and technical conditions.

TRANSIT SERVICE AND OPERATIONS IMPACTS - Table 2.3-5

Transit service provided by the No Build Alternative would be overcrowded during peak hours and would not accommodate all those wishing to ride. By implementing one of the build alternatives, the capacity of the system would increase and the quality of service offered to the public would improve considerably. All the build alternatives have about equal coverage of the Westside -- significantly greater than that of the No Build -- because of new bus routes in the developing area west of Beaverton and improved transfer capabilities on the Westside.

Reliability of schedules would improve with the build alternatives. Buses in the No Build would operate in mixed traffic which would be severely congested during peak hours. The Bus Service Expansion Alterantive would provide low-cost improvements enabling buses to avoid several congestion areas and, hence, increasing reliability. The Sunset Busway provides even greater reliability by placing the major bus trunkline for Portland in its own reserved right-of-way to Beaverton. The two LRT alternatives provide this exclusive right-of-way west of Beaverton to 185th Avenue.

TABLE 2.3-5. COMPARATIVE SUMMARY OF ALTERNATIVES - TRANSIT SERVICE AND OPERATIONS IMPACTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Service Quality	Low coverage of developing areas west of Highway 217. Peak hour capacity is insufficient to meet projected demand, potential riders will not be accommodated.	Extensive transit coverage of Westside. Improved travel speeds between Portland and Beaverton. Expanded and improved transfer capabilities. Capacity sufficient to accommodate projected demand.	Same as Bus Service Expansion alternative with higher speeds between Portland and Beaverton due to separation of buses from auto traffic and congestion.	Same as Sunset Busway with higher speeds between 185th St. and Beaverton and Beaverton and Portland due to exclusive guideway and better vehicle characteristics.	Generally same as Sunset LRT except longer travel time between Beaverton and Portland. Has greater transfer capabilities than Sunset LRT.
Schedule Reliability	Frequent peak hour delays due to operation of transit vehicles in increased volumes of mixed traffic. Poor schedule adherence.	Improved flow of buses on Sunset, Hwy. 217 and arterials because of ramp metering and bus priority measures. Delay to buses will occur sporadically due to traffic accidents and adverse weather conditions.	High schedule adherence for trunkline buses due to separation of buses from traffic between Portland and Beaverton.	High schedule adherence for light rail vehicles due to separation of rail vehicles from traffic between Portland and 185th Avenue. More reliable bus operation due to shorter bus route configuration.	High schedule adherence for light rail vehicles due to separation of rail vehicles from traffic between Portland and 185th Avenue. More reliable bus operation due to shorter bus route configuration.
Ability to Absorb Future Growth	Bus service will be overloaded during peak hours and unable to accommodate short-term ridership increases. There will be no capital facilities to expand service.	Expanded bus system has a modest capability for accommodating short-term increases in ridership. Transit centers and maintenance facilities will be in place for future service. Only limited space exists in downtown Portland and Central Beaverton for increased bus volumes.	Expanded bus system has a modest capability for accommodating increases in ridership. Only limited space exists in downtown Portland and Central Beaverton for increased bus volumes. Busway can be extended to Hillsboro or Tigard or converted to LRT.	Rail line is capable of accommodating short-term increases in ridership. LRT could be extended west to Hillsboro or south to Tigard. LRT volumes can double without additional construction.	Rail line is capable of accommodating short-term increases in ridership. LRT could be extended west to Hillsboro or south to Lake Oswego or southeast to Milwaukie. LRT volumes can double without additional construction.

TABLE 2.3-5. COMPARATIVE SUMMARY OF ALTERNATIVES - TRANSIT SERVICE AND OPERATIONS IMPACTS (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Downtown Portland Operations	No change in physical facilities except for construction of LRT line for Banfield project.	Downtown bus volumes on some streets twice as high as No Build. Requires extensions to mall and exclusive buslanes on some streets.	Downtown bus volumes on some streets twice as high as No Build. Requires extensions to mall and exclusive buslanes on some streets.	Low downtown bus volumes. Requires exclusive LRT lanes and short bus lanes on several streets.	Low downtown bus volumes. Requires exclusive LRT lanes and short bus lanes on several streets.
Central Beaverton Operations	Existing transit center remains. Slower bus speeds due to more traffic congestion.	Transit center expanded or relocated. Highest on-street bus volumes due to heavy service on TV Hwy. and on-street connection to Hwy. 217.	Transit center expanded or relocated. High on-street bus volumes due to heavy service on TV Hwy.	Transit center expanded or relocated. Lower bus volumes on TV Hwy. due to diversion of passengers to LRT. Would involve from 0-2 LRT crossings of Canyon Road.	Transit center expanded or relocated. Lower bus volumes on TV Hwy. due to diversion of passengers to LRT. Would involve one LRT crossing of Canyon Road or construction of subway under Canyon Road.

The capability of the transit system to respond to both short and long-term ridership increases is improved by each of the build alternatives. The No Build would be overcrowded and unable to respond to sudden increases in ridership, such as those accompanying gasoline shortages. The infrastructure would not be in place to allow for easy expansion of the system. The two all-bus alternatives would have a larger fleet of vehicles with enough reserve capacity to handle some ridership surges. Most important, an infrastructure of transit centers, transit-related highway improvements and transit routes would be in place to allow for an orderly expansion of service. Expansion of the all-bus alternatives would eventually be impeded by bus capacity constraints in the local road networks in Downtown Portland and Central Beaverton. The light rail alternatives have the best ability to absorb future growth with minimum future construction and operating costs. Both light rail alternatives have excellent opportunities to be extended to other major population/employment centers.

LAND USE AND REGIONAL ECONOMIC IMPACTS - Table 2.3-6

The No Build Alternative does not provide the transportation infrastructure required to implement Westside and regional land use development plans. Without this infrastructure, development prospects for Downtown Portland, Central Beaverton and the urbanizing portion of western Washington County would be impaired. Constrained development in these areas may encourage growth in other portions of the region, particularly at the fringes of its urban growth boundary. The overall effect could require a re-examination of the region's growth management policies.

Through its development plans and policies, Portland has chosen to limit downtown development to mostly that which can be serviced by transit. Estimates indicate that without increased transit access only about one-half of Downtown Portland's planned development potential would be realized. The Bus Sevice Expansion option would provide sufficient capacity to permit reasonable access to downtown from its Westside market area. Improved accessibility for additional labor force, shoppers and others would enable the downtown economic environment to expand. However, development prospects may eventually suffer from the effects of large volumes of buses on downtown environments and the reliability problems inherent in running buses in mixed traffic (even with ramp metering). Therefore, while implementation of this option would assist in meeting intermediate-term downtown development objectives, it may not provide sufficient service to meet long-term objectives.

The Sunset Busway Alternative, with its exclusive lanes for buses, eliminates some of the transit reliability concerns that may affect development. However, the development problems associated with large volumes of buses in a downtown environment would not be significantly less than those anticipated by the Bus Service Expansion Alternative. The light rail alternatives would increase reliability and reduce bus operations concerns. Both light rail options would require a north-south alignment through downtown (complementing the east-west alignment being constructed for the Banfield LRT), which would be supportive of the core area's high density commercial spine. The Multnomah LRT alignments would have greater exposure to existing and committed office space blocks than the Sunset LRT. The effects of this exposure could be significant for future development potentials, in particular in the South Waterfront District.

TABLE 2.3-6. COMPARATIVE SUMMARY OF ALTERNATIVES - LAND USE AND REGIONAL ECONOMIC IMPACTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Comprehensive Plan Consistency	Does not provide transportation capacity to support legally-mandated comprehensive plans.	Generally consistent with local and regional plans; however, does not provide for implementation of the 185th overlay plan.	Generally consistent with local and regional plans; however, does not provide for implementation of the 185th overlay plan.	Consistent with local and regional plans. Allows for the implementation of the 185th overlay plan.	Consistent with local and regional plans. Allows for the implementation of the 185th overlay plan.
Regional Sprawl/Urban Growth Boundary (UGB) Impact	The inability to develop to planned densities could contribute to increased sprawl and place pressures on the UGB.	Needed transportation capacity provided to developing areas within the Urban Growth Boundary; development pressures on the UGB reduced.	Needed transportation capacity provided to developing areas within the UGB. Development pressures on UGB are greatly reduced.	Needed transportation capacity provided to developing areas within the UGB. Development pressures on UGB are greatly reduced.	Needed transportation capacity provided to developing areas within the UGB. Development pressures on UGB are reduced. Has the most impact on focusing development towards the center of the region.
Relationship to Growth in Downtown Portland	Only one-half of the build-out potential of Downtown Portland can be realized without increased transit service.	Provides the capacity required to facilitate reasonable access between downtown and its market area. In the long-term, reliability and system expansion limitations will reduce the development benefits of this alternative.	Generally the same as the BSE, except transit reliability constraints on development are reduced by the construction of the exclusive busway.	Over the short-term, would have the same development benefits as the Sunset Busway. However, the Sunset LRT would have better reliability and expansion potential to meet the long-term needs of downtown development. The additional north/south rail alignment supports the downtown high density commercial spine.	Generally the same as the Sunset LRT. Future development potentials particularly in the South Waterfront District may be higher due to the greater coverage of downtown Portland.

TABLE 2.3-6. COMPARATIVE SUMMARY OF ALTERNATIVES - LAND USE AND REGIONAL ECONOMICS IMPACTS (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Relationship to Growth in Central Beaverton	Auto oriented development in Central Beaverton, in particular in its Uptown District, would make multi-story development less economical. Extremely difficult traffic circulation patterns could discourage investment in the Central Beaverton area.	Provides the minimum transit service required to meet development objectives. The Hall/Watson transit center option could stimulate market demand in the area north of Canyon Rd. The Lombard/Broadway location could stimulate redevelopment opportunities.	Generally the same as the BSE. Exclusive facility for buses could improve traffic circulation and increase development prospects.	Generally the same as the Sunset Busway. Would better tie the Central Beaverton area with Tektronix campus and Cedar Hills Boulevard area, thereby enhancing development opportunities.	Generally the same as the Sunset LRT. Provides better connection to southwest residential areas, possibly enhancing development opportunities.
Relationship to Growth in Washington County	The capacity deficiencies of the Washington Co. transportation system will impede future development. Development standards adopted by Washington Co. cannot be met without additional transportation capacity.	Supplies some of the capacity required to meet development standards. Increased accessibility to and within the county may enhance its development potential.	Generally the same as the BSE Alternative.	Implementation of LRT would allow for increased densities in the 185th subarea. Development would be shifted from other portions of the county to station areas in the 185th subarea, consistent with local plans.	Generally the same as the Sunset LRT.

The Central Beaverton Plan establishes policies to maintain Beaverton's role as the civic, financial and commercial center of the western suburban region. The development of Central Beaverton is constrained by the irregular parcelization of its land uses (caused, in part, by bisecting transportation rights-of-way) and a congested traffic circulation system. Under the No Build Alternative, the overall auto-oriented commercial development and its related parking space requirements could make multi-story development in Beaverton's Uptown District less economical. An auto-dependent Uptown (high density) District would generate greatly increased north-south traffic volumes through the central area. This traffic flow will cut across the already congested east-west traffic flow, creating a general traffic circulation problem which could discourage private investments in Beaverton's Downtown and Transition Districts.

The Bus Service Expansion Alternative provides transit capacity to reduce Beaverton's reliance on the automobile. The major hub of the time-transfer system in Washington County will remain in Central Beaverton. Two options exist for siting the major transit center: Hall/Watson and Broadway/Lombard. The development impacts of the Bus Service Expansion Alternative depend on the location selected for the transit center. Development of the Uptown area as a high density commercial/residential area could be stimulated and organized around the option using the Hall/Watson site. The potential for joint development opportunities with the Civic Center is high. Development of the option using the Broadway/Lombard site provides the opportunity to redevelop underutilized properties in the Downtown District for mixed retail and office purposes.

The Busway would have the same general economic develoment impacts as the Bus Service Expansion Alternative, with the exception that development impediments related to traffic circulation would be reduced by the exclusive bus facility. The Sunset LRT has the same general impacts with some additions. Most important, the LRT option provides more coverage, more development opportunities, and ties Central Beaverton with the 14,000 Tektronix employees at Murray Boulevard. The options using the Broadway/Lombard site would tie the Downtown District with Tektronix; and options using Hall/Watson would support an Uptown/Tektronix relationship. In either case, the LRT would stimulate demand in the Cedar Hills Boulevard area that would not likely occur in the Bus Service Expansion option.

The basic land use and economic development impacts of the Multnomah LRT option are similar to those described for the Sunset LRT. The Multnomah LRT may place Central Beaverton in a more competitive position for office development on the Westside because the alignment provides less access to office development parcels outside of Central Beaverton than the Sunset LRT.

Capacity and design deficiencies in the Washington County transportation system have impeded development in the urbanizing portion of western Washington County since the 1970s. The Washington County growth management strategy dictates that development can occur only if urban service standards are met. Development approvals hinge on assuring the county administration that needed service improvements (in particular transportation) will be made before development occurs. Without a major expansion of the transportation system, the demand placed on Washington County roads will far exceed their capacity, causing development conditions and costs which could limit development.

The Bus Service Expansion and Sunset Busway Alternatives will increase accessibility within Washington County and between western Washington County and Downtown Portland. They will thus enhance prospects of development in this area in comparison to other parts of the region. In addition, to the extent that increased transit service reduces the need for highway improvements, the Bus Service Expansion Alternative may also lead to reductions in the local charges that developers must pay under the growth management strategy to help the county provide needed facilities and services. This may eliminate some of the financial impediments to development.

Implementation of LRT would activate local policies which allow density increases in the urbanizing portions of western Washington County. The effect would be to shift development from other portions of the unincorporated area to station areas where density bonuses, up to fivefold increases, would be permitted. A doubling of residential development in station areas could be expected. In total, at build-out, 30 percent more population and employment would be expected in the urbanizing area in western Washington County with LRT in comparison with the other alternatives.

The No Build Alternative is likely to encourage greater growth in the Southwest Corridor and fringes of the Westside Corridor than anticipated by land use plans, zoning, available urban service capacities and the urban growth boundary. All of the build alternatives provide sufficient transportation capacity to permit orderly development in the Westside Corridor, thereby reducing growth pressures on the fringes of the containment line and the Southwest Corridor. The LRT options would stimulate public policy and private investment choices which better support regional urbanization policies than the all bus options.

DISPLACEMENT AND NEIGHBORHOOD IMPACTS - Table 2.3-7

Considering the magnitude of these alternatives, right-of-way impacts on the community are small. Most of the acreage needed for transit centers and transitways is already in public ownership or is presently undeveloped. The number of dwelling units displaced varies depending upon the particular design options involved in each alternative. Displacements resulting from the Sunset LRT Alternative range from seven dwelling units (second lowest of the build alternatives) to 101 dwelling units (highest of the build alternatives), depending upon the design option chosen. Most of this variance is related to whether a specific apartment building in Downtown Portland is affected. The Bus Service Expansion Alternative displaces no dwelling units under any design option. Displaced businesses are highest with the Multnomah LRT (25 businesses) and lowest with the Bus Service Expansion Atlernative (2 businesses); displaced jobs reflect this pattern, with 240 in the Multnomah LRT and 22 in the Bus Service Expansion Alternative.

Beyond direct displacements, the project alternatives can differ in the way they affect the social activity and aesthetic quality of the neighborhoods. Visual impacts are minor even among those alternatives involving extensive fixed facilities. The only significant example of neighborhood disruption occurs in the Multnomah LRT Alternative where the abandoned railroad right-of-way through the Vista Brook neighborhood is used for light rail operations. This would have the effect of dividing a residential area.

TABLE 2.3-7. COMPARATIVE SUMMARY OF ALTERNATIVES - DISPLACEMENT AND NEIGHBORHOOD DISRUPTING IMPACTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Range of Dwelling Units Displaced (Low/High)	0	0	9/18	7/101	17/88
Range of Businesses Displaced (Low/High)	0	2	10/16	8/16	25
Range of Jobs Displaced (Low/High)	0	22	81/121	51/141	240
Social-Neighborhood	Increases in regional auto traffic on neighborhood streets.	No significant adverse impact.	No significant adverse impact.	No significant adverse impact.	Divides Vista Brook neighborhood.
Key Visual Impacts	None	None	Paved guideway in Sunset Canyon.	Guideway in Sunset Canyon; electrified guideway with overhead wires and support poles; above grade structure on Jefferson from S.W. 14th to Sunset Highway; redesign Collins Circle.	Electrified guideway with overhead wires and support poles; above-grade structure on Macadam through Stephen's Gulch to Multnomah Boulevard.

ENVIRONMENTAL IMPACTS - Table 2.3-8

There are few other environmental impacts of significance, and the differences among the alternatives are minor. All of the build alternatives will result in a modest (one to four percent) reduction in the amount of petroleum-based fuel consumed for transportation in the corridor. Most efficient in this regard is the Sunset LRT Alternative, which would result in a daily corridor-wide consumption of 5248 barrels of petroleum fuels, compared to 5433 barrels in the No Build case. Although this difference is a relatively small percent change, it results in a savings of about 30,200 barrels of oil per year. The light rail alternatives would consume electrical energy, in addition to petroleum fuels. Even so, the total energy required to operate the rail alternatives would still be lower than the bus options.

In spite of the energy efficiency of transit operations, there is a great deal of energy required to construct a system. Therefore, it is important that the savings in corridor-wide operations energy be greater than energy expended to develop the transit system. Among build alternatives, the best ratio of construction energy consumption to operations energy savings would be experienced with the Sunset LRT. This alternative would require nine years of operation to accrue operating energy savings equivalent to the construction energy. The least efficient, in this sense, would be the Multnomah LRT, which would require 24 years of operation to offset its construction energy.

Air quality conditions would generally improve with all the build alternatives. This would result in a three to six percent reduction in hydrocarbon and particulate emissions realized by the build alternatives as compared to the No Build. The light rail alternatives produce slightly more air quality benefits than the bus alternatives. None of the alternatives create "hot spots" where carbon monoxide concentrations exceed federal standards. The build alternatives would not cause an increase over the No Build Alternative in the number of receptors exposed to noise levels exceeding federal standards, except for the Sunset Busway, which would affect some residences in the Central Beaverton areas.

The ecological impacts of the alternatives on the corridor are generally minor, due largely to the urbanized nature of much of the Westside. There are no significant impacts in terms of habitat lost, nor are any endangered species affected. However, some filling of wetlands in Beaverton is anticipated. Each of the build options would occupy land in the Beaverton floodplain.

Construction of the build alternatives, especially those involving transitways, would result in temporary rerouting of traffic and an increase of noise and traffic congestion in adjacent areas. These effects would be somewhat more noticeable with the Multnomah LRT, which passes closer to established neighborhoods and business districts than the other project alternatives. The design options for light rail utilizing tunnels (either in Beaverton or Vista Ridge) will have more construction impacts that those options utilizing surface alignments. Both of the LRT alternatives would affect existing railroad operations. Both the Sunset and Multnomah routes would require some relocation of Burlington Northern railroad tracks in and west of Beaverton; the Multnomah route has the added effect of displacing the Southern Pacific rail line adjacent to Macadam Avenue.

TABLE 2.3-8. COMPARATIVE SUMMARY OF ALTERNATIVES - ENVIRONMENTAL IMPACTS

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Daily Consumption of petroleum fuels by Westside transportation system	5,453	5,431	5,416	5,248	5,250
Daily Consumption of Electrical Energy by Westside transportation system(kilowatt hours/ barrels of oil equivalents)	0	0	0	58,500/101	76,300/130
Number of Years Required for Annual Operation Energy Savings to Offset Construction Energy	N/A	10	17	9	24

TABLE 2.3-8. COMPARATIVE SUMMARY OF ALTERNATIVES - ENVIRONMENTAL IMPACTS (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Number of Sensitive Receptors Exposed to Federal CO standard violations	None	None	None	None	None
1995 Hydrocarbon Emissions (10^3kg/day)	6.746	6.520	6.513	6.392	6.407
1995 Total Suspended Particulate Emissions (10^3kg/day)	1.925	1.836	1.831	1.801	1.806.
Number of Sensitive Receptors Exposed to Noise Levels in Excess of Federal Standards (67 dba LEQ)	38	38	44/52	38	38
Wetland Impacts	None	None	Up to 2.1 acres.	Up to 2.5 acres.	Up to 0.5 acres.

TABLE 2.3-8. COMPARATIVE SUMMARY OF ALTERNATIVES - ENVIRONMENTAL IMPACTS (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS. SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Impacts to Public Services Located in the Right-of-Ways	None	None	No significant impact.	Minor realignment of railroad service to Tektronix; slight southerly relocation of Burlington Northern line west of Cedar Hills.	Elimination of Southern Pacific operations along Macadam; slight southerly relocation of Burlington Northern line west of Cedar Hills.
Short-Term Construction Impacts Created by Facility Construction	N/A	Limited use of excavation equipment for transit center and climbing lane construction; temporary bus rerouting in Downtown Portland for transit mall extension, non-peak hour traffic impacts on Sunset Hwy. for climbing lane construction.	Extensive use of construction equipment for excavation and construction; some traffic congestion created by construction equipment and commuting workers; non-peak hour traffic impacts on Sunset Hwy. Temporary bus rerouting in Downtown Portland for transit mall extension.	Extensive use of construction equipment for excavation and construction; tunnel option would disrupt residential area and cause potential cosmetic damage to homes on ridge; traffic congestion and rerouting would occur during work hours.	Extensive use of construction equipment for excavation and construction; traffic congestion and rerouting would occur during work hours.

TABLE 2.3-8. COMPARATIVE SUMMARY OF ALTERNATIVES - ENVIRONMENTAL IMPACTS (CONTINUED)

PERFORMANCE MEASURE	NO BUILD	BUS SERVICE EXPANSION	SUNSET BUSWAY	SUNSET LIGHT RAIL	MULTNOMAH LIGHT RAIL
Parkland Impacts	None	None	Right-of-Way required from inactive section of Washington Park on the south side of Sunset Highway.	Right-of-Way required from inactive section of Washington Park on the south side of Sunset Highway.	Air space (2 ft. for track and 17 ft. at platform) and right-of-way (10 ft. grading) are required from Willamette Park.
Number of National Historic Properties Affected (Directly/ Indirectly)	0	0	0	0/1	0/3
Number of Local Land-marks and Historic Resources Affected (Directly/Indirectly)	0	0	0/5	1/7	5/5

Three of the alternatives would require using parkland as part of their right-of-way. In all three cases, the amount of land in question and the impacts of using that land are minor. Both the Sunset Busway and Sunset LRT Alternatives would require land from Washington Park. The area affected is on the south side of the Sunset Highway, away from the active uses of the park. The Multnomah LRT Alternative requires a small amount of right-of-way and air space from Willamette Park. This requirement is not anticipated to affect any of the recreational uses of the park.

Very few historic properties are affected by the alternatives. No national historic properties are displaced by any of the alternatives, although the light rail alternatives pass near one to three such properties. The light rail options do displace a small number of local landmarks and indirectly affect several others. The Sunst Busway Alternative indirectly affects five local landmarks.

Chapter 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 LAND USE AND REGIONAL ECONOMICS

Land use patterns are a direct result of economic development of the region. There are four basic prerequisites for the economic development of an urban area:

1. An adequate supply of vacant developable or redevelopable land must be available at a reasonable price.
2. Adequate public services (sewer, water, schools, transportation capacity, etc.) must be provided.
3. There must be a market demand.
4. There must be no legal or political barriers.

Section 3.1 examines these prerequisites for the Westside Corridor and the individual development areas that make up the Corridor for each alternative.

The importance of Oregon land use law in this analysis should be appreciated. Statewide Land Conservation and Development goals were adopted in 1974 requiring cities and counties to adopt enforceable land use plans that comply with state objectives. Oregon's Land Conservation and Development Commission (LCDC) enforces these plans. Each comprehensive plan includes a land use plan with designations showing the type, level and location of development adopted by the community. These plans are not vague statements of general desires. They are development blueprints implemented by state land use laws which are vigorously enforced.

Oregon law requires that zoning be consistent with land use designations in the comprehensive plans. In other states, plans or zoning standards do not necessarily assure that development could occur to the maximum density allowed. Vague and discretionary standards for actual development approval in tandem with lack of community consensus often make actual development at planned density impractical or impossible. In Oregon, however, plans and zoning represent the legal commitment of a jurisdiction to allow development to occur at the specified density and for the specified use. While there is a chance formal plan amendments can change development prospects, the adopted plans are the results of years of intense political and legal scrutiny; future attempts to change them dramatically are likely to be challenged by other interests.

The state mandated comprehensive plans offer a clear, publicly agreed upon yardstick for appraising project impacts. Projects that stimulate higher density housing or commercial uses in areas designated for more intensive use in a plan have positive impacts. Projects that promote high density in areas designated for less intensive uses would be viewed as having negative impacts, as well as projects which encourage low intensity uses in areas planned for high density development.

EXISTING SETTING

SYSTEMWIDE

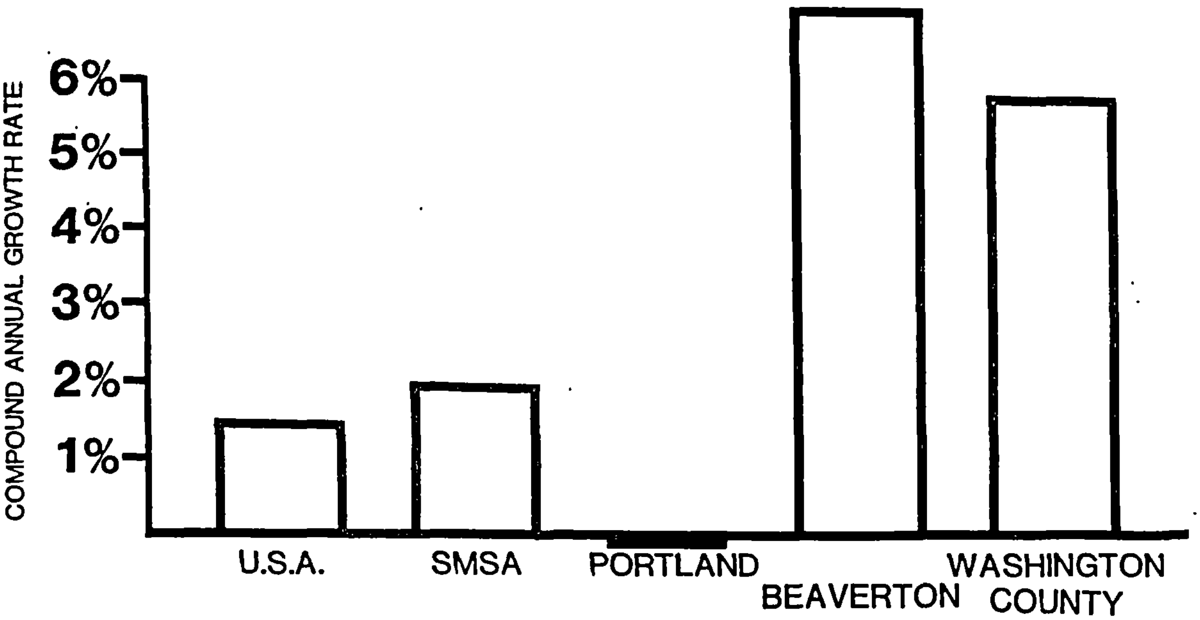
Economic Development Trends and Market Demand Relationships. The Westside economy is part of the larger economic systems of the Portland metropolitan region, the State of Oregon and the Pacific Northwest. In recent years, the demand for development in these parent economic systems has greatly outpaced that exhibited by the national economy. The rapid expansion of these economies has been complemented by their diversification.

Empirical evidence of these trends is quite clear. Figure 3.1-1 illustrates 1970-1980 annual population and employment growth rates of the nation, the metropolitan region and the major portions of the Westside Corridor. Table 3.1-1 shows the existing distribution of population and employment in the Westside Corridor. Using the annual rate of employment growth as an indicator of the demand for economic development, the Portland region is experiencing 25 percent per year greater development pressure than the nation. The region's rate of residential development is 60 percent greater per year than that of the nation.

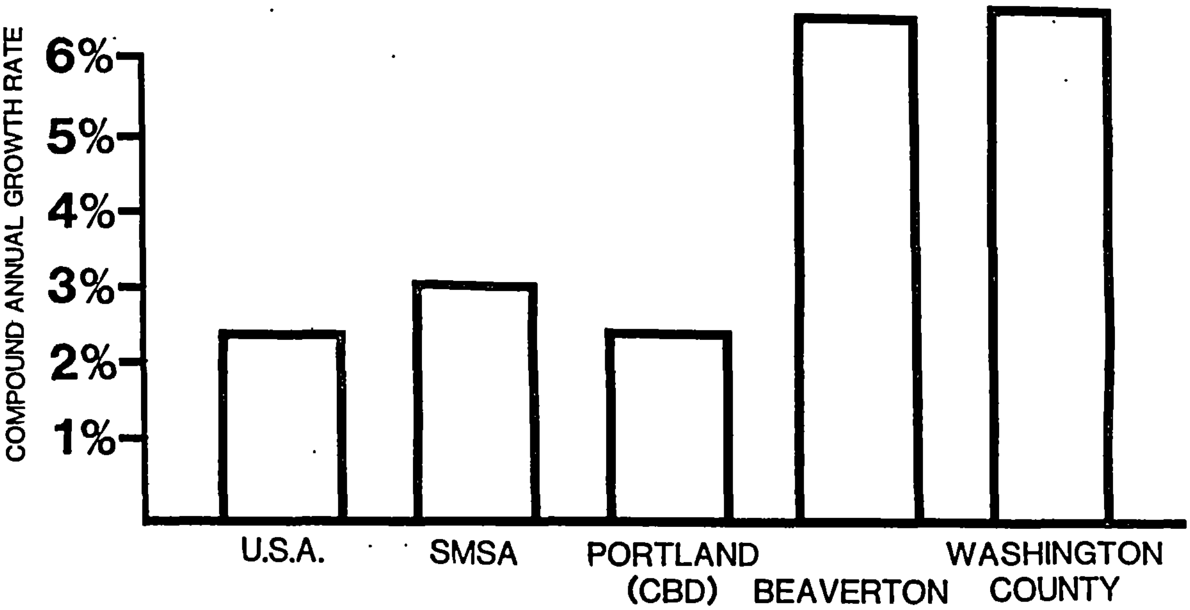
At the same time the Portland region economy expanded, it diversified substantially. Traditionally, it had been an urban service center for one of the country's primary lumber producing areas. Recently it has moved away from its dependency on the heavy manufacturing sector toward the finance, insurance, real estate (F.I.R.E.), trade and service centers. This is not to say that manufacturing employment dropped; in fact, it increased by almost 30,000 during the last decade. Moreover, the composition of manufacturing employment changed; half of that growth was in electrical equipment and instruments manufacturing--the high growth industries. Tektronix, a major instruments manufacturer, now employs far more people in the Portland region than all the lumber and wood products manufacturers combined.

Between 1950 and 1970, Washington County captured almost one half of the population growth in the SMSA. During this period, Washington County's annual employment growth rate (5.7 percent) was three times as great as the region's. Employment growth in the Portland Central Business District (CBD) was heavily concentrated in F.I.R.E. and services. Washington County, meanwhile, had an abundance of vacant, developable, lower priced land. This encouraged growth in land extensive employment (principally manufacturing), single family and medium density housing, and in services and retail trade to support that population growth. To understand the change in Washington County, one should note that in 1950, one quarter of the county's jobs were in agriculture. By 1970, one quarter of the jobs in the county were in the manufacturing sector;

POPULATION GROWTH RATE



EMPLOYMENT GROWTH RATE



WESTSIDE CORRIDOR

FIGURE 3.1-1

ANNUAL POPULATION AND EMPLOYMENT GROWTH RATES 1970-1980 agriculture plummeted to four percent. Washington County captured approximately one half of all manufacturing growth (primarily electronics) in the Portland SMSA between 1971 and 1977. Past growth trends and a diversifying economy both indicate a strong market demand for the Westside Corridor for the next 10 to 20 years.

TABLE 3.1-1 DISTRIBUTION OF POPULATION AND EMPLOYMENT IN THE WESTSIDE CORRIDOR (1977)

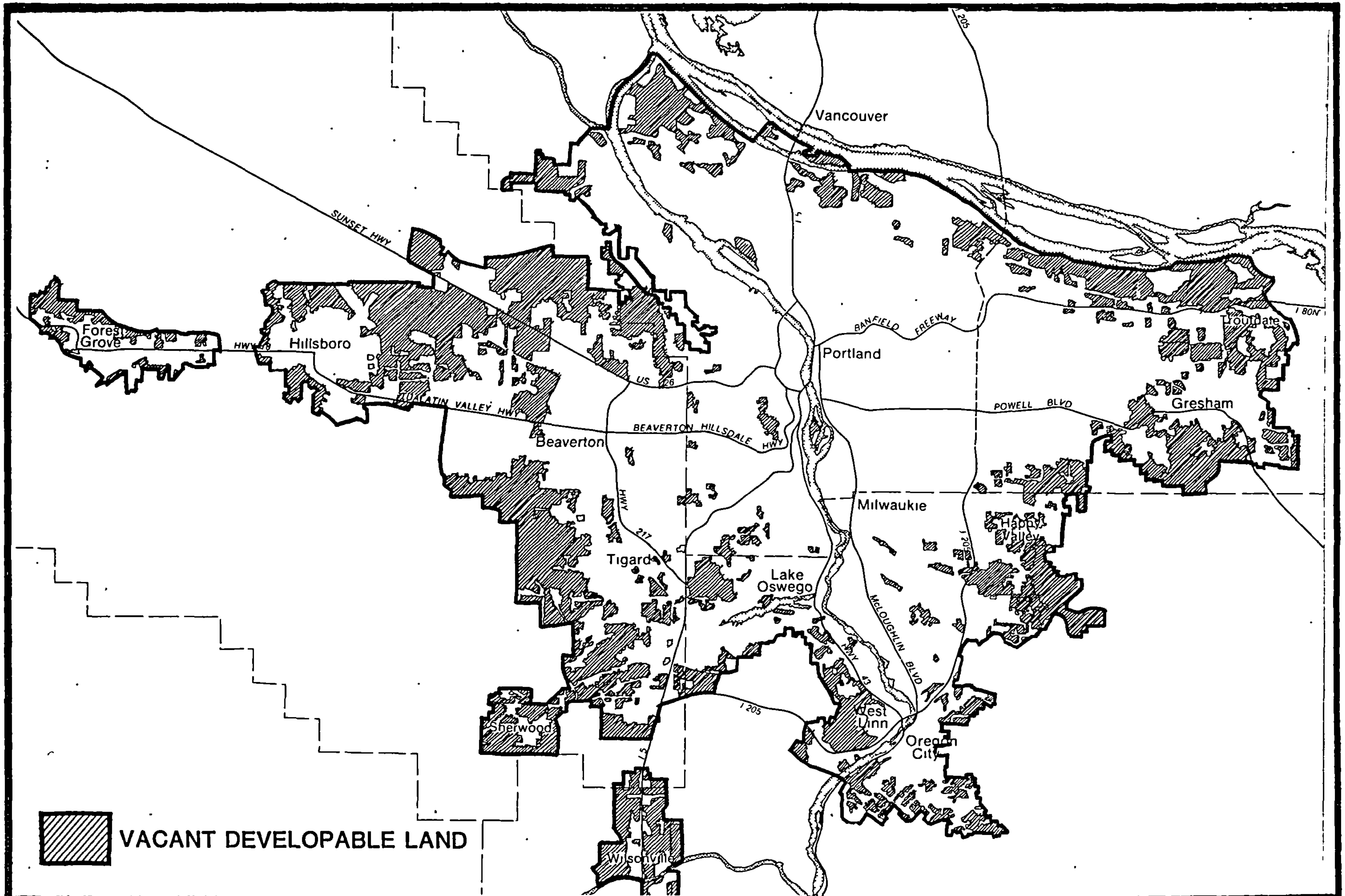
SUBAREA	POPULATION	EMPLOYMENT
Downtown Portland	7,900	73,966
Portland to Beaverton	64,456	32,601
Beaverton	71,289	38,121
Western (Urban) Washington County	64,545	13,361

Source: METRO, 1981

Legal Guidelines and Urban Service Requirements for Future Development. To comply with the state law regarding urbanization, METRO has adopted a regional Urban Growth Boundary (UGB) that circumscribes the area in which urban development and urban investment will occur in the Oregon portion of the Portland region over the next 20 years. State law requires that the UGB contain sufficient land to accommodate growth to the year 2000 and that there be sufficient land for various uses to ensure market choice. A binding determination for the UGB has been made through lengthy technical analyses and political and legal negotiations.

Granted broad authority under state law to adopt and enforce the UGB, METRO has pursued a two part approach to its implementation. Outside the UGB, METRO and county governments have prohibited and sharply restricted urban level development. Inside the UGB, METRO reviews local plans to assure that they make adequate provision for the development envisioned in the UGB assumptions. Where city or county plans do not meet regional development expectations, METRO and LCDC have the authority to require plan amendments.

Figure 3.1-2 shows the vacant developable land within the UGB. All significant new development over the next 20 years will occur within this boundary on these parcels. It is crucial to note that one third of all the buildable land in the UGB is in the Westside Corridor. Washington County and the region have clearly chosen to expand the region through the Westside Corridor. Public policies encouraging this expansion have been developed over an eight year period. Recent Washington County policy and current indications of market demand for the area between Hillsboro and Beaverton clearly establish the Westside Corridor as a primary area for major economic expansion in the immediate future.



WESTSIDE CORRIDOR

FIGURE 3.1-2

1980 VACANT LAND WITHIN THE URBAN GROWTH BOUNDARY

The UGB also defines the area in which urban services are to be provided by the year 2000. The three services critical for development are water, sewer and transportation. All of the land affected by the Westside Corridor alternatives either has water available or could easily be served. Portland, Beaverton, Hillsboro and the Wolf Creek Highway Water District supply almost all of the urban area with water. All lands along the Westside Corridor now have sewer service. Thus, virtually no vacant land in the Westside Corridor is constrained from development for lack of water or sewer service.

The major constraint to accomplish adopted development objectives is transportation service. Deficiencies in the design and capacity of the transportation system seriously threaten economic development at each of the Corridor's primary development nodes--Downtown Portland, Beaverton and Western Washington County. The relationship between transportation and economic development at each of these nodes differs and is described individually in subsequent sections of this chapter.

DOWNTOWN PORTLAND

Economic Development Trends and Market Demand Relationships. Downtown Portland is firmly established as the business and financial center for the metropolitan area. It is also the center of a much larger regional economy, comprising the entire State of Oregon and portions of Washington as well. The relative physical isolation of these urbanizing sections of the Northwest tend to reduce the dependence of residents and businesses on other larger centers such as Seattle and San Francisco. The position of downtown in the center of the metropolitan area tends to reinforce its importance. Geographic features (Willamette River, West Hills) have tended to prevent the continuous sprawl of commercial development from the core and to maintain the downtown as an identifiable and fully diversified center.

Downtown Portland has maintained a significant and relatively steady share of office growth, even with the significant growth in suburban locations in recent years. During the past five years, it attracted about one third of all new office construction and about 40 percent of the building permit valuation. On the average, about 325,000 square feet of office space was constructed annually and occupancy rates remain high.

Development trends in retailing have been different from office growth. Though downtown's share of regional sales has declined, it remains a viable, growing retail market. An estimated 330,000 square feet of new retail and services space has been constructed downtown since 1974 and this has been accompanied by substantial remodeling in various locations. In total, the downtown has been absorbing significant amounts of retailing and services space (perhaps 70,000 to 100,000 square feet annually, according to various studies completed since 1974). Completion of the new Nordstrom store, the decision of J.C. Penney's to remain downtown, remodeling of the Galleria and activity associated with the Morrison Street Project all point to the continuance of a major retailing presence in downtown. It is noteworthy that the Nordstrom and J.C. Penney decisions were directly tied to the construction of the Downtown Portland transit mall.

These features and investments in capital projects, in particular transit, have maintained demand for downtown development at impressive levels measured against overall regional economic development. Downtown employment totals (estimated at 66,000 in 1970 and 82,000 in 1980) show a very significant 24 percent increase since 1970, not significantly different from SMSA growth (27 percent).

Recent experience indicates that an annual demand of 400,000 to 425,000 square feet of additional commercial space can be easily absorbed in downtown.

Legal Guidelines and Urban Requirements for Future Development. The framework for downtown development is established in the Downtown Plan and its related policies, including the Downtown Parking and Circulation Plan. The basic strategy (Figure 3.1-3) requires:

- High density north-south concentration of office development reinforcing existing patterns.

- Compact east-west retail core concentration extending to the river.

- Medium density office concentrations at selected access points into downtown.

- Remainder of area inside the I-405 freeway loop, development in medium and lower density uses.

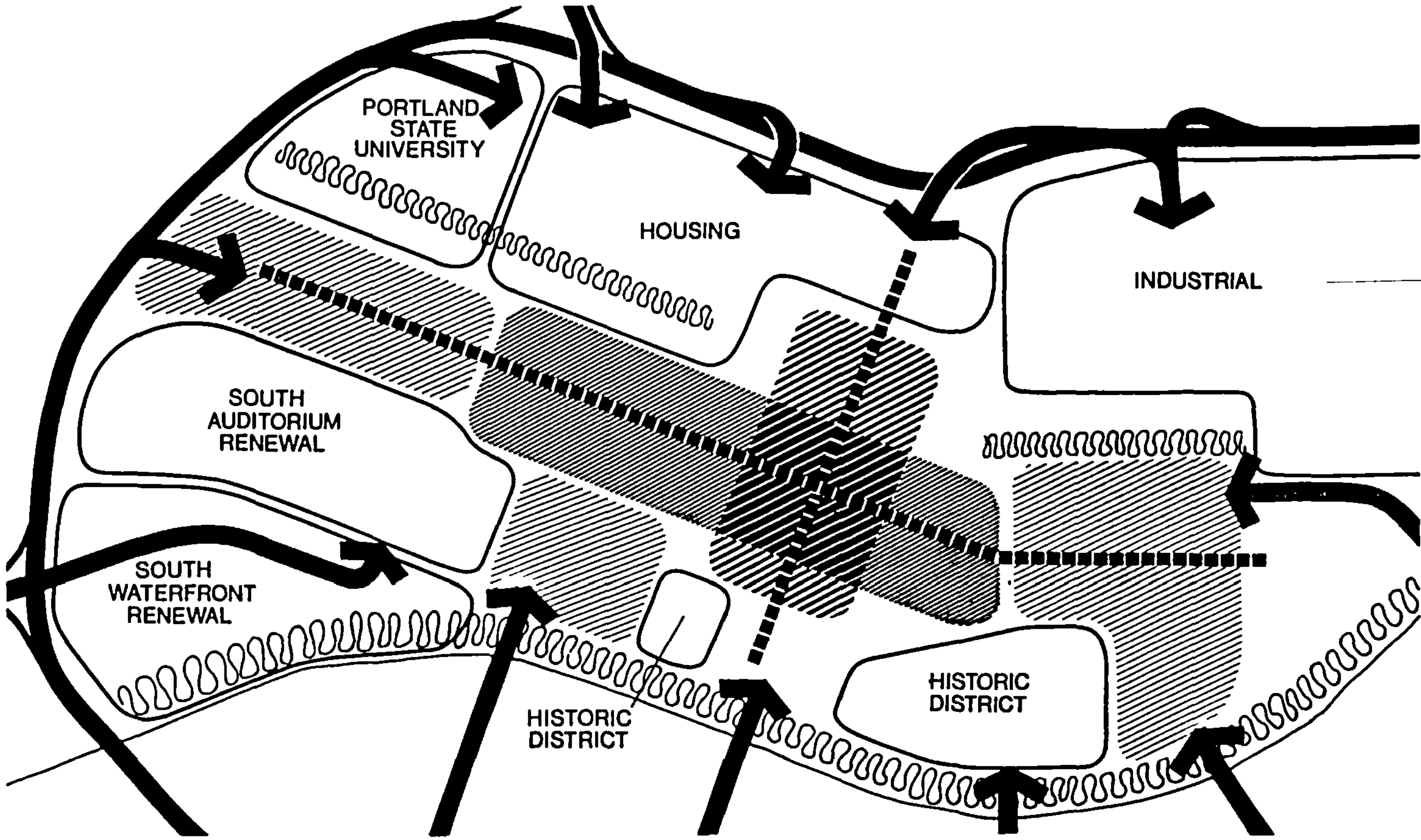
- Existing special districts identified and strengthened.

The Plan is based on the assumption that transit will provide most (75 percent) of the access to downtown. The Downtown Parking and Circulation Plan supports this assumption by establishing a lid on the number of parking spaces and requiring a reduction in the number of long-term (six hour) spaces. Through its plans and policies the City Council has chosen to permit downtown development which can be served primarily by transit. The development potential of the South Waterfront Urban Renewal Area is particularly tied to increased transit service.

The floor area ratio regulations illustrated in Figure 3.1-4 indicate the basic intensity described for each district at buildout. The currently approved (but not fully constructed) projects and future development opportunities are shown in Figure 3.1-5. By applying the floor area ratio restrictions to the opportunity parcels and making some adjustments for developers choosing to build at less than permitted maximums, an estimate of 18.7 million square feet of probable development supply is remaining in downtown.

Downtown Portland's continued economic health and realization of its full development potential depends on access from the growing Westside. Travel from the Westside is approaching the capacity limits of the existing transportation network.

This will eventually cause downtown development as we now characterize it to significantly diminish, limiting downtown employment to 120,000 jobs or roughly 40,000 jobs more than today. These additional jobs would use approximately 9 million square feet of the remaining 18 million square foot develop-



SOURCE: PORTLAND BUREAU OF PLANNING • 1979

DOWNTOWN ALIGNMENT
WESTSIDE TRANSITWAY

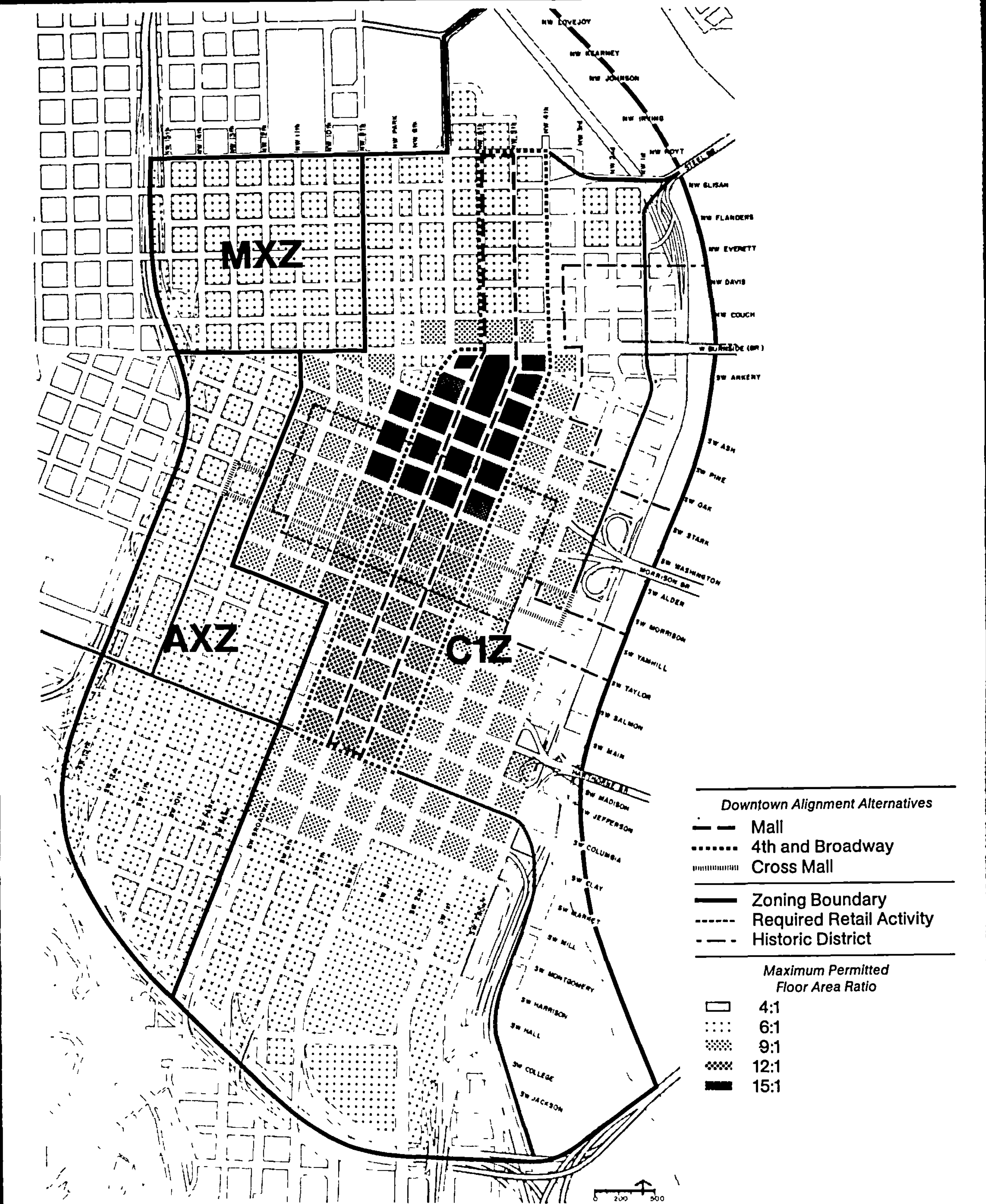
DOWNTOWN PLAN CONCEPT

RETAIL CORE
MAJOR OFFICE CORRIDOR
MEDIUM DENSITY OFFICES
MAJOR VEHICLE ACCESS
MASS TRANSIT
MAJOR OPEN SPACE

WESTSIDE CORRIDOR

FIGURE 3.1-3

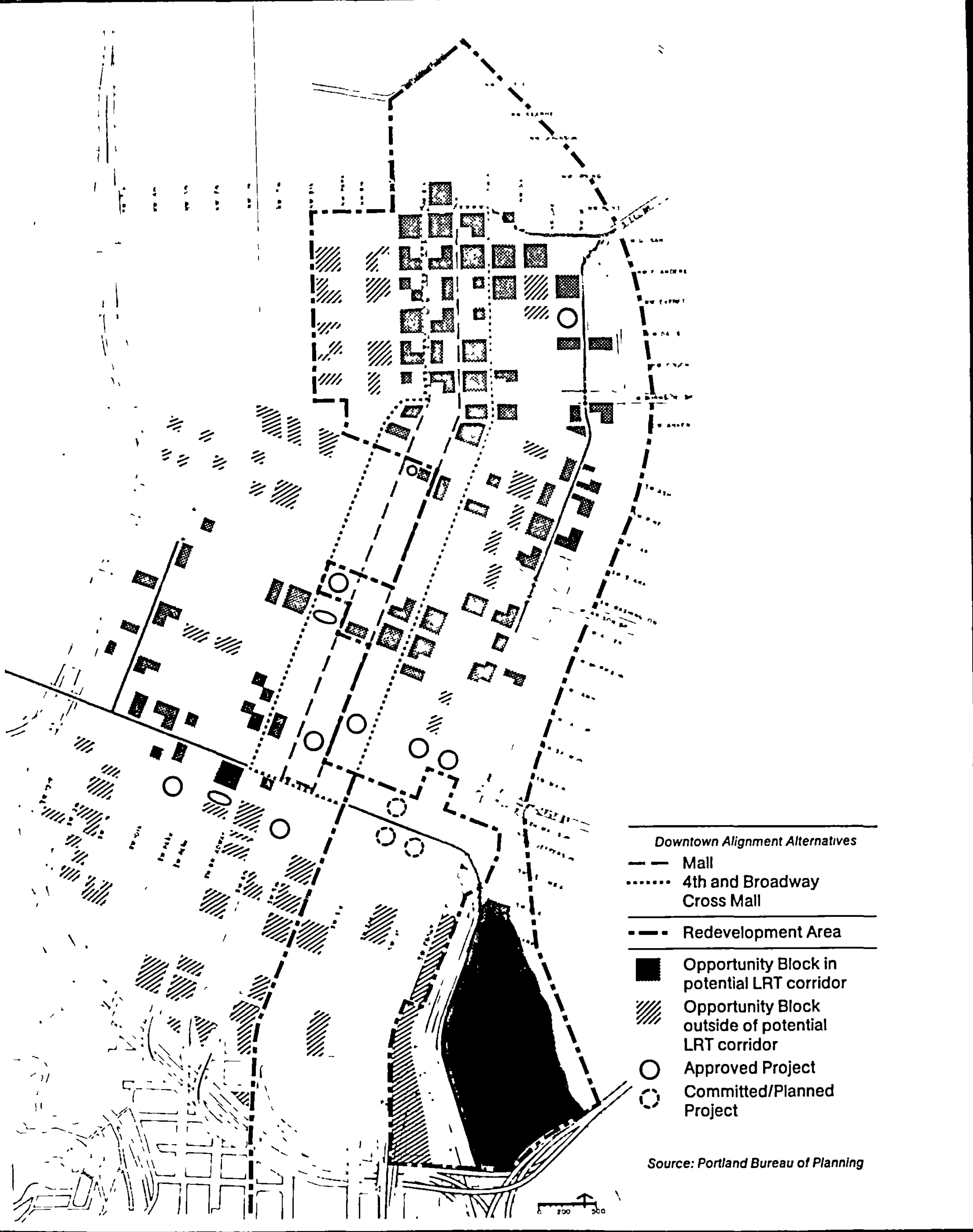
DOWNTOWN PORTLAND PLAN CONCEPT



WESTSIDE CORRIDOR

FIGURE 3.1-4

DOWNTOWN PORTLAND DEVELOPMENT REGULATIONS



WESTSIDE CORRIDOR

FIGURE 3.1-5

DOWNTOWN PORTLAND DEVELOPMENT OPPORTUNITIES

ment potential. Thus, perhaps only one half of the remaining downtown development potential, which is being planned and invested for, could actually occur if the transportation system was not modified. Assuming current downtown development rates, this situation would be 20 years away, although development rates may slow when traffic saturation effects become evident.

PORTLAND TO BEAVERTON

Economic Development Trends and Market Demand Relationships. The Sunset and Multnomah alignments follow widely different paths between Downtown Portland and Central Beaverton. The Sunset alignment goes directly west from Downtown Portland, climbing through the West Hills. The Multnomah alignment swings south, paralleling the Willamette River and goes around the West Hills, following the route of Multnomah Boulevard. The development potential of the two routes is as different as the terrain each traverses. The Sunset route passes through steep and unbuildable land in the West Hills; development opportunities are quite limited. The Multnomah route travels through flatter, more developable terrain, and abuts established neighborhoods as well as major redevelopment opportunities, notably along Macadam Avenue.

Although development opportunities along the Sunset Corridor alignment are severely limited by steep and unstable terrain, there are major regional activity centers along the route. The Zoo, Oregon Museum of Science and Industry and Western Forestry Center are all located together, near the Sunset Highway just west of the Vista Tunnel. Combined they currently attract over 1.1 million visitors annually. Attendance is expanding proportionate to population. The Civic Stadium, Portland's major outdoor athletic stadium, is located in the 18th and Jefferson vicinity. The stadium attracts attendance throughout the year, varying from 7,000 per event in the football season to 10,000 to 12,000 per event in the soccer and baseball seasons.

The Multnomah Corridor alignment is far greater in length and in the amount of land area it traverses. Further, this corridor alignment passes through the Macadam Avenue zone along the Willamette riverfront, where considerable development has occurred in recent years and additional activity is expected in the near future. This includes the proposed South Waterfront Redevelopment Project, an area just south of the downtown office concentration and strategically located for additional commercial or residential development with excellent riverfront exposure. The Multnomah Corridor alignment also includes a considerable area of already developed residential and light commercial neighborhoods.

Legal Guidelines and Urban Service Requirements for Economic Development. The Macadam section of the Multnomah Corridor has the greatest growth potential of any of the segments of the possible alignments from Downtown Portland to Beaverton (Report No. 5, Economic and Land Use Impacts, METRO, 1981). Land values are high, reflecting its proximity and accessibility to the downtown, its quality environment, with views of Mt. Hood and its access to dedicated Greenway along the Willamette River. The northern half of the Macadam section contains many older industrial uses and vacant lots used for storage, particularly on the east side of the freeway. It is already redeveloping and there is good potential for expanding mixed uses east of Macadam. The southern half of the Macadam section includes the Johns Landing area, a major development of office and retail commercial and multi-family housing (primarily expensive condominiums). Significant numbers of small parcels are being assembled for office and retailing use. It is likely that some existing residential structures will be converted as development pressure builds. The Burlingame section has limited development potential. Some vacant commercial land is wedged between the I-5 freeway and Barbur Boulevard on the north, while the freeway acts as a significant barrier to the south.

Multnomah Boulevard, a two lane east/west road passes through a well defined neighborhood with commercial districts at 35th Avenue, Oleson Road and Scholls Ferry Road. Residential neighborhoods are well established and active in the preservation of current intensity levels in their area. The area is already responding to a growing supply of multi-family housing at 45th Avenue, Oleson Road and Allen Boulevard.

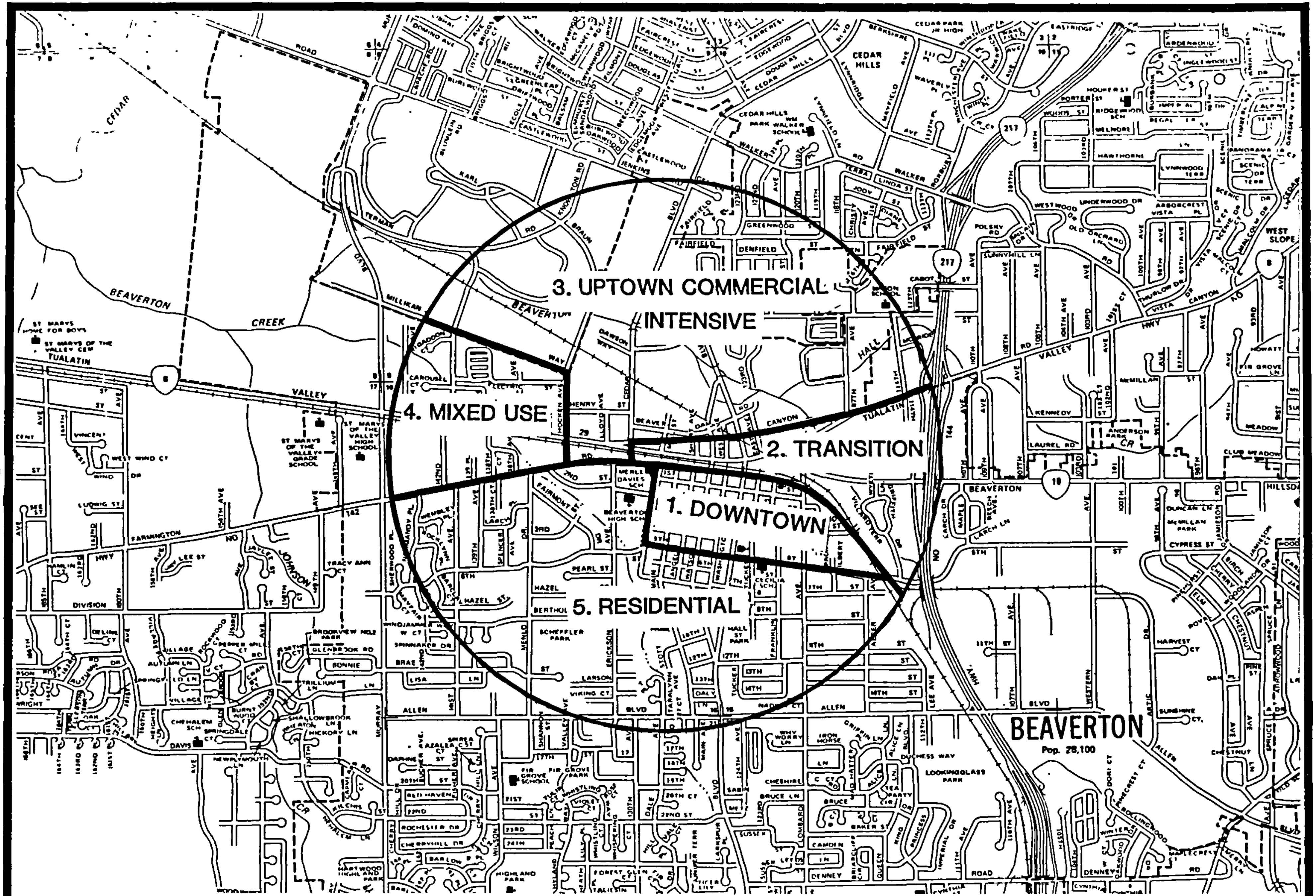
The area along the Sunset Highway with the greatest potential is adjacent to the Sunset/217 interchange, a 250 acre holding under a single family ownership (the Peterkort property). This is the largest single parcel of developable land in single ownership inside the UGB. Regional access to this site is perceived to be high, especially with the scheduled rebuilding of the highway interchange. The land uses being proposed call for about 110 acres of commercial development (generating 8,000 jobs at full development) and medium density residential development to house about 2,200 people. The development plans are dependent upon a major transit presence on this site.

BEAVERTON

Economic Development Trends and Market Demand Relationships. Beaverton is the third largest of the cities in the SMSA (Portland and Vancouver are larger). The city's population has grown at an annual rate of 4.7 percent per year since 1970, almost double the Portland-Vancouver SMSA average. Beaverton's residential development demand has been high for several years; however, the current demand for office and commercial development is unprecedented. Foremost is the development of Beaver Creek Centre, a 641,000 square foot commercial-municipal center adjacent to the Hall/Watson transit center option. The Beaverton Town Square, a six building, 127,000 square feet, retail center, is under construction in proximity to the existing transit center. Tektronix and Floating Point Systems have purchased 78 acres and 60 acres, respectively, immediately west of Murray Boulevard for corporate headquarters and expansion of production activities. Development just outside of the city has been rapid. For instance, the Tektronix Company, located just west of Beaverton, employs 14,000 people.

Legal Guidelines and Urban Service Requirements for Development. The design for development in Beaverton is described in the Central Beaverton Plan and its related city council policies. The plan identifies five development districts, each with its own development objectives and constraints (Figure 3.1-6.)

Area 1: Downtown. The traditional downtown area includes a mix of commercial, residential and institutional uses. The small blocks and one-to-two story densities are to be retained and existing uses and buildings preserved. Because of existing auto congestion, more intensive development is discouraged. Pedestrian, bicycle and transit access is encouraged.



WESTSIDE CORRIDOR

FIGURE 3.1-6

CENTRAL BEAVERTON PLAN

Area 2: Transition. This triangle of land is bounded by major through transportation routes. Its commercial viability is particularly sensitive to the amount of through traffic. Because of its auto congestion, the plan indicates little capacity for more intensive development. Allowed uses are to be transit supportive rather than auto related. It is defined as a medium intensity transitional zone between the low intensity use in downtown and the intensive uses in uptown.

Area 3: Uptown Commercial Intensive. Intensive commercial development is proposed for this area in the form of high rise (five or more stories) retail/office and residential development. The area is to be developed as a regional employment hub in Beaverton. Policies discourage auto dependent uses such as shopping centers.

Area 4: Mixed Use. The area north of Farmington and west of Hocken Street is a mixture of commercial and industrial uses, although there are large pockets of multi-family housing. Policies call for maintenance of the present mix with the introduction of transit supportive residential and employment uses along transit routes.

Area 5: Residential. The large residential area south of Fifth Street contains most of the existing and planned multi-family housing and older single family housing in Beaverton. Policies seek to increase densities in proximity to services, while restricting commercial development. Most of the area is entirely built up, so little significant change of use or density is expected in the near future. As Central Beaverton grows, traffic through the residential district will increase, encouraging the conversion of single family to multi-family housing along main streets.

The transportation problem in Beaverton is different from those experienced in other portions of the corridor. Rather than having too little general access to its business districts it has too much. Almost every major travel arterial in Washington County intersects in Central Beaverton at acute angles to each other. In addition, the two major railroads serving Washington County intersect in the middle of Downtown Beaverton. Auto dependency impedes Beaverton's development future. Although needed improvements to streets, sidewalks and parking facilities have been implemented in the Transition Area in recent years, the area remains constrained by irregular parcelization and a congested street system. Increasing auto traffic to this part of Beaverton would isolate the Transition Area, making it less accessible to pedestrians.

Because of these factors, some developers would choose to avoid the area for other areas where lot sizes are not limiting factors. A key to avoiding this possibility is maintaining the Transition Area as an identifiable whole, not merely as an area through which vehicles pass on their way to other parts of Beaverton. A strategy of property assembly, selective closings of streets and railroad rights-of-way and retaining perimeter parking (i.e., Canyon, Farmington, Lombard) could strengthen and give greater identity to this area. Until now the demand for land in this area was insufficient to overcome the costs and difficulties of developing in the floodplain area. The Uptown Area currently has very few streets, sidewalks or parking facilities. Developers will be expected to assume the cost of internal street capacity and may be required to assume the floodplain management costs. Given these front end costs, only relatively high intensity uses will be financially justifiable. With prevailing tendencies for auto dependency and Beaverton requirements for minimum parking space (one space for every 100 to 300 square feet of development depending on use), the high intensity uses will require significant space for parking. This adds to cost and reduces the chances for meeting market demand opportunities. It is important to note that an auto dependent Uptown Area will generate greatly increased north/south traffic flow which will cut across the complicated east/west circulation pattern which already discourages investment in the downtown and transition districts.

The market demand pressures make Beaverton the likely location to be the civic, financial and commercial center of the western suburban region. The Central Beaverton Plan establishes policies to assure this role and emphasizes transportation service as a critical need.

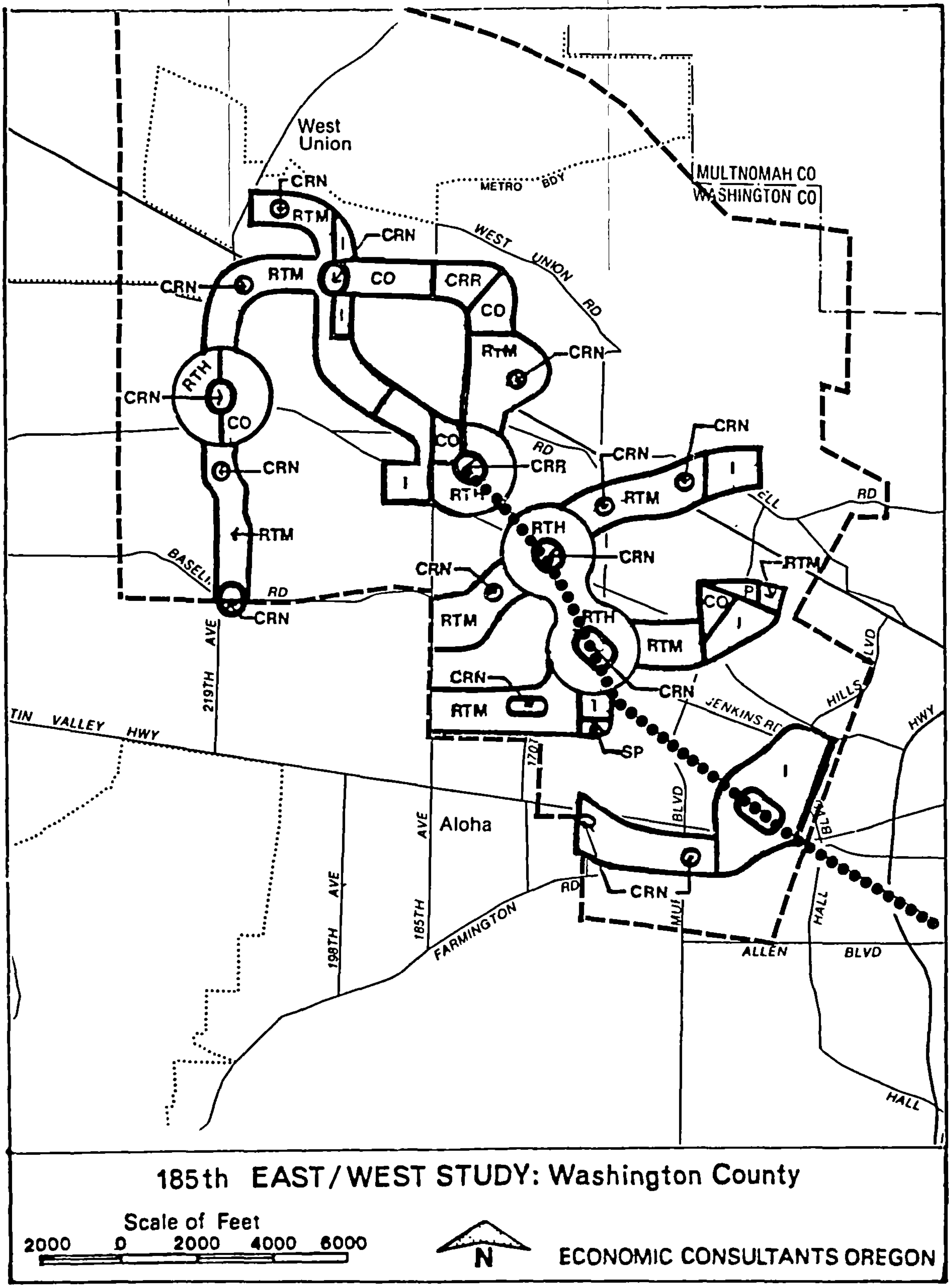
WESTERN WASHINGTON COUNTY

Economic Development Trends and Market Demand Relationships. This area includes not only the greatest concentration of employment outside of Downtown Portland (about 14,000 employees at the Tektronix Company), but also includes one third of the region's vacant developable land. Because of public service constraints, particularly an inadequate road system, the policies applied to this area over the past few years have prohibited the private market from developing this area, despite strong development pressures and a willing investment community.

Since the early 1970s a number of events have kept the land west of Murray Boulevard from developing. First, sewers were unavailable, but a special district was created and this problem was remedied. In 1973, the county adopted policies to preserve certain areas for future development, and despite the fact that this area could be sewered, it was placed in a zoning category (future urban) that precluded anything but very low density development (two units per acre). Moreover, the county prohibited even these large lot subdivisions for several years because the school district could not accommodate additional enrollment. This problem was also eventually remedied. Since the last part of the 1970s, the inadequacy of the road system has impeded expansion. Not only is capacity inadequate but existing roads, built for rural traffic, are decaying structurally.

Since the early 1970s, landowners and developers have petitioned the county to remove building restrictions, arguing that the land was in high demand. In response to these petitions, the county conducted a detailed study of land uses and public facilities in the area (the 185th Study Area, Figure 3.1-7).

The study found demand for residential and industrial land on the Westside is large and growing, and land in the 185th area has almost all the requisite characteristics and services to meet that demand. The study recommended that the county remove its existing building restrictions, expand its industrial land, upzone its residential land and arrange its land uses to support transit.



(SEE LEGEND ON FOLLOWING PAGE)

WESTSIDE CORRIDOR

FIGURE 3.1-7

RECOMMENDED TRANSITWAY LAND USE OVERLAY

TRANSITWAY LAND USE OVERLAY

LEGEND FOR

Figure 3.1-7

RTH: Residential, Transit-related, high-density. 28.1 to 35.0 units per gross acre.
Implementing zones must be created.

RTM: Residential, Transit-related, medium-density. 15.0 to 28.0 units per gross acre.
Implementing zones must be created.

RL: Residential, low-density. 4.0 to 6.5 dwelling units per gross acre.
Potential Implementing Zones: R-5, R-7.

RLM: Residential, low/medium-density. 6.6 to 10.6 dwelling units per gross acre.
Current Implementing Zones: RU-6, RU-8, RU-10.

RM: Residential, medium-density. 10.7 to 15.0 dwelling units per gross acre.
Current Implementing Zones: RU-15.

CRN: Commercial, Retail, Neighborhood level. Market area includes only the immediate neighborhood.
Current Implementing Zones: B-1.

CRR: Commercial, Retail, Regional level. Market area includes several neighborhood market areas.
Current Implementing Zones: B-2

CO: Commercial, Office
Current Implementing Zones: B-3

I: Industrial. Besides light manufacturing, also allows office uses as described in B-3 zone.
Current Implementing Zones: MA-1, MA-2, RD.

P,SP: Public and Semi-Public Uses. Includes parks, schools, churches, and other institutional uses.
Current Implementing Zones: These uses are conditional in any of the above zones.

FU: Future Urban. Indicates that the land use is in a Future Urban area and not immediately developable. These designations are more suggestive, since such land will require a plan change before it can develop. The land-use designations give guidance to the county when reviewing that plan change.

With the adoption of the 185th Land Use Plan, the 185th area is slated to be the major growth area in the unincorporated part of Washington County. At Murray Boulevard, Tektronix and Floating Point Systems have acquired about 100 acres for further expansion. A Tektronix facility with several hundred employees at 185th Avenue is next to the Oregon Graduate Center with large land holdings and long range plans for expansion. Just north are 700 acres of vacant land, about 90 percent of which is in two ownerships and under a single management. Farther west in Hillsboro, Intel will have almost 10,000 employees by 1990.

Legal Guidelines and Urban Service Requirements for Future Development. Future development in the area west of Beaverton within the Westside Corridor will be dictated by two recent Washington County policies, the Urban Growth Management strategy and the 185th Land Use Plan.

The adopted Growth Management strategy removes the "Future Urban" (land to be developed post 1985) designation in all areas that have recently adopted community plans. As a result, 3,000 acres of vacant developable land in the 185th Study Area will be converted from "Future Urban" to "Urban".

The Growth Management strategy dictates that Future Urban land converted to Urban or existing Urban land can only develop if urban services standards are met. There are some very specific policies and standards for transportation requiring developers to build and finance all local roads and minor collectors. Developers are also required to conduct a study of the development's impact on the major collector and arterial system for an area deemed appropriate by the Department of Public Works. Development approvals hinge on the developers assuring the county administration that needed arterial improvements will be made before their project will be built.

The county completed its land use plan for the 185th Study Area in October, 1980. The plan contains policies on most of the land between 158th and 185th and Sunset Highway and Tualatin Valley Highway and was coordinated from its inception with Westside Corridor planning. The plan changes low density, suburban land uses (almost entirely residential) to high density, urban land uses (including substantial land for industrial and commercial development). It includes provisions for the mandatory reservation of a transit corridor right-of-way and for large density bonuses to developers who cluster development along transit routes and potential station areas.

To ensure that urban development in the county would not outpace its ability to provide roads or destroy future opportunities for a transitway by preempting its right-of-way, an overlay plan to the base Planned Unit Development was developed for the 185th Study Area. The overlay plan (Figure 3.1-7) is designed to allow the type and density of dwelling units desired without the risk of exceeding the maximum number of units that can be accommodated by the transportation system. At the same time, the zone preserves options for a future intensification of development when decisions about major transit improvements are made. The zone accomplishes this by allowing developers to transfer densities from one part of their development to another to receive density bonuses of up to 30 percent. Future development will be allowed at higher densities if light rail improvements are made. The zone allows developers a rare flexibility with respect to site design, density, dwelling type and phasing.

IMPACTS

Federal policy dictates that a 15 year timeframe (in this case, to the year 1995) be used for transit ridership forecasts to justify projects of the type examined in this DEIS. Various project implementation schedules for the different options estimate completion by 1986 (Bus Service Expansion) to 1990 (LRT). Development effects of transitway projects have historically not begun until somewhere between the time when the right-of-way is purchased to one year after operation begins. Thus, for the transitway options, major development pressure impacts would be in existence for only the last five years before 1995. Thus, the statistical differences in population and employment estimates between the alternatives offer only limited understanding of the land use and economic development impacts of the alternative. This section explains the major statistical differences in land use between the options by 1995, but also describes the causal relationships that may change longer term development pressures and trends.

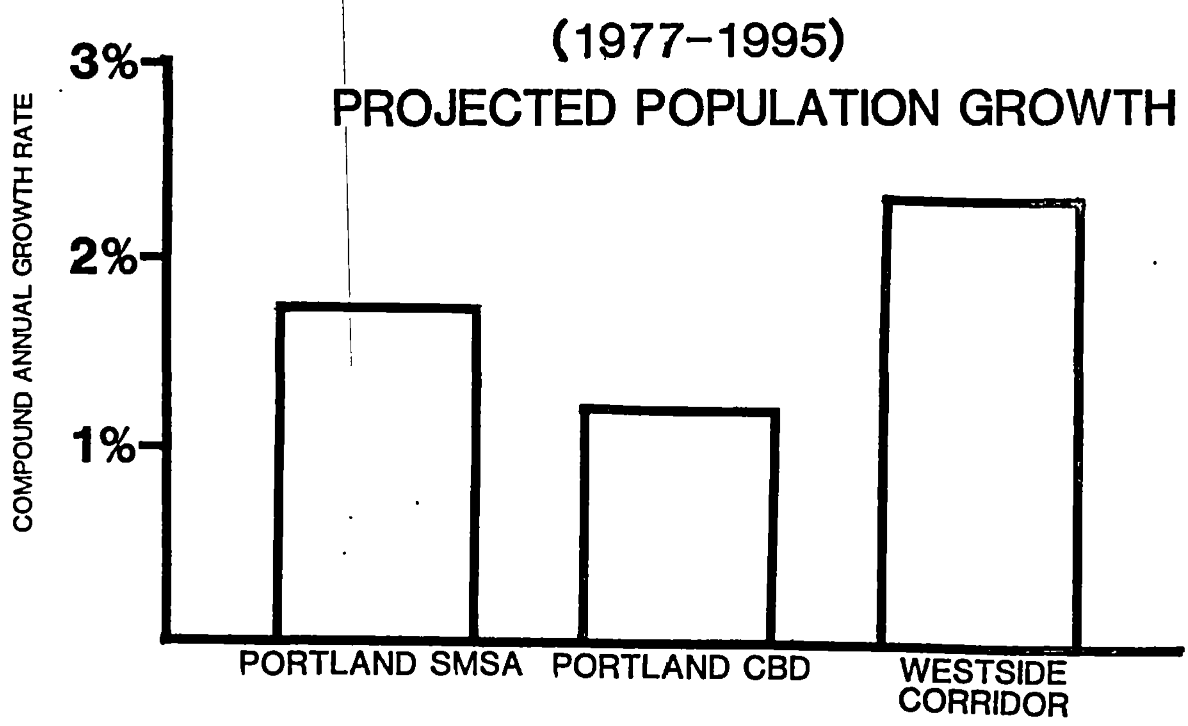
ALTERNATIVE 1: NO BUILD

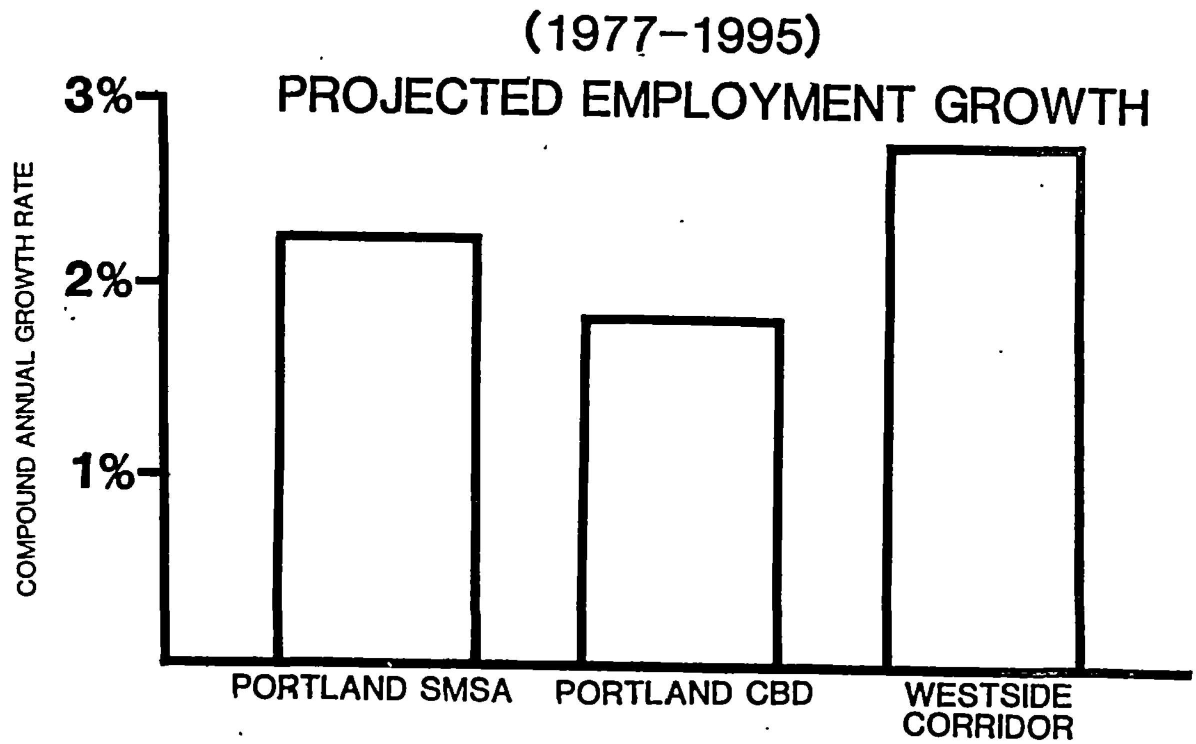
SYSTEMWIDE. Population in the Portland SMSA is expected to increase at an annual growth rate of 1.7 percent to the year 1995, and employment to increase at 2.2 percent. Even with the transportation service constraints, the demand for development in the Westside Corridor (Figure 3.1-8) will be substantially higher than that of the region. Corridor population growth is projected to be 2.3 percent per year, employment 2.7 percent. Table 3.1-2 shows the forecasted distribution of population and employment growth in the corridor (METRO, 1981).

While the market demand for development in the region will remain strong, the urban service constraints discussed in the preceding sections are likely to redirect growth from the Westside to other portions of the region. The No Build Alternative is likely to encourage greater growth in the Southwest Corridor of the region (Tualatin, Wilsonville, Tigard) and Northern Corridor (Clark County, Washington), as well as the fringes of the Westside Corridor (Economic Consultants of Oregon, 1980). The land use plans, zoning and urban service capacities for the Southwest Corridor have not anticipated development constraints in the Westside Corridor, and therefore, could not easily accommodate the accelerated growth demands. Community expectations, private investment plans and public capital improvement programs would have to be redeveloped in these areas.

Based on the difficulties observed during minor amendments to the UGB, it would likely take several years of technical and political negotiations to arrive at a new overall growth strategy for the region. During the period of these negotiations, growth would likely proceed in an ad hoc fashion due to uncertainty (regarding zoning, public services, etc.) in both the public and private sectors. While this analysis assumes there would likely be no change in overall regional growth rates, the region's development potential would be reduced by this uncertainty. Growth shifted from the Westside Corridor to Clark County, Washington would mean tax base losses to the State of Oregon.

DOWNTOWN PORTLAND. While there is an adequate supply of land in the downtown to meet the projected demand for commercial space beyond 1995, analyses





WESTSIDE CORRIDOR

FIGURE 3.1-8

WESTSIDE CORRIDOR POPULATION AND EMPLOYMENT GROWTH (NO-BUILD), 1977-1995 show that the No Build situation in 1995 produces congestion at all entrances to the CBD. Without significant transit capacity additions, the demand for the downtown regional travel paths will exceed their capacity. Congestion could damage the prospect for new development projects (the proposed Morrison Street Development Project and the South Waterfront Development Project are two examples), if employees, shoppers and visitors cannot reasonably move in and out of the zone. A comparison of the observed impacts in other downtown areas (where major transit investments occurred) to the Downtown Portland situation (Leblanc, 1981) reveals that as much as 100,000 square feet (15 percent) of annual development or redevelopment may not occur through 1995 due to a No Build decision.

TABLE 3.1-2 FORECASTED 1995 NO BUILD DISTRIBUTION OF POPULATION AND EMPLOYMENT IN THE WESTSIDE CORRIDOR

SUBAREA	POPULATION	EMPLOYMENT
Downtown Portland	9,791	101,819
Portland to Beaverton	86,579	42,840
Beaverton	87,619	57,633
Western (Urban) Washington County	112,095	26,699

Source: METRO, 1981

PORTLAND TO BEAVERTON. For the Sunset Alignment, a moderate increase in population (1.0 percent per year) and employment (1.4 percent per year) is expected in the Sylvan vicinity. Virtually no growth is projected for the Walker Road/Humphrey Park vicinity and both communities are projected to maintain the same basic character as today. Substantial growth is expected in the Sunset Highway/Highway 217 interchange area where population is expected to grow at 2.8 percent per year and employment at four percent annually.

In the Multnomah Alignment, the Macadam area will continue to grow at its current rapid pace. Employment is projected to increase at over two percent per year and population at over 2.5 percent per year. The Multnomah section of the alignment is characterized by established residential neighborhoods and growth is projected to be predominantly residential.

BEAVERTON. Beaverton's dramatic growth in population will begin to decline as residentially zoned parcels become scarce. However, Beaverton area employment will continue to grow at a rate greater than the City of Portland or the Portland SMSA, as its function as the commercial center of urban Washington County expands.

Without a transit investment, the thread which ties the Uptown, Transition and Downtown districts together would be auto-related, making a reduction in minimum parking space requirements unlikely. On site parking requirements for commercial developers could make multi-story office development uneconomical. In contrast, significant improvements in transit service could minimize the need for extensive parking facilities, increasing the potential profitability of intensive commercial development. With a No Build scenario, the overall auto dependent character and density of development in Beaverton would not substantially change from today.

With a No Build scenario, the Central Beaverton districts would be forced to compete with each other to meet their objectives. The desired balance between districts, in terms of type and scale of development, could not likely be established. As development occurred in one district, it would limit the ability of development occurring as planned in the other districts.

WESTERN WASHINGTON COUNTY. Without a major expansion of the transportation system, the demand placed on Western Washington County roads will far exceed their capacity (discussed in section 3.2). This problem would be exceptionally acute in the vicinity of the 185th Study Area. The county's growth management strategy requires developers to pay roadway system expansion costs as a prerequisite to construction approval. These front end costs could be substantial and could limit intensive development in the area. Given the distribution of developable land inside the UGB, high development levels would still be expected for Washington County. However, the No Build would cause increased growth pressures on the Southwest Corridor where higher density planned development would be complicated by (a) increased citizen reaction (not having worked with the community groups to establish a detailed growth plan) and (b) fewer large development parcels in single ownership (making planned community style development unlikely). Additionally, market forces would dictate increased development pressures in other fringes of the region as discussed in systemwide impacts.

ALTERNATIVE 2: BUS SERVICE EXPANSION

SYSTEMWIDE. The Bus Service Expansion option would provide a substantial proportion of the transportation capacity needed for Westside economic expansion. However, the transit capacity may suffer the effects of large volumes of buses (over 1 per minute in the peak hour) on downtown environments and the reliability problems inherent in running in mixed traffic (even with ramp metering). Therefore, implementation of this option will assist in meeting the intermediate term (5 to 10 years) of the regional urbanization objectives but may not meet its long term objectives. Within the 1995 timeframe, it is estimated that the Bus Service Expansion option would induce about 200 more residential units and 6700 more jobs into the corridor than the No Build.

DOWNTOWN PORTLAND. Implementation of the Bus Service Expansion option provides the capacity required to facilitate reasonable access to downtown from its market area. Improved accessibility for additional labor force, shoppers and others will enable the downtown economic environment to expand. Congestion being predicted for highways and major streets leading into the downtown will at some point constrain the movement of buses during peak hours, cutting transit capacity and reliability, particularly during rainy weather on the six percent grade of the Sunset Highway. The reliability problem could reduce expected development even with the ramp metering.

Three levels of downtown office space development potential, ranging from low to high were evaluated assuming a major Westside transit investment (LeBlanc, 1981). The most likely figure of 500,000 square feet of new office space annually on average (accounting for new growth as well as relocation and upgrading demand) would come about with a major Westside transit investment. Retail space would be expected to be absorbed at the rate of roughly 100,000 square feet per year. As a whole, development demand would be moderately increased (15 percent) in comparison to the No Build (LeBlanc, 1981). A commitment to major bus routes and service levels, such as that given to the Transit Mall, will be required to achieve this objective. Service of this type is being considered with the BSE option as it is presently envisioned.

PORTLAND TO BEAVERTON. The major development impact in this segment would occur at the Sunset Highway/Highway 217 transit center. The proposal for development of the 250 acre "Peterkort Property" site is based on high mode split assumptions that implicitly assume a transit center at this location (Benkendorf Associates, Ltd., 1981). Without a transit investment, the traffic impacts of the proposed development would become prohibitive - requiring a reduction in planned densities.

BEAVERTON. The Bus Service Expansion Alternative would impact Central Beaverton's economic development. The physical addition of buses into Beaverton will not represent by itself a major stimulus; however, the service expansions and linkages between the major districts in Beaverton will facilitate development. This could provide the city council with the policy choice to reduce parking requirements and thereby increase the potential profitability of higher scale development investments. The transit investment envisioned by the Bus Service Expansion option is the minimum required to meet the objectives of the Central Beaverton Plan.

The location and design of the timed transfer transit center would determine the likely area in which the impact will be felt. The Hall/Watson location could very well stimulate market demand in the area north of Canyon Road. Locating the transit center at the Lombard/Beaverton-Hillsdale Highway location would help give that end of downtown some definition and could help stimulate redevelopment opportunities. This site could provide service to parts of the uptown district, if direct pedestrian crossings of Canyon Road were added. The relative merits of the two transit center site options is discussed in the Sunset Busway section.

WESTERN WASHINGTON COUNTY. The Bus Service Expansion Alternative will increase accessibility within Washington County and between western Washington County and Downtown Portland. It may thus induce some development to occur in this area of the corridor rather than in other parts of the region. In addition, to the extent that increased transit service reduces the need for highway improvements, the BSE Alternative may also lead to reductions in the local charges that developers must pay under the growth management strategy to help the county provide needed facilities and services. These front end costs can be significant enough to impede development. Regardless of the transit option selected, however, the condition of the Washington County road system will require the continued use of development charges to respond to new growth.

Under the BSE option, officials would not implement density bonuses nor the planned high density around transit stations which are a part of the transitway overlay at the 185th sub-area. In the long term, loss of this opportunity will increase the public costs of providing effective transit to this area.

ALTERNATIVE 3: SUNSET BUSWAY

SYSTEMWIDE. The systemwide impacts of the Sunset Busway are similar to those described for the Bus Service Expansion option. Minor additional development concentrations could occur in the Beaverton and Cedar Hills areas, away from the fringes of the Westside Corridor. In the 1995 timeframe, it is estimated that the Sunset Busway would induce an additional 1300 residential units and 7600 more jobs into the corridor than the No Build.

DOWNTOWN PORTLAND. The impacts of the Sunset Busway option on Downtown Portland are the same as those for the Bus Service Expansion.

PORTLAND TO BEAVERTON. The area at 18th and Columbia serves as a major bus transfer point as well as a destination zone for the Portland Civic Stadium. Improved pedestrian links between the station site and the stadium would probably result in redevelopment of vacant land, restaurants, taverns or other medium density commercial establishments. The Zoo station experiences no new development because it is severely limited by the rugged terrain.

The Sylvan station site is characterized by a mix of low value land uses such as service stations and high value office and residential developments. The most vacant and underutilized land is zoned for single family residential. Most of this land is located on steep slopes that naturally restrict higher density development. Although the demand for residential and office development could be enhanced by a transitway, most development will occur independent of transit. Thus, introduction of a transitway will not change the density and character of the area.

The construction of a transitway project concurrent with the Peterkort development would influence the distribution and the magnitude, of the land use impacts at the Peterkort site. The opportunity for joint development is great. The Washington County plan of development for this area has space reserved for a station and a park and ride lot. Though the majority of the development will occur even without a transitway project, such a project is likely to cause greater development in the short run than otherwise because of the better access, the economic stimulus of a major investment (both direct and psychological) and preferential public policies to encourage transit supportive development.

At the Walker Road station, the transitway will induce no employment. It may result in a minor amount of additional infill housing units. However, the composition and character of the neighborhood will not be changed by the transitway.

BEAVERTON. The options in Beaverton are essentially defined by the location of the major transit center. Development of the uptown area as a high density commercial residential area could be stimulated and organized around the options using the Hall/Watson site. Construction of the transitway and its associated Hall/Watson station, would reinforce demand for Beaverton's only major development area. The potential for joint development opportunities with the Civic Center is high.

Implementation of the options that use the Hall/Watson site, accompanied by intensive, commercial development could relieve the pressure on downtown for more intensive development. Under these circumstances, downtown would retain more of its present small scale development and small town atmosphere, consistent with the Central Beaverton Plan and related city policies. Since blocks and parcels in downtown are small, there is also a built in limitation to the kind of large scale development and redevelopment which is possible.

Like many areas which border railroad tracks, the properties north of the Southern Pacific railroad effectively turn their backs on the railroad. Some of these commercial uses were developed for rail accessibility, but most were developed historically as the center of commerce for Beaverton. Today, however, a few warehousing and distribution firms make inefficient use of what have become strategically located, high value properties. Development of the options using the Lombard/Beaverton-Hillsdale Highway site provide the opportunity to redevelop some of these properties for mixed retail and office purposes.

In a similar way, underutilized properties could be redeveloped at a compatible scale and density. This corridor could provide the opportunity to strengthen the core of the downtown and to create a more pedestrian oriented precinct. The triangle (bounded by Farmington and Canyon) might require new perimeter parking lots to serve the pedestrian oriented core. Minimizing traffic on Broadway could help to reduce the number of east/west streets in downtown which act as barriers to north/south auto and pedestrian movements.

Residential areas south of Farmington Road would be served by these options. There would be one quarter mile walking distance south to Fifth Avenue, an area where a number of opportunities exist for the conversion of older single family properties along the more heavily traveled north/south streets to multiple family housing or to commercial uses.

Most of the commercial area in north Beaverton would remain largely unaffected by development of options using the Lombard/Beaverton-Hillsdale Highway. Station opportunities along 117th Avenue may provide some minor development opportunities.

WESTERN WASHINGTON COUNTY. The impacts of the Sunset Busway on Western Washington County are virtually identical to those described for the Bus Service Expansion option.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

SYSTEMWIDE. Like the options previously discussed, the Sunset LRT provides the transportation service required for the economic expansion objectives of the region. In addition, the Sunset LRT will lead to higher density development on the Westside as local officials implement the transitway overlay plan for the 185th sub-area. This would allow for increased expansion in the corridor and reduced growth pressures on the fringes of the containment line and the Southwest Corridor. It would also likely slow the UGB expansion required past the year 2000. The Sunset LRT option would stimulate public policy and private investment choices which better support regional urbanization policies than the all bus options previously discussed. In the 1995 timeframe, it is estimated that the Sunset LRT would induce an additional 2100 residential units and 8700 jobs into the corridor than the No Build.

DOWNTOWN PORTLAND. The Sunset LRT would allow for the same development and redevelopment levels as the all bus options. The major difference appears to be that LRT would focus development pressures at identifiable points consistent with downtown district objectives. One exception may be the residential development along S.W. 12th Avenue where LRT service may lead landowners to request commercial uses. The additional north/south rail routing (on Fourth/Fifth and Fifth/Sixth) supports the core area's high density office spine. The cross mall, to be constructed initially for the Banfield LRT, would continue to support the retail core area.

PORTLAND TO BEAVERTON. The impacts of the Sunset LRT on development between Downtown Portland and Central Beaverton are not significantly different than under the Sunset Busway. However, impacts on the Peterkort property indicate that rail may provide more opportunity for joint development.

BEAVERTON. As with the Busway option, the routing of the transitway through Beaverton and the location of the timed transfer transit center is a critical determinant of land use impacts. The same general impacts for the two transit center options are observed for the Sunset LRT as with the Sunset Busway with some additions. Most importantly, the LRT option provides more coverage, more development opportunities, and ties Central Beaverton with the 14,000 Tektronix employees at Murray Boulevard. The options using the Lombard/Beaverton-Hillsdale Highway would tie the downtown district with Tektronix, the options using Hall/Watson would support an uptown/Tektronix relationship. In either case, the LRT would stimulate demand in the Cedar Hills Boulevard area that would not likely occur in the Bus Service Expansion option.

WESTERN WASHINGTON COUNTY. The Sunset LRT option (if implemented in 1990) is projected to produce 750 residential units and 625 jobs above the No Build projections by 1995 in this area. Full implementation of the transitway overlay plan would provide for approximately 30 percent greater residential and economic development in this area in the long term.

The proposed 141st Avenue and Murray Boulevard station areas will be located in areas currently in industrial use or zoned for industry. The 141st Avenue station area would serve Tektronix employees. Employment growth is occurring on the newly acquired Tektronix and Floating Point Systems properties located at the Murray Boulevard station. There is no residential land in either the 141st Avenue or Murray Boulevard station areas.

The 158th Avenue station is also without residential land. As with Murray Boulevard, some of the forecast employment growth occurred between 1977 and 1980. Tektronix added facilities here and TRI-MET built a maintenance facility. There are still about 40 acres of developable land zoned for industrial uses in the quarter mile radius station area.

The station areas at 170th and 173rd are primarily residential in character. The county has planned these areas for low density housing, but also has policies which allow the land to be converted to high densities if an LRT is constructed. The effect would be to shift development from other parts of the unincorporated area to the station areas. The changes would be dramatic, in many cases a fivefold increase in permitted densities. Thus, a doubling of residential development in these station areas is not at all unreasonable.

The 185th station area is forecast to have residential development like that at 170th and 173rd: 250 units under No Build assumptions and an additional 250 with LRT by 1995. Because of the commercial and industrial land in the area (including Tektronix at 185th and Walker) and because 185th is a major north/south arterial, employment in the station area is projected to increase by 400 under No Build assumptions, with additional 200 jobs with LRT by 1995.

In summary, the segment from Murray to 185th is primarily undeveloped, but both public policy and private investments indicate that growth rates of five to ten percent for population and employment are to be expected during the next 15 years. The area is particularly suited for industry (especially electronics related) and residential development. As in Beaverton, the necessary conditions to encourage transit supportive economic expansion exist: high expected growth; transit supportive policies; and large tracts of vacant, developable land. The long term prospects for transit induced development is much higher than that estimated for 1995. In total, 30 percent more population and employment is expected with transit than without at buildout.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

SYSTEMWIDE. The Multnomah LRT option passes through more development area and has more stations between Downtown Portland and Beaverton than the Sunset LRT option. The likely result of this option would be to increase development in the center of the region, thereby reducing sprawl pressures more than implementation of the Sunset LRT. The Multnomah LRT alignment option would support Downtown Portland and Beaverton expansion and local officials would implement the 185th overlay plan. In the 1995 timeframe it is estimated that the Multnomah LRT will induce an additional 3000 residential units and 10,300 jobs into the corridor than the No Build.

DOWNTOWN PORTLAND. Although the forecast growth is identical, the Multnomah Corridor alignment provides greater opportunities than the Sunset LRT for transit related development. Those cited in the Sunset LRT are applicable to the Multnomah LRT with the exception of the high density residential zone impact. However, the Multnomah alignments tend to have greater exposure to existing and committed office space blocks. The effects of this exposure are dramatic for future development potentials, in particular in the south downtown Waterfront district, a site located between the Willamette River and the south downtown area. These seventy-three acres are owned by the Portland Development Commission which plans to convert about 21 acres of vacant and under utilized land to office, retail and housing development. With improved pedestrian access to the downtown and the south auditorium urban renewal project, this site would become an extension of the Central Business District. Uses will be mixed to include a marina and waterfront park area, as well as office and retail. The development will be of medium to high density and of high value. An analysis done for the Portland Development Commission showed the south downtown waterfront project could accommodate twice as many employees with the Multnomah LRT as without it.

PORTLAND TO BEAVERTON. The Macadam section of the Multnomah Corridor has the greatest growth potential of any area between the downtown and Beaverton. It definitely will grow, even in the absence of LRT. The importance of LRT, however, is that it would reduce travel time between this area and the downtown below that of buses or even automobiles (when parking is considered). This increases the attractiveness of the Macadam area. It becomes an extended arm of the downtown rather than a separate suburban development and will capture some portion of the growth that a transitway can induce in a downtown area. Thus, it could expedite redevelopment for more intensive uses in the Corridor.

The inclusion of LRT will provide a minor additional development pressure along the Multnomah section. The greatest employment gain will be at either end of this segment, 25th Avenue and Allen Boulevard, where most of the now vacant land and non-retail employers (office, services, wholesaling) are located. Only marginal increases will occur at the other stations, including the Multnomah Community at 35th Avenue, because they will remain as relatively low employment density retail centers. Conversion of underutilized land will be required for most of these increases.

Housing growth is expected to increase more rapidly with transit, particularly multi-family at 25th and 45th Avenues where vacant land exists. Similar to the employment forecast, the residential forecasts could be much higher if the underutilized land areas are converted to higher intensity residential uses.

BEAVERTON. The basic land use and economic development impacts of the Multnomah LRT option are similar to those described for the Sunset LRT for the two transit center alternatives through Beaverton. The Multnomah LRT may place Central Beaverton in a more competitive position for office development on the Westside because the alignment provides less access to competing office development parcels outside of Central Beaverton than the Sunset LRT.

WESTERN WASHINGTON COUNTY. The Multnomah LRT will have virtually the same land use and economic development impact in western Washington County as the Sunset LRT option.

MITIGATION MEASURES

ALTERNATIVE 1: NO BUILD

The No Build Alternative does not provide the transportation infrastructure required to support implementation of legally-mandated comprehensive plans. Without this infrastructure, major re-examination of the Urban Growth Boundary and local comprehensive plans by METRO and the affected jurisdictions may be required. This would be difficult given the political and public acceptance of the currently adopted plans.

ALTERNATIVES 2, 3, 4, 5:

No mitigation required.

3.2 TRANSPORTATION SYSTEM

The transportation system serving the Westside Corridor consists of a network of state highways, arterials and local streets and transit routes providing express and local bus services. Presently, use of many of these roadways and transit routes is exceeding design capacity, especially during peak periods. In Section 3.1, analyses of residential and economic activity in the Westside indicate that a significant development demand will continue through the next decade and a half. If this growth is realized, it will be accompanied by a demand for increased mobility in the corridor which the present transportation system cannot provide.

There are two primary constraints to providing the additional capacity needed to accommodate this demand. First, the West Hills form a major topographic barrier between Washington County and Portland. Since existing transportation facilities have already used the few natural routes available through these hills, only costly man-made alternatives remain. Second, a significant amount of travel in the Westside is not radially oriented; rather, it is local to the corridor or crosses to adjacent corridors. Not only are the roadway capacities deficient, but many of them, primarily in Washington County, were never engineered to carry even present traffic volumes, their composition reflecting their rural origins. Most roads in Washington County were built as farm-to-market roads and upgrading to the standards required to support present use has not kept pace with the rapid transition in adjacent land use. Significantly, 80 percent of Washington County roads within the urbanized area are substandard. Estimates to structurally upgrade just the arterial and collector portion of the urban road network are in the order of $100-$150 million. As such, rehabilitating these thoroughfares for present loads is an important complementary concern to the capacity enhancements examined in this study.

The Westside Corridor requires a major transportation investment to match today's needs and the requirements for orderly economic growth. The overall issue is to define an improvement program to meet these needs. The basic assumption is that this program will consist of some blend of highway and transit improvements. While this Draft Environmental Impact Statement is aimed, for the most part, at selecting the transit element, the project options must be evaluated within an overall (highway and transit) system framework. This section examines the alternatives in this context; Section 3.7 focuses on local traffic issues. The capital and operating costs and efficiencies of the alternatives are documented in Section 3.3.

EXISTING TRANSPORTATION SYSTEM SETTING

WESTSIDE CORRIDOR ROADWAYS. Currently, over 683,000 total person trips are made within the Westside Corridor on an average weekday. Of these, 95 percent are made by auto. Most major Westside Corridor roads are oriented in an east-west radial pattern. In the eastern portion of Washington County a grid pattern begins to form. The "regional" highway facilities include the Sunset Highway which is an expressway, and the Tualatin Valley/Beaverton-Hillsdale Highway and Canyon Road, which are principal arterials. The Sunset Highway and the Tualatin Valley/Beaverton-Hillsdale Highway provide the only continuous routes from west of S.W. 218 Avenue to east of the Multnomah/Washington County line. In fact, they are the only major highways which penetrate the West Hills into Downtown Portland from the Westside. Principal "non-regional" road facilities include Cornell Road, Walker Road, Barnes Road and Farmington Road, all minor arterials.

There are very few facilities accommodating movements which are essentially north-south within the Westside Corridor. Highway 217, an expressway which links with the Sunset Highway in the north and Interstate 5 in the south, is the only "regional" circumferential highway in the Corridor. Hall Boulevard/Cedar Hills Boulevard, a two-to-four-lane facility through commercial and residential areas in and around Beaverton, is the primary "non-regional" highway facility (minor arterial) in the corridor. Additionally, there are Murray Boulevard and 185th Avenue, which serve as principal north-south connectors west of Beaverton between the Tualatin Valley and Sunset Highways. The local roadway facilities throughout the inner Westside are predominantly circuitous streets which serve suburban housing tracts and commercial facilities, while following the natural topography.

The level of service concept, as defined by the Highway Capacity Manual, was used to summarize travel conditions throughout the corridor. This concept provides a qualitative assessment of roadway operating conditions, collectively measuring speeds, traffic volumes and conflicts among vehicles. As described in Table 3.2-1, there are six degrees of operating conditions, levels of service A through F, for different types of roadways. Level of service A (LOS A) for controlled access highways, for example, is the best case, representing free flow conditions at high speeds. LOS F for the same type of facility, on the other hand, is the worst case and implies forced flow whereby severe congestion occurs and speeds range from stop-and-go to about 30 mph. Based on the Highway Capacity Manual definitions, LOS D implies stable flow at less than posted speed limits (approaching unstable flow), with roadway use approaching about 90 percent of design capacity. For arterials, it represents streets operating at low speeds near capacity with delays occurring at intersections. It is this level of service which is the objective for any major Westside improvements.

In terms of level of service, the p.m. peak hour operating conditions on the existing Westside roadway system are illustrated in Figure 3.2-1. As indicated by this figure, substantial links of Sunset Highway, Canyon Road and Tualatin Valley Highway are presently operating at less than level of service D. The problems discussed in Section 3.1 regarding regional access to Downtown Portland and the over-saturation of Central Beaverton are apparent in this illustration. Regional traffic infiltrates local neighborhoods as highways and arterials become congested. That is, motorists confronting traffic bottlenecks seek the path of least resistance and skirt the congestion by traveling over local streets. This is becoming a serious problem within the corridor--in particular, in the Southwest Portland, Garden Home and Cedar Hills areas.

As illustrated in Figure 3.2-2, Downtown Portland is served by a regional highway network which is arranged in a radial pattern converging on the central business district (CBD). At its heart is an inner-city freeway loop consisting of Interstate 405 and the East Bank Freeway section of Interstate 5. The radial highways include Interstate 5 from the north and southwest, Interstate 84 (Banfield Freeway) from the east, and the Sunset Highway from the west. While there are a considerable number of radial arterials

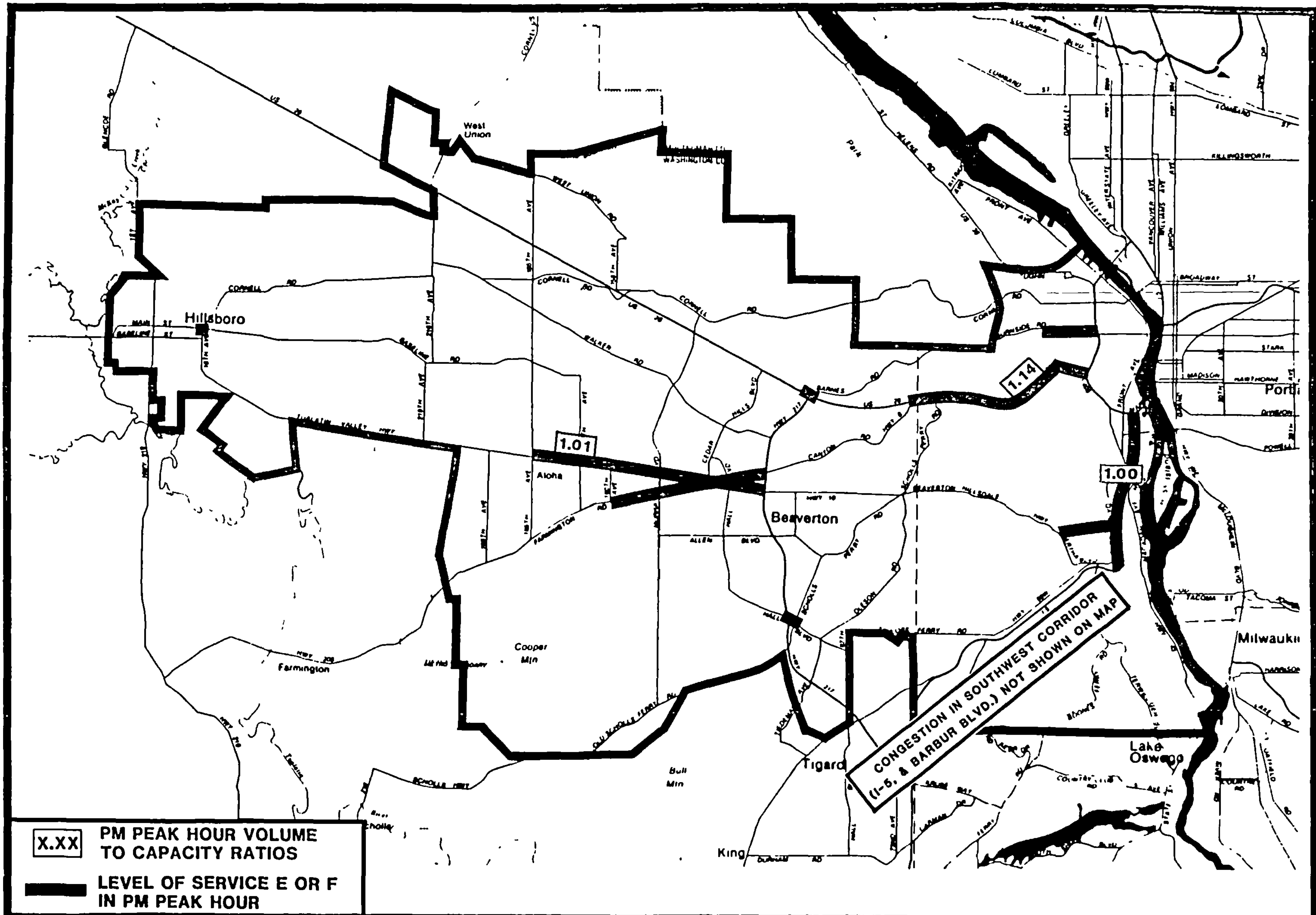
LEVEL OF SERVICE BY HIGHWAY TYPE

LEVEL OF SERVICE	URBAN AND SUB-URBAN ARTERIALS	CONTROLED ACCESS HIGHWAYS
A	Average overall travel speed of 30 mph or more. Free flowing with volume capacity ratio of 0.60. Load factor at intersections near the limit of the 0.0 range. Peak hour factor at about 0.70.	Free flow. Operating speeds at or greater than 60 mph. Service volume of 1400 passenger cars per hour on 2 lanes, on direction. Each additional lane serves volume of 1000 vph lane.
B	Average overall speeds drop due to intersection delay and inter-vehicular conflicts, but remain at 25 mph or above. Delay is not unreasonable. Volumes at 0.70 of capacity and peak hour factor approximately 0.80. Load factor at intersections approximately 0.1.	Higher speed range of stable flow. Operating speed at or greater than 55 mph. Service volume on 2 lanes in one direction not greater than 2000 passenger vehicles per hour. Each additional lane above two in one direction can serve 1500 vph.
C	Service volumes about 0.80 of capacity. Average overall travel speeds of 20 mph. Operating conditions at most intersections approximate load factor of 0.3. Peak hour factor approximately 0.85. Traffic flow still stable with acceptable delays.	Operation still stable, but becoming more critical. Operating speed of 50 mph and service flow on two lanes in one direction at 75% of capacity or not more than 5 min. flow rate of 3000 passenger cars per hour. Under ideal conditions each additional lane above two in one direction would serve 1800 vph.
D	Beginning to tax capabilities of street section. Approaching unstable flow. Service volumes approach 0.90 of capacity. Average overall speed down to 15 mph. Delays at intersections may become extensive with some cars waiting two or more cycles. Peak hour factor approximately 0.90,load factor of 0.7.	Lower speed range of stable flow. Operation approaches instability and is susceptible to changing conditions. Operating speeds approximately 40 mph and service flow rates at 90% capacity. Peak 5 min. flow under ideal conditions cannot exceed 3600 vph for 2 lanes, one direction. 1800 vph each added lane.
E	Service volumes at capacity. Average overall traffic variable but in area of 15 mph. Unstable flow. Continuous back-up on approaches to intersections. Load factor at intersections in range between 0.7 and 1.0. Peak hour factor likely to be 0.95.	Unstable flow. Overall operating speeds of 30-35 mph. Volumes at capacity of about 2000 vph lane under ideal conditions. Traffic flow metered by design constructions and bottlenecks, but long back-ups do not normally develop upstream.
F	Forced flow. Average overall traffic speed below 15 mph. All intersections handling traffic in excess of capacity with storage distributed throughout the section. Vehicular back-ups extend back from signalized intersections through unsignalized intersections.	Forced flow. Freeway acts as a storage for vehicles backed-up from downtown bottleneck. Operating speeds range from near 30 mph to stop-and-go operation.

WESTSIDE CORRIDOR

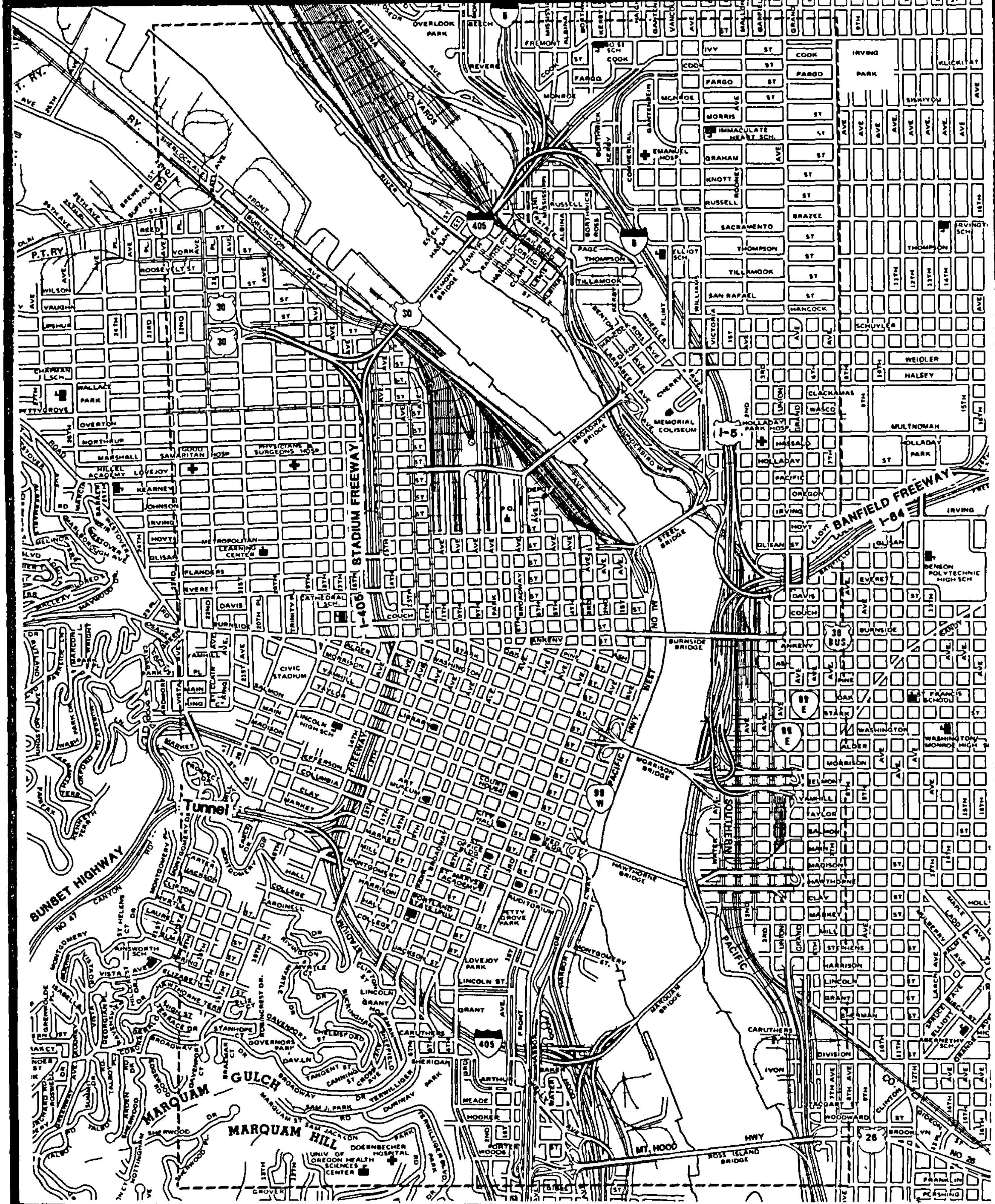
TABLE 3.2-1

DEFINITION OF LEVELS OF SERVICE



WESTSIDE CORRIDOR

FIGURE 3.2-1
HIGHWAY FACILITIES OPERATING AT CONGESTED (LOS E OR F) SERVICE LEVELS DURING THE P.M. PEAK HOUR IN 1980



WESTSIDE CORRIDOR

FIGURE 3.2-2

REGIONAL ACCESS TO DOWNTOWN PORTLAND

approaching the downtown, they either merge into several key arterials or are channeled onto the bridges spanning the Willamette River before penetrating the CBD. Thus, the arterial routes entering Downtown Portland are reduced to the following: St. Helens Road/Fremont Bridge (U.S. 30) from the north, the Steel, Burnside, Morrison, Ross Island and Hawthorne Bridges from the east, Macadam Avenue from the south, Barbur Boulevard from the southwest, and Burnside Avenue from the west. Collectively, these radial highway and arterial routes provide about 17,500 vehicles per hour capacity per direction into and out of the CBD during the peak hour. Over three-fourths of this capacity is currently being used.

<u>WESTSIDE CORRIDOR TRANSIT SERVICE</u>. During 1980 TRI-MET served 42.1 million passenger trips on 559 diesel buses traveling some 21.7 million miles on 58 bus routes. Average weekday travel during the Spring of 1980 totaled 149,000 passenger trips. Service is provided on most bus routes at five to 20 minute intervals during peak hours; off-peak, buses are operated on 15 to 60 minute schedules.

At present, TRI-MET operates a predominantly radial system. The routes serving Downtown Portland focus upon the Portland Mall. This facility consists of exclusive lanes for buses on two parallel streets in the heart of the downtown area, supplemented by passenger shelters and transit information displays. The mall was opened in December, 1977 and allows buses rapid passage through this congested district, having reduced travel time by 36 percent. The capacity of the mall is about 200 standard buses per hour in each direction. TRI-MET is presently operating up to 170 buses per hour per direction during peak periods.

The bus routes first established in the Westside by TRI-MET and its predecessors had one principal objective: to provide no-transfer, radial service from the suburbs to Downtown Portland. While such service responded well to the travel demand of one market--that of the peak-hour downtown commuter--it involved inherent operating inefficiencies and ignored the travel needs of other potential riders. For example, the radial route structure was not conducive to intra-suburban travel. A trip from a Westside home to a Westside workplace could involve a frustrating journey on several bus routes in which schedules were not coordinated and transfer points were not clearly delineated. This service structure was, therefore, unsuccessful in attracting local trips. Furthermore, the no-transfer, radial pattern resulted in expensive duplication of service. Since few roadways breach the West Hills, several bus lines had to be funneled onto the same street to reach Downtown Portland. This was especially inefficient during off-peak hours, when more bus service was provided along these streets than warranted by ridership levels. Conversely, increases in service required during peak hours along one portion of a route had to be provided along the entire route. These characteristics of the service pattern resulted in unnecessary operating costs, as well as a poor match between transit capacity and ridership.

For these reasons, a major restructuring of Westside bus service occurred in June 1979 when TRI-MET introduced a timed-transfer system to the area. This system involved four elements: (1) construction of two transit centers where buses in the area would meet at regular intervals; (2) realignment of routes into feeders and trunklines; (3) establishment of a "pulse" scheduling system; and (4) expansion of routes into previously unserved areas.

The transit centers--one in Central Beaverton, the other at the Cedar Hills Shopping Center--form the focus of the system. Both facilities are simply constructed, consisting of sawtooth-shaped bus bays along the curbside of existing public streets. Passenger shelters and transit information displays were provided for passenger convenience. The route structure was realigned so that most bus lines in the area operate to one (or both) of these centers. Certain routes operate only within the Westside, and these are designated as feeders. Other routes, labeled trunklines, operate to Downtown Portland or to other major destinations beyond the Westside.

Buses on all routes converge at the transit centers simultaneously, resulting in a "pulse" of service at regular intervals (every 20 minutes during peak hours, 30 minutes midday, and 60 minutes evenings and Sundays). Buses wait at the transit center for about five minutes during each pulse. Passengers wishing to make a downtown trip arrive at a transit center on a feeder bus and transfer to a trunkline bus that is waiting there. Those wishing to make a local trip can simply transfer to another feeder. This system has permitted the service on the trunklines to be more closely correlated with demand, and has allowed fewer buses to be routed all the way to Downtown Portland during off-peak hours when demand is low. During peak hours, certain buses on the feeder lines continue to Downtown Portland to supplement service on the trunklines.

The results of this change in transit service have exceeded original expectations. During the year following implementation, ridership in the Westside increased by 40 percent, five times more than the eight percent increase experienced on the TRI-MET system as a whole during the same time period. Of particular interest is the fact that local travel, non-work travel, and non-peak travel--all traditionally difficult markets for transit to attract--grew significantly. Local travel, for example, increased by 1,100 daily trips--a 138 percent over 1977 levels. The Washington County portion of Westside ridership as of Spring 1980 was 24,400 daily trips, 8,200 trips greater than the previous year, and approximately 15 percent of the TRI-MET system as a whole. Total Westside ridership was 34,100 daily trips, approximately one-quarter of the TRI-MET system.

The success of this limited application of timed-transfer service improvements has led to increasing ridership on the trunklines and the need to consider ways of expanding the capacity of the system in the most efficient manner. It also provides an indication of the ridership potential on the Westside in markets which have not yet been served.

TRANSPORTATION SYSTEM IMPACTS

ALTERNATIVE 1: NO BUILD

The No Build Alternative was formulated to illustrate the consequences in 1995 of making no transit investment in the Westside beyond what exists today. It does assume expansion of the transit system in other parts of the region, including the Southwest service area. Some of this Southwest service relates directly to Westside operations, particularly east of Highway 217 and south of Beaverton-Hillsdale Highway. The effect of this ambiguity is negligible and does not alter the overall evaluation of alternatives.

TRANSIT SERVICE AND DEMAND IMPACTS. The 1995 No Build service levels are represented by the operating statistics listed in Table 2.2-1. Expansion of Westside transit service is one-fourth that of the remainder of the region. Since buses would continue to operate in mixed traffic, transit travel times are projected to increase significantly between 1980 and 1995 as roadways become more congested (Table 3.2-2). The decreased travel time between S.W. 35th/Multnomah Boulevard and the Beaverton Transit Center reflect more the direct routings between these points brought about by the Southwest improvement package.

The projected population and employment growth on the Westside indicated transit ridership would increase from 1980 to 1995 up to the capacity of the current system. Overall, Westside service in 1995 would account for a total of 65,400 daily transit trips. There would be approximately 288,000 daily riders throughout the region (about a 110 percent increase over current regional levels). Peak hour transit ridership, which is constrained by lack of transit capacity, will account for 9,300 trips. The largest increases in transit use would occur in the western Washington County and Cedar Hills areas (Table 3.2-3). The transit share of total travel between the Westside and Downtown Portland, however, would decrease. Transit would comprise 8.8 percent of the Westside Corridor's travel during the peak hour and 6.2 percent of its daily trips.

HIGHWAY IMPACTS. Section 3.1 reported that annual population and employment growth rates in the Westside Corridor would be roughly one-third greater than that of the region. Over a 15-year period this would equate to roughly a 50 percent greater population and employment growth in the Westside Corridor than the region as a whole. Without substantial increases in transit service and capacity, transit ridership gains are not significant. Thus, Westside vehicle trips are expected to increase by roughly one-half from 519,000 in 1980 to 772,000 in 1995 (Figure 3.2-3). This massive increase in vehicle trips will be infused on a system which has only minor capacity additions from today. The result (Table 3.2-4) will be that one-half (51.7 lane miles) of all of the mileage on major highways and arterials will be operating at service levels E or F in the peak hour. Congestion would persist as far west as Highway 217 and as far south as the Multnomah/Clackamas County line (Figure 3.2-4). Congestion would occur not only on freeways but also on secondary facilities such as Beaverton-Hillsdale Highway, Canyon Road, Barbur Boulevard and Patton Road. Highway facilities leading into Beaverton such as Walker Road, Canyon Road, Beaverton-Hillsdale Highway and Fifth Street would also be congested, as would isolated intersections throughout the Corridor.

Clearly, the transit service provided in the No Build Alternative and completion of the committed highway improvement projects together would be insufficient to reduce the congestion in the Westside roadway network to the desirable level of service D. To do so would require the additional roadway improvements explained in Chapter 1.

SYSTEM IMPLICATIONS. The No Build Alternative will not provide the flexibility for the transportation system which is required over the long term. Even if the highway projects discussed in Chapter 1 were implemented, the system can be expected to reach its capacity around 2005.

TABLE: 3.2-2 PEAK HOUR TRAVEL TIMES[1] BETWEEN SELECTED AREAS FOR THE NO BUILD ALTERNATIVE

	Transit Times		Highway Times	
	1995 No Build	% Change from 1980	1995 No Build	% Change from 1980
Downtown Portland and 35th/Multnomah	35	+30%	22	+38%
Downtown Portland and Cedar Hills	43	+43%	30	+58%
Downtown Portland and Beaverton	54	+46%	38	+52%
Downtown Portland and Hillsboro	85	+31%	56	+47%
35th/Multnomah and Beaverton	30	-30%	13	+18%
35th/Multnomah and Hillsboro	78	- 1%	48	+30%
Cedar Hills and Beaverton	25	+25%	8	+33%
Cedar Hills and Hillsboro	48	+33%	33	+27%
Beaverton and Hillsboro	51	+38%	33	+38%

[1]Includes wait time, transfer time and line-haul time

TABLE 3.2-3

WESTSIDE CORRIDOR TRAVEL DEMAND
NO BUILD ALTERNATIVE

	Daily Transit Trips			Peak Hour Transit Trips		
	Existing (1980)	No Build (1995)	Percent Change	Existing (1980)	No Build (1995)	Percent Change
Transit Trips made by residents from the following zones:						
Beaverton/Cedar Hills	7,900	13,000	65%	1,400	1,800	29%
Western Washington County	6,100	19,600	221	1,100	2,000	82
Southwest Portland	9,900	14,900	51	1,700	2,400	41
Northwest Portland/Sylvan	3,600	3,800	6	400	500	25
Transit trips made to opportunities within the following zones:						
Beaverton/Cedar Hills	3,700	10,800	192%	700	1,400	100%
Western Washington County	2,200	9,100	314	300	900	200
Southwest Portland	4,500	5,400	20	400	600	50
Northwest Portland/Sylvan	3,100	4,400	42	500	700	40
Downtown Portland	19,000	26,800	41	3,400	3,900	15
Transit trips made by residents between the following zones:						
Downtown Portland/Eastside and						
- Beaverton/Cedar Hills	6,400	6,800	6%	1,100	1,100	-%
- Western Washington County	4,100	10,700	161	700	1,000	43
- Southwest Portland	10,000	12,800	28	1,700	2,200	29
- Northwest Portland/Sylvan	3,900	4,300	10	500	700	40
Beaverton/Cedar Hills and						
- Western Washington County	1,300	4,200	223	300	500	67
- Southwest Portland	800	1,500	89	100	200	100

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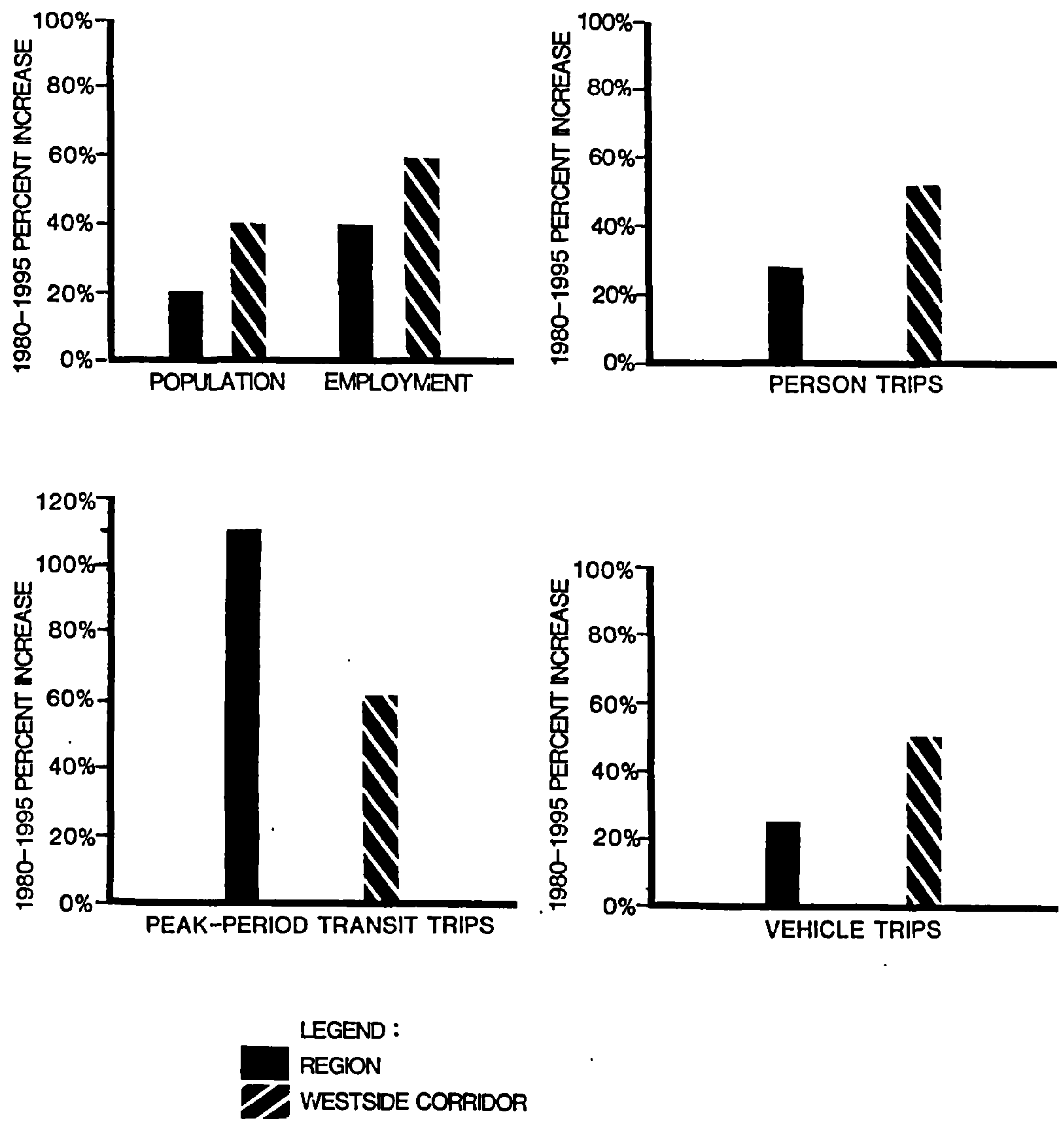

WESTSIDE CORRIDOR

FIGURE 3.2-3

1980-1995 NO-BUILD TRAVEL CHANGES IN THE PORTLAND REGION AND WESTSIDE CORRIDOR

TABLE 3.2-4

WESTSIDE CORRIDOR ROADWAY LEVELS OF SERVICE
NO BUILD ALTERNATIVE

Facility Type	Roadway Lane Miles Total	LOS A-D	Percent of Total	LOS E	Percent of Total	LOS F	Percent of Total
Freeways/Interstates	37.1	18.6	50%	7.1	19%	11.4	31%
Major Arterials	65.9	32.7	50%	10.9	17%	22.3	33%
Minor Arterials and Collectors	84.7	65.2	77%	13.2	16%	6.3	7%
TOTALS	187.7	116.5	62%	31.2	17%	40.0	21%

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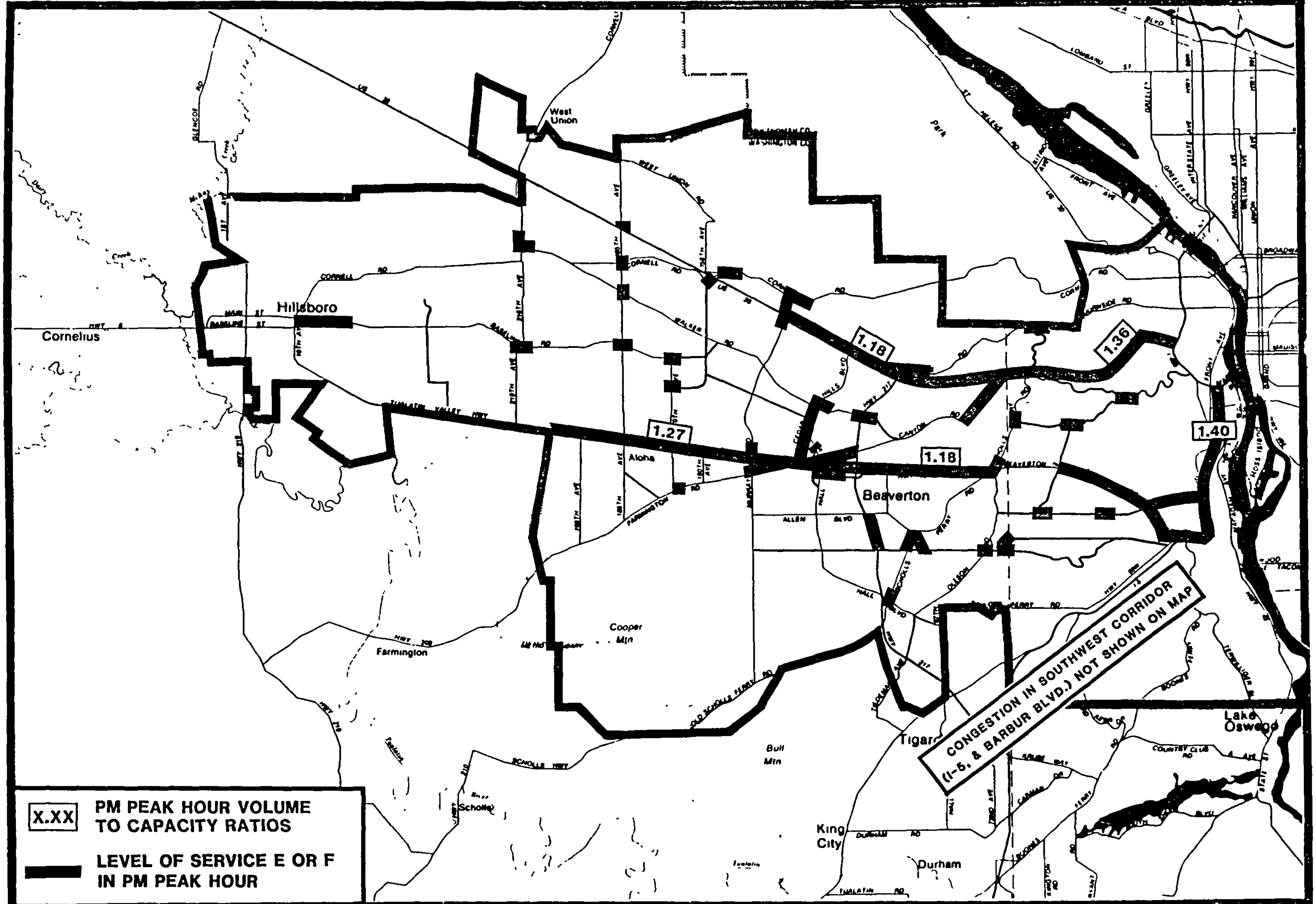

WESTSIDE CORRIDOR

FIGURE 3.2-4
1995 PM PEAK HOUR HIGHWAY CONGESTION WITH THE NO-BUILD ALTERNATIVE

The transit system on the Westside will reach its practical capacity prior to 1995. Service quality will deteriorate annually to the point where potential transit riders will not be served during peak hours because of overcrowding. Transit coverage of the developing areas west of Highway 217 will fall behind the service demands of the anticipated population and employment growth. Expansion of the transit system could not occur because existing transit facilities (i.e., transit centers and maintenance yards) would be unable to accommodate any increases under the No Build Alternative.

ALTERNATIVE 2: BUS SERVICE EXPANSION

The Bus Service Expansion Alternative proposes an increase in the coverage and frequency of bus service to the Westside, supplemented by a series of relatively low-cost capital improvements designed to increase the capacity and efficiency of Westside transit service. These improvements include additional transit centers at major activity points; extensive use of articulated buses on trunkline routes; and street and traffic control modifications giving preference to transit traffic at normally congested locations. A ramp metering system for the Sunset Highway and Highway 217 would be a critical element in expediting the flow of buses in this alternative by keeping traffic moving at a stable rate.

TRANSIT SERVICE AND DEMAND IMPACTS. Table 2.2-2 lists the 1995 operating statistics representative of the service levels for this alternative and compares them to the No Build case. As shown, peak period revenue bus hours and bus miles would increase 62 percent and 72 percent respectively over the No Build, while the number of articulated buses would quadruple. The door-to-door peak hour transit travel times in Table 3.2-5 indicate the travel time savings compared to the No Build case. The combination of reduced travel times and the increased transit capacity in relation to the No Build Alternative results in a dramatic increase in transit use. Overall, the Bus Service Expansion Alternative would account for a total of 96,100 daily corridor transit trips (327,300 trips regionwide), a 47 percent increase over the No Build case. Of these corridor trips, 15,500 would occur in the peak hour. The gains in transit trips (Table 3.2-6) are most noticeable for trips produced by or attracted to the Beaverton/Cedar Hills, western Washington County and Downtown Portland areas. Transit would comprise 14.7 percent of the Westside Corridor's travel during the peak hour and 9.1 percent of its daily trips.

HIGHWAY IMPACTS. While the projection of peak hour auto trips is less than the No Build, the number of auto trips by 1995 would still be greater than the existing situation and would produce congestion on the corridor roadway system. The implementation of traffic management measures to facilitate transit movements, however, would also be beneficial to other roadway traffic. Compared to the No Build situation, travel conditions would improve on Burnside Road and the Beaverton-Hillsdale Highway. Travel conditions on facilities accessing Beaverton such as Barnes Road, Walker Road, Canyon Road, Beaverton-Hillsdale Highway, Allen Boulevard and Denny Road would be level of service D. East/west and north/south facilities in eastern Washington County and major intersections throughout the corridor would experience some isolated congestion.

TABLE 3.2-5 PEAK HOUR TRAVEL TIMES[1] BETWEEN SELECTED AREAS FOR THE BUS SERVICE EXPANSION ALTERNATIVE (BSE)

	Transit Times		Highway Times	
	BSE	% Change from No Build	BSE	% Change from No Build
Downtown Portland and 35th/Multnomah	33	- 6%	17	-23%
Downtown Portland and Cedar Hills	28	-35%	18	-40%
Downtown Portland and Beaverton	34	-37%	24	-37%
Downtown Portland and Hillsboro	60	-29%	38	-32%
35th/Multnomah and Beaverton	28	- 7%	12	- 8%
35th/Multnomah and Hillsboro	63	-19%	42	-13%
Cedar Hills and Beaverton	19	-24%	6	-25%
Cedar Hills and Hillsboro	32	-33%	27	-18%
Beaverton and Hillsboro	39	-24%	27	-18%

[1] Includes wait time, transfer time and line-haul time

TABLE 3.2-6

WESTSIDE CORRIDOR TRAVEL DEMAND
BUS SERVICE EXPANSION ALTERNATIVE

	Daily Trips	% Change from No Build	Peak Hour Trips	% Change from No Build
Transit Trips made by residents from the following zones:				
Beaverton/Cedar Hills	22,300	72%	3,600	100%
Western Washington County	33,300	70	5,400	170
Southwest Portland	17,100	15	2,800	17
Northwest Portland/Sylvan	4,900	29	700	40
Transit trips made to opportunities within the following zones:				
Beaverton/Cedar Hills	13,700	27%	2,000	43%
Western Washington County	11,700	29	1,500	67
Southwest Portland	6,000	11	700	17
Northwest Portland/Sylvan	4,900	11	900	29
Downtown Portland	49,700	85	8,100	108
Transit trips made by residents between the following zones:				
Downtown Portland/Eastside and				
- Beaverton/Cedar Hills	14,400	112%	2,600	136%
- Western Washington County	20,100	88	3,400	240
- Southwest Portland	15,000	17	2,500	14
- Northwest Portland/Sylvan	5,300	23	900	29
Beaverton/Cedar Hills and				
- Western Washington County	6,100	45	900	80
- Southwest Portland	1,700	13	200	-

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The congestion attributable to this alternative is summarized in Table 3.2-7, which lists the number of lane miles of roadway by facility type for various levels of service. As shown, by 1995, there would be a total of 18.9 lane miles operating below level of service D in the Westside. This is a reduction of 73 percent from the No Build. Figure 3.2-5 illustrates the major changes in congestion between this alternative and the No Build case. The traffic management measures and projected transit ridership would reduce the burden of congestion in the Westside roadway network below that of the No Build case; however, additional roadway improvements would be needed to achieve a minimum level of service D throughout the corridor. The Bus Service Expansion Alternative would reduce the cost of additional highway projects needed to achieve level of service D on corridor roadways by about $150 million.

SYSTEM IMPLICATIONS. The transit capacity provided by the Bus Service Expansion Alternative is sufficient to accommodate the expected patronage demand to 1995 and reduces the need for several highway projects that could have adverse environmental impacts. Transit service coverage will respond to the developing areas west of Highway 217 and double the availability of bus service to these areas. Coupled with the improvements to the highway system (i.e., ramp metering and bus priority measures), schedule reliability and operating characteristics should improve over the No Build Alternative, especially on the transit trunk routes on Sunset Highway. However, delay to Sunset trunkline buses will occur sporadically due to adverse weather conditions and traffic accidents or breakdowns.

The capital components of the Bus Service Expansion Alternative (transit centers, maintenance yards and park-and-ride lots) offer transit expansion capabilities on the Westside with reduced levels of additional capital investments. These expansion capabilities are limited by the capacity for additional bus movements in Downtown Portland and central Beaverton. Operating costs would increase nearly proportionately with the increase in bus service.

The Bus Service Expansion Alternative offers flexibility to adapt to land use changes by modifying bus routes and schedules. It also provides the basis for implementing a busway or LRT facility by creating the transit centers and park-and-ride lots that would be necessary for these more capital-intensive projects.

ALTERNATIVE 3: SUNSET BUSWAY

The Sunset Busway Alternative offers a capital intensive all-bus strategy for improving Westside transit service. The primary departure from the Bus Service Expansion Alternative is the construction of a two-lane busway with stations along Highway 217 and the Sunset Highway between Beaverton and Downtown Portland to accommodate trunkline bus traffic and preserve schedule reliability. Otherwise, it contains the same features as the foregoing alternative, including additional transit centers at major activity points, extensive use of articulated buses on trunkline routes, and street and traffic control modifications giving preference to transit traffic at normally congested locations.

TABLE 3.2-7

WESTSIDE CORRIDOR ROADWAY LEVELS OF SERVICE
BUS SERVICE EXPANSION ALTERNATIVE

Facility Type	Roadway Lane Miles: Total	LOS A-D	% Change from No Build	LOS E	% Change from No Build	LOS F	% Change from No Build
Freeways/Interstates	37.1	37.1	99%	0	-100%	0	-100%
Major Arterials	65.9	55.4	69%	7.0	-36%	3.5	-84%
Minor Arterials and Collectors	84.7	76.3	17%	5.7	-57%	2.7	-57%
TOTALS	187.7	168.8	45%	12.7	-60%	6.2	-85%

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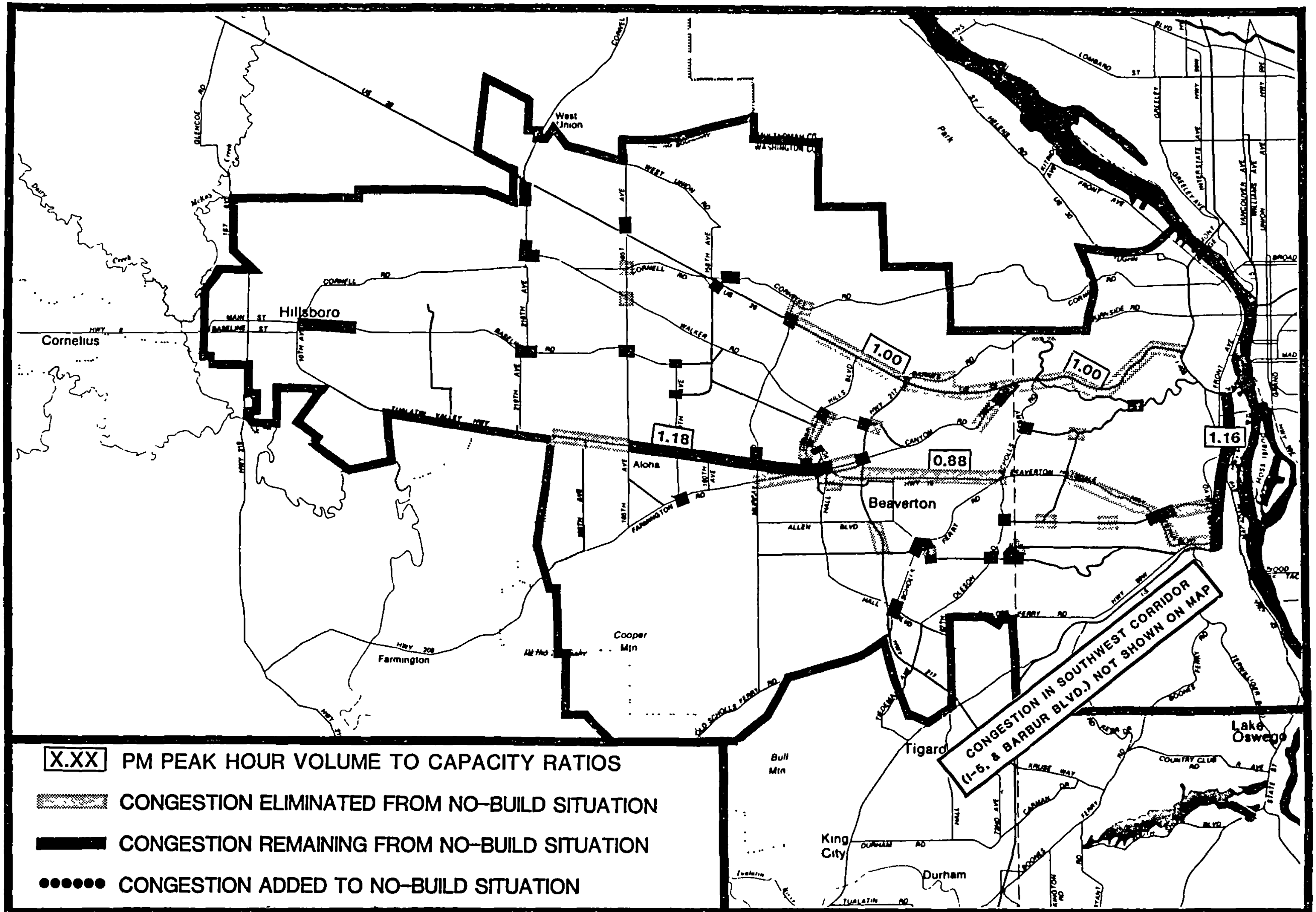

WESTSIDE CORRIDOR

FIGURE 3.2-5

PM PEAK HOUR TRAFFIC SERVICE LEVEL IMPACTS OF THE BUS SERVICE EXPANSION ALTERNATIVE

TRANSIT SERVICE AND DEMAND IMPACTS. The service provided by the Sunset Busway Alternative would be nearly identical to that described for the Bus Service Expansion Alternative: providing a substantial increase of transit service in the Westside over the No Build case. The 1995 operating statistics representing this service, which are listed in Table 2.2-3, also nearly replicate the Bus Service Expansion Alternative results. As indicated, peak period revenue bus hours and bus miles would increase 62 percent and 71 percent respectively over the No Build, while the number of articulated buses would similarly quadruple.

Besides construction of the busway, this alternative includes the implementation of traffic management improvements along major transit routes, in the vicinity of transit centers and access roads to the busway, and in Downtown Portland and Beaverton. The busway avoids a number of congested locations and collectively with the traffic management improvements, reduces bus travel times and increases schedule reliability compared to the No Build case. As indicated in Table 3.2-8 this reduction ranges from five to 41 percent for door-to-door peak hour travel between selected areas, which is only a marginal improvement over the Bus Service Expansion Alternative.

Since the service levels and characteristics are nearly identical to the Bus Service Expansion Alternative, similar attraction to transit should be expected. As shown in Table 3.2-9, the Sunset Busway Alternative would generate a major increase in transit travel on the Westside in comparison to the No Build. The largest gains in transit trips occur in trips produced by or attracted to the Beaverton/Cedar Hills, western Washington County and Downtown Portland areas. Contrasted to the Bus Service Expansion Alternative, this alternative would increase transit travel attributable to the Beaverton/Cedar Hills area by about ten percent. Overall, the busway alternative would generate approximately 97,800 total daily corridor transit trips (15,900 peak hour trips) for an increase of 50 percent over the No Build Alternative and two percent more than the Bus Service Expansion Alternative. On an all-day basis, approximately 45,900 trips will be made on the busway. The peak hour link volumes and station boardings for the busway are shown in Figure 3.2-6. Transit would comprise 15.2 percent of the Westside Corridor's trips in the peak hour and 9.3 percent of its daily trips.

HIGHWAY IMPACTS. The Sunset Busway Alternative provides nearly equivalent transit service to the Westside as the Bus Service Expansion Alternative. Therefore, the forecasts for auto person trips are also similar. Despite the construction of the busway, the implementation of traffic management improvements, and the high volume of transit use, some congestion would still occur, attributable to an increase of 13,300 peak hour vehicle trips over the present situation. This would occur in the same locations as the Bus Service Expansion Alternative. Table 3.2-10 summarizes this congestion by measuring the lane miles of roadway by facility type for various levels of service. As indicated, there would be a total of 18.9 lane miles operating below level of service D in the Westside in 1995, the same decrease as the Bus Service Expansion Alternative. Figure 3.2-7, which illustrates the major changes in congestion between this alternative and the No Build case, is virtually identical to the same representation for the Bus Service Expansion Alternative. The same additional roadway improvements needed for the Bus Service Expansion Alternative would be needed to achieve a minimum level of service D throughout the corridor.

TABLE: 3.2-8 PEAK HOUR TRAVEL TIMES[1] BETWEEN SELECTED AREAS FOR THE SUNSET BUSWAY ALTERNATIVE

	Transit Times: Sunset Busway	Transit Times: % Change from No Build	Highway Times: Sunset Busway	Highway Times: % Change from No Build
Downtown Portland and 35th/Multnomah	33	- 6%	17	-23%
Downtown Portland and Cedar Hills	26	-40%	18	-40%
Downtown Portland and Beaverton	32	-41%	24	-37%
Downtown Portland and Hillsboro	58	-32%	38	-32%
35th/Multnomah and Beaverton	28	- 7%	12	- 8%
35th/Multnomah and Hillsboro	63	-19%	42	-13%
Cedar Hills and Beaverton	17	-32%	6	-25%
Cedar Hills and Hillsboro	32	-33%	27	-18%
Beaverton and Hillsboro	39	-24%	27	-18%

[1]Includes wait time, transfer time and line-haul time

TABLE 3.2-9

WESTSIDE CORRIDOR TRAVEL DEMAND
SUNSET BUSWAY ALTERNATIVE

	Daily Trips	% Change from No Build	Peak Hour Trips	% Change from No Build
Transit Trips made by residents from the following zones:				
Beaverton/Cedar Hills	23,800	83%	3,800	111%
Western Washington County	33,900	73	5,500	175
Southwest Portland	16,600	11	2,800	17
Northwest Portland/Sylvan	5,000	32	700	40
Transit trips made to opportunities within the following zones:				
Beaverton/Cedar Hills	15,200	41%	2,200	57%
Western Washington County	11,500	26	1,500	67
Southwest Portland	5,900	9	700	17
Northwest Portland/Sylvan	5,000	14	900	29
Downtown Portland	49,900	86	8,200	110
Transit trips made by residents between the following zones:				
Downtown Portland/Eastside and				
- Beaverton/Cedar Hills	15,200	124%	2,700	145%
- Western Washington County	19,900	86	3,400	240
- Southwest Portland	14,500	13	2,500	14
- Northwest Portland/Sylvan	5,300	23	900	29
Beaverton/Cedar Hills and				
- Western Washington County	6,700	60	1,000	100
- Southwest Portland	1,800	20	200	-

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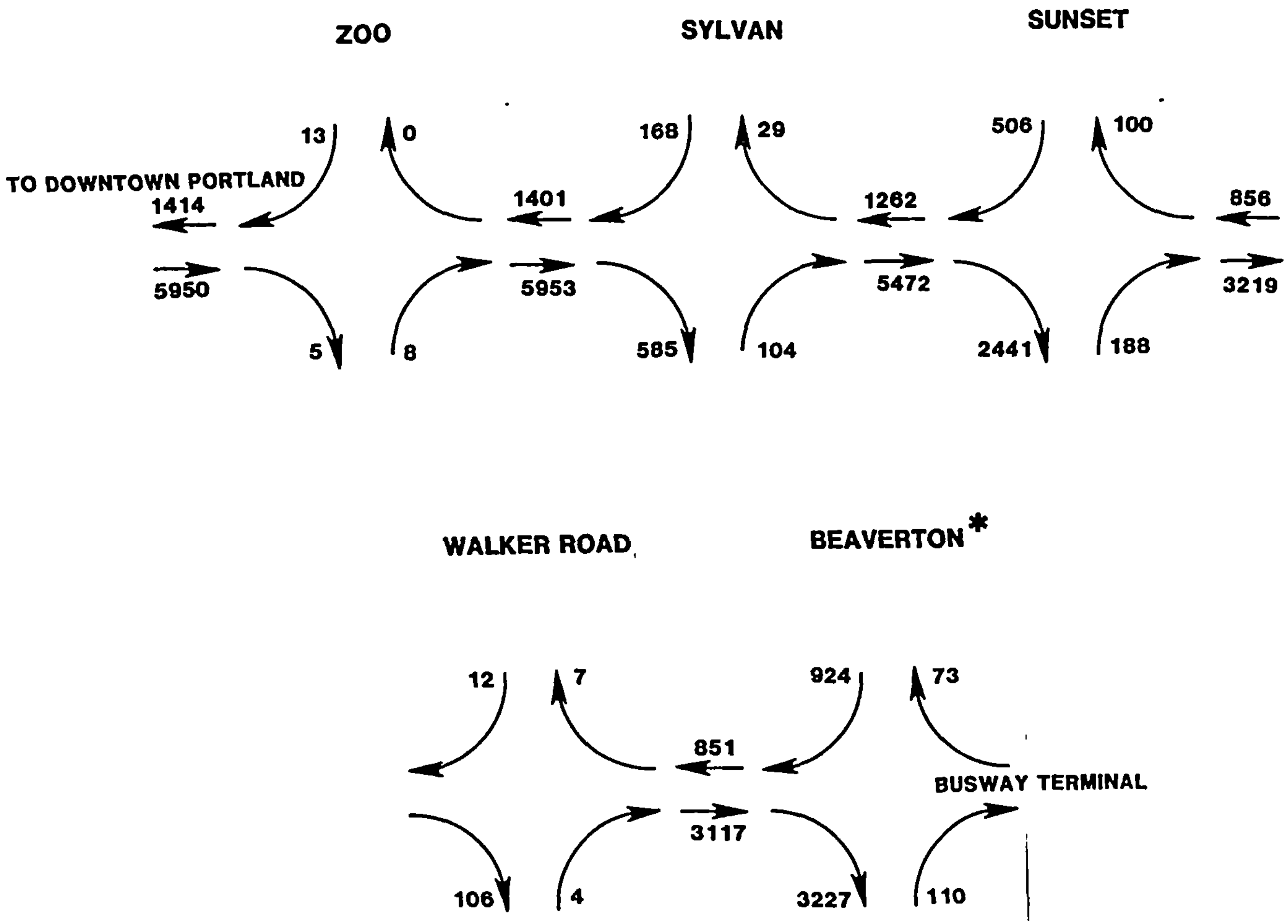
SUNSET BUSWAY



*"BEAVERTON" Includes All Stations In the Central Beaverton Area

WESTSIDE CORRIDOR

FIGURE 3.2-6

PM PEAK HOUR STATION LOADINGS AND LINK VOLUMES FOR THE SUNSET BUSWAY ALTERNATIVE

TABLE 3.2-10

WESTSIDE CORRIDOR ROADWAY LEVELS OF SERVICE
SUNSET BUSWAY ALTERNATIVE

	Roadway Lane Miles						
Facility Type	Total	LOS A-D	% Change from No Build	LOS E	% Change from No Build	LOS F	% Change from No Build
Freeways/Interstates	37.1	37.1	99%	0	-100%	0	-100%
Major Arterials	65.9	55.4	69%	7.0	-36%	3.5	-84%
Minor Arterials and Collectors	84.7	76.3	17%	5.7	-57%	2.7	-57%
TOTALS	187.7	168.8	45%	12.7	-60%	6.2	-85%

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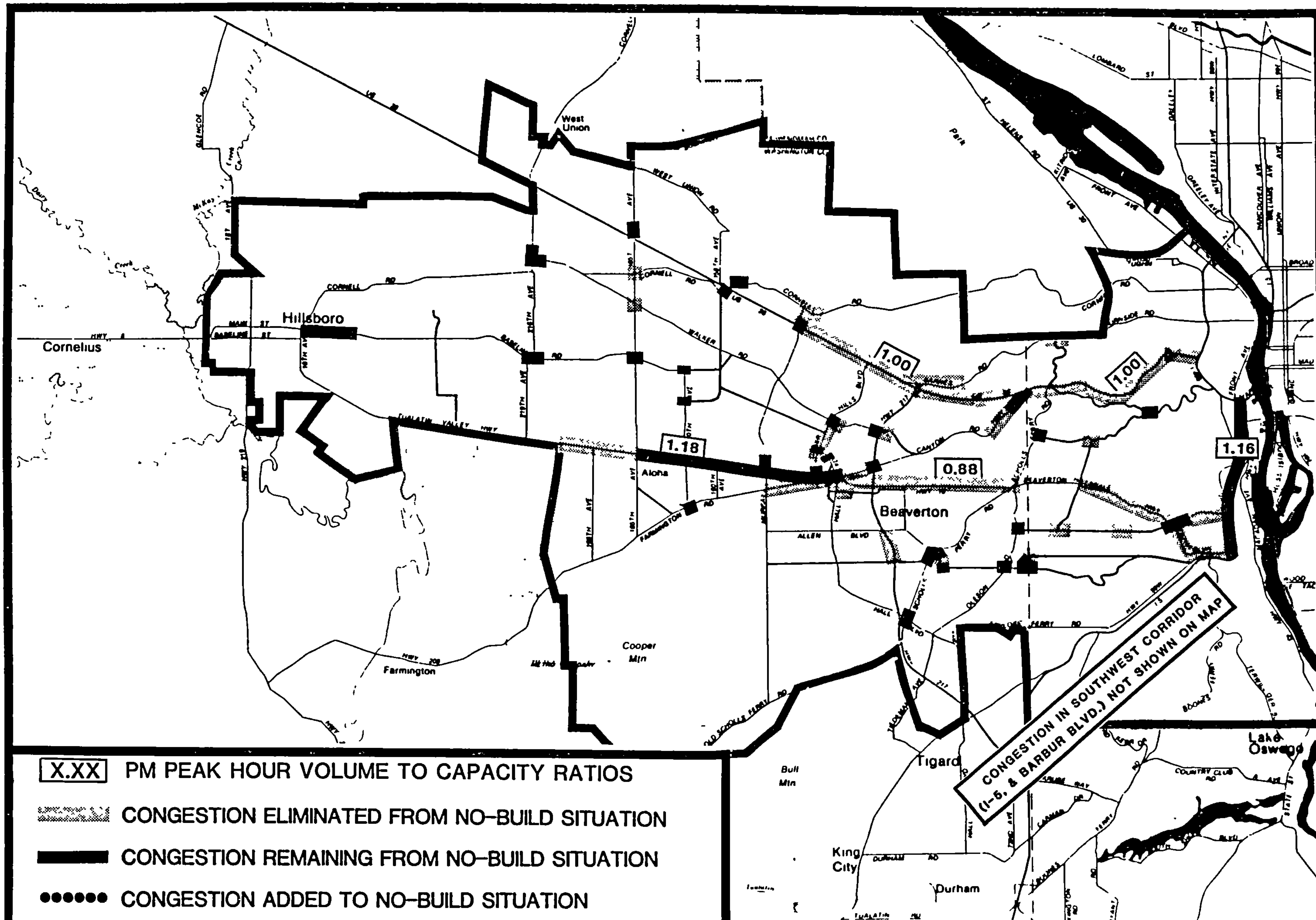


WESTSIDE CORRIDOR

FIGURE 3.2-7
PM PEAK HOUR TRAFFIC SERVICE LEVEL IMPACTS OF THE SUNSET BUSWAY ALTERNATIVE

SYSTEM IMPLICATIONS. The Sunset Busway Alternative would exhibit similar sensitivities to patronage demand as the previous alternative but it would be better equipped to accommodate passenger growth over the long-term than the Bus Service Expansion Alternative. Moreover, with an exclusive roadway, bus service reliability would not fluctuate with changing traffic conditions on Westside highways and arterials between Downtown Portland and Beaverton. In addition, the busway could be used as a High Occupancy Vehicle (carpool) lane if the situation warranted. Transit system expansion opportunities with the Sunset Busway Alternative would basically reflect those of the Bus Service Expansion Alternative. The busway facility itself, however, does offer the opportunity to convert to a light rail facility in the Portland to Beaverton sequences with less additional capital cost since the exclusive right-of-way would be established.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

The Sunset LRT Alternative would provide an exclusive rail transit facility between Downtown Portland and Beaverton along the Sunset Highway and Highway 217 and, unlike the busway, would extend northwest from Beaverton to 185th Avenue. New transit centers would be established, some of which would also be rail stations. Traffic management measures would be implemented to facilitate transit movements on major routes in the vicinity of transit centers and rail stations and in Downtown Portland and Beaverton.

TRANSIT SERVICE AND DEMAND IMPACTS. The Sunset Light Rail Alternative would concentrate corridor travel on the rail facility, limiting buses on the Westside to predominantly rail feeder and local circulation service. In total, buses would provide service over 309 miles of Westside streets while the light rail facility would extend for 12.2 miles.

Rail transit service would be operated by two-car trains and would be through-routed with the Banfield LRT in the Eastside. By 1995, peak hour frequencies averaging three minutes would be maintained between Downtown Portland and Central Beaverton and six minutes west of Beaverton. Frequencies of 5 to 7.5 minutes would be operated midday and would not exceed 30 minutes during other off-peak times. Nearly half of the buses serving the corridor would operate at 15-minute intervals, while the remainder would run every 30 minutes. No buses would travel on the Sunset Highway. Off-peak bus service would operate every 30 minutes on most routes.

Representative 1995 operating statistics for this alternative, which are shown in Table 2.2-4 constitute a significant service expansion above the No Build case. The bus component of this service alone would be greater than that provided by the No Build, exceeding peak period revenue bus hours and bus miles for the No Build by 17 percent and 15 percent respectively. The articulated bus fleet for this alternative would be 57 percent larger. The rail service in the Westside does not have a counterpart in the No Build for comparision. The Sunset light rail facility would provide faster trunkline service through the corridor than any all-bus system because of its separate right-of-way and higher-performing vehicle (better acceleration/deceleration characteristics, especially up the six percent grade on Sunset Highway). However, many trips would originate or terminate away from the corridor, requiring a transfer to or from a local bus. Table 3.2-11 lists the peak hour transit travel times

TABLE: 3.2-11 PEAK HOUR TRAVEL TIMES[1] BETWEEN SELECTED AREAS FOR THE SUNSET LRT ALTERNATIVE

	Transit Times		Highway Times	
	Sunset LRT	% Change from No Build	Sunset LRT	% Change from No Build
Downtown Portland and 35th/Multnomah	33	- 6%	17	-23%
Downtown Portland and Cedar Hills	22	-49%	18	-40%
Downtown Portland and Beaverton	26	-52%	24	-37%
Downtown Portland and Hillsboro	55	-35%	38	-32%
35th/Multnomah and Beaverton	28	- 7%	12	- 8%
35th/Multnomah and Hillsboro	61	-22%	42	-13%
Cedar Hills and Beaverton	14	-44%	6	-25%
Cedar Hills and Hillsboro	32	-33%	27	-18%
Beaverton and Hillsboro	31	-39%	27	-18%

[1]Includes wait time, transfer time and line-haul time

for trips between several selected areas. Some could be made totally on the rail line while others would involve a transfer. Compared to the No Build, these travel times would be seven percent to 71 percent less for similar trips.

The Sunset LRT Alternative would exhibit an increase in ridership over the previous two bus alternatives. As shown in Table 3.2-12, it would generate the highest Westside transit use among the alternatives for trips produced by or attracted to Beaverton/Cedar Hills, western Washington County, and trips between these two areas and Downtown Portland. Overall, this alternative would generate a total of 104,900 daily corridor transit trips (17,200 peak hour), a 60 percent increase over the No Build case. On an all-day basis, the Sunset LRT would carry 51,400 trips. The peak hour link volumes and station boardings are shown in Figure 3.2-8. Transit would comprise 16.3 percent of the Westside Corridor's travel during the peak hour and ten percent of its daily trips. Systemwide ridership in 1995 would total 339,900 daily riders.

HIGHWAY IMPACTS. Because of its high transit ridership attraction, the Sunset Light Rail Transit Alternative would experience among the lowest levels of auto usage. Even with the reduced growth in auto usage resulting from this alternative, 13,000 more peak hour vehicle trips would occur in 1995 than presently, resulting in traffic congestion at a number of locations throughout the corridor. Travel conditions would improve over the No Build situation on Burnside Road, the Beaverton-Hillsdale Highway and Patton Road. Travel conditions on facilities accessing Beaverton would also improve from the No Build forecast, with acceptable conditions on Barnes Road, Walker Road, Canyon Road, the Beaverton-Hillsdale Highway, Allen Boulevard and Denny Road. There would be some isolated congestion at major intersections throughout the corridor. The congestion attributable to this alternative is summarized in Table 3.2-13 which lists the number of lane miles of roadway by facility type for various levels of service. As shown, by 1995 there could be a total of 18.7 lane miles operating below level of service D in the Westside. This is a reduction of 90 percent from the No Build. Figure 3.2-9 illustrates the major changes in congestion between this alternative and the No Build case. While the Sunset Light Rail Transit Alternative would reduce the impact of highway congestion on the Westside below the No Build case, additional roadway improvements would be needed to achieve a minimum level of service D throughout the corridor. These improvements would be the same as those for the Bus Service Expansion Alternative.

SYSTEM IMPLICATIONS. The Sunset LRT Alternative provides sufficient transit capacity and coverage to respond to the long-term Westside transit demand. The light rail component of this alternative between Portland and 185th Avenue would offer high speed and reliable transit service between these points. Modifications to bus service would result in shorter bus route configurations to feed the LRT trunkline and more reliable bus service would result. Transit service coverage would be higher than either bus alternative with the addition of transit stations to serve the LRT line.

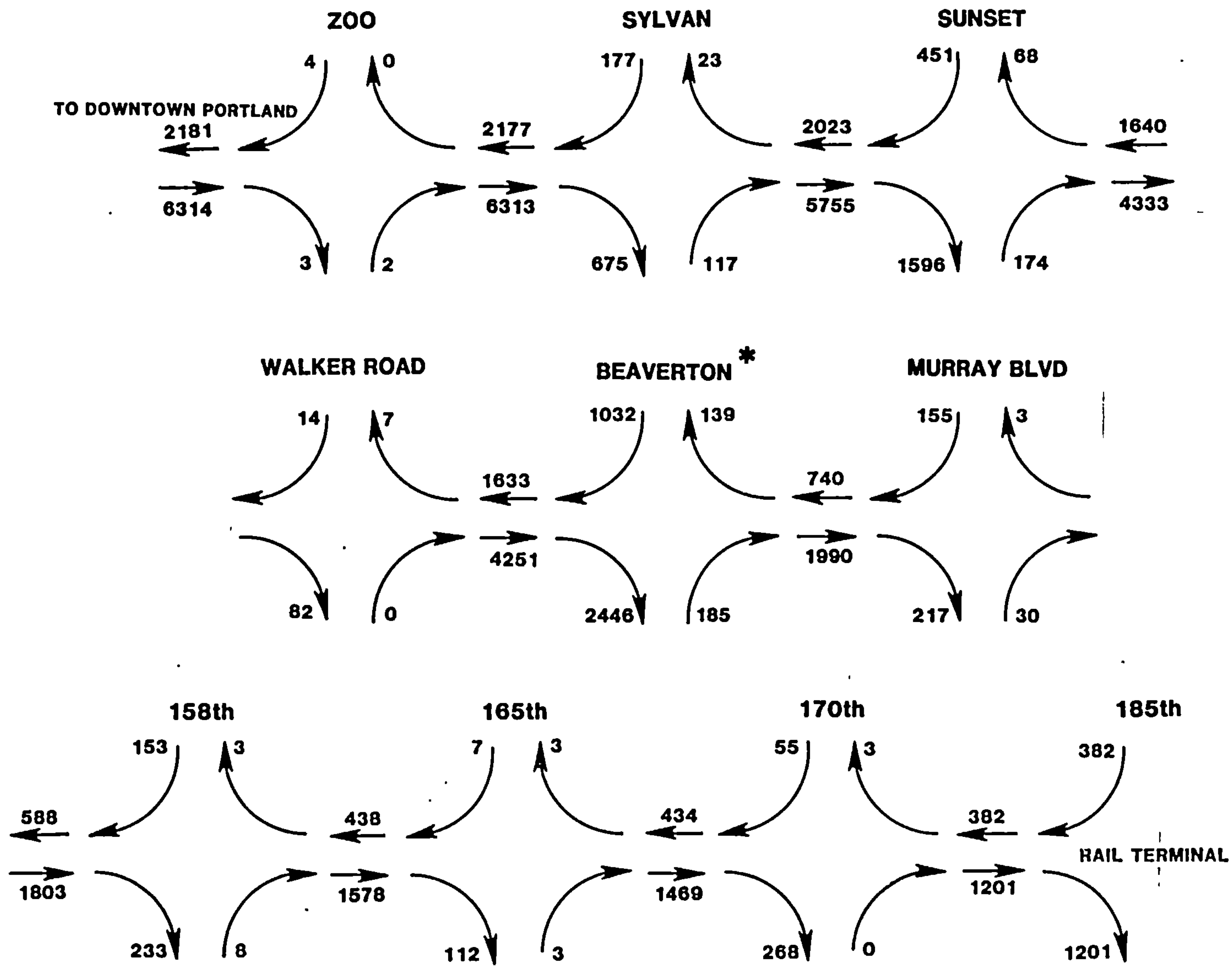
Modifications to the Portland Transit Mall would be required to accommodate the LRT line. The LRT line would, however, reduce bus volumes in Downtown Portland. The Beaverton Transit Center would be expanded or relocated to respond to the mix of bus and LRT service through the site.

TABLE 3.2-12

WESTSIDE CORRIDOR TRAVEL DEMAND
SUNSET LIGHT RAIL TRANSIT ALTERNATIVE

	Daily Trips	% Change from No Build	Peak Hour Trips	% Change from No Build
Transit Trips made by residents from the following zones:				
Beaverton/Cedar Hills	24,700	90%	4,000	122%
Western Washington County	37,100	89	6,000	200
Southwest Portland	18,000	21	2,800	17
Northwest Portland/Sylvan	5,100	34	700	40
Transit trips made to opportunities within the following zones:				
Beaverton/Cedar Hills	17,000	57%	2,500	79%
Western Washington County	13,500	48	1,700	89
Southwest Portland	6,300	17	700	17
Northwest Portland/Sylvan	5,600	27	1,000	43
Downtown Portland	50,800	90	8,200	110
Transit trips made by residents between the following zones:				
Downtown Portland/Eastside and				
- Beaverton/Cedar Hills	16,100	137%	2,900	163%
- Western Washington County	21,800	104	3,700	270
- Southwest Portland	15,500	21	2,500	14
- Northwest Portland/Sylvan	5,300	23	900	29
Beaverton/Cedar Hills and				
- Western Washington County	7,900	88	1,200	140
- Southwest Portland	2,000	33	200	-

SUNSET LIGHT RAIL



*"BEAVERTON" Includes All Stations In the Central Beaverton Area.

WESTSIDE CORRIDOR

FIGURE 3.2-8

PM PEAK HOUR STATION LOADINGS AND LINK VOLUMES FOR THE SUNSET LRT ALTERNATIVE

TABLE 3.2-13

WESTSIDE CORRIDOR ROADWAY LEVELS OF SERVICE
SUNSET LIGHT RAIL TRANSIT ALTERNATIVE

	Roadway Lane Miles						
Facility Type	Total	LOS A-D	% Change from No Build	LOS E	% Change from No Build	LOS F	% Change from No Build
Freeways/Interstates	37.1	37.1	99%	0	-100%	0	-100%
Major Arterials	65.9	56.0	71%	7.0	-36%	2.9	-87%
Minor Arterials and Collectors	84.7	76.3	17%	6.1	-54%	2.3	-63%
TOTALS	187.7	169.4	45%	13.2	-58%	5.2	-87%

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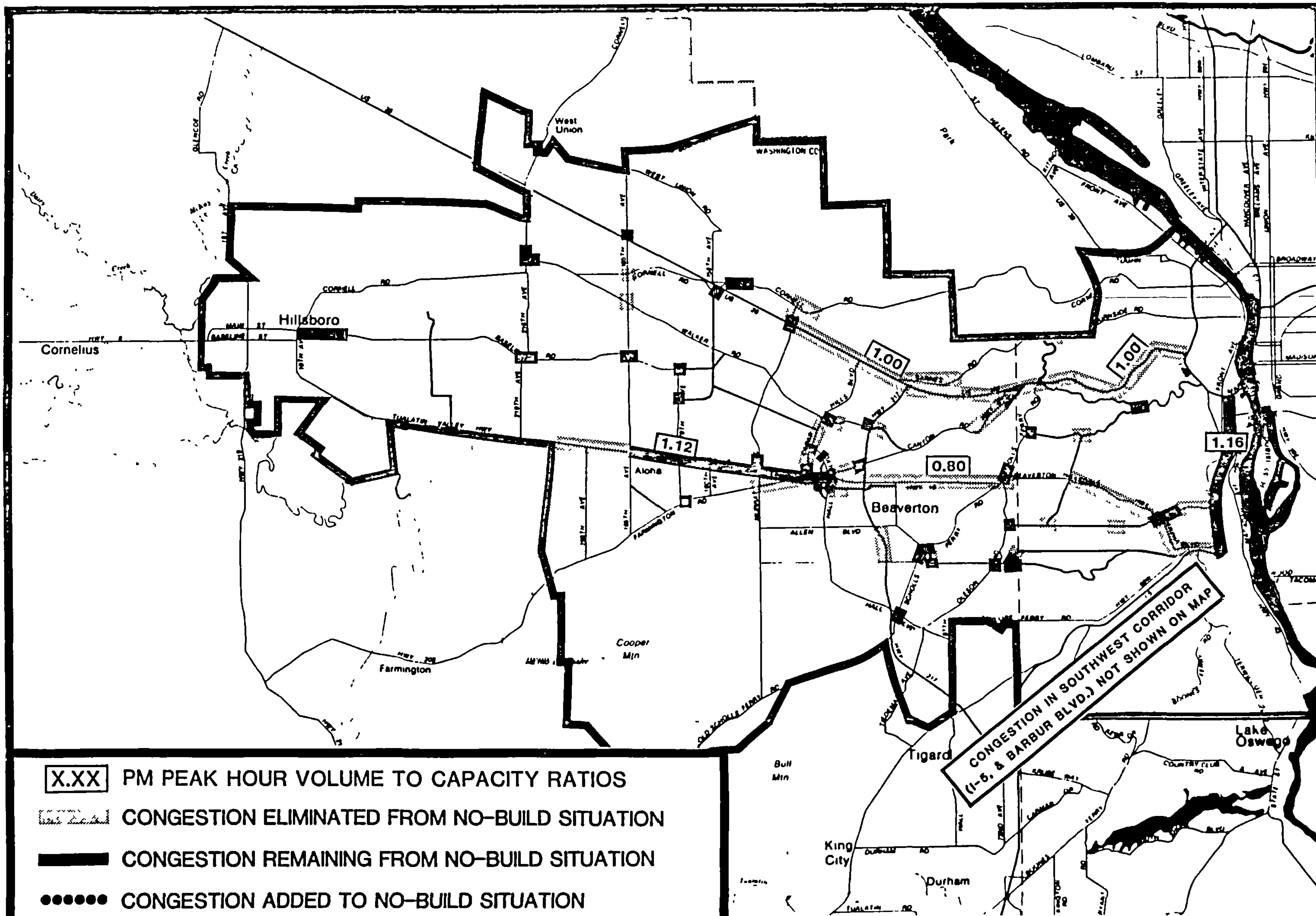

WESTSIDE CORRIDOR

FIGURE 3.2-9
PM PEAK HOUR TRAFFIC SERVICE LEVEL IMPACTS OF THE SUNSET LRT ALTERNATIVE

The Sunset LRT is capable of expanding to accommodate passenger growth over the long term with reduced capital requirements. Additional costs related to system expansion are normally limited to the purchase of new vehicles and perhaps some enhancements to support facilities. The Sunset LRT Transit stations have been designed to accommodate longer rail trains than would initially operate on the system and would therefore be equipped to respond to system expansions. If land use develops at lower densities than planned, however, the effectiveness of the system would be diminished.

Perhaps most important is that significant increases in capacity can be achieved without commensurate growth in operating costs. Rail service envisioned for the Westside for 1995 would consist of two-car trains operating at average three-minute headways during peak periods, which empirically converts to a line capacity of 6,400 passengers per hour assuming 160 passengers per car. Doubling train length to four cars would likewise double the hourly capacity, but with one-person train operation and self-service fare collection, no additional train operators would be required. Thus, in general, rail service is less labor intensive and becomes more efficient as capacity increases.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

The Multnomah Light Rail Transit Alternative would provide an exclusive rail transit facility between Downtown Portland and Beaverton in a more southwesterly route than the Sunset Alternative; however, northwest from Beaverton to 185th Avenue, the alignments would be identical. New transit centers would be established, some of which would also be rail stations. Traffic management measures would be implemented to facilitate movements on major routes, in the vicinity of transit centers and rail stations, and in Downtown Portland and Beaverton.

TRANSIT SERVICE AND DEMAND IMPACTS. Like the Sunset LRT Alternative, the Multnomah Light Rail Transit Alternative would concentrate corridor travel on the rail facility, limiting buses on the Westside to predominantly rail feeder and local circulation service. The exception would be service to the Cedar Hills area and west which would be provided by buses operating in mixed traffic on the Sunset Highway to Downtown Portland. This latter trunkline service would be required since transferring to the rail line from this area for travel to Downtown Portland would result in a circuitous trip. In total, buses would operate over 319 miles of streets in the Westside, while the light rail facility would extend 15.5 miles, 3.3 miles longer than its Sunset counterpart.

Rail service on the Multnomah route would be the same as that provided on the Sunset. Frequencies of the respective bus routes would also be similar. Operating statistics representing these service levels for 1995 are listed in Table 2.2-5. The bus component would exceed the No Build Alternative by 19 percent and 16 percent for peak hour revenue bus hours and bus miles respectively. In comparison to the Sunset Light Rail Transit Alternative, rail statistics are significantly greater for the Multnomah Alternative because, even though the same level of service would be provided, it is a longer and slower rail route.

The Multnomah Light Rail Transit Alternative is based on the same service concept as the Sunset Light Rail Transit Alternative, whereby the rail line would be used as a trunkline route and buses would be employed for feeder and local circulation service. However, the Multnomah route is longer and has more speed restrictions than the Sunset alignment, resulting in greater transit travel times for most trips between similar endpoints. While travel times are more attractive than the No Build by two to 43 percent (as shown in Table 3.2-14), when compared to the Sunset LRT, the Multnomah service would require 14 more minutes for trips between Downtown Portland and Beaverton and beyond. It would be 12 minutes shorter, however, for service to the 35th Avenue/Multnomah Boulevard area.

As with the other build alternatives, the Multnomah Light Rail Transit Alternative would experience a dramatic growth in transit ridership over the No Build case. As shown in Table 3.2-15, this alternative closely follows the Sunset Light Rail Transit Alternative for the greatest increase in transit trips produced by or attracted to the Beaverton/Cedar Hills and western Washington County areas and trips between these two areas and Downtown Portland. A significant difference between the two rail alternatives though is that, due to its southerly location within the Westside Corridor, the Multnomah Alternative attracts a larger number of trips from the southwest area. In fact, this alternative generates greater transit demand from the southwest than any of the other build alternatives. Overall, the Multnomah Light Rail Transit Alternative would experience the highest daily corridor ridership of 106,400 trips (regionwide ridership totals 339,900), which is 63 percent more than the No Build Alternative and virtually the same as the Sunset Light Rail Transit Alternative. Because of the characteristics of the service, the peak hour corridor ridership would be 17,100, slightly lower than the Sunset LRT Alternative. On an all-day basis the light rail would carry 48,700 trips. The peak hour link volumes and station loadings are shown in Figure 3.2-10. Transit would comprise 16.2 percent of the Westside Corridor's peak hour travel and 10.2 percent of its all-day trips.

HIGHWAY IMPACTS. Like the Sunset Light Rail Transit Alternative, the transit improvements included in the Multnomah Alternative would reduce auto travel as compared with the No Build circumstance. A forecast of 69,600 peak hour vehicle trips by 1995 would cause a six percent reduction in vehicle trips compared to the No Build Alternative. The congestion attributable to this alternative is summarized in Table 3.2-16, which lists the number of lane miles of roadway by facility type for various levels of service. As shown, by 1995 there would be a total of 19.9 lane miles operating below level of service D on the Westside. This is a reduction of 89 percent from the No Build. Figure 3.2-11 illustrates the major changes in congestion between this alternative and the No Build case. In addition to the transit improvements and traffic management measures proposed by this alternative, supplemental roadway projects would be necessary in order to achieve a minimum level of service D throughout the corridor. These projects are the same as those required for the other build alternatives.

SYSTEM IMPLICATIONS. The responsiveness to long-term demand and uncertainties with the Multnomah LRT Alternative is similar to that for its Sunset counterpart. One additional advantage of the Multnomah Alternative, however, is that it would provide an established rail route to Downtown Portland from potential new rail corridors extending to the south and southwest.

TABLE: 3.2-14 PEAK HOUR TRAVEL TIMES[1] BETWEEN SELECTED AREAS FOR THE MULTNOMAH LRT ALTERNATIVE

	Transit Times		Highway Times	
	Multnomah LRT	% Change from No Build	Multnomah LRT	% Change from No Build
Downtown Portland and 35th/Multnomah	24	-31%	17	-23%
Downtown Portland and Cedar Hills	28	-35%	18	-40%
Downtown Portland and Beaverton	34	-37%	24	-37%
Downtown Portland and Hillsboro	60	-29%	38	-32%
35th/Multnomah and Beaverton	19	-37%	12	- 8%
35th/Multnomah and Hillsboro	52	-33%	42	-13%
Cedar Hills and Beaverton	19	-24%	6	-25%
Cedar Hills and Hillsboro	32	-33%	27	-18%
Beaverton and Hillsboro	31	-39%	27	-18%

[1]Includes wait time, transfer time and line-haul time

TABLE 3.2- 15

WESTSIDE CORRIDOR TRAVEL DEMAND
MULTNOMAH LIGHT RAIL TRANSIT ALTERNATIVE

	Daily Trips	% Change from No Build	Peak Hour Trips	% Change from No Build
Transit Trips made by residents from the following zones:				
Beaverton/Cedar Hills	24,000	85%	3,800	111%
Western Washington County	36,000	84	5,700	185
Southwest Portland	21,800	46	3,500	46
Northwest Portland/Sylvan	4,500	18	700	40
Transit trips made to opportunities within the following zones:				
Beaverton/Cedar Hills	16,200	50%	2,400	71%
Western Washington County	13,400	47	1,700	89
Southwest Portland	7,900	46	1,200	100
Northwest Portland/Sylvan	4,700	7	800	14
Downtown Portland	53,400	99	8,600	121
Transit trips made by residents between the following zones:				
Downtown Portland/Eastside and				
- Beaverton/Cedar Hills	15,600	129%	2,700	145%
- Western Washington County	20,600	93	3,400	240
- Southwest Portland	18,800	47	3,100	41
- Northwest Portland/Sylvan	4,900	14	900	29
Beaverton/Cedar Hills and				
- Western Washington County	7,400	76	1,100	120
- Southwest Portland	2,500	67	400	100

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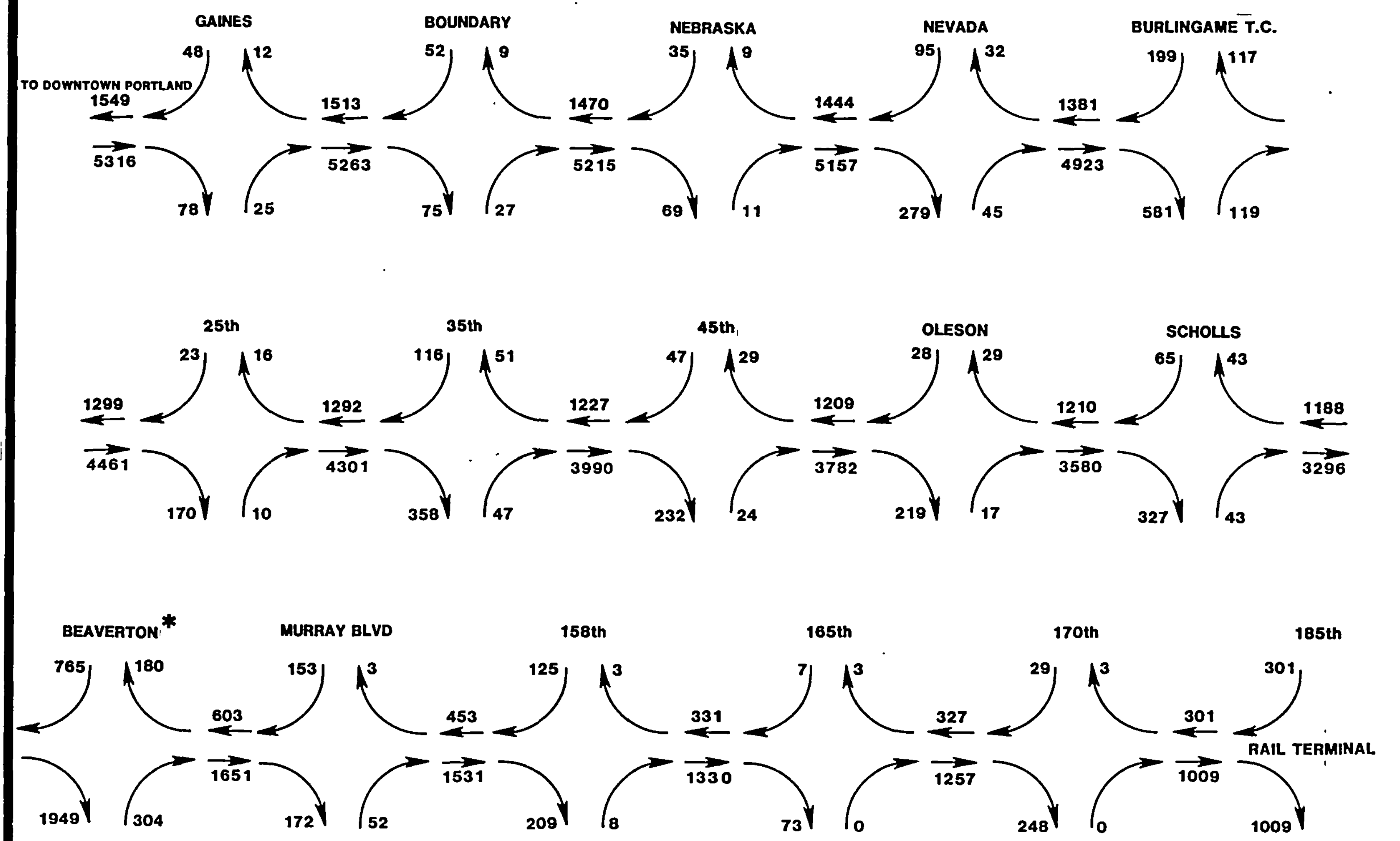
MULTNOMAH LIGHT RAIL



*"BEAVERTON" Includes All Stations in the Central Beaverton Area

WESTSIDE CORRIDOR

FIGURE 3.2-10

PM PEAK HOUR STATION LOADINGS AND LINK VOLUMES FOR THE MULTNOMAH LRT ALTERNATIVE

TABLE 3.2-16

WESTSIDE CORRIDOR ROADWAY LEVELS OF SERVICE
MULTNOMAH LIGHT RAIL TRANSIT ALTERNATIVE

	Roadway Lane Miles						
Facility Type	Total	LOS A-D	% Change from No Build	LOS E	% Change from No Build	LOS F	% Change from No Build
Freeways/Interstates	37.1	37.1	99%	0	-100%	0	-100%
Major Arterials	65.9	54.8	68%	7.4	-32%	3.7	-83%
Minor Arterials and Collectors	84.7	75.9	16%	6.1	-54%	2.7	-57%
TOTALS	187.7	167.8	44%	13.5	-57%	6.4	-84%

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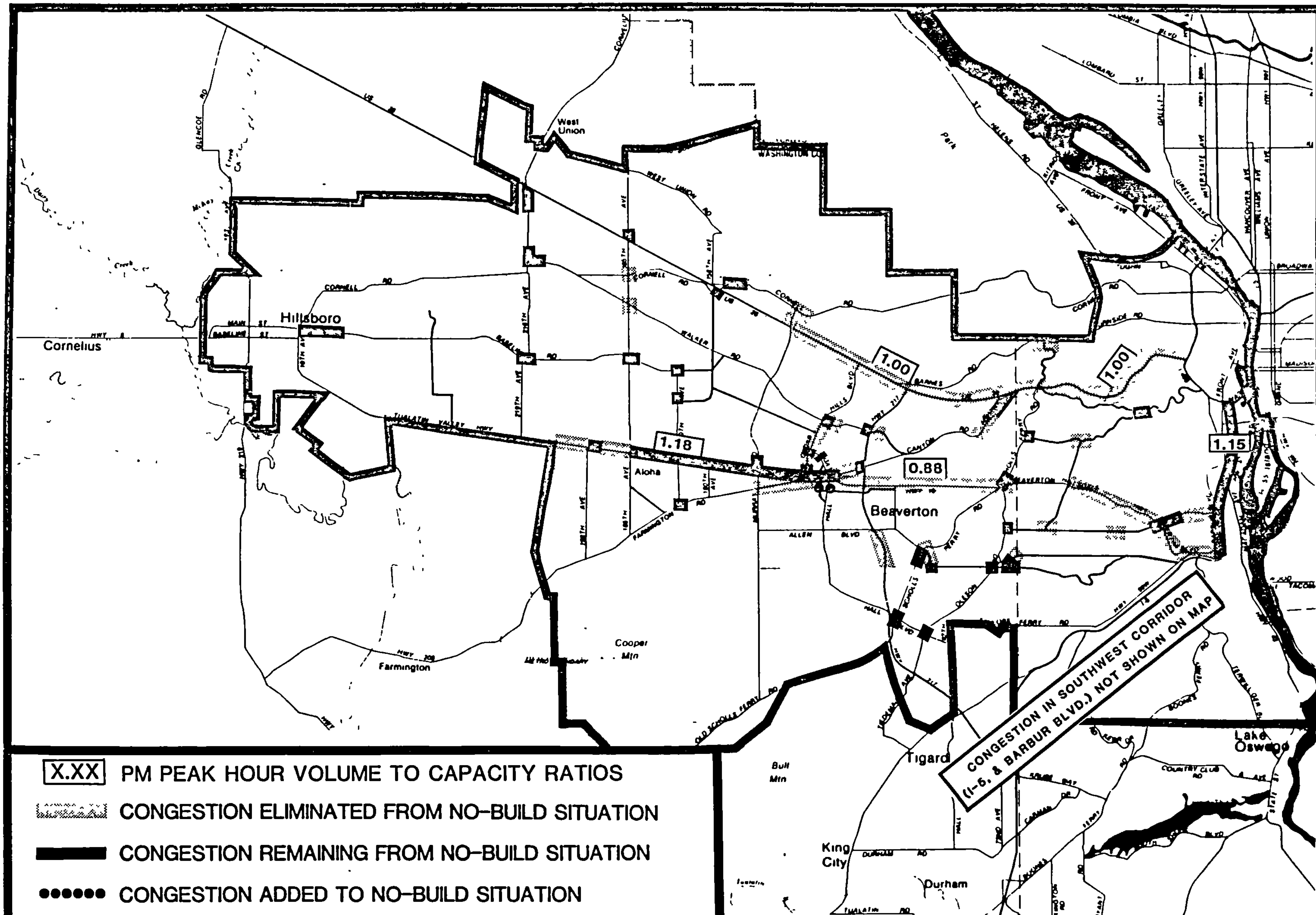

X.XX PM PEAK HOUR VOLUME TO CAPACITY RATIOS

CONGESTION ELIMINATED FROM NO-BUILD SITUATION

CONGESTION REMAINING FROM NO-BUILD SITUATION

CONGESTION ADDED TO NO-BUILD SITUATION

WESTSIDE CORRIDOR

FIGURE 3.2-11
PM PEAK HOUR TRAFFIC SERVICE LEVEL IMPACTS OF THE MULTNOMAH LRT ALTERNATIVE

MITIGATION MEASURES

ALTERNATIVE 1: NO BUILD

No mitigation required.

ALTERNATIVES 2, 3, 4, and 5:

See Section 3.7, Local Traffic.

3.3 TRANSPORTATION ECONOMICS

This transportation economic analysis examines the capital and operating costs of the five alternatives. Initial capital costs and annual operating and maintenance costs are converted to total annualized costs, which provide a common basis for comparing the alternatives. The annualized costs for each alternative are presented under a number of different assumptions, showing their relative cost efficiency in the short-term and long-term, and with different levels of patronage. These estimates are also used to examine the fiscal feasibility of the alternatives.

BASE-YEAR COST ESTIMATES

CAPITAL COSTS. Base-year, capital cost estimates describe the cost of an alternative irrespective of the construction schedule. Construction costs are assumed to occur during 1980. The following assumptions were employed in preparing the capital cost estimates:

- The estimates were based on standards, design criteria and design concepts developed during the Westside Corridor Phase II Alternatives Analysis.

- Cost estimates were based on prices in effect on July 1, 1980. Price information based on other dates was adjusted to July 1, 1980, using appropriate indices.

- Utility cost estimates include only public utilities. These estimates were based on a typical cost per foot of transitway, except for those for which mitigation costs could be expected to exceed $200,000. Those utilities were estimated separately for each option.

- Streets, utilities, and any other facilities relocated or replaced as part of planned construction were cost-estimated for "in-kind" replacement. Upgrading of replaced facilities was not reflected in estimates.

- Mark-up for engineering and contingencies was assumed to be 50 percent for stations and construction. In conformance with the methodology of previous estimates, no mark-up was applied to right-of-way (real estate) costs.

- Estimates assume standard contracting practices for procurement and construction.

- LRT alternatives were assumed to be similar to the Banfield LRT Project.

- It was assumed that no unusual soils or groundwater conditions would be encountered along the alignments chosen.

Table 3.3-1 presents a range of capital costs for each alternative. Costs are itemized which sum to a 'low' estimate. A 'high' estimate is shown for comparison and to establish the upper limit of the range. As shown in this table, the No Build Alternative by definition would have no transit improvement costs

TABLE 3.3-1

BASE YEAR CONSTANT DOLLAR CAPITAL COST ESTIMATES
(1980 $ in millions)

	No Build	Bus Service Expansion	Sunset Busway	Sunset LRT	Multnomah LRT
TRANSITWAY					
Route Segments	$ -	$ -	$76.2	$121.9	$163.1
Light Rail Vehicles	-	-	-	50.6	72.0
Storage/Maintenance Facilities	-	-	-	6.6	8.7
Electrification and Signals	-	-	-	13.9	16.3
Other	-	-	-		3.4
Subtotal	-	$ -	$76.2	$193.0	$263.5
TRANSIT CENTERS AND PARK AND RIDE					
158th/T.V. Highway (P&R Only)	$ -	$ 0.8	$0.8	$ -	$ -
Burlingame (TC Only)	-	3.8	3.8	3.8	-[a]
Hillsboro (TC/P&R)	-	1.5	1.5	1.5	1.5
Tanasbourne (TC Only)	-	0.7	0.5	-	-
Washington Square(TC Only)	-	0.4	0.4	0.4	0.4
Sunset/217 (TC/P&R)	-	9.7	1.6[a]	1.6[a]	9.7
Beaverton (TC Only)	-	0.8	-[a]	-[a]	-[a]
Murray (P&R Only)	-	-	-	1.0	1.0
Sylvan (P&R Only)	-	-	0.4	0.5	-
N.W. 185th (TC/P&R)	-	-	-	1.2[a]	0.6[a]
N.W. 170th (P&R Only)	-	-	-	0.7	0.7
N.W. 158th (P&R Only)	-	-	-	0.6	0.6
Oleson Road (P&R Only)	-	-	-	-	0.5
Scholls Ferry Road (P&R Only)	-	-	-	-	0.3
Subtotal	-	$17.7	$9.0	$11.3	$15.3
BUS EQUIPMENT AND FACILITIES					
Buses	-	$42.8	$42.0	$15.5	$14.3
Maintenance Facilities	-	8.6	8.6	-	-
Miscellaneous	-	2.0	2.0	2.0	2.0
Subtotal	-	$53.4	$52.6	$17.5	$16.3
ASSOCIATED IMPROVEMENTS					
Sunset Climbing Lane	-	$3.7	$3.7	$3.7	$3.7
Sunset/217 Ramp Metering	-	1.5	1.5	1.5	1.5
Portland TSM	-	2.7	2.7	-[a]	-[a]
Beaverton TSM	-	-[b]	-[b]	-	-
Other TSM	-	1.3	0.4	0.2	-
Other	-	-	-	-	0.2
Subtotal	-	$9.2	$8.3	$5.4	$5.4
GRAND TOTAL (Low)	-	$80.3	$146.1	$227.2	$300.5
GRAND TOTAL (High)	-	$90.7	$157.0	$236.7	$307.2

(a) Transit Center component included in Transitway cost.
(b) Included in Transit Center Cost.

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in the Westside Corridor. The No Build Alternative would include improvement costs for service costs outside of the Westside Corridor and the costs of replacing vehicles and facilities as they wear out.

The Bus Service Expansion Alternative is the lowest cost build alternative. This alternative would require an initial investment in the range of $80.3 to $90.7 million, with bus equipment and facilities accounting for more than half of these totals. Options within the alternative include various traffic management improvements in Downtown Portland and Central Beaverton, and the location of the transit center in Beaverton.

The Sunset Busway Alternative represents the next highest level of capital expenditure, ranging in cost from $146.1 million to $157.0 million. The cost for bus facilities and equipment is nearly equal to the Bus Service Expansion Alternative. The cost difference between the two alternatives is almost entirely due to the cost of the busway. As with the foregoing bus alternative, there are several traffic management options in Downtown Portland. Also, there are four options in Beaverton which vary in where they traverse the Beaverton core area.

The Sunset LRT Alternative, ranging from $227.2 million to $236.7 million, is much more capital intensive than the previous bus alternatives. Approximately 75 percent of the cost of this alternative would be for rail-related equipment and facilities. The remainder would be for buses, bus transit centers, the Sunset climbing lane and miscellaneous traffic management improvements. Options in the alternative include several routing arrangements in Downtown Portland and through the Beaverton core area and the various traffic management improvements in Downtown Portland.

The Multnomah LRT Alternative is the most expensive build alternative, having an estimated cost in the range of $300.5 to $307.2 million. Almost 80 percent of the costs would be required for rail equipment and facilities; the balance would be for buses, bus transit centers, the Sunset climbing lane and miscellaneous traffic management improvements. The higher cost compared to the Sunset LRT Alternative is primarily due to the longer route (3.3 miles) between Downtown Portland and Beaverton, eight more stations and the 22 more rail vehicles required to maintain the same schedules with longer travel time. Like the Sunset LRT Alternative, options for this case include routing and traffic management variations in Downtown Portland and routing choices into and through Beaverton. There are only two routing options in Downtown Portland and three in Beaverton, one of which is a short tunnel under Canyon Road. Additionally, there are two routing options through an industrial park east of the Beaverton core.

OPERATING AND MAINTENANCE COSTS. Operating and maintenance costs are the recurring costs of providing transit service. These costs were estimated on an annual basis in 1980 dollars for each alternative for 1995 service levels. Costs were identified both for the region as a whole and for the Westside Corridor.

The preparation of these estimates proceeded through several distinct steps. First, uniform operating policies for all alternatives were established which identified minimum levels of service, vehicle loading standards and general operating assumptions. Minimum levels of service defined the least transit service which would be provided, regardless of the patronage demand. Vehicle loading standards specified that standee densities would not exceed four passengers per square meter during peak periods and one passenger per square meter at other times. Major operating assumptions included the following:

- TRI-MET would operate the Westside Corridor service under their present work rules, operating practices and costs.

- A preventive maintenance philosophy would prevail.

- Light rail trains, through 1995, would be limited to two cars because of Downtown Portland block lengths. Trains would be operated and attended by one person.

- Fare collection would be by self-service, proof-of-payment methods.

Second, operating scenarios were developed for each alternative. The scenarios were developed by applying the relationships and assumptions described above to the forecast ridership. These scenarios were expressed in terms of fleet size estimates and representative operating statistics, such as vehicle miles, vehicle hours, train hours and the like.

Table 3.3-2 shows the operations and maintenance costs of the alternatives. These estimates are presented in 1980 dollars for the entire region and for the Westside Corridor, and are accompanied by key Westside operating statistics.

Maintaining the No Build status through 1995 would result in an annual Westside operating and maintenance cost totaling $18.9 million. In comparison, the Bus Service Expansion Alternative would cost $33.8 million to operate by 1995, which is the highest of the build alternatives. This is a $14.9 million, or 75 percent, increase over the No Build Alternative. The Sunset Busway Alternative would have associated operating costs totaling $32.7 million by 1995 for the Westside. This cost is slightly less than that for the Bus Service Expansion Alternative because the busway would allow slightly shorter bus travel times, thereby lowering labor costs.

The Sunset LRT Alternative at $30.9 million for the Westside is the lowest cost alternative. This is because the rail option is more efficient in providing trunkline service than the buses used in the foregoing two alternatives.

The operating costs of the Multnomah LRT Alternative would be virtually the same as for the Bus Service Expansion Alternative. The statistics clearly show the Multnomah LRT is considerably more expensive than the Sunset LRT Alternative. Though both provide the same level of rail service, the Multnomah LRT requires 30 percent more vehicle miles and 42 percent more train hours than the Sunset LRT, principally because the Multnomah route is 3.3 miles longer.

Direct comparisons of 1995 operating costs discount the fact that each of the alternatives accommodates a different amount of patronage. In 1995, for example, the Sunset LRT Alternative would cost $2.9 million less to operate

TABLE 3.3-2

ESTIMATED ANNUAL TRANSIT OPERATING COSTS
(in Thousands of 1980 Dollars)

Alternative	Labor	Materials and Services	Total Operating Cost	Westside Component of Operating Cost
1980 Existing System	$42,690	$16,810	$59,500	$16,065
1995 Do Nothing Alternative	64,471	26,859	91,330	18,928
1995 Bus Service Expansion Alternative	75,634	30,520	106,154	33,752
1995 Sunset Busway Alternative	74,500	30,609	105,109	32,707
1995 Sunset LRT Alternative	72,601	30,695	103,296	30,894
1995 Multnomah LRT Alternative	74,741	31,378	106,119	33,717

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than the Bus Service Expansion option. Hidden in that comparison is the fact that the Sunset LRT Alternative is also projected to be carrying nine percent more passengers. If the Bus Service Expansion Alternative was designed to carry Sunset LRT Alternative patronage levels, its operating costs would be about $5.4 million more than that in the Sunset LRT case. Direct comparisons between bus alternatives or between light rail alternatives would not be misleading. When the operating costs of the light rail alternatives are directly compared to those of the bus alternatives for any one year, the operating cost efficiencies attributable to light rail are underestimated.

ECONOMIC ANALYSIS

This economic analysis compares capital investment alternatives by reducing their capital costs and annual operating costs to a common denominator. This is done by discounting the cash flow to current year dollars assuming a "discount rate" which effectively represents the rate of interest on an "alternative investment". In private industry, this "alternative investment" would be the investment of funds in an interest-bearing account (in lieu of investing in capital improvements).

As input, the analysis required two cash flow tables for each alternative, one for capital and one for operating costs. These tables represent the chronological flow of expenditures to implement and operate a transit alternative. Base-year capital costs, presented in Table 3.3-1, were distributed over the year(s) during which the various investments would be made. This distribution was based on construction schedules and programmed vehicle purchases for each alternative.

The capital investment program included the continual replacement of vehicles and facilities as they reached their economic life. It was assumed that buses would be repowered every six years and replaced every 18 years. Rail vehicles would be replaced every 25 years and facilities would be reconstructed every 40 years. The analysis assumed that there would be no expansion of the system (i.e., no new increase in transit fleet size and no additional facilities) after 1995.

The capital improvement program was converted into present values and equivalent uniform annual costs, based on standard economic formulae and a range of discount rates. The results of the computations are shown in Table 3.3-3. The annual operating and maintenance cost for each alternative was converted to equivalent uniform annual costs assuming that service would increase over time to 1995 levels and then stay frozen at 1995 levels in perpetuity. These results are also shown in Table 3.3-3. The equivalent uniform annual total cost of an alternative is the sum of its capital cost component and its operating and maintenance cost component.

Under the stated assumptions, the No Build naturally exhibits the lowest equivalent uniform total cost, as it requires no capital costs beyond vehicle replacement and provides less than one-half of the service of the other alternatives. The rank order of the equivalent uniform annual total costs of the build alternatives mirrors the ranking of the capital costs of these alternatives.

TABLE 3.3-3

ECONOMIC ANALYSIS OF WESTSIDE CORRIDOR ALTERNATIVES
(Cost in Millions-1980 $)

	No Build	Bus Service Expansion	Sunset Busway	Sunset LRT	Multnomah LRT
Total 1995 Westside Capital Costs (over 100 years)	$234.0	$474.8	$555.8	$656.8	$770.2
Annual Total Westside O&M Costs (1995)	18.9	33.8	32.7	30.9	33.7
Total Costs (over 100 years)					
Present Value @ 6%	384.7	584.3	631.2	678.6	749.4
Present Value @ 10%	238.0	338.5	372.7	409.0	449.5
Present Value @ 12%	201.1	279.1	308.7	340.4	372.8
Equivalent Uniform Annual Costs @ 6%	23.2	35.2	38.0	40.8	45.1
Equivalent Uniform Annual Costs @ 10%	23.8	34.1	37.3	40.9	44.9
Equivalent Uniform Annual Costs @ 12%	24.1	33.5	37.1	40.8	44.7
Capital Costs (over 100 years)					
Present Value @ 6%	59.3	122.7	179.0	236.7	276.7
Present Value @ 10%	40.5	83.9	122.1	161.0	187.2
Present Value @ 12%	35.5	73.4	105.8	138.7	160.6
Equivalent Uniform Annual Costs @ 6%	3.6	7.4	10.8	14.2	16.7
Equivalent Uniform Annual Costs @ 10%	4.1	8.4	12.2	16.1	18.7
Equivalent Uniform Annual Costs @ 12%	4.2	8.8	12.7	16.6	19.3
O&M Costs (over 100 years)					
Present Value @ 6%	325.4	461.6	452.2	441.9	472.7
Present Value @ 10%	197.5	254.6	250.6	248.0	262.3
Present Value @ 12%	165.6	205.7	202.9	201.7	212.2
Equivalent Uniform Annual Costs @ 6%	19.6	27.8	27.2	26.6	28.4
Equivalent Uniform Annual Costs @ 10%	19.7	25.7	25.1	24.8	26.2
Equivalent Uniform Annual Costs @ 12%	19.9	24.7	24.4	24.2	25.4

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While a straight comparison of total annualized costs answers the question, "Which alternative is the most expensive?", it ignores important differences in capacity, service levels and patronage served. For example, earlier it was noted that the build alternatives supplied more than twice as much capacity as the No Build Alternative. In comparison, the total annualized costs of the build alternatives are only 43 to 88 percent greater than that of the No Build. Thus, the build alternatives provide greater capacity per dollars than the No Build.

It should also be pointed out that the relative total annualized costs of the alternatives could change under different assumptions. The assumption used here - no transit service or patronage expansion after 1995 - is a conservative one. Under this condition, any additional capacity or potential operating efficiency that was untapped in 1995 would remain unused for the life of the project. This condition works to the disadvantage of the capital intensive options which provide this potential. If, however, the condition holds and patronage does not increase after 1995, any capital used to purchase this unused potential would clearly be an over-investment.

COST EFFICIENCY ANALYSIS

The relative cost efficiencies of the alternatives is a complex issue to address. The most efficient alternative to operate may not be the most efficient to implement. The most efficient alternative to operate under one set of conditions may not be the most efficient in another set of circumstances. The most efficient alternative in one time period may not be the most efficient in another. Clearly, cost-efficiency cannot be adequately addressed by one simple measure. Table 3.3-4 includes an array of measures which are compared under several different assumptions.

The efficiency measures displayed can be essentially placed in two broad categories: (1) those that are based on total annualized costs, and (2) those that are based on 1995 operating and maintenance costs. The total annualized cost-per-passenger statistics are based on the same assumptions described in the previous subsection and, therefore, have the same conservative implications. The efficiency measures based on operating costs provide a basis for re-examining the results of the total annualized cost-per-passenger statistics from the perspective of a system which continues to grow after 1995. The rank order of the total annualized capital costs-per-passenger statistics replicates the base-year capital costs of the project alternatives at each of the assumed discount rates.

At a six percent discount rate, the No Build Alternative exhibits the lowest total annualized cost-per-passenger. Interestingly, the Bus Service Expansion Alternative exhibits lower total annualized costs per 1995 passenger than the No Build at discount rates greater than six percent. This is because the patronage of the Bus Service Expansion Alternative increased at a faster rate than total annualized costs relative to the No Build. The total annualized cost per 1995 passenger of the transitway alternatives are from seven to 19 percent higher than the Bus Service Expansion Alternative. Thus, if Westside transit demand is not expected to increase beyond the 1995 levels, the Bus Service Expansion Alternative would be the most efficient alternative in terms of total annualized costs. The Multomah LRT would be the least efficient alternative under this condition.

TABLE 3.3-4

COST PER-RIDER OF WESTSIDE CORRIDOR ALTERNATIVES
(1980 $)

	No Build	Bus Service Expansion	Sunset Busway	Sunset LRT	Multnomah LRT
Total 1995 Westside Ridership (millions)	19.3	28.3	28.9	30.9	31.4
Cost Per 1995 Passenger					
Equivalent Uniform Annual Cost @ 6%	1.20	1.24	1.31	1.31	1.44
Equivalent Uniform Annual Cost @ 10%	1.23	1.20	1.29	1.32	1.43
Equivalent Uniform Annual Cost @ 12%	1.25	1.17	1.28	1.31	1.43
Capital Cost Per 1995 Passenger					
Equivalent Uniform Annual Cost @ 6%	0.18	0.26	0.38	0.45	0.53
Equivalent Uniform Annual Cost @ 10%	0.21	0.30	0.42	0.52	0.60
Equivalent Uniform Annual Cost @ 12%	0.22	0.31	0.44	0.53	0.62
O&M Cost Per 1995 Passenger					
Equivalent Uniform Annual Cost @ 6%	1.01	0.98	0.93	0.86	0.95
Equivalent Uniform Annual Cost @ 10%	1.02	0.91	0.87	0.80	0.83
Equivalent Uniform Annual Cost @ 12%	1.03	0.87	0.84	0.78	0.81
1995 O&M Cost Per 1995 Passenger	1.02	1.21	1.16	1.02	1.10
Average Fare Per 1995 Passenger	0.47	0.47	0.47	0.47	0.47
Average Operating Subsidy Per 1995 Passenger	0.55	0.74	0.69	0.55	0.63
Increases in Costs Per Additional 1995 Passenger above the No Build					
Equivalent Uniform Annual Total Cost @ 10%	N/A	1.14	1.41	1.47	1.74
1995 O&M Cost	N/A	1.66	1.44	1.03	1.22

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Table 3.3-4 also shows the 1995 operating costs per passenger. It is not surprising that the No Build Alternative would exhibit the lowest operating cost per passenger. This system was allowed to carry its existing capacity and did not expand to meet the demands of new or larger markets. This operating policy would naturally enable the least expensive operations and the highest farebox recovery rate (i.e., percent of trip paid by fares). Interestingly, implementation of the Sunset LRT Alternative would permit a 60 percent increase in trips at the same operating-cost-per-trip and operating subsidy rate as the No Build. This gives a strong indication of the long-term potential for LRT operating efficiencies in the corridor.

The operating cost per trip for the light rail alternatives would be five to 15 percent less than all-bus alternatives. The operating cost efficiencies of the build alternatives can be further assessed by comparing their increase in 1995 operating costs per additional 1995 passenger (i.e., how much more in operating costs did each passenger require?). The additional operating cost for each additional passenger in the light rail alternatives was from 15 to 40 percent less than for the all-bus alternatives.

This has major implications for the relative long-term efficiencies of the alternatives. At some point in time after 1995, the lower operating costs per passenger with the LRT alternatives would more than compensate for their higher capital costs.

Because the Bus Service Expansion Alternative was designed for a possible conversion to light rail, another possibility is raised - integrating alternatives into a phased implementation program. For example, the Bus Service Expansion Alternative could be phased into the Sunset LRT Alternative. This could be accomplished in essentially three stages: (1) build bus facilities that would also be necessary as part of the Sunset LRT alternative, (2) expand transit service towards 1995 levels and (3) construct the light rail facility when demand and cost efficiencies warrant it. The Bus Service Expansion Alternative could be phased into the Sunset Busway and Multnomah LRT Alternatives in a similar manner. If transit demand would continue to increase after 1995, the cost-efficiency measures indicate that a conversion from the Bus Service Expansion Alternative to light rail in the intermediate term could be the most cost efficient long-term transit development strategy for the Westside Corridor.

FISCAL FEASIBILITY

Associated with the issue of cost efficiency is the issue of fiscal feasiblity - what can this region afford to implement and operate? As in all long-term financing analyses, revenues can be projected using varying sets of assumptions. In examining transit alternatives, the problems inherent in projecting revenues are compounded by two major factors. First, fiscal feasibility must be examined from both capital and operating cost perspectives. Second, there are a large variety of funding sources involved, each with its own uncertainties and restrictions.

Funds offsetting capital expenditures would come from two sources: federal capital assistance and local capital assistance. Federal capital assistance is probably the largest variable in the fiscal analysis. This is partly due to the multitude of funding sources (Section 3, Section 5 and e(4) Interstate Transfer Funds). The uncertainty in federal funding is also due to the shifting policy of the federal administration and Congress toward mass transit funding.

Initially, regional policy reserved approximately $65 million (in 1980 dollars) of the Portland metropolitan area's Interstate Transfer program for capital construction in the Westside Corridor. Recently, most of the Interstate Transfer Funds were exchanged for Urban Mass Transportation Administration discretionary (Section 3) funds. The Westside reserve now consists of approximately $44.4 million (in 1980 dollars) in Section 3 funds and $16.9 million (in 1980 dollars) in Interstate Transfer Funds. The reservation of Section 3 funds is backed-up by a Letter-of-Intent from the Urban Mass Transportation Administration which was mandated by Congress in the Fiscal Year 82 Transportation Appropriation Bill. Both of these federal revenue sources require local matching funds, bringing the total of the Westside reserve account to $75.4 million (in 1980 dollars). Current estimates indicate that there are sufficient local funds to match the anticipated federal revenues. Revenues for replacement of the vehicles will be derived from other Section 3 funds not covered in the Letter-of-Intent and from UMTA Section 5 funds.

Implementation of the Bus Service Expansion Alternative can be virtually fully-funded from these existing sources. Obviously, there are substantial capital revenue shortfalls for the transitway alternatives. These capital shortfalls can be overcome in one of two ways (or some combination of the two): (1) applying for and receiving additional UMTA discretionary (Section 3) funds or (2) raising the level of local financial participation. Currently, UMTA policy is to defer the funding of rail projects, at least until the condition of the federal budget and national economy improve. Federal funding for these projects thus depends upon improvements in economic conditions and the magnitude of competing demands for federal assistance if and when funding becomes available. Increased local participation is not possible without the creation of an additional tax-base or private revenue source.

Assuming a phase-out of federal operating assistance, revenues for operating and maintenance costs will be derived from two main sources: TRI-MET's payroll tax and farebox revenues. Assuming transit fares and operating costs inflate at the same rate and no operating efficiencies are implemented, the question of the fiscal feasiblity of operating the Westside alternatives simply becomes whether the net increase in payroll tax beyond inflation is greater than the increase in operating costs on a systemwide basis.

The Bus Service Expansion Alternative requires the highest annual operating costs among the alternatives. Implementation of the Bus Service Expansion Alternative would increase operating costs by 78 percent beyond inflation between 1980 and 1995 (as a comparison, the Sunset LRT Alternative would cause a 73 percent increase). Based on historic trends, the payroll tax would increase by about 80 percent above inflation during this same period. Thus, the rate of expansion of systemwide service is consistent with the rate of increase in its operating revenues.

While the historic rates of growth in payroll tax may be substantial over the long-term, individual years (such as 1981-82) can be substantially depressed. Thus, there may be time periods when service expansion would have to be slowed. The TRI-MET Board of Directors makes such timing decisions on a regular basis. Due to the 1982 recession, it appears that a major expansion (to 1995 service levels) of Westside service between now and the mid-1980s is not fiscally feasible without additional revenue for operations, but some incremental expansion can take place during that period.

The importance of considering the phasing of alternatives is once again accentuated. The initial construction of improved bus facilities over the next five to seven year period appears financially feasible. During this period, some increased bus service can occur in response to growing demand. A major expansion of Westside transit service can be financially feasible beginning in the mid-1980s, if payroll taxes expand at historic rates or an additional revenue source is established. The availability of either federal or local funds to implement a transitway could be greatly enhanced by the success of the first two phases. The exact timing requirements of moving from one phase to another would depend on future financial and technical conditions.

3.4 SOCIAL IMPACTS

Social impacts can be analyzed within two categories: social equity and neighborhood cohesion. Social equity impacts refer to the distribution of costs and benefits, and whether the costs to particular groups are disproportionate to the benefits received. Particular attention is paid to the effects of the project alternatives on the low income, minority, elderly or handicapped populations of the Westside. Social equity impacts can be beneficial (i.e., provide needed accessibility for one or more of these groups) or negative (i.e., cause undue hardships to one or more of these groups in terms of displacements, noise, etc.). Neighborhood cohesion impacts examine the effects of the project alternatives on the types and levels of social interaction within and between neighborhoods. The project alternatives can have several impacts on neighborhoods (i.e., noise, air quality, etc.) that may not affect their social activities. These impacts are not addressed in this section, but are addressed elsewhere in the document. Neighborhood cohesion impacts can be beneficial (i.e., the project may enhance social interaction within neighborhoods) or negative (i.e., the project may create barriers to social activities).

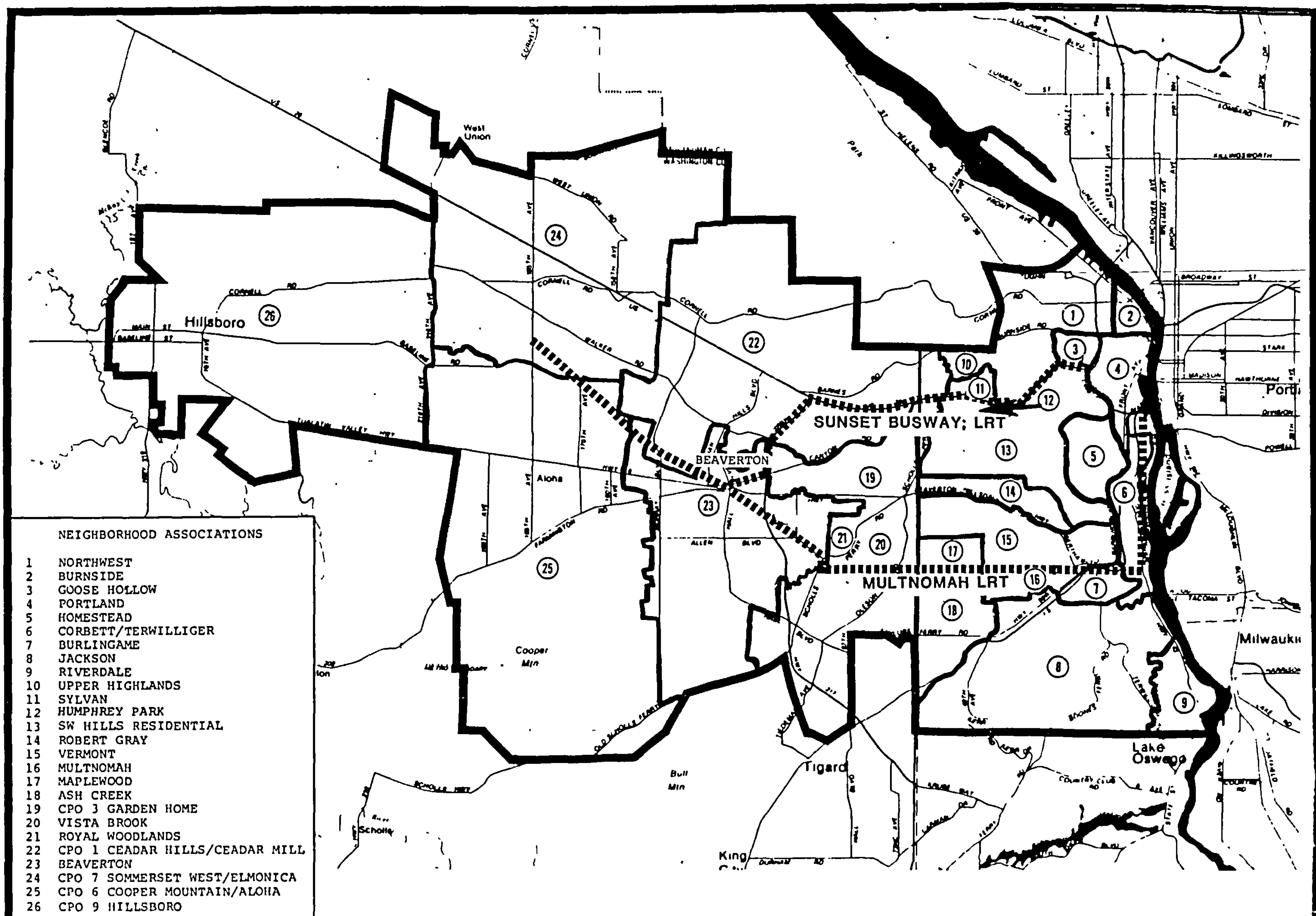
EXISTING SETTING

State-mandated comprehensive planning strengthened the definition and role of neighborhoods as part of the political and land use planning processes. Figure 3.4-1 illustrates the formalized boundaries of Neighborhood Associations in Portland and Community Planning Organizations (CPOs) in Washington County. The demographic profile of the corridor's neighborhoods is illustrated in Figures 3.4-2, 3.4-3, and 3.4-4. While the Westside Corridor contains over 25 percent of the region's population, it contains disproportionately small amounts of the region's low income (11.6 percent), elderly (13.6 percent) and minority (15.3 percent) populations. The highest concentration of these groups (about one-half of the low income and one-third of the elderly) is in the Northwest District, which is only peripherally affected by the project alternatives.

It should be noted that there is no specific accounting of the handicapped population in the Portland region. As part of the analyses that led to the region's Special Transportation Plan (1979), it was estimated that Washington County contained approximately 13 percent of the region's functionally handicapped. The analysis further indicated that the location of handicapped persons was closely correlated with the location of persons over 65 years of age. Thus, for general description purposes, Figure 3.4-2 can be viewed as the distribution of handicapped persons as well as elderly.

IMPACTS

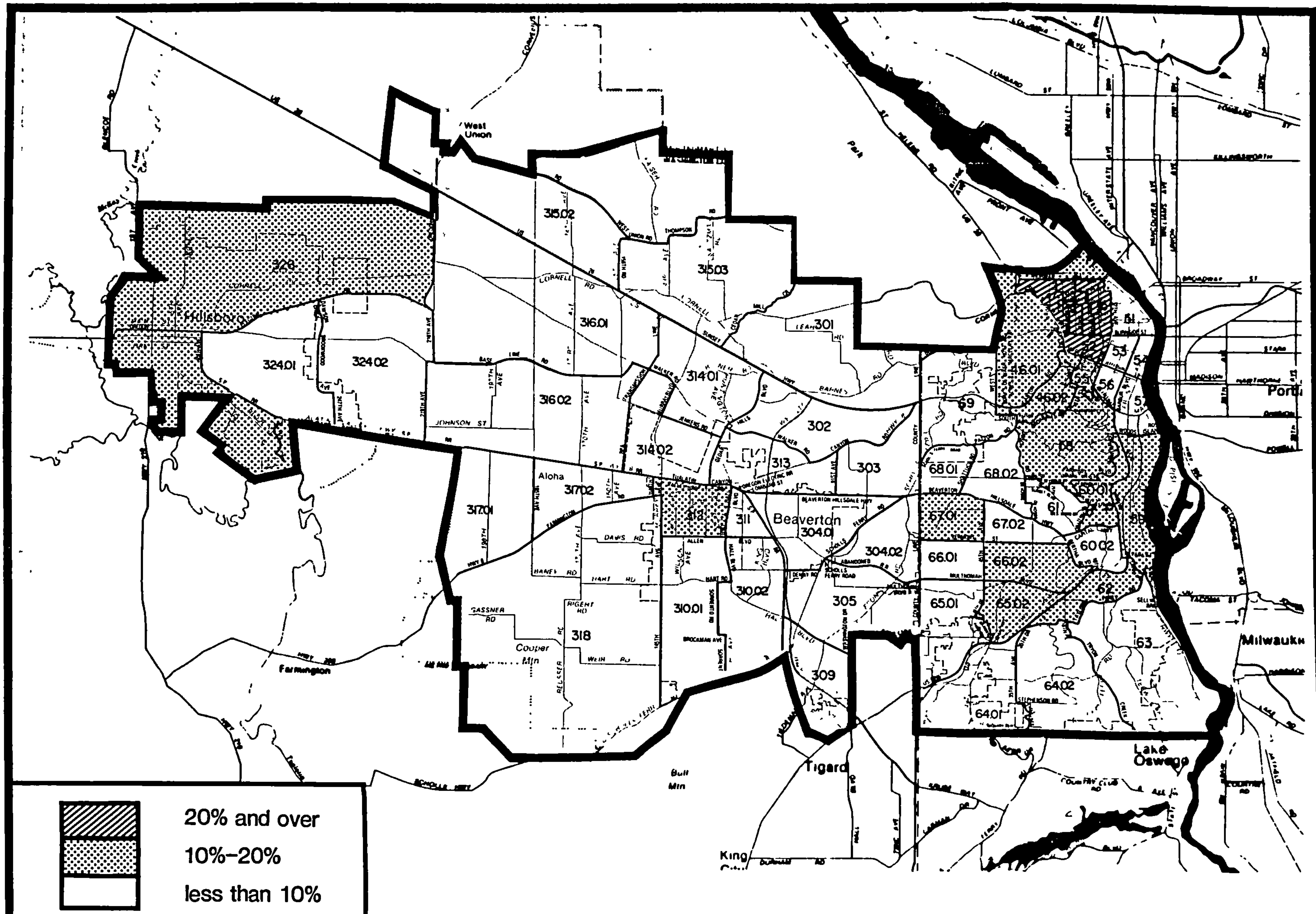
Because of the demographic profile of the corridor, which is not projected to change relative to the remainder of the region, the issue of the relative social equity of the project alternatives is generally not significant. Outside the general accessibility benefits of the build alternatives, there are no significant beneficial or negative social equity impacts among the alternatives.



WESTSIDE CORRIDOR

FIGURE 3.4-1

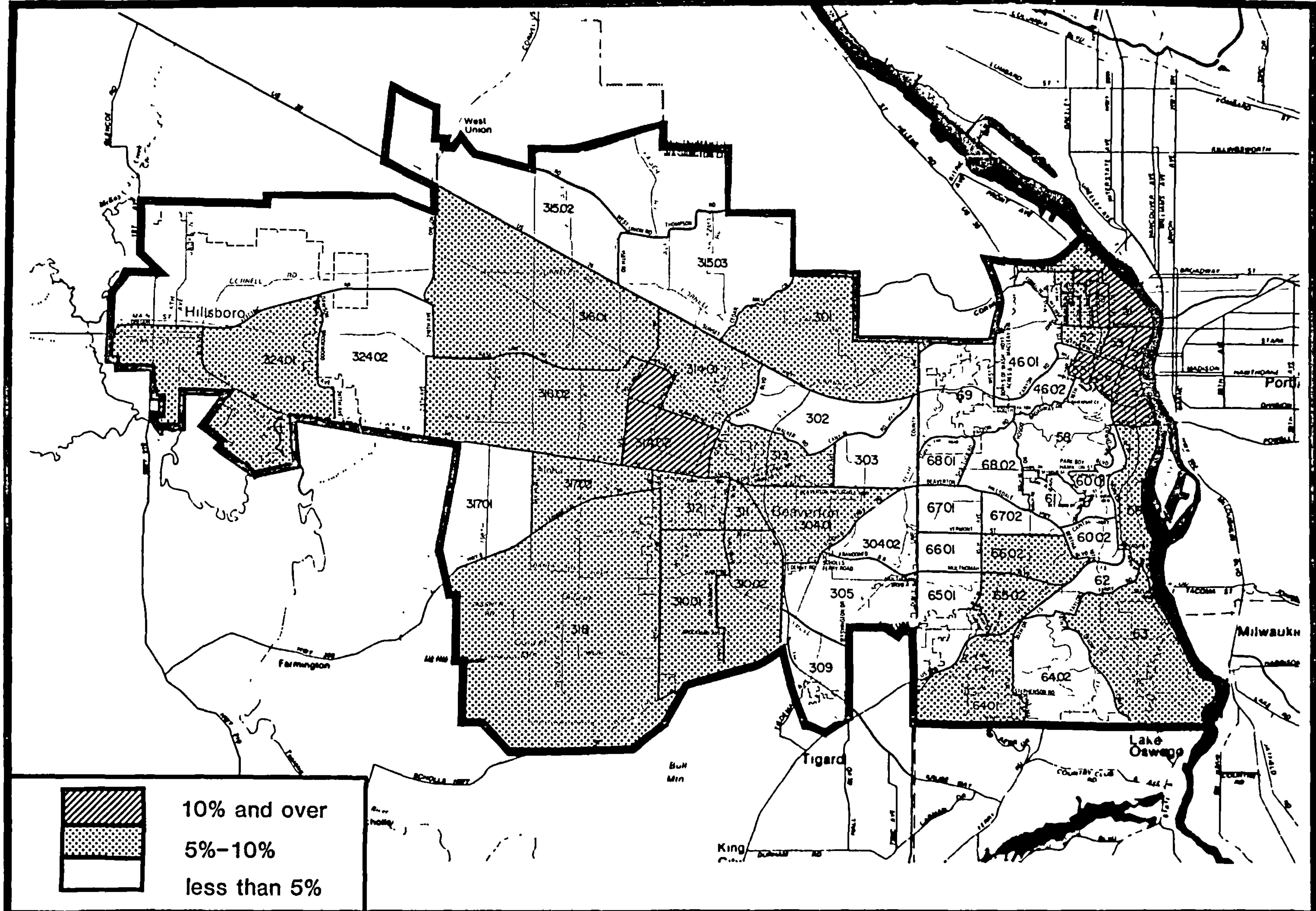
NEIGHBORHOOD ASSOCIATIONS AND COMMUNITY PLANNING ORGANIZATIONS



WESTSIDE CORRIDOR

FIGURE 3.4-2

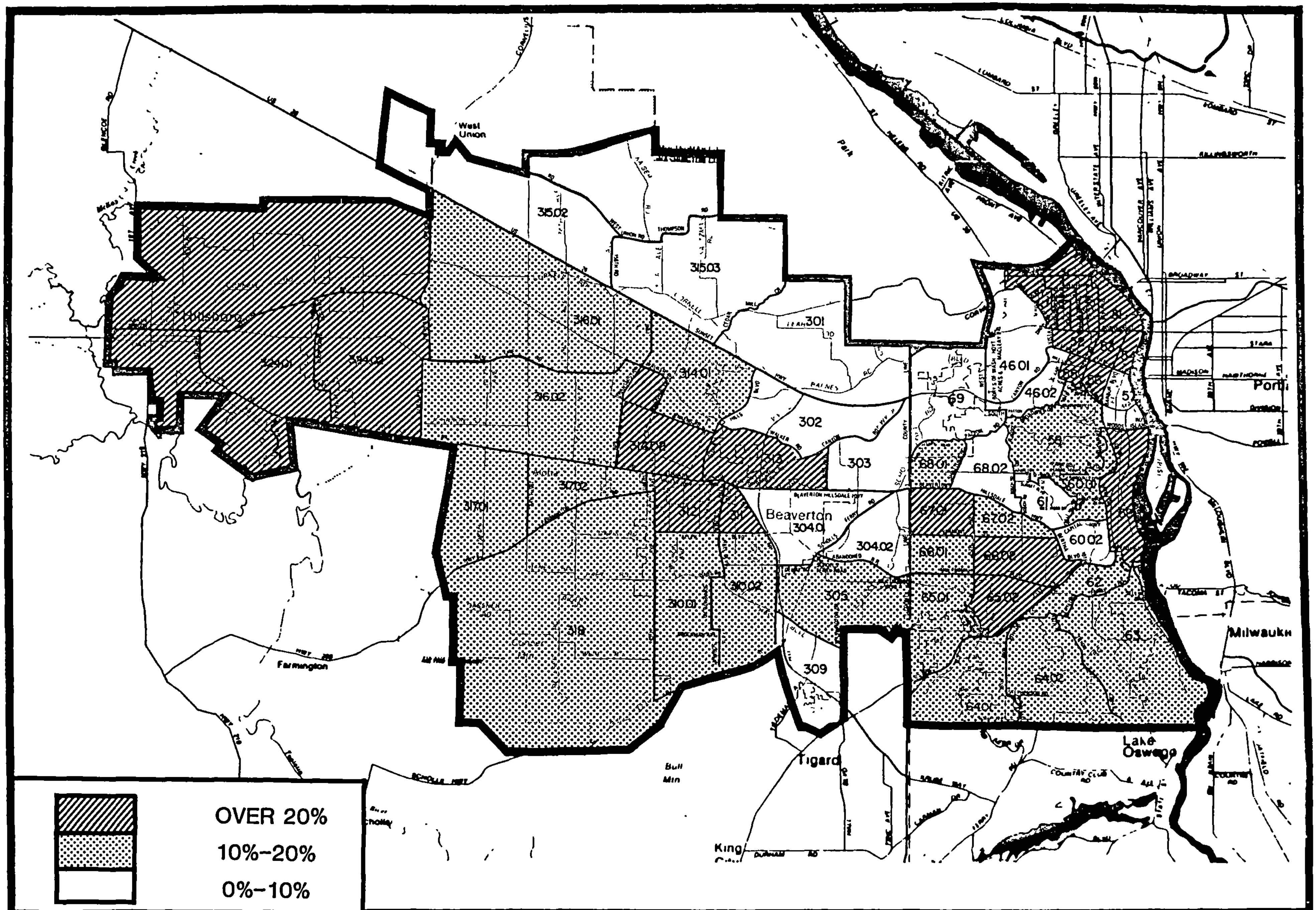
PERCENT OF POPULATION 65 YEARS AND OLDER



WESTSIDE CORRIDOR

FIGURE 3.4-3

PERCENT OF MINORITY POPULATION



WESTSIDE CORRIDOR

FIGURE 3.4-4

PERCENT OF LOW INCOME HOUSEHOLDS IN THE WESTSIDE CORRIDOR

ALTERNATIVE 1: NO BUILD

The major impact of the No Build Alternative would be the large increase in vehicle volumes. Section 3.2 demonstrated traffic volumes in excess of capacity on the regional highways and arterials entering both Beaverton and Downtown Portland. As the service levels of these facilities become unstable (level of service E or F), motorists would seek alternate routes such as Cornell Road, Patton Road, Burnside Road, Multnomah Boulevard and other local streets which pass through established neighborhoods. Neighborhoods which could be affected include Multnomah, CPO 1, CPO 3, Maplewood, Vermont, Corbett-Terwilliger, Northwest District and Goose Hollow.

Increased local traffic could lead to changes in social interaction, such as changing the time of daily activities and curtailing street-related activities such as bicycling and jogging. The Portland region has already experienced increased neighborhood traffic in several areas. These experiences indicate that this increase can change the social character of neighborhoods, i.e., from owner-residents to renters or from single-family to multi-family housing. All corridor neighborhoods would experience increased travel times to social service, cultural, recreational and educational facilities. The peak hour travel times between various Westside locations are presented in Section 3.2.

ALTERNATIVE 2: BUS SERVICE EXPANSION

Neighborhood cohesion impacts could be caused by either the presence of new or expanded physical facilities or the effects of increased transit service. Because timed-transfer transit centers would be located in trafficways or commercial areas, they would not significantly affect the activity pattern or the character of local neighborhoods. The Sunset trunkline necessitates increased bus volumes on Jefferson Street through the Goose Hollow neighborhood. Jefferson Street already serves as a neighborhood boundary; therefore, the increased bus volumes would not significantly change the pattern or type of social activity in Goose Hollow.

The Sunset climbing lane and ramp metering would add 1100 vehicles per-hour to p.m. peak-direction regional highway system capacity and would reduce the potential for increased traffic through West Hills neighborhoods. Transit patronage increases relative to the No Build would result in fewer vehicles crossing the West Hills during the peak-hour, thereby further reducing the potential for traffic-related changes in neighborhood social activity. Increased service levels on both the highway and transit system would result in generally increased access between neighborhoods and social service, cultural, recreational, and educational facilities.

ALTERNATIVE 3: SUNSET BUSWAY

The Sunset Busway includes the same transit centers, transit service levels and highway-related projects as the Bus Service Expansion Alternative. Therefore, any differences in the social impacts of the two alternatives could only be due to the presence of the exclusive transitway in the neighborhoods it traverses. The transitway would begin at S.W. 18th and Jefferson in the Goose Hollow neighborhood. This segment of the transitway would be located at the edge of the neighborhood and would not significantly affect its social activity. From Jefferson Street to Beaverton, the busway would be located adjacent to major regional highways and, therefore, would not divide any neighborhoods or community planning areas. The busway passes by several multi-family areas between Highway 217/Walker Road and both of the possible Beaverton Transit Center station locations, but would not divide any established neighborhood. No significant social impacts are anticipated in this area.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

The Sunset LRT Alternative includes the same transit centers and highway related projects as the bus alternatives. Social impacts attributable to these elements would be generally the same as those described for the bus alternatives. Transit service levels would be higher than the bus alternatives and, therefore, the potential for neighborhood traffic-related social impacts would diminish.

The physical presence of the Sunset LRT alignment would be similar to the Sunset Busway except in the segment on S.W. Columbia between S.W. 14th and S.W. 18th Avenues (for the Jefferson Street option) and in the segment west of the Beaverton Transit Center options to the 185th Avenue terminal. The S.W. 14th to S.W. 18th segment would be a structure approximately ten feet above street level which would cause a minor additional social activity barrier at the edge of the Goose Hollow neighborhood. The effect would not be significant as long as a pedestrian crossing is maintained. An alternative to the elevated structure would be the LRT tunnel option through the West Hills. Prior to entering the tunnel, however, the alignment would pass through exclusively residential areas as opposed to the commercial areas along Jefferson Street which are affected by the elevated structure. The segment west of Beaverton does not divide any existing neighborhoods and would be planned into the design of developing neighborhoods; therefore, no significant social impacts are anticipated in this segment.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

The Multnomah LRT includes the same transit centers, highway related improvements and general transit service levels as the Sunset LRT Alternative. Therefore, the social impacts are similar to those described for the Sunset LRT for these elements. The physical presence of the transitway from Portland to Beaverton is different, however, and results in different social impacts.

The Multnomah LRT would traverse the edge of the Corbett-Terwilliger neighborhood through mostly commercial and industrial districts. No major social impacts are foreseen in this segment. The transitway would use existing transportation right-of-way through the Multnomah neighborhood and is not anticipated to create an additional social barrier. The most significant social impact would occur in the CPO 3, Raleigh Hills/Garden Home neighborhoods when the alignment leaves the existing right-of-way. The alignment would bisect the Vista Brook area close to residences and would permanently divide this neighborhood. In addition, the alignment would eliminate the existing recerational use associated with the abandoned right-of-way and would impede access from one part of the neighborhood to the other. The Multnomah LRT, following the same alignment as the Sunset LRT, would have no significant social impacts from Beaverton to 185th Avenue.

MITIGATION MEASURES

If the Multnomah LRT Alternative is selected, the lead agency will work with the Vista Brook neighborhood during preliminary engineering to design the transitway to minimize its social impacts through this area.

3.5 RIGHT-OF-WAY DISPLACEMENT IMPACTS

EXISTING SETTING

For the most part, the Westside Corridor Alternatives follow existing transportation rights-of-way from Portland to Beaverton. The alignment west of Beaverton traverses vacant land which is currently being planned for short-term development. Because of this right-of-way setting, major displacement of homes and businesses is not expected for any of the alternatives.

U.S. Department of Transportation and State of Oregon guidelines call for a survey and demographic profile of displaced households; an analysis of likely impacts on the neighborhoods and housing which relocation will affect; an estimate of the size and type of businesses displaced; and a discussion of plans to retain displaced businesses in the community and mitigate potential adverse effects on them. This level of analysis would occur during engineering studies which follow the selection of the preferred alternative and would be documented in the Final Environmental Impact Statement. A general demographic profile of Westside Corridor residents was discussed in Section 3.4. Table 3.5-1 shows general housing mixes and values for the two alternative right-of-way corridors. This profile was used to determine the availability of generally equivalent housing to that displaced by project alternatives. A detailed analysis of commercial displacements will also be required after the preferred alternative is selected to comply with UMTA Order 4530.2 on Relocation Planning for Displaced Businesses. These matters will be discussed in greater detail in MITIGATION MEASURES.

IMPACTS

Table 3.5-2 summarizes the right-of-way costs and displacement impacts by alternative (ODOT, 1981). The summary presents a range for each alternative reflecting the various suboptions of the alternatives.

ALTERNATIVE 1: NO BUILD No property or displacement impacts.

ALTERNATIVE 2: BUS SERVICE EXPANSION

SYSTEMWIDE. Table 3.5-3 shows the range of displacements caused by the various Bus Service Expansion suboptions. Maximum total displacement is estimated as two businesses employing 22 persons. No residential impacts are anticipated.

DOWNTOWN PORTLAND. No displacement impacts.

DOWNTOWN TO BEAVERTON. No displacement impacts.

BEAVERTON. The Hall/Watson Transit Center option displaces approximately two businesses (22 jobs) with a right-of-way cost of $1.6 million. Expansion of the existing transit center requires no displacement.

WESTERN WASHINGTON COUNTY. No displacement impacts.

TABLE 3.5-1. HOUSING TYPES AND APPRAISED VALUES FOR SELECTED WESTSIDE AREAS, 1980

	PERCENT OF HOUSING UNITS BY TYPE SF/MF[1]	HOUSING UNIT VALUE BY TYPE[2] SF	MF	PERCENT OF MULTIPLE FAMILY RENTAL[3]
Sunset Corridor				
18th & Columbia	10/90	46,700	14,700	100%
Zoo/OMSI[5]	100/0			
Sylvan	56/47	85,500	36,500	100%
Sunset/217	100/0	66,100	------	----
Walker Road	100	84,800	------	----
Beaverton	7/93	41,100	15,400	100%
185th Avenue	80/20	27,900	10,300	100%
Multnomah Corridor				
S.W. Gaines Street	26/74	20,000	11,700	100%
S.W. Boundary Street	23/77	27,000	33,700	76%
S.W. Nebraska	70/30	28,600	51,500	82%
S.W. Nevada	91/9	35,000	29,900	57%
Burlingame Transit Center	76/24	40,100	17,500	100%
S.W. 25th Avenue and Multnomah Boulevard	38/62	30,500	22,800	86%
S.W. 35th Avenue and Multnomah Boulevard	56/44	25,700	21,800	83%
S.W. 45th Avenue and Multnomah Boulevard	63/37	31,100	19,500	100%
S.W. Oleson Road	18/82	44,200	19,100	100%
S.W. Scholl's Ferry Road	40/60	54,200	18,400	100%
Washington County[4]		55,600	------	----

1 SF is single family residences including manufactured housing. MF is multiple family residence including condominium.

2 Housing values and the count of housing units by type from the Multnomah or Washington County Assessor's records. Housing values do not include land.

3 Multiple family residential rentals are total multiple family residences minus condominium divided by the total.

4 This is the average appraisal value of all single family housing in Washington County except that in appraisal area 6 which is exclusively farms. Multiple family (including condominium) accounts are tabulated by the number of buildings and not by number of housing units; therefore, the unit value for multi family and the single family/multiple family housing split could not be calculated. The source is the "Certification of Assessors Preliminary Ratio Study" for Washington County for 1980.

5 Oregon Museum Of Science and Industry

TABLE 3.5-2 OVERALL SUMMARY OF RIGHT-OF-WAY COSTS* AND DISPLACEMENT IMPACTS BY ALTERNATIVE

	BUS SERVICE EXPANSION		SUNSET BUSWAY		SUNSET LRT		MULTNOMAH LRT	
COSTS (Millions of 1980 Dollars)	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
Right-of-Way	2.6	4.0	10.4	12.7	13.9	18.9	32.9	34.7
DISPLACEMENT IMPACTS								
Single Family Residences Displaced	0	0	9	18	5	29	6	7
Multi Family Residences Displaced	0	0	0	0	2	72	11	81
Businesses Displaced	0	2	10	16	8	16	25	25
Jobs Displaced	0	22	81	121	51	141	240	240
Right-of-Way (Acres)	28.5	30.2	54.2	62.7	123.3	126.9	168.2	176.4

* Costs in million of 1980 dollars, include engineering and contingencies. "Low" and "High" costs reflect the range associated with the possible design options analyzed for each alternative.

TABLE 3.5-3 SUMMARY OF BUS SERVICE EXPANSION ALTERNATIVE, COST, AND DISPLACEMENT IMPACTS

	DOWNTOWN PORTLAND	PORTLAND TO BEAVERTON	BEAVERTON		WESTERN WASHINGTON COUNTY	TOTALS*	
			LOW	HIGH		LOW	HIGH
RIGHT-OF-WAY COSTS (Millions of 1980 Dollars)	0	0	0	1.6	0	2.6	4.0
DISPLACEMENT IMPACTS							
Single Family Housing Units Displaced	0	0	0	0	0	0	0
Multi-Family Housing Units Displaced	0	0	0	0	0	0	0
Businesses Displaced	0	0	0	2	0	0	2
Jobs Displaced	0	0	0	22	0	0	22
Right-of-Way (Acres)	0	0	1.4	3.1	0	28.5*	30.2*

*Total figures include acres for park and ride lots and are systemwide.

Source: Engineering Description Report, TRI-MET, June 1981

ALTERNATIVE 3: SUNSET BUSWAY

SYSTEMWIDE. Table 3.5-4 summarizes the range of right-of-way costs and displacements systemwide and in segments for the Sunset Busway Alternative. Maximum displacement impact is estimated as 18 single family residences and 16 businesses providing 121 jobs. No displacements appear to pose unique relocation problems.

DOWNTOWN PORTLAND. No displacement impacts.

PORTLAND TO BEAVERTON. The largest concentration of residential displacement in this segment occurs in the vicinity of the Vista Ridge Bridge where six homes would be displaced. Business displacement in this segment is mostly concentrated between S.W. 18th and the Vista Ridge Bridge where eight businesses are displaced, affecting 71 employees.

BEAVERTON. The busway has four alternative routes into Beaverton, each varying in its specific displacement impact. The high estimates reflect the north entry sub-options. Displacements caused by the transit center options are the same as those shown for the BSE alternative.

WESTERN WASHINGTON COUNTY. No displacement impacts.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

SYSTEMWIDE. Table 3.5-5 summarizes the range of right-of-way costs and displacement impacts for the Sunset LRT on a systemwide basis and by segment. Maximum displacement impact is estimated at 20 single-family and 72 multi-family residences and 16 businesses employing 141 persons.

DOWNTOWN PORTLAND. Residential dwellings at the intersection of S.W. 12th and Columbia are potentially affected by both the Sunset and Multnomah LRT alternatives. The dwelling units along the south side of Columbia between S.W 16th and S.W 14th would be displaced by the Sunset LRT options using Jefferson Street. The "high" estimate for residential units in Downtown Portland primarily reflects the displacement of one Old Town transient housing hotel with 70 units. A minor alignment revision can prevent this taking.

PORTLAND TO BEAVERTON. The Sunset LRT option which uses Jefferson Street has the same displacement impact in this segment as estimated for the Sunset Busway. The displacement impacts for the tunnel options are the "low" estimates. Construction of the tunnel itself requires taking only one residence.

BEAVERTON. The Sunset LRT displacement impacts in Beaverton depend on the method of entering Beaverton from Highway 217 (North Entry or South Entry) and the location of the transit center (Hall/Watson or existing location). The north entry options cause the higher displacement impacts. Most of the displacements affect mobile homes along 117th Street. Options which use the existing transit center location cause displacements of businesses along Mill Street. Options using the Hall/Watson transit center site cause displacements in that area similar to those described for the BSE alternative.

WESTERN WASHINGTON COUNTY. A significant amount of land would be required, much of which is now in agricultural uses. Few existing residences would be displaced.

TABLE 3.5-4 SUMMARY OF SUNSET BUSWAY ALTERNATIVE RIGHT-OF-WAY COSTS AND DISPLACEMENT IMPACTS

COMPONENT	DOWNTOWN PORTLAND	PORTLAND TO BEAVERTON	BEAVERTON LOW	BEAVERTON HIGH	WESTERN WASHINGTON COUNTY	TOTALS LOW	TOTALS HIGH
COMPONENT COSTS (Millions of 1980 Dollars)							
Right-of-Way	0	6.7	2.1	4.4	0	10.4	12.7
DISPLACEMENT IMPACTS							
Single Family Residences Displaced	0	8[a]	1	10	0	9	18
Multi Family Residences Displaced	0	0	0	0	0	0	0
Businesses Displaced	0	10	0	6	0	10	16
Jobs Displaced	0	81	0	41	0	81	121
Right-of-Way (Acres)	0	25.8	6.3	14.3	0	54.2	62.7

[a] Six in the Goose Hollow neighborhood area.

Source: Engineering Description Report, TRI-MET, June 1981

TABLE 3.5-5 SUMMARY OF SUNSET LRT RIGHT-OF-WAY COSTS AND DISPLACEMENT IMPACTS

COMPONENT	DOWNTOWN PORTLAND*		PORTLAND TO BEAVERTON		BEAVERTON		WESTERN WASHINGTON COUNTY	TOTALS	
	LOW	HIGH	LOW	HIGH	LOW	HIGH		LOW	HIGH
COSTS									
Right-of-Way (Millions of 1980 Dollars)	0.3	2.5	5.2	6.7	3.2	4.6	4.0	13.9	18.9
DISPLACEMENT IMPACTS									
Single Family Residences Displaced	0	7	1	8	1	11	3	5	29
Multi-Family Residences Displaced	2	72**	0	0	0	0	0	2	72
Businesses Displaced	0	5	2	10	6	6	0	8	16
Jobs Displaced	0	45	10	81	41	15	0	51	141
Right-of-Way (Acres)	0.1	1.1	26.1	25.8	11.1	14.0	66.6	123.3	126.9

* Estimates may change depending on which options are selected in downtown.

** Includes 70 units of transient housing in the Burnside area.

Source: Engineering Description Report, TRI-MET, June 1981

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

SYSTEMWIDE. Table 3.5-6 summarizes the systemwide and segment displacement impacts and right-of-way costs for the Multnomah LRT. Maximum displacement impact is estimated as six single family and 81 multi-family residences and 25 businesses providing 240 jobs.

DOWNTOWN PORTLAND. Impacts are similar to those described for the Sunset LRT. Downtown residential displacements are primarily caused by the removal of one 70 unit transient housing hotel. This impact can be mitigated by a minor re-alignment. The commercial dislocations in Downtown Portland are small.

PORTLAND TO BEAVERTON. Residential displacement in this segment affects just six units. Most business displacements and employee impacts are concentrated in two areas: six businesses involving 120 employees are affected between S.W. Bancroft and S.W. Nevada and seven businesses involving 70 employees are affected between the Ross Island Bridge and S.W. Bancroft Street.

BEAVERTON. The displacement impacts of all three suboptions are generally small. The tunnel (M-2) option requires the least displacement. The "split" (M-1/S-1) option causes displacement of business along Mill Street. The M-3 option causes displacements in the vicinity of Hall/Watson.

WESTERN WASHINGTON COUNTY. Same as described for the Sunset LRT.

MITIGATION MEASURES

The 70 units of low-income housing which are displaced from Downtown Portland by the Sunset LRT and Multnomah LRT can be preserved by shifting the LRT alignment to the south side of Northwest Glisan at Sixth. This alignment revision is recommended for both alternatives.

Dwellings displaced due to the selected Westside Corridor alternative will be addressed in accordance with the Oregon Department of Transportation Relocation Assistance Program. The procedure ODOT follows includes public hearings, professional appraisals, personal contacts, and allowances for appeals. Property wil be obtained for the market value or just compensation will be paid for any change in value if a portion is taken. Additional payments beyond the dwellings' market value are available to cover increased interest costs for financing and closing costs for the replacement housing. Moving expenses and reimbursement for expenses incurred while searching for a new location will be provided.

The amount of financial assistance varies with square footage on room requirements and is offered in accordance with the expense schedule in the Relocation Assistance Program. In addition, ODOT relocation agents and various governmental agencies will help by providing information on suitable replacement sites. The Portland Economic Development Loan Fund could also be used to help offset relocation expenses for small businesses adversely affected by a selected alternative within the Portland city limits. All replacement housing offered will be fair housing open to all persons regardless of race, color, religion, sex, or national origin.

TABLE 3.5-6 SUMMARY OF MULTNOMAH LRT RIGHT-OF-WAY COSTS AND DISPLACEMENT IMPACTS

COMPONENT	DOWNTOWN* PORTLAND LOW	DOWNTOWN* PORTLAND HIGH	PORTLAND TO BEAVERTON LOW	PORTLAND TO BEAVERTON HIGH	BEAVERTON LOW	BEAVERTON HIGH	WESTERN WASHINGTON COUNTY	TOTALS LOW	TOTALS HIGH
COSTS									
Right-of-Way (Millions of 1980 Dollars)	0.3	1.2	22.0	21.3	2.9	0.7	4.0	32.9	34.7
DISPLACEMENT IMPACTS									
Single Family Residences Displaced	0	0	3	3	1	0	3	6	7
Multi-Family Residences Displaced	8	78**	3	3	0	0	0	11	81
Businesses Displaced	0	3	17	17	3	6	0	25	25
Jobs Displaced	0	9	219	219	15	15	0	240	240
Right-of-Way (Acres)	0.1	0.2	59.1	52.1	5.4	6.6	66.6	168.2	176.4

*Estimates may change depending on which options are selected in downtown.

**Includes 70 units of transient housing in the Burnside area.

Source: Engineering Description, TRI-MET, June 1981

In addition to the provisions mentioned above, the Relocation Assistance Program will contain the following elements:

- a statement of family characteristics of households displaced;

- identification of impacts on neighborhoods where replacement housing may occur;

- a commitment to provide relocation housing and relocation services, including constructing housing ("last resort" housing), if found necessary;

- a statement of the size, type of businesses to be displaced, number of employees and effect of displacement on the community;

- specific plans to mitigate adverse impacts on displaced businesses including relocation advisory services, and timing relocation to minimize impacts to residents and businesses;

- exploration of sources of funding from local, state and federal agencies to assist the businesses and retain them in the community;

- a plan for early and formal consultation with local officials, community groups, and those directly displaced;

- the relocation plan will comply with the following:

    * the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646; 42 USC 4601 et seq, and UMTA C4530.1 and UMTA 0 4530.2)

    * 49 CFR Part 25, Relocation Assistance and Land Acquisition for Federal and Federally Assisted Programs

    * DOT 562d, Replacement Housing Policy

    * the DOT Business Relocation Policy of 2-15-80 and DOT Notice 1270.2

Based on current housing characteristics (Table 3.5-1), discussion with realtors and review of classified advertisements, it appears there is no shortage of equivalent housing at equivalent prices in similar settings for those being displaced. This general analysis does not anticipate unmitigable problems for the Relocation Assistance Program.

3.6 AESTHETICS AND DESIGN PATTERNS

EXISTING SETTING

The Westside Corridor is diverse in its visual elements. Visual elements include mountains, city landscapes, hills, forested areas, open field, industrial areas and high and low density residential areas. Vistas and prominent natural features visible from vantage points in the Westside Corridor include the eastside, Mt. Tabor, Mt. Hood, Mt. St. Helens, and the Willamette River. Views of the eastside and Willamette River exist from hillside residences west of the Willamette River, Interstate 5, and Barbur Boulevard. From the proposed Macadam Avenue LRT alignment, views of the eastside and Willamette River are blocked generally by intervening buildings and trees. However, limited views of the eastern shore, Ross Island, and forested areas exist from Macadam Avenue. Views of Mt. Hood and Mt. St. Helens vary depending on visibility conditions. From high vantage points (Interstate 5, downtown high rise buildings) views of Mr. Hood and Mt. St. Helens frequently are outstanding. Mt. Tabor itself is developed with residences and a park. Of volcanic origin, the mountain has long since worn down and is not distinguishable from the generally hilly landscape of eastern Portland, as viewed from west of the Willamette River.

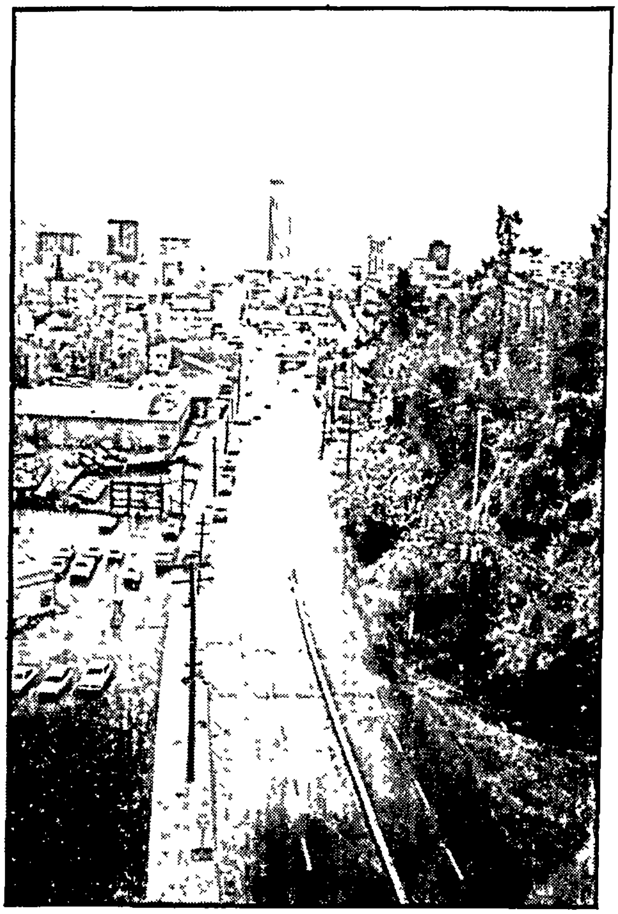
Views from other vantage points in the Westside Corridor include scenic but less prominent natural features. Viewed from the Sunset Highway, natural scenery consists of forested areas near the Portland Zoo. From State Highway 217 (the elevated section of that highway), large expanses of relatively flat land in the Beaverton and Rock Creek floodplains can be seen. Within those plains, views of residential and commercial developments in the City of Beaverton exist below the distant horizon lines. West of the Beaverton CBD, Western Washington County has noticeably less development, offering views of open grasslands and some wooded areas (St. Mary's Woods and Jenkins Forest) which are transected by existing road, railway, and power line right-of-way.

Figure 3.6-1 illustrates existing proximate views in the Westside Corridor. The three views shown are the view looking east down Jefferson Street in Downtown Portland, the view looking east down Multnomah Boulevard from the Capitol Highway overpass, and the existing Beaverton Transit Center in Central Beaverton.

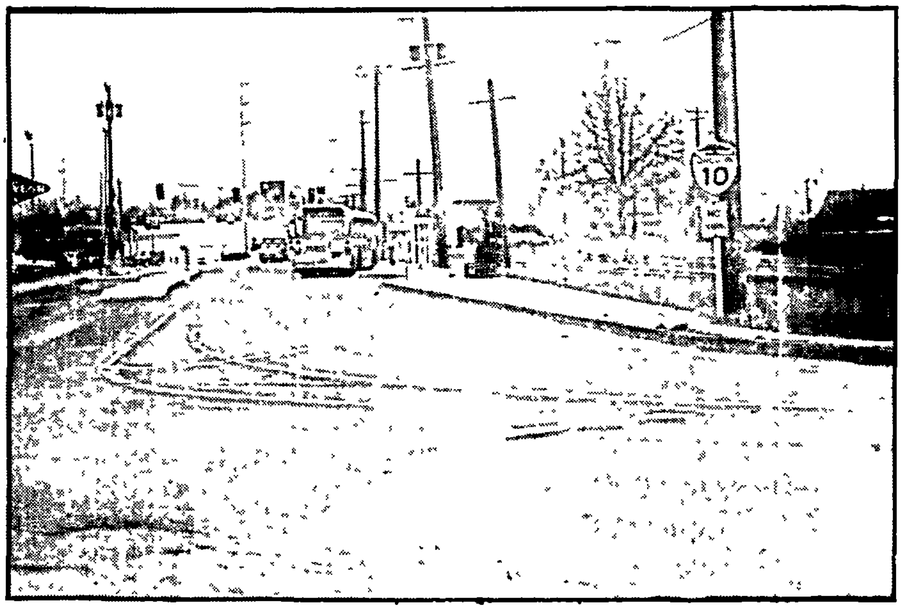
IMPACTS

Westside transportation alternatives would have no impact on existing views of vistas and prominent natural features. In particular, the alternatives would not block views of Mt. Hood, Mt. St. Helens, or the eastside (including Mt. Tabor). Also, views of the Willamette River and Willamette Park would not be blocked. Because of their slightly beneficial effect on air pollutant emissions, none of the alternatives would contribute to visibility reduction that would obscure views of distant mountains and horizon lines.

Structures introduced as a consequence of Westside transportation alternatives would alter local viewscapes. Except where noted otherwise, this impact would be insignificant because proposed structures are visually consistent with existing transportation facilities (e.g., the Sunset Highway, State Highway 217, Macadam Avenue, Multnomah Boulevard, and Burlington Northern right-of-way). Indirect visual alterations, such as those which would result from



VIEW LOOKING EAST DOWN JEFFERSON

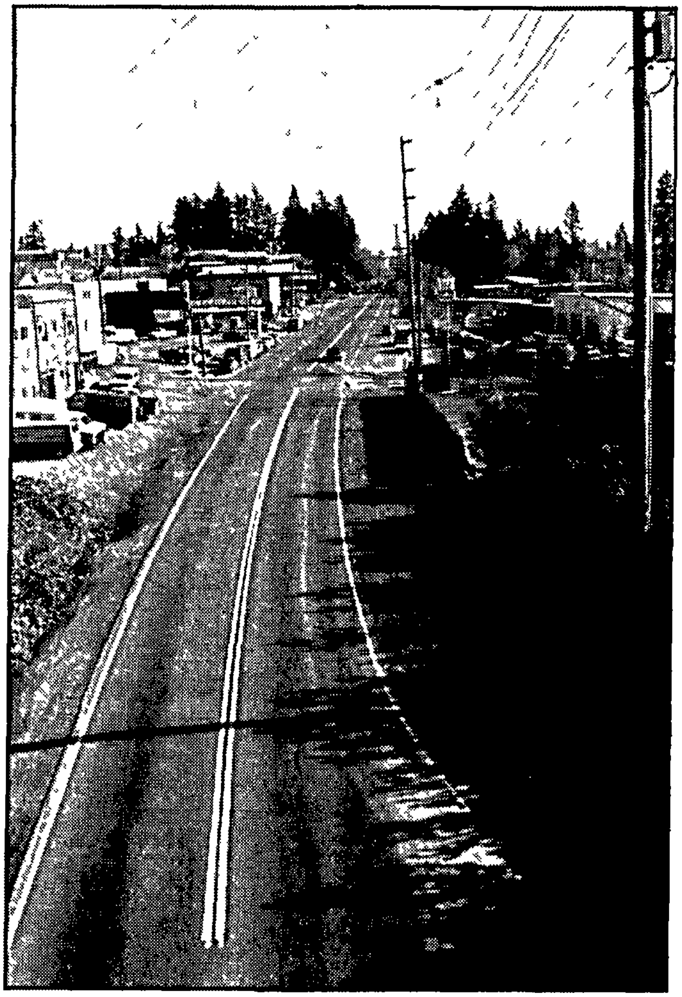


BEAVERTON TRANSIT CENTER

WESTSIDE CORRIDOR

FIGURE 3.6-1

EXISTING VIEWS IN CORRIDOR



MULTNOMAH BLVD. LOOKING EAST FROM CAPITAL HIGHWAY OVERPASS

WESTSIDE CORRIDOR

FIGURE 3.6-1 (CONTINUED)

EXISTING VIEWS IN CORRIDOR

tree removal, also would be insignificant because of the limited proposed alteration of the land under each of the build alternatives. The following sections focus on highly localized impacts to proximate viewscapes.

ALTERNATIVE 1: NO BUILD

Under the No Build Alternative, no new transportation facilities would be introduced into the visual landscape. Therefore, there would be no impacts.

ALTERNATIVE 2: BUS SERVICE EXPANSION

There would be no significant impact under the BSE Alternative. The proposed climbing lane to the Sunset Highway would have no adverse visual impact.

New or expanded transit centers at Burlingame, Sunset/State Highway 217, Beaverton, Washington Square, and Hillsboro would have no significant visual impact. Each of these centers would be constructed on existing commercially zoned land. Figure 3.6-2 illustrates the conceptual appearance of the Hall/Watson Transit Center which is typical of other transit centers to be built under the BSE and other build alternatives.

ALTERNATIVE 3: SUNSET BUSWAY

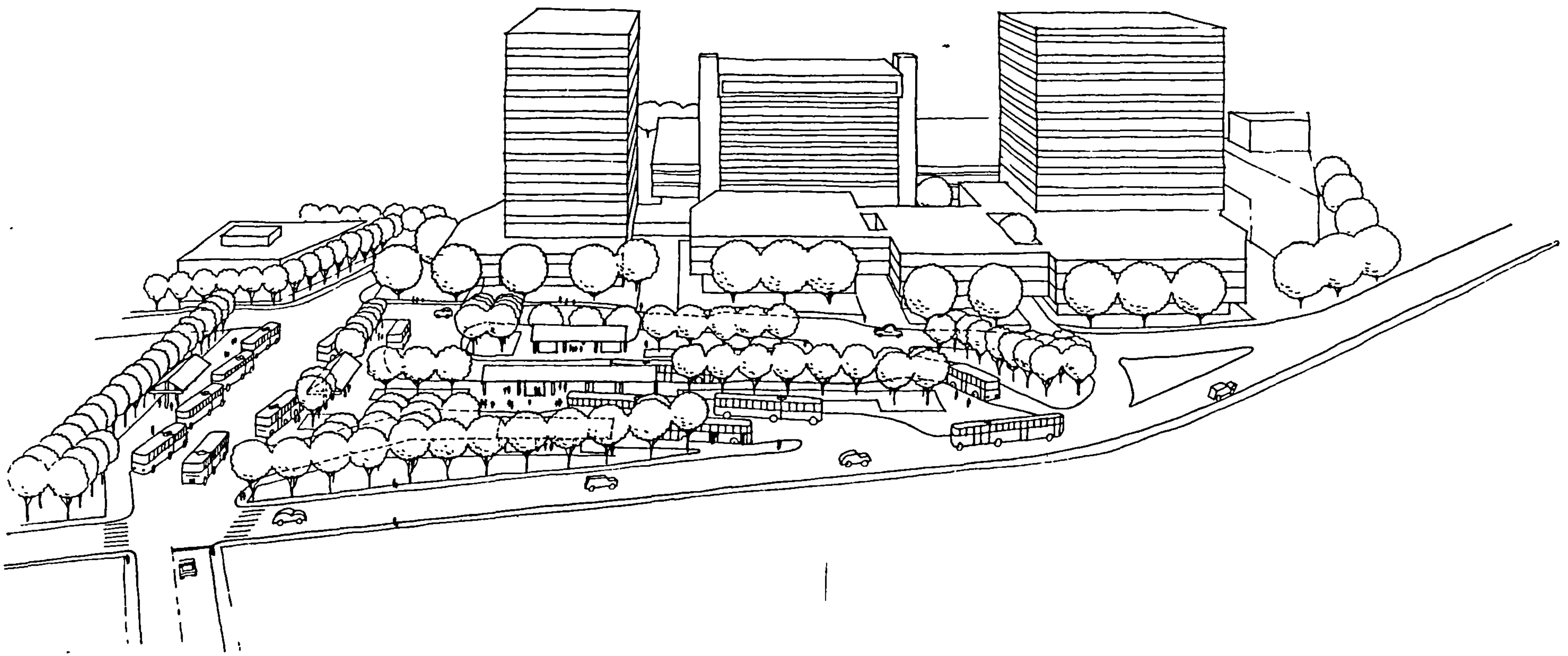
The Sunset Busway would have an insignificant impact on local views because most sections of the proposed busway would be built parallel to and along existing highways. The most visually prominent busway sections would be the elevated sections that would cross over the Sunset Highway and that extend from Walker Road to the Beaverton CBD. The sections that cross over the Sunset Highway would mostly impact the proximate viewscape for drivers and passengers in vehicles on the highway. The size of the overpass structures would be significant, but their visual quality would be consistent with the existing transportation facility. Neither alignment from Walker Road to the CBD would have a significant adverse impact, but the South Entry alignment option would circumvent the natural area adjacent to Wessenger Creek.

Visual impacts of proposed new or expanded transit centers would be insignificant. Proposed transit stations (Zoo/OMSI, Sylvan, and Walker Road) would have no adverse visual impact because they would be small in scale and visually consistent with existing commercial structures. Other proposed transit stations (114th, Uptown, and Center street) also would have no adverse visual impact.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

There would be no adverse visual impact as a consequence of the Sunset LRT and related minor land alteration. Visual effects related to the introduction of guideway and other new facilities between Portland and Central Beaverton would be basically the same as those described for the Sunset Busway Alternative (see Figure 3.6-3). Electrification (single poles spaced approximately 100 to 200 feet apart and one wire in each direction) would not block views or otherwise adversely affect local visual elements.

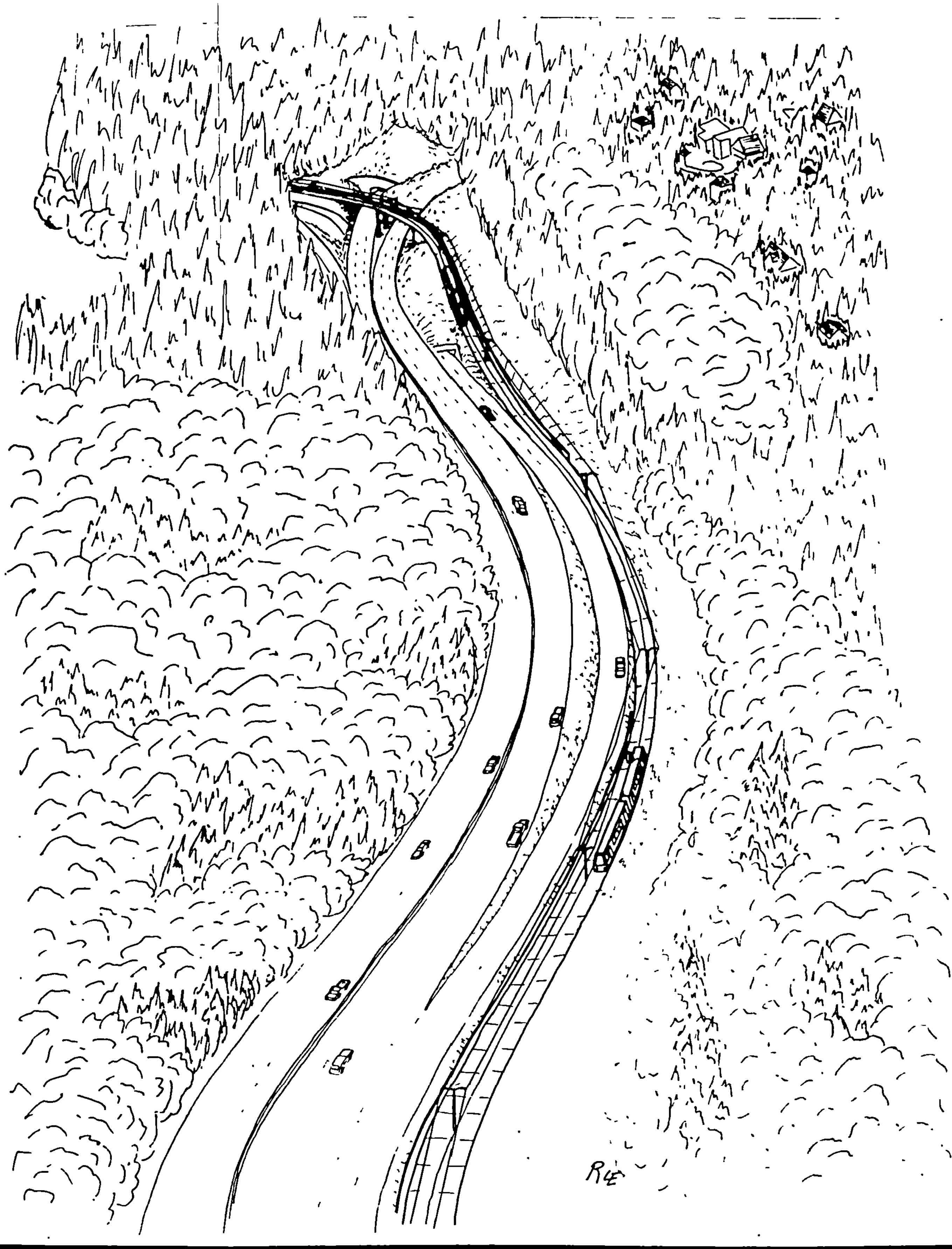
The Sunset LRT would be built on a structure in the vicinity of the Vista Ridge tunnel. In the neighborhood, known locally as Goose Hollow, the structure would consist of single piers spaced approximately 30 feet apart. The guideway would be on top of the piers, at an elevation of zero to 15 feet



WESTSIDE CORRIDOR

FIGURE 3.6-2

VIEW OF BEAVERTON TRANSIT CENTER: HALL/WATSON
Looking East Towards Proposed Beaver Creek Centre



WESTSIDE CORRIDOR

FIGURE 3.6-3

SUNSET LRT ALIGNMENT - SUNSET/CANYON RD. AT TUNNEL PORTALS above grade. This structure would be visually prominent locally but not visually imposing to pedestrians, drivers, or residents, because its scale relative to Montgomery Street and existing buildings would be moderate. Under the optional Columbia/Jefferson Street alignment visual impacts also would not be significant. The Columbia/Jefferson option for the Sunset LRT would require alteration to Collins Circle, a landscaped traffic separator approximately one-half acre in size. Collins Circle was built with a combination of public and private funds (donations) and is maintained by the City of Portland. The alteration would result in a reduction of landscaped area to allow the Sunset LRT and traffic to operate through the intersection of S.W. 18th/ Jefferson (Lackey, 1981). The tunnel option for the Sunset LRT would not have significant visual impacts.

In western Washington County the Sunset LRT alignment would be parallel to the existing Burlington Northern right-of-way, but at Merlo Road would turn north of the railway. The Sunset LRT therefore would have an insignificant visual effect because of its location in the railway right-of-way. West of Merlo Road, the Sunset LRT guideway and fences would not adversely impact proximate views from existing residences, but future residences should be protected from potential adverse visual impacts caused by design oversights (see Mitigation Measures).

All transit stations and transit centers have been described except for those in western Washington County and Downtown Portland. In western Washington County, transit stations would have no impact on views from existing land uses. Future sensitive land uses nevertheless should be protected from unsightly proximate viewscapes (see Mitigation Measures). In particular, the 185th transit station and nearby maintenance yard will have the potential to reduce visual quality for future residential land uses because of their relatively large scale and commercial character.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

The Multnomah LRT would not block views of prominent natural features, in particular Mt. Hood, Mt. St. Helens, and the eastside. In the alignment segment through Stephen's Gulch, the LRT would scarcely be visible because of the tree cover. No significant distant views exist from Macadam Avenue or Multnomah Boulevard, and therefore views would not be adversely affected. The LRT facilities would be built in existing road corridors except in the vicinity of Willamette Park and the Oregon Electric right-of-way. In Willamette Park, the Multnomah LRT would be on structure, descending from 30 feet above grade in Stephen's Gulch to ground level in the vicinity of Nebraska Street. The Multnomah LRT would present a new visual element in the viewscape of the park. The visual impact would not be significant to the overall appearance of the park. In the segment of the alignment through the Oregon Electric right-of-way, distant views would not be affected, but visual characteristics would be adversely altered by the removal of trees and low shrubs (see Mitigation Measures). Between Elm Avenue and Central Beaverton, the Multnomah LRT facilities would have no visual impact because they would be built within existing rights-of-way or in an industrial park. The visual impact of the Multnomah LRT system through Beaverton and western Washington County has been described (see Alternative 4: Sunset Light Rail Transit).

Indirect visual impacts that would result from implementation of the Multnomah LRT Alternative include those related to foliage loss and road widening. These impacts would be minor in the Oregon Electric right-of-way and along Multnomah Boulevard. Visual impacts of aerial electrification wires would not be significant, because the LRT would require a very simple system consisting of only one wire in each direction.

None of the proposed transit stations in Downtown Portland, on Macadam Avenue (Figure 3.6-4), Multnomah Boulevard, and Oleson Road, or at Scholl's Ferry/Allen Boulevard would have significant visual impacts. Lighting could potentially have an indirect adverse visual effect on residences near the Oleson Road and Scholl's Ferry transit stations and parking lots (see Mitigation Measures). In western Washington County, the impacts would be the same as under the Sunset LRT.

MITIGATION MEASURES

ALTERNATIVE 1: NO BUILD

No mitigation measures are required.

ALTERNATIVE 2: BUS SERVICE EXPANSION

- Loss of vegetation removed for construction of climbing lane on Highway 26 (Sunset Highway), could be mitigated by establishing replacement flora in the area, possibly during the construction period.

ALTERNATIVE 3: SUNSET BUSWAY

In addition to the above mitigation measure, the lead agency will ensure that the design of transit centers and stations comply with local design review process and design guidelines to ensure compatibility with surrounding development.

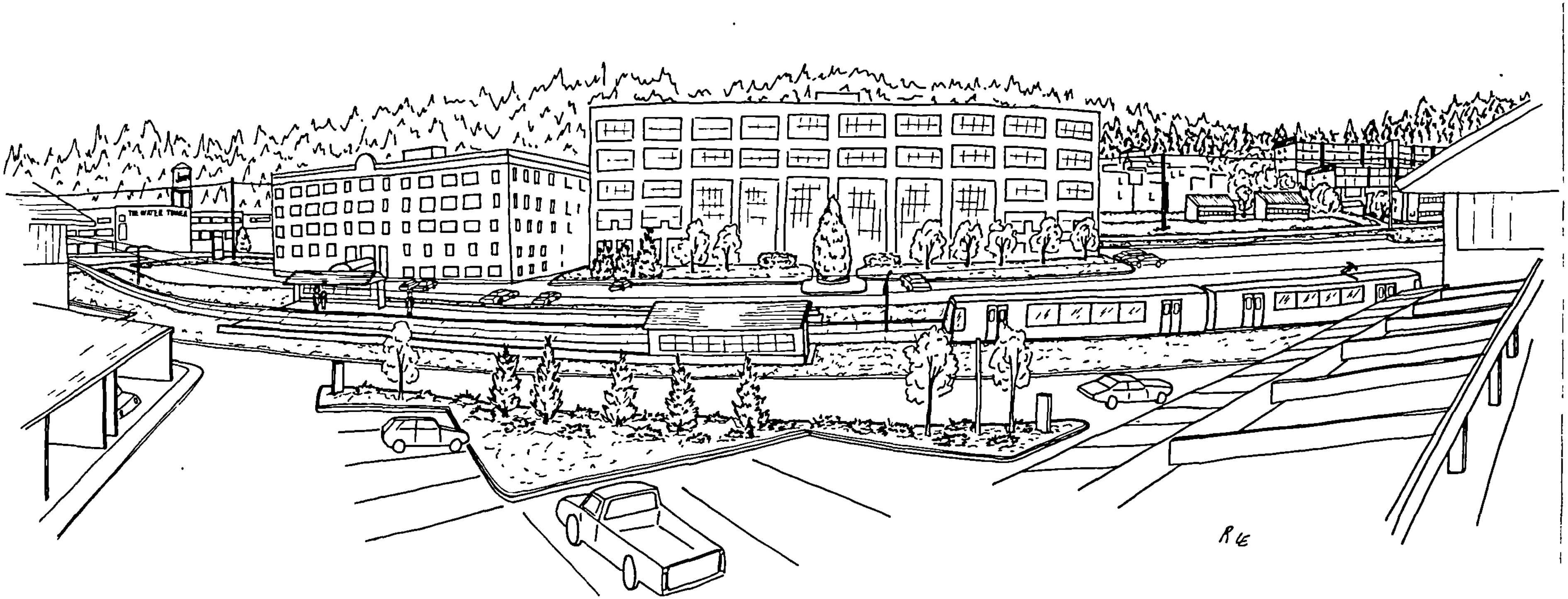
ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

In addition to mitigation measures for the Sunset Busway, the lead agency will:

- Include landscaping in the new design for Collins Circle. The design will be coordinated with the Portland Parks Bureau and the Collins Foundation.

- In preliminary engineering, examine landscaping designs which would enhance the visual compatibility of proposed transit facilities with future residential uses in western Washington County.

- During preliminary engineering study the feasibility of using structural engineering techniques to minimize the scale of structures through Goose Hollow (Sunset LRT only).



WESTSIDE CORRIDOR

FIGURE 3.6-4

BOUNDARY STREET STATION - MULTNOMAH LRT

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

In addition to the mitigation measures described for the Sunset LRT, the lead agency will:

- In preliminary engineering, design landscape plans to provide and/or preserve vegetative buffers between the LRT system and existing residences on Multnomah Boulevard and in the Oregon Electric right-of-way.

- In preliminary engineering, consider potential lighting impacts on residences near LRT transit facilities; mitigate these impacts if significant.

3.7 LOCAL TRAFFIC

This section discusses the impact of each alternative on (1) traffic service levels at key intersections affected by the options, (2) property access and local traffic flow caused by street closures and at-grade crossings and (3) pedestrian and bicycle safety. Data on Downtown Portland traffic was obtained from Wilsey and Ham (1981a and 1981b). Westside traffic data was compiled by Basmaciyan-Darnell (1981) and CH2M Hill (1981). Information on alignment interferences and street closures was obtained from TRI-MET (1981).

Traffic conditions at intersections were evaluated according to levels of service (LOS) ranging from A to F. Definitions of these levels of service are provided in Section 3.2. For purposes of this analysis an LOS of A to D meets regional standards, LOS of E or F during the peak hour is below regional standards.

There are numerous cases of restricted or impaired local access to residences and businesses caused by street closures, signal pre-emptions, at-grade crossings or prohibitions of left turns. For the most part, these impacts have been determined to be insignificant. All properties which had their only access eliminated and for which replacement was not viable were assumed to be dislocated. These impacts are incorporated in the Right-of-Way Impacts' discussion in Section 3.5. This section discusses the impacts which are likely to be of community-wide interest. Appendix C contains a complete accounting of these impacts which may interest particular property holders along the rights-of-way.

EXISTING SETTING

DOWNTOWN PORTLAND. The evaluation of downtown traffic impacts in the City of Portland is based on the Downtown Parking and Circulation Policy (September, 1980), which defines desired traffic characteristics for each street in Downtown Portland. In Downtown Portland a series of one way streets provides a traffic circulation pattern which generally meets regional standards. However, certain streets, primarily the major access points into the downtown area operate below regional standards. These streets include Front Avenue, Burnside Street, the ramp approaches to the Morrison Bridge and the vicinity of Clay Street and 13th Avenue (an access point to the Sunset Highway). At a number of intersections, high vehicle turning movements coupled with high pedestrian activity create traffic conflicts not indicated by LOS values. These intersections include 4th/Salmon, 4th/Taylor, 4th/Washington, 4th/Stark, Broadway/Taylor and Broadway/Main.

Transit-oriented streets in Downtown Portland include exclusive operations on the Transit Mall (5th and 6th Avenues) and mixed traffic operations on Columbia, Jefferson, Yamhill and Morrison. Transit Mall bus operations are presently close to the 200 buses per hour capacity limit during peak hours. Mixed traffic bus operations presently exceed the desirable volume of buses per hour (20), but are well below the maximum volume standards of 90 buses per hour (PB/LTK, 1981).

The City of Portland's Downtown Parking and Circulation Policy also designates pedestrian and bicycle classifications. 5th and 6th Avenues and Morrison and Yamhill Streets, respectively, are the major north/south and east/west pedestrian corridors in the downtown. In addition to being the Transit Mall, 5th and 6th offer many pedestrian amenities (e.g., art, cafes, etc.). Morrison and Yamhill Streets will provide pedestrian-oriented amenities with the completion of the Banfield LRT. Additionally, several downtown streets are classified as principal bicycle streets, including Morrison Street, Yamhill Street, Jefferson Street, 2nd Avenue, 3rd Avenue, 10th and 11th Avenues.

PORTLAND TO BEAVERTON. Outside of Downtown Portland, the City of Portland's Arterial Street Classification Policy defines desired street operation characteristics by classifying city streets for traffic, transit, pedestrian, and bicycle uses. Currently, all major intersections in the vicinity of 18th Street and Zoo/OMSI have a LOS of A. Streets in the vicinity of the Sunset/ Highway 217 intersection are in planning stages and currently do not exist. Several intersections in the vicinity of Sylvan and Walker Road are at level of service E, including Scholls/Raab, Skyline/Canyon Court and Walker/Roxbury. Delays in automobile traffic are particularly evident at Skyline/Canyon Court and for vehicles turning left from Roxbury onto Walker. Pedestrian movement and traffic safety problems exist in the Sylvan area. Parking on Canyon Court coupled with steep grades limit sight distance and tend to create safety problems. While there is a sidewalk along Scholls Ferry Road across Sunset Highway, there are no well defined pedestrian pathways elsewhere.

Major intersections along Macadam and Multnomah Boulevard currently meet regional standards except in the areas of Nevada Street (LOS E) and Burlingame (LOS E). In these areas traffic delays are apparent especially for left turning vehicles at Virginia/Macadam and Barbur/Bertha. Macadam Avenue, a major arterial, is currently being reconstructed into a boulevard style facility with center medians and left turn lanes. Multnomah Boulevard, a neighborhood collector street, is increasingly used by southwest Washington County residents for regional connections to Interstate 5. The resulting heavy vehicle traffic and high speeds, ranging from 40 to 55 mph, adversely affect the residential character of the street and make pedestrian crossing hazardous. The Willamette Greenway and Terwilliger Boulevard Bikeways are the major bike facilities in this segment. Multnomah Boulevard is classified as a bicycle pathway by Portland, although no separated facility exists. The Multnomah Business District is a designated pedestrian district where public and private improvements are encouraged to increase pedestrian activities and access to transit facilities.

BEAVERTON. Service levels below regional standards currently exist at the intersections of Broadway/Hall, Canyon/Cedar Hills, Center/Hall, and 114th/Canyon (all LOS E). The Beaverton Bikeway Program (August, 1974) outlines a detailed bikeway improvement program and design guidelines. Farmington Road has been designated as a bikeway by Beaverton and the bikeway is presently constructed west of Central Beaverton. Pedestrian activity is focused in Downtown Beaverton. Recent transportation improvements in the central area have provided pedestrian amenities, such as widened sidewalks and benches. As the area north of Canyon Road continues to develop, a pedestrian connection either along Cedar Hills, Watson or Mill Street will be required to unite the downtown area with the new developments.

WESTERN WASHINGTON COUNTY. The intersections of Murray/Tualatin Valley (TV) Highway, Murray/Jenkins, 170th/Baseline, 170th/Merlo, 185th/Walker, and 185th/ Baseline are at level of service E. Pedestrian and bicycle activity is limited in this area because of the nature of the road system, primarily two lane streets with no sidewalks. Walker and Baseline Roads are designated as the primary east/west bicycle routes and 185th Avenue is designated as the north/south bicycle route. Separated bicycle facilities do not presently exist along any of these routes.

IMPACTS

ALTERNATIVE 1: NO BUILD

DOWNTOWN PORTLAND. Under this alternative in 1995, Front Avenue between Market and Pine Streets would operate at level of service E, as would the intersections of Front Avenue with Market, Clay, Columbia, Jefferson and the intersection of 4th/Washington. Bus volumes on mixed traffic streets would exceed the maximum capacity (90 buses per hour) and would increase delays at 1st Avenue between Harrison and Yamhill and on the ramps to and from the Morrison Bridge. Buses and light rail vehicles from the Banfield LRT would create similar traffic problems between Yamhill and Burnside on 1st Avenue and between 1st Avenue and 11th Avenue on Morrison, Yamhill and Taylor. Left turning motor vehicles would experience conflicts with light rail vehicles at the intersections of Morrison Street with 3rd Avenue, Broadway and Park Avenue and the intersections of Yamhill Street with 4th Avenue, Park and 10th Avenue. Conflicts between turning vehicles and high pedestrian volumes and designated bicycle streets would occur at intersections along Broadway at Washington, Alder, Morrison and Yamhill in addition to Morrison at 5th and 6th Avenues, Yamhill/ 6th and Salmon/4th. Right turns would be prohibited on 5th Avenue between Madison and Hall. Parking would be removed along these same street segments during peak hours.

PORTLAND TO BEAVERTON. Population and employment growth will translate into increased traffic and poorer service levels at numerous intersections throughout this segment. This situation will be particularly acute in the Multnomah Boulevard vicinity where service levels will decrease at Barbur/Terwilliger (LOS C to E), 34th/Capitol (LOS A to D/E), 35th/Capitol (LOS B to E), 45th/Multnomah (LOS B to C), Garden Home/Multnomah (LOS D to E), Allen/Scholls Ferry (LOS B to E), Allen/92nd (LOS A to E) and 92nd/Garden Home (LOS A to E). The Macadam Avenue improvement, currently under construction, will help maintain its intersection service levels at regional standards. Corbett Avenue, a neighborhood collector, will experience poor service levels (LOS E) at its intersections with Boundary Street and Nebraska Street. The increased traffic and poorer service levels, caused by increased traffic from Interstate 5 to Johns Landing, would generally cause worse conditions for local access and pedestrian and bicycle activity, but no specific significant impacts to designated bikeways or pedestrian areas are forecast. Intersections in the Sylvan area would exhibit slightly worse service levels than currently exist; however Skyline/Canyon Court (LOS E) would be the only intersection which does not meet regional standards.

BEAVERTON. As development occurs north of Canyon Road, north/south traffic conflicts with east/west traffic will become more prevalent. All major intersections in the Beaverton area would experience an increase in congestion under this alternative. The most severely impacted intersections include Griffith/5th (LOS B to E), Canyon/Broadway (LOS A to E), Farmington/Watson (LOS A to D), Center/Cedar Hills (LOS C to E) and Broadway/Cedar Hills (LOS B to E). Many other intersections would continue to operate at service levels below regional standards as they currently do. The increased congestion would generally reduce local access to business, but no specific access problems are forecast.

Buses using the transit center at Broadway/Lombard would encounter increased delays entering and exiting the facility. Pedestrian and bicycle activity, particularly in the Canyon Road area would be adversely impacted by the increased traffic levels.

WESTERN WASHINGTON COUNTY. The most significant impacts would occur at Terman/Murray (LOS D to E), 170th/TV Highway (LOS D to E), 173rd/Walker (LOS B/C to E), 185th/TV Highway (LOS C to E) and 185th/Cornell (LOS D to E). All major intersections in the vicinity of Murray/Terman, 158th/Merlo, 170th/Baseline, 173rd/Walker, and Tanasbourne would not meet regional standards (LOS E). Congestion at the TV Highway/Murray intersection would increase greatly over 1980 levels and impede east/west traffic movements on the Tualatin Valley Highway. The increased traffic and poorer service levels would generally cause worse conditions for pedestrian and bicycle activity, but no specific significant impacts to designated bikeways are forecast.

ALTERNATIVE 2: BUS SERVICE EXPANSION

DOWNTOWN PORTLAND. Service levels at the Front/Jefferson and 4th/Washington intersections would improve relative to the No Build Alternative to meet regional standards. The Transit Mall would provide for two lanes of bus traffic and one lane of local access traffic between Columbia and the Transportation Center (Old Town vicinity), except at the existing blocks where the local access lane is dropped. Exclusive bus lanes are being proposed for S.W. 5th and 6th south of the Transit Mall to Harrison and Hall, respectively. The projected volumes of buses would create a traffic capacity problem on both streets. The exclusive bus lane would operate in the right lane of each street during the peak hours, 7 to 9 a.m. and 4 to 6 p.m. Parking will be removed from both sides of the streets during the peak hours, but will be restored in non-bus stop areas with two hour traffic meters during the non-peak hours. Capacity problems associated with the operations of large volumes of buses in mixed traffic would also occur on 5th and 6th between Burnside and the Transportation Center.

PORTLAND TO BEAVERTON. Compared to the No Build Alternative, some minor improvements to intersection service levels are forecast. The most notable include Allen/Scholls Ferry (LOS E to D) and 34th/Capitol (LOS E to D). Improvements at the Sylvan interchange will eliminate the queuing and left turn problems on Skyline Drive. The climbing lane will eliminate direct access to the Sunset Highway from several local streets between S.W. 70th and S.W. 86th Avenues (see Appendix C). These closures will allow for more efficient traffic flow on Sunset Highway and will not eliminate other viable paths to access the affected residences. Some minor frontage road improvements are incorporated into the preliminary designs of the climbing lane. No significant pedestrian or bicycle impacts are forecast.

BEAVERTON. Local traffic related impacts of the BSE in Beaverton are primarily a function of the selected transit center site. In either case, the transit trunkline would follow Highway 217 to Beaverton-Hillsdale Highway and then proceed westerly to the major transit center. If the existing transit center location were selected as the long term site, traffic circulation would be prevented from passing through the station area. The completion of the Beaverton-Hillsdale Highway-Farmington Road connection would eliminate the necessity of this movement. This impact is considered insignificant.

The local traffic impacts of the Hall/Watson transit center option depend on the routings of the buses as they access the station. One possibility would use East Street to access Beaverdam Road through a T-intersection with Hall Street at the entrance to the station. A second possibility would use Hall Street directly. Various mixtures of routings are also possible. Given the current design of the transit center, the Beaverdam Road routing would require a southerly jog to enter the station. This jog could conflict with the northerly flow of auto traffic along Hall. The use of Hall as the transit trunkline may reduce auto capacity to levels inconsistent with the City of Beaverton's objectives for its Uptown district. The determination of these impacts depends on the final development plans for the Hall/Watson vicinity and the ultimate design of the transit center. Given the options that exist, it appears that a final design could be established which would eliminate any significant negative impacts on traffic flow in this area.

Neither option exhibits significant intersection impacts, nor do they adversely impact local access, pedestrians or bicycle activity. In fact, pedestrian linkages may be provided as part of the final design of the transit center.

<u>WESTERN WASHINGTON COUNTY</u>. Basic traffic conditions would be improved as indicated in Section 3.2. Transit would have no significant impacts on the intersections examined with the possible exception of minor turning conflicts at the Tanasbourne Transit Center. The Bus Service Expansion option would have no significant adverse impacts on local access, pedestrian or bicycle activity.

ALTERNATIVE 3: SUNSET BUSWAY

<u>DOWNTOWN PORTLAND</u>. The intersection, access, pedestrian, bicycle and local traffic flow impacts of the Sunset Busway are identical to those described for the Bus Service Expansion Alternative.

<u>PORTLAND TO BEAVERTON</u>. The local traffic, pedestrian, bicycle and access impacts of the Sunset Busway are similar to those of the Bus Service Expansion option. One exception is the park and ride impact at the Sylvan station. Approximately 100 parking spaces are proposed at the Sylvan station. One half of these would be on the north side of the Sunset Highway and the other half on the south side. The number of park and ride spaces provided may not be sufficient. A review of the area and the characteristics of the residential neighborhoods which would access the Sylvan Station indicates that demand for park and ride could be substantial. If the park and ride spaces are insufficient, there would be a tendency to park at unauthorized locations. Since the option of providing additional park and ride spaces does not appear to be feasible, the solution would be to control the residential and commercial parking areas in the vicinity.

Pedestrian access across Sunset Highway to and from the park and ride lot on the south side of Sunset Highway would be inconvenient. The walking distance from the southern park and ride lot to the LRT station is over 600 feet (may be as much as 1000 feet, depending on exactly where one parks). Although the walk involves crossing the path of vehicular traffic at three locations, the existing traffic controls are considered adequate to ensure safety.

A second exception is the access impact of the busway structure in the Vista Ridge vicinity. Access would be eliminated to several residences where no viable alternative exists. These homes were considered dislocated and were accounted for in Section 3.5, Right-of-Way Impacts.

BEAVERTON. The Sunset Busway eliminates the capacity impact of buses in mixed traffic. The south entry option requires the displacement of the Cabot Street overpass of Highway 217. This overpass would be replaced at Center Street which would be beneficial to the local circulation system of the Uptown district. The remainder of the impacts would be similar to those of the Bus Service Expansion Alternative.

WESTERN WASHINGTON COUNTY. The local traffic, pedestrian and bicycle impacts of the Sunset Busway are the same as those described for the Bus Service Expansion option.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

DOWNTOWN PORTLAND. Service levels at the intersections of Jefferson with Broadway and Front would improve to level of service D. The projected volumes of buses proposed for S.W. 5th and S.W. 6th would create a traffic capacity problem on both streets if the existing three lane roadway section is maintained. An exclusive bus lane would be operated in the right lane of each street during the peak hours, 7 to 9 a.m. and 4 to 6 p.m. Parking would be removed from both sides of the streets during the peak hours, but would be restored in non-bus stop areas with two hour meters during the non-peak hours.

The alignment of the two way LRT operations on S.W. Columbia between 18th and 5th or 4th Avenues limits traffic operations to local access movements. Through traffic movements would be diverted to either existing eastbound streets or placed on S.W. Jefferson as a two way traffic operation. The option chosen for this study was to design Jefferson as a two way street between 18th and 3rd Avenues. An eight foot sidewalk would be included on both sides of Jefferson. The eight foot sidewalk widths would not be adequate for pedestrian use when combined with bus stop use to the east of the Transit Mall. Therefore, no bus stops will be designated on Jefferson between 5th and 3rd Avenues. The introduction of LRT on the Westside would eliminate the capacity problem associated with bus operations in mixed traffic on Jefferson Street and in the Old Town vicinity. Conflicts, however, between traffic (bus, auto and pedestrian) and light rail vehicles would occur at the intersections of Columbia with Park, 10th Avenue and 12th Avenue (and at 6th Avenue, if the 4th/5th Avenue LRT alignment is used). Some access to parking garages on S.W. 4th and S.W. 5th would be impeded. The remainder of the impacts would be similar to those described for the Bus Service Expansion Alternative.

PORTLAND TO BEAVERTON. Local traffic, pedestrian, bicycle and local access impacts of the Sunset LRT in this segment would be similar to the Sunset Busway Alternative except for the following. For the Jefferson Street option, the LRT structure through the Goose Hollow neighborhood would limit local access between S.W. 14th and S.W. 18th Avenues. Additionally, traffic circulation at the 18th/Jefferson intersection would be redesigned and there would be some removal of on street parking. The tunnel option requires the closure of S.W. 21st, south of Jefferson Street (Appendix C).

BEAVERTON. The local traffic impacts of the Sunset LRT are generally similar to those of the Sunset Busway. A few notable exceptions exist. The S1/S2 (split alignment south of Canyon Road) options require the elimination of one lane of traffic along Broadway. Broadway would require a cul-de-sac west of Watson, which would eliminate auto access into this area. One lane of parking would be eliminated on Broadway between East Street and Mill Street. Both parking lanes would be removed between Mill Street and Watson. Mill Street would be relocated and upgraded to improve its local circulation function.

The two crossings of Canyon Road would be accomplished during the normal traffic progression and are not anticipated to have a significant impact on the capacity of Canyon Road because the crossing would occur at signalized intersections. There would be some minor turn conflicts between the LRT and auto traffic.

WESTERN WASHINGTON COUNTY. The local traffic, access, pedestrian and bicycle impacts of the Sunset LRT in this segment would be the same as the Sunset Busway with the addition of an at-grade crossing conflict in the vicinity of the Carlton Springs School. Beaverton School District #48 has acknowledged the potential for light rail operations in the vicinity of Carlton Springs School and has recognized that a transitway is a part of the adopted land use plan in the area (Hearings Officer Order #7; Carlton Springs Conditional Use Permit).

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

DOWNTOWN PORTLAND. The local traffic impacts of the Multnomah LRT are virtually identical to those described for the Sunset LRT. The most significant exception is the additional LRT/auto left turn conflicts at Columbia/4th and Columbia/2nd.

PORTLAND TO BEAVERTON. Three properties along Macadam Avenue in the vicinity of Gaines Street would lose their access to Macadam Avenue, leaving the properties totally inaccessible. These impacts were accounted for as dislocations in Section 3.5, Right-of-Way Impacts. Several other properties would have access impacts, but alternate access was provided in the preliminary design.

Additional population and employment growth induced by the LRT would add a minor amount of additional traffic to the street system. The most notable intersection impacts would occur at Macadam/Boundary (LOS D to E) and Macadam/Nebraska (LOS D to E). Both of these impacts would be caused by queuing problems around stations and could be solved during the final design of the stations. These impacts are considered insignificant.

One concern raised is the possible unauthorized use of Willamette Park as a park and ride facility for the Nebraska Street station. Willamette Park might be attractive as a park and ride area for commuters approaching downtown from the southwest suburbs and from the Sellwood Bridge. It is expected that such use would be at a low level and would not constitute a problem. It is also expected that the LRT would not have significant impacts on pedestrian or bicycle activity in the Macadam segment of the alignment.

The LRT would use the existing Interstate 5 northbound on-ramp to cross the freeway and connect Multnomah Boulevard with Stephens Gulch. The closure of the on-ramp would divert traffic onto S.W. 22nd and S.W. 24th Avenues, which are local streets, in order to access Barbur Boulevard. However, the closure of the on-ramp would reduce the regional traffic on Multnomah Boulevard, and reinforce it as a street linking the neighborhoods of Multnomah, Garden Home, and Vermont Hills.

The LRT alignment runs along the median of Multnomah Boulevard with crossings and U-turns allowed only at 25th, 35th and 45th Avenues and Garden Home Road. Considering the length of this corridor, street and property access would be a problem only in a few cases (Basmaciyan-Darnell, 1981). The most notable access problems would occur between S.W. 45th Avenue and Garden Home Road, where, for approximately 1.3 miles, no crossing of the light rail corridor is proposed. While no homes or businesses have their access totally eliminated, some would require out-of-direction travel to reach permitted U-turn crossings.

The introduction of LRT into this corridor would not, in itself, negatively impact pedestrian or bicycle activity. It would, however, encourage more pedestrian activity in the area, which could require the investigation of pedestrian amenities during final design.

The Sunset climbing lane and Sylvan interchange improvements are included in the Multnomah LRT alternative. Therefore, the local traffic, pedestrian, access and bicycle impacts of the Multnomah LRT in the Sylvan vicinity would be identical to the Bus Service Expansion option.

BEAVERTON. The local traffic impacts of the M-1/S-2 option are similar to those described for the S-1/S-2 option of the Sunset LRT except that signal preemption at Farmington/Hall and Farmington/Watson under the M-1/S-2 option results in level of service E at those intersections. The M-2 (tunnel) option provides for the greatest separation of traffic and transit volumes. Broadway, Canyon, Hall, Beaverdam and Watson would not be used by substantial volumes of transit. Traffic access would be eliminated through the existing transit site as in the Bus Service Expansion option. In general, however, this option maximizes local circulation and access. The M-3 option would cross Canyon Road and 117th Avenue at-grade, but no significant traffic conflict impacts are anticipated. None of the options would have a significant adverse impact on pedestrian or bicycle activity.

WESTERN WASHINGTON COUNTY. The local traffic, access, pedestrian and bicycle impacts of the Multnomah LRT in this segment are the same as those described for the Sunset LRT.

MITIGATION MEASURES

A concern that is generally raised is the impact of unauthorized park and rides around transit centers and stations. Predictions of this impact are unreliable. There will be periodic assessments of whether this problem exists at each of the station sites. If necessary, a parking management plan will be initiated by the local jurisdiction.

ALTERNATIVE 1: NO BUILD

No mitigation required.

ALTERNATIVE 2: BUS SERVICE EXPANSION

No mitigation recommended beyond those listed in Appendix C.

ALTERNATIVE 3: SUNSET BUSWAY

No mitigation recommended beyond those listed in Appendix C.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

- Include mitigation measures recommended in Appendix C.
- Replace parking spaces removed in Downtown Beaverton.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

- Include mitigation measures recommended in Appendix C.
- Examine the effectiveness of providing left-turn and U-turn capabilities along Multnomah Boulevard at S.W. 31st, S.W. 40th, S.W. 51st, S.W. 56th and S.W. 64th Avenues during preliminary engineering.
- Provide separate turn pockets for all turning movements at Farmington/Watson.
- Change the through lane on the west approach of Farmington/Hall to an additional left turn lane to result in acceptable conditions at all approaches.

3.8 NOISE

EXISTING SETTING

This section describes existing acoustical conditions in each of the Westside Corridor segments: Downtown Portland, Portland to Beaverton, Beaverton and Western Washington County. Figures 3.8-1 and 3.8-2 identify sound levels at sensitive receptor sites. The sound levels are presented in terms of two descriptors: Leq (one hour) and L10. Leq (one hour) is a sound level unit that weights sound intensity and sound variability. L10 is the sound that is exceeded ten percent of the time during a specified hour.

The Federal Highway Administration (FHWA) outdoor sound level criterion for residences, schools, libraries, hospitals, parks and playgrounds is 67 dBA (Leq). The alternate sound level criterion of 62 dBA (Leq) also was considered in this analysis, because this level affords additional quiet inside residences and at sensitive non-residential sites. DEQ and the City of Portland have additional noise regulations and ordinances that pertain to the Westside Corridor Project (see Appendix D for details).

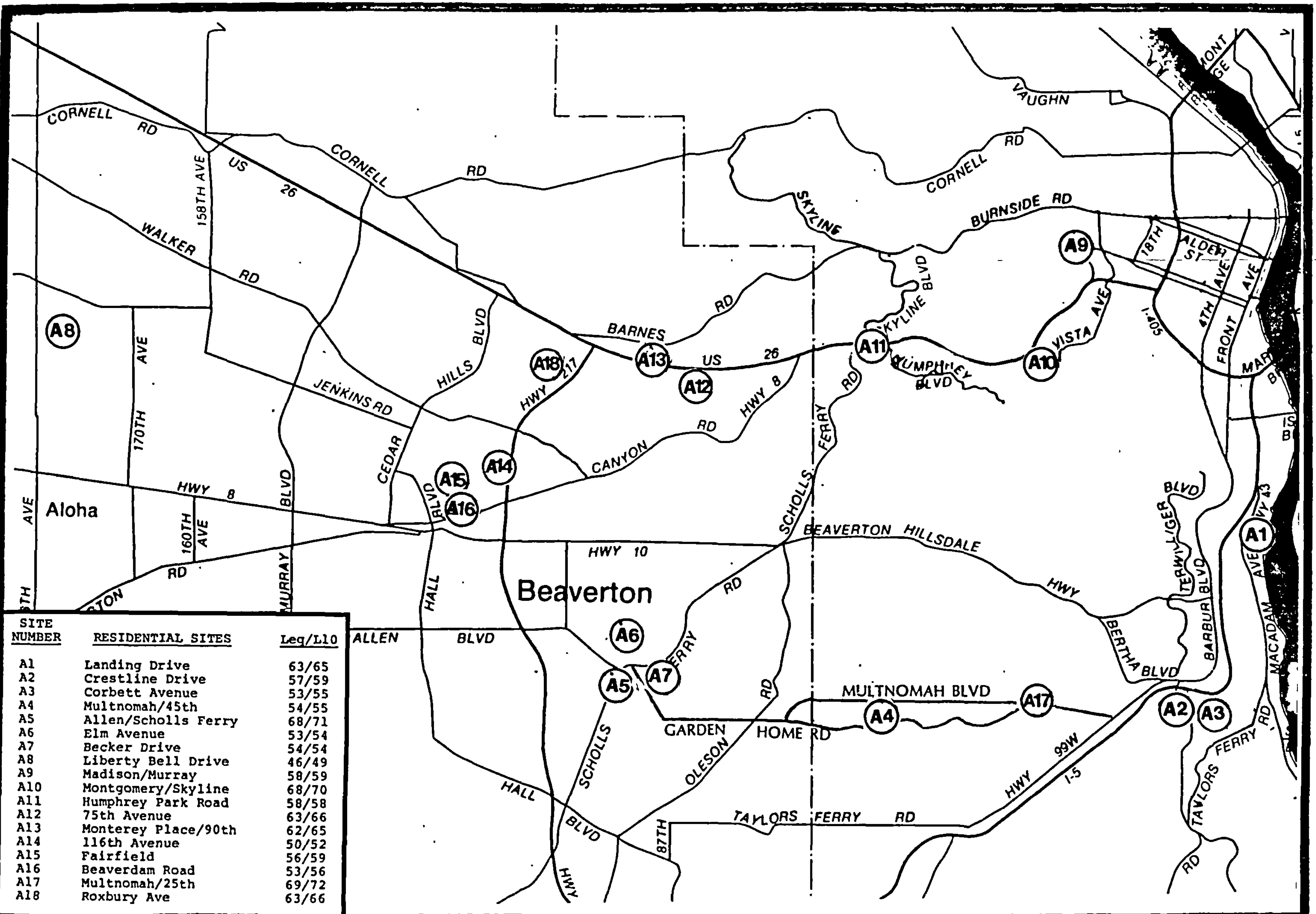
DOWNTOWN PORTLAND. Portions of the downtown presently are considered unacceptable for new residential land uses by HUD, because of high noise levels. The City of Portland, DEQ, and TRI-MET are engaged in efforts to reduce sound levels in the downtown. Average noise levels range from 65 to 75 dBA (Leq).

The Transit Mall (Fifth and Sixth Avenues) and major bus routes (S.W. 12th, Jefferson, and Columbia) are of key concern because of sound level peaks (85 to 90 dBA) generated by buses. TRI-MET is engaged in a study of bus retrofitting for noise control, and most of its fleet meets EPA standards for new buses.

PORTLAND TO BEAVERTON. Sound levels at residential and sensitive non-residential sites are highly dependent on the proximity of the sites to transportation facilities. For example, the Sunset Highway, State Highway 217, and I-5 are associated with sound levels (Leq) of 55 dBA to 73 dBA at distances of 250 feet and 75 feet from the highways. Macadam Avenue has sound levels (Leq) that vary from 54 dBA to 76 dBA at distances of 200 feet and 25 feet. Multnomah Boulevard has sound levels that typically are lower than those of Macadam Avenue by four dBA.

Residential sites in the alignments, exposed to sound levels (Leq) that exceed 67 dBA, include approximately nine sites within 125 feet of the Sunset Highway and State Highway 217, and five sites in Stephen's Gulch in proximity to Interstate 5. Other residential exposures in the alignments which exceed the FHWA criterion sound level include 21 sites adjacent to Multnomah Boulevard, and three sites adjacent to Allen Boulevard. The total existing exposures to FHWA criterion sound are 38 residential sites. An additional 66 sites are exposed to sound levels (Leq) that exceed 62 dBA.

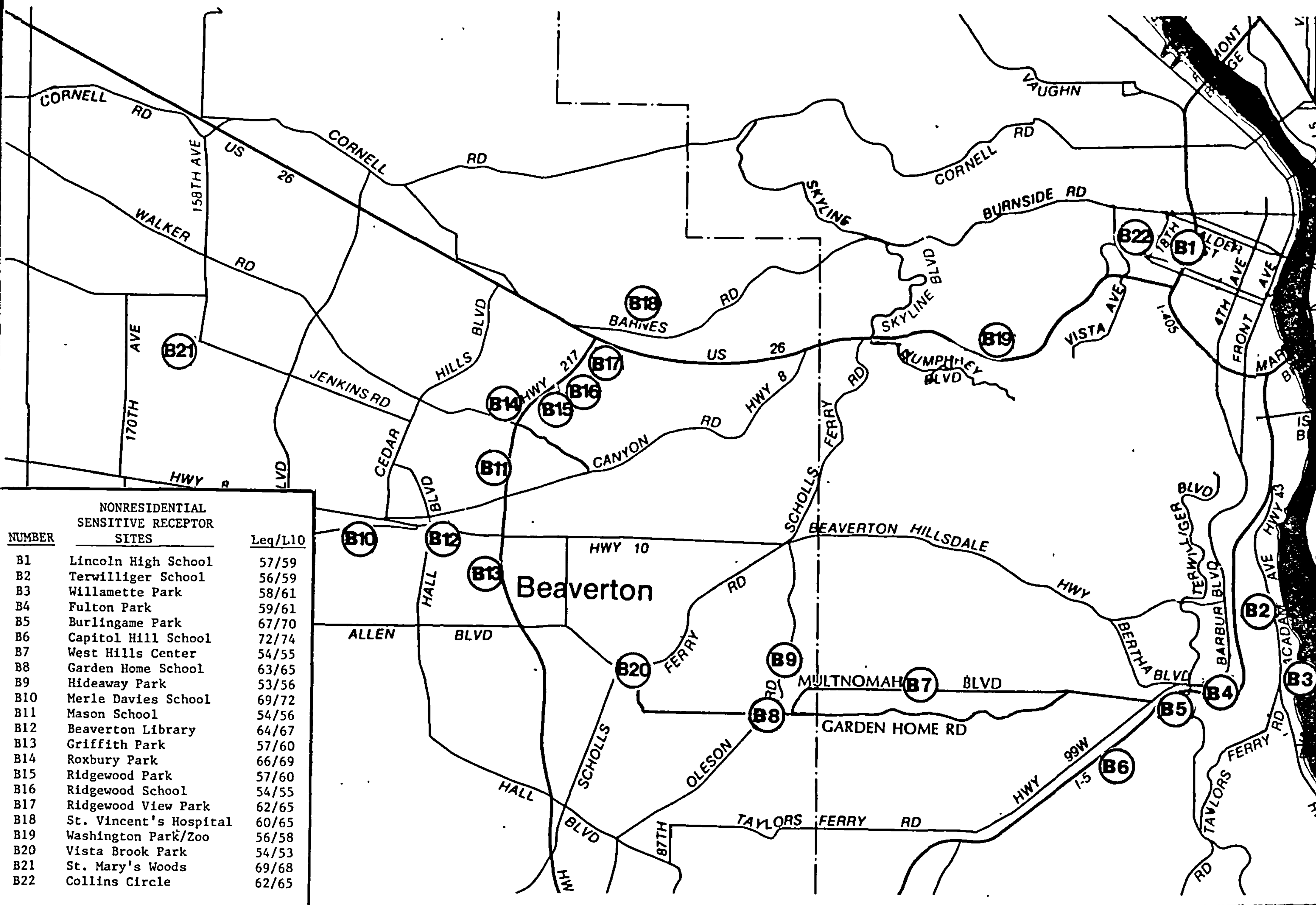
Sensitive non-residential sites in the alignments generally are not exposed to sound levels (Leq) that exceed the FHWA criterion (see Figure 3.8-2). Sound levels (Leq) in portions of Washington Park, Ridgewood View Park, Roxbury Park, and Burlingame Park exceed 62 dBA but not 67 dBA. Sound levels (Leq) at the Sylvan School (to be closed in 1982-83 school year) and Garden Home



SITE NUMBER	RESIDENTIAL SITES	Leq/L10
A1	Landing Drive	63/65
A2	Crestline Drive	57/59
A3	Corbett Avenue	53/55
A4	Multnomah/45th	54/55
A5	Allen/Scholls Ferry	68/71
A6	Elm Avenue	53/54
A7	Becker Drive	54/54
A8	Liberty Bell Drive	46/49
A9	Madison/Murray	58/59
A10	Montgomery/Skyline	68/70
A11	Humphrey Park Road	58/58
A12	75th Avenue	63/66
A13	Monterey Place/90th	62/65
A14	116th Avenue	50/52
A15	Fairfield	56/59
A16	Beaverdam Road	53/56
A17	Multnomah/25th	69/72
A18	Roxbury Ave	63/66

WESTSIDE CORRIDOR

FIGURE 3.8-1
EXISTING SOUND LEVELS AT SELECTED RESIDENTIAL SITES IN THE WESTSIDE CORRIDOR (dBA)



NUMBER	NONRESIDENTIAL SENSITIVE RECEPTOR SITES	Leq/L10
B1	Lincoln High School	57/59
B2	Terwilliger School	56/59
B3	Willamette Park	58/61
B4	Fulton Park	59/61
B5	Burlingame Park	67/70
B6	Capitol Hill School	72/74
B7	West Hills Center	54/55
B8	Garden Home School	63/65
B9	Hideaway Park	53/56
B10	Merle Davies School	69/72
B11	Mason School	54/56
B12	Beaverton Library	64/67
B13	Griffith Park	57/60
B14	Roxbury Park	66/69
B15	Ridgewood Park	57/60
B16	Ridgewood School	54/55
B17	Ridgewood View Park	62/65
B18	St. Vincent's Hospital	60/65
B19	Washington Park/Zoo	56/58
B20	Vista Brook Park	54/53
B21	St. Mary's Woods	69/68
B22	Collins Circle	62/65

WESTSIDE CORRIDOR

FIGURE 3.8-2
EXISTING SOUND LEVELS AT SENSITIVE NON-RESIDENTIAL SITES IN THE WESTSIDE CORRIDOR (dBA)

Elementary School exceed 62 dBA but not 67 dBA. In Willamette Park sound levels (Leq) vary between 58 dBA and 54 dBA at 100 to 200 feet, respectively, of Macadam Avenue. The one exception is the Capitol Hill Elementary School where the outdoor sound level (Leq) of 72 dBA exceeds the FHWA criterion.

BEAVERTON. Sound levels (Leq) within 100 feet of Canyon Road, Broadway, Farmington Road, and Cedar Hills Boulevard vary between 64 dBA and 72 dBA. Existing levels are compatible with the commercial and industrial land uses in central Beaverton. Residential and sensitive non-residential sites generally are not exposed to sound levels (Leq) that exceed the FHWA criterion of 67 dBA. The two exceptions are Merle Davies School and the Beaverton Library, where existing levels (Leq) are 69 dBA and 64 dBA, respectively.

WESTERN WASHINGTON COUNTY. The Western Washington County segment is a relatively quiet area. The eastern part consists of commercial and light industrial land uses. The central part is mainly undeveloped land, and the western part consists of some residential developments. Sound levels (Leq) range from 46 dBA to 66 dBA. The highest levels are within 100 feet of arterials, such as Baseline Road and Merlo Road. No residential or sensitive non-residential sites are exposed to sound levels (Leq) that exceed 62 dBA. The existing sound level (Leq) at the Liberty Bell Drive residential site during daytime hours is 50 dBA.

IMPACTS

The initial acoustical impact of any of the alternatives would result from earthmoving and other construction equipment and from construction related traffic. Sound levels experienced by local receptors would vary, depending on the specific equipment operated, distance and topography. Similar construction equipment would be used in all alternatives, although the duration and location of construction would vary. For example, where aerial track is necessary, cranes and girder transport trucks would be used. Construction of subway sections would involve backhoes, bulldozers, front end loaders, excavation trucks, and pile drivers. Certain sections of depressed and at grade track would also require the use of pile drivers. Where an alignment crosses over existing streets, jackhammers and air compressors would be necessary. Receptors in proximity to the alternative alignments would experience significant temporary acoustical impacts due to operation of construction equipment.

Construction related traffic would result in moderate localized noise impacts along certain streets in all build alternatives. Noise sources would include: 1) considerable volumes of trucks transporting construction materials; 2) queued or double parked (idling) trucks and construction equipment on roadways; and 3) commuting of construction workers to and from the site in motor vehicles. Of these categories, truck traffic on local streets probably would cause the most significant noise increases. Table 3.8-1 summarizes sensitive sites exposed to temporarily elevated noise levels caused by construction.

After construction, acoustical impacts of the alternative projects would result from new transportation noise sources (e.g., light rail vehicles) and/or modified road characteristics (e.g., busway lanes). Changes in sound levels (Leq) relative to No Build generally would be insignificant, being less than three dBA (see Table 3.8-2). Therefore, residential sound exposures to the FHWA criterion of 67 dBA would be similar for each alternative (see Table 3.8-3).

TABLE 3.8-1 SENSITIVE SITES EXPOSED TO TEMPORARILY ELEVATED NOISE LEVELS CAUSED BY CONSTRUCTION (dBA)

SITE NUMBER	LOCATION	ALTERNATIVE UNDER WHICH IMPACT OCCURS	MAXIMUM L10
A1	Landing Drive	5	86
A2	Crestline Drive	5	85
A3	Corbett Avenue	5	85
A4	Multnomah/45th	5	87
A5	Allen/Scholls Ferry	5	87
A6	Elm Avenue	5	84
A7	Becker Drive	5	84
A8	Liberty Bell Drive	4,5	82
A9	Madison/Murray	3,4	83
A10	Montgomery/Skyline	4	86
A13	Monterey Place/90th	3,4	84
A14	116th Avenue	3,4 a	86
(next to A14)	Center Street/113th	3,4 b	86
A15	Fairfield Street	3,4 a	86
A16	Beaverdam Road	3,4	88
A17	Multnomah/25th	5	87
A18	Roxbury Avenue	3,4	85
B5	Burlingame Park	5	82
B6	Capitol Hill School	5	81
B7	West Hills Center	5	85
B20	Vista Brook Park	5	84

a North Entry alignment option only
b South Entry alignment option only
Source: Earth Metrics Incorporated, 1981

TABLE 3.8-2 COMPARISON OF PEAK HOUR SOUND LEVELS (Leq) AT RESIDENTIAL SITES (dBA)

SITE NUMBER	RESIDENTIAL SITES	1995 NO BUILD Leq	DIFFERENCE COMPARED TO NO BUILD			
			BSE	SUNSET BUSWAY	SUNSET LRT	MULTNOMAH LRT
A1	Landing Drive	65	0	0	0	+1
A2	Crestline Drive	58	0	0	0	+2
A3	Corbett Avenue	56	0	0	0	0
A4	Multnomah/45th	56	+1	0	0	0
A5	Allen/Scholls Ferry	69	+1	0	0	+2
A6	Elm Avenue	56	0	0	0	0
A7	Becker Drive	54	0	0	0	+4
A8	Liberty Bell Drive	52	0	0	+1	+1
A9	Madison/Murray	60	+1	0	-1	0
A10	Montgomery/Skyline	69	0	0	0	0
A11	Humphrey Park Road	60	+1	+2	+2	0
A12	75th Avenue	64	0	0	0	0
A13	Monterey Place/90th	63	0	+1	+1	0
A14	116th Avenue	51	0	+8	+3	0
A15	Fairfield Street	64	0	+3	0	0
A16	Beaverdam Road	57	0	+10	+6	+6
A17	Multnomah/25th	69	+1	0	0	+2
A18	Roxbury Avenue	64	0	+2	0	0

TABLE 3.8-3. RESIDENTIAL SITES EXPOSED TO FHWA CRITERION SOUND (67 dBA Leq) a

EXISTING 1981	NO BUILD 1995	BUILD ALTERNATIVES BSE	SUNSET BUSWAY	SUNSET LRT	MULTNOMAH LRT
38	38	38	52 b 44 c	38	38

a Refers to sites in the proposed transitway alignments.
b North Entry alignment option.
c South Entry alignment option.

Significant adverse impacts would occur only in isolated parts of the extended transit mall, busway, and LRT alignments. Under the BSE Alternative sound levels in the neighborhood of the extended bus mall north of Burnside would increase 5 to 7 dBA compared to No Build. Two other neighborhoods that would be exposed to peak passby noise from transit vehicles are Fairfield Street/ 116th neighborhood in Beaverton. For both the busway and LRT, construction of noise walls will be studied to mitigate the intrusive quality of vehicle passby noise. Two buildings also would be exposed to passby noise from the Multnomah LRT: the apartment complexes at Allen Boulevard/Scholls Ferry Road (A5) and Multnomah Boulevard/28th Avenue (A17). At these buildings, acoustical treatment will be studied to mitigate the intrusive quality LRT passby noise.

Parks and other open space areas would not be exposed to noise levels in excess of the FHWA criterion of 67 dBA (Leq) as a consequence of the alternatives. Open and park space that would be exposed to peak noise levels from light rail vehicle passbys include Vista Brook Park (Multnomah LRT) and the portion of St. Mary's Woods near the light rail alignment.

It should be noted that certain areas may undergo an increase in noise annoyance even though numerical index increases in Leq are slight; for example, where a considerable number of bus passbys are added in a quiet environment. Vibration has been analyzed for all Westside Corridor alternatives. It has been found that (i) there are presently no portions of the corridor exposed to noticeable persistent vibration levels and (ii) none of the alternatives lead to any locations of noticeable persistent vibration.

ALTERNATIVE 1: NO BUILD

SYSTEMWIDE. The No Build Alternative would not be associated with significant construction noise. Some noise would occur during maintenance operations.

The No Build Alternative, although it is not related to major transportation actions, would be associated with increases in traffic volumes compared to the existing setting. These increases would result from general population and commercial growth in the Westside Corridor. Noise levels also would increase along the many highways and other roads of the corridor. By 1995, typical changes in ambient sound levels measured in 1980 would range from one to three dBA. Predicted changes along Multnomah Boulevard and Macadam Avenue are one to two dBA. Along Sunset Highway/State Highway 217 sound levels would increase by up to three dBA. In Downtown Portland, Beaverton, and Western Washington County sound levels generally would increase by one or two dBA between 1980 and 1995. Changes of this magnitude generally are insignificant, not being related to a noticeable change in sound exposures.

DOWNTOWN PORTLAND. The noise climate of Downtown Portland in 1995 would be very similar to that existing in 1980. In particular, noise levels on the transit mall would remain near existing levels despite replacement of some older buses by new buses that meet the existing EPA bus noise regulation.

PORTLAND TO BEAVERTON. Noise levels within 100 to 200 feet of commuter and commercial corridors (including Barbur Boulevard, Macadam Avenue, Multnomah Boulevard, Sunset Highway, Beaverton Hillsdale Highway, and State Highway 217) would increase by one or two dBA between 1980 and 1995. The greatest change (up to three dBA) is expected to occur along the Sunset Highway. Although a change of three dBA is not considered significant, it represents a cumulative impact that may not be desirable at sensitive land uses near the Sunset Highway, such as the Zoo.

BEAVERTON. Noise levels associated with traffic volumes forecast for the No Build Alternative would not be significantly higher in 1995 than in 1980. Changes of one or two dBA would occur within 100 feet of roads including the Tualatin Valley Highway, State Highway 217, Walker Road, Murray Boulevard, and Cedar Hills Boulevard.

WESTERN WASHINGTON COUNTY. Because of the presently undeveloped nature of large parts of Western Washington County, changes in sound climate would depend on future land development as well as on traffic growth. Even under the No Build Alternative, non-transportation related construction would be a source of temporary noise impacts in Western Washington County.

ALTERNATIVE 2: BUS SERVICE EXPANSION

SYSTEMWIDE. The Bus Service Expansion Alternative would be associated with temporary construction noise impacts. Projects that would generate noise above ambient levels include transit mall extension and non-mall road widening in Downtown Portland, and construction of transit centers or transit center expansions. Maximum impacts would occur along haul routes and in the vicinity of transit center construction sites.

Additional buses associated with the Bus Service Expansion Alternative would contribute incrementally to sound levels. Impacts related to the additional bus operations would vary depending on ambient noise levels. For example, impacts along the Sunset Highway attributable to bus operations would be insignificant, because high ambient sound levels would mask the effect of bus related noise.

DOWNTOWN PORTLAND. Temporary construction noise impacts would occur in the vicinities of the transit mall extension from S.W. Madison to S.W. Columbia, the mall extension north of Burnside, and widening of S.W. Front between Morrison and Taylor. Construction noise would be subject to regulation by the Portland Office of Noise Control (see Appendix D).

After construction, additional buses on the transit mall south of Burnside would add incrementally to sound levels that prevailed before the bus service expansion action. The increase (two dBA) would not be noticeable, but would be inconsistent with existing efforts to reduce sound levels in the downtown. The change also could increase the area of downtown that is not eligible for HUD housing money because of HUD noise standards. North of Burnside, the extended transit mall would experience peak noise level increases (compared to the No Build) of five to seven dBA. The precise change would depend on future bus volumes on this part of the extended transit mall and would be inconsistent with existing noise abatement efforts in the downtown.

PORTLAND TO BEAVERTON. Construction noise would occur at the sites of the proposed Burlingame, Sunset Highway/State Highway 217, and Washington Square transit centers. Residences near Barbur Boulevard may discern noise associated with haul trips for construction of the Burlingame transit center, but the impact in terms of sound intensity will be insignificant. Sensitive receptors in the vicinity of the proposed Sunset Highway/State Highway 217 transit center include St. Vincent's Hospital. The construction noise impact on the hospital would be insignificant because of the distance separating it from the proposed transit center site. Inside the hospital, construction noise would not be discernible. Washington Square transit center expansion would not be associated with adverse noise impacts to sensitive receptors.

After construction, the Bus Service Expansion Alternative would not be associated with changes in exposures of residential or sensitive non-residential sites to the FHWA criterion sound level (67 dBA) or supplemental criterion level (62 dBA). Noise levels associated with each transit center and related traffic would be consistent with DEQ regulations.

BEAVERTON. Temporary construction noise would occur at the sites of the optional Hall/Watson or Broadway/Beaverton Hillsdale transit centers. Construction of the Beaverton transit center could have short term impacts on sensitive receptors including Beaverton Library users and students at the Merle Davies School; however, these impacts would be conditional on the choice of haul route and could be minimized by routing construction traffic on alternate roads.

Bus Service Expansion operations would be associated with an increase in noise levels (compared to the No Build alternative) in the vicinity of the Hall/Watson or optional Broadway/Beaverton Hillsdale transit center and related bus routes. The magnitude of the increase would be less than one dBA along bus routes, but at the Beaverton transit station would be approximately three dBA on the platforms. Each transit center would be consistent with the FHWA criterion and DEQ regulations.

WESTERN WASHINGTON COUNTY. Construction at the sites of the proposed Tanasbourne and Hillsboro transit centers would temporarily increase ambient noise levels. Noise levels generated in the vicinity of each transit center from related traffic would be consistent with the FHWA criterion and DEQ regulations. Noise impacts related to the proposed bus maintenance yard would depend on the siting of this facility. The site of the maintenance facility should be commercially zoned and adequately buffered from residential or other sensitive land uses.

ALTERNATIVE 3: SUNSET BUSWAY

SYSTEMWIDE. Construction projects would generate noise above ambient levels at the transit mall and non-mall road improvements in Downtown Portland, along the busway, and at transit centers and stations. Maximum construction noise impacts would occur along haul routes and in the busway alignment (North Entry option) between Walker Road and the Beaverton transit center.

Buses associated with the Sunset Busway alternative would add incrementally to ambient sound levels. Near the Sunset Highway, non-bus traffic would mask the effect of busway related noise. However, along the North Entry alignment in Beaverton, the noise climate would undergo an audible change attributable to busway operations.

DOWNTOWN PORTLAND. Construction noise would cause temporary impacts in the vicinity of the transit mall extension and S.W. Front widening between Morrison and Taylor. Noise levels during various construction activities and hauling would attain peak levels of 85 to 95 dBA for short periods. These noise levels would be typical of jackhammers, saws, and generators/compressors heard from a distance of 50 feet or less. Construction noise would be subject to regulation by the Portland Office of Noise Control (see Appendix D).

After construction, peak hour noise levels on the transit mall south of Burnside would increase by two dBA compared to the corresponding No Build sound levels. North of Burnside, the extended transit mall would experience peak hour noise level increases (compared to No Build) of five to seven dBA. The precise change would depend on future bus volumes on this part of the extended transit mall and would be inconsistent with existing noise abatement efforts in the downtown.

Increases in peak hour noise levels along the proposed exclusive bus lanes on Columbia and Jefferson in Goose Hollow would be five dBA compared to the No Build Alternative. This change would be attributable to the future increase in bus volumes in conjunction with the slight upgrade of these roads. The exclusive bus lanes would be consistent with DEQ regulations.

PORTLAND TO BEAVERTON. Construction noise would occur at the sites of the proposed Zoo/OMSI, Sylvan, and Walker Road transit stations; also, construction noise would occur at the proposed site of the Sunset Highway/State Highway 217 transit center and along the proposed busway. Traffic noise from the Sunset Highway and State Highway 217 would mask all but the loudest noise related to busway construction.

Noise related to construction of the Zoo/OMSI transit station would have an insignificant impact on the Zoo. The proposed Zoo/OMSI transit station is located south of the Sunset Highway. The proposed Sylvan transit station is located in the northeast quadrant of the S.W. Skyline Boulevard/S.W. Canyon Court intersection; at this point in the busway alignment, the busway is north of the highway. Construction noise would be audible at nearby commercial land uses, including the restaurant next to the proposed park and ride lot. However, the effect on commercial uses would be insignificant. The effect of busway construction on the Sylvan School (to be closed in the 1982-83 school year) could be significant, if that school is reopened or assigned to a sensitive use. The school is located approximately 200 feet from the proposed busway; at this distance haul trucks, pavers, and backhoes would generate outdoor noise levels of approximately 75 dBA, which also would be discernible inside the school. Noise related to construction of the Walker Road transit station would have a significant but temporary impact on nearby residents. Nearest residences are 200 feet from the proposed transit station; residences would be exposed to outdoor noise levels of 75 dBA during construction.

Construction noise related to the Sunset Highway/State Highway 217 transit center and associated park and ride lot would not have a significant impact on nearby land uses which include vacant land and commercial uses. St. Vincent's Hospital would not be exposed to a significant noise impact related to construction of the transit center, park and ride lot, or associated busway. Even if Barnes Road were used as a haul route, the noise impact on St. Vincent's Hospital would be insignificant. However, construction of the associated busway north of the Sunset Highway would have an impact on residents of Monterey Place, 88th, 89th, and 90th Streets. Construction noise also would be discernible inside the residences.

After construction, the Sunset Busway Alternative would be consistent with FHWA criterion sound levels for residential or sensitive non-residential sites. The transit center and transit stations also would be consistent with DEQ regulations.

<u>BEAVERTON</u>. Busway and transit station construction would have temporary adverse noise effects on residents of Fairfield Street and 116th Avenue, 117th Avenue mobile home park, and Beaverdam Road apartments. Noise impacts of busway and transit station construction would depend on the chosen busway alignment option. Noise impacts would be insignificant under the SB-1/SB-2 and SB-3 North Entry alignment options; also, noise related to construction at the 117th Avenue transit station would adversely affect any mobile home residents that are not relocated. Construction of both of the SB-3 alignment options would adversely affect noise conditions at the Beaverdam Road apartments. The SB-3 South Entry alignment option would avoid construction related noise impacts to residents of Fairfield Street and 116th Avenue.

Busway operations after construction would adversely affect sound levels and exposures under the North Entry alignment options (SB-1/SB-2 and SB-3 North Entry). The North Entry alignment would be associated with up to 14 residential exposures to sound levels of 67 dBA (Leq), depending on the treatment of the Fairfield and 116th Avenue residences, mobile home park, and Beaverdam Road apartments. Sound levels (Leq) in the alignment would be a maximum of 65 dBA within 200 feet of State Highway 217. A corner of the Beaverdam Road apartments would be so close (30 feet) to the North Entry alignment that the apartments would be exposed to average sound of 67 dBA (Leq) with peak passby levels of 79 dBA. This would be in violation of the FHWA criterion sound level and DEQ regulation OAR 340-35-035A. Bus passbys would increase existing sound levels at the Beaverdam Road apartments and residences at the end of 116th Avenue, by 10 to 12 dBA, in violation of the DEQ regulation, OAR 340-35-035B. This impact could be mitigated as described under Mitigation Measures. Noise walls would not be effective, so that special acoustic treatment such as double glazed windows and solid core doors would be necessary.

The South Entry alignment options would impact six residential properties on Center Street near 113th Avenue, which would be exposed to sound levels of 67 dBA (Leq), in violation of FHWA criterion sound levels. Sound levels would peak at 75 dBA, but would not be associated with any violation of the DEQ regulations. Nevertheless, the noise peaks would be intrusive in nature, as they would not occur under the No Build Alternative.

WESTERN WASHINGTON COUNTY. Impacts would be limited to the period of construction of proposed transit centers and maintenance facility. The facilities and related traffic would be consistent with the FHWA criterion and DEQ regulations.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

SYSTEMWIDE. East of Beaverton, the Sunset LRT Alternative would have many of the same temporary construction noise impacts as the Sunset Busway. West of Beaverton, it would have additional noise impacts related to construction of the 185th Avenue park and ride station, LRT transitway, and several additional transit stations. After construction, the Sunset LRT would be associated with slight decreases in 1995 noise levels compared to the No Build Alternative in the portions of the alignment near the Vista Ridge tunnels; also, the Sunset LRT would alter noise frequency spectra in 1995 in the relatively undeveloped or open portions of the alignment in Western Washington County.

DOWNTOWN PORTLAND. Construction of LRT guideway in the downtown would be a major project and would have significant noise impacts. Asphalt sawing, hauling, and numerous other activities would generate noise levels of 85 to 95 dBA in the vicinity of construction sites. Construction related noise would be subject to regulation by the Portland Office of Noise Control. The Sunset LRT after construction would not have significant noise impacts in Downtown Portland. Light rail vehicle passbys would be noticeably quiet compared to those of buses. Leq noise levels on the transit mall would be similar to those associated with the No Build Alternative because of the continuation of bus service on the transit mall under the Sunset LRT Alternative.

Alignment options in the downtown include the Jefferson/Columbia option and Vista Ridge Tunnel option. Both alignment options would be consistent with the FHWA sound criterion and DEQ regulations; however, peak passby noise levels of 74 dBA at 50 feet would be intrusive for the multi-family residences along Montgomery Street near the eastern tunnel portal, because that street presently is not in a transit corridor.

There would be no change in noise levels, relative to the No Build, in the Goose Hollow area resulting from the Sunset LRT.

PORTLAND TO BEAVERTON. Construction noise impacts would be similar to those described for the Sunset Busway Alternative. The Sunset LRT after construction would have no significant impact on noise conditions between Downtown Portland and Beaverton. Predicted noise levels, FHWA criterion exposures, and consistency with DEQ regulations under the Sunset LRT would be similar to those of the No Build Alternative.

BEAVERTON. Light rail guideway and transit station construction could have temporary adverse noise effects on residents of Fairfield Street, 117th and 116th Avenues, and Beaverdam Road. Construction related noise impacts would depend on the choice of LRT alignment. The alignment options and associated construction noise impacts were described under the Sunset Busway Alternative for the portion of the alignment that terminates at the proposed Beaverton transit center.

West of the Beaverton transit center, the Sunset LRT would also be associated with temporary noise generated by LRT guideway and transit station construction. Much of this portion of the alignment is open or commercial land, so that noise impacts would not be severe.

After construction, the Sunset LRT system would be consistent with the FHWA criterion sound level and DEQ regulations. In contrast to the Sunset Busway, the Sunset LRT would not alter residential sound exposures (Leq) in the Fairfield Street/116th Avenue neighborhood (see Table 3.8-2).

Sunset LRT North Entry alignment options (S-1/S-2 and S-3 North Entry) would be associated with peak passby noise levels of 72 dBA, at the backyard property lines of 11 residences at Fairfield Street and 116th Avenue. Peak passby noise would be discernible from ambient noise, inside and outside of Fairfield Street and 116th Avenue residences, 40 times during the hour of peak LRT service. A corner of the Beaverdam Road apartments would be exposed to peak passby noise of 76 dBA. The South Entry alignment options would expose six residental properties on Center Street near 113th Avenue to peak passby levels of 72 dBA. North and South Entry alignment options would be consistent with the DEQ regulation (OAR 340-35-035B).

WESTERN WASHINGTON COUNTY. Impacts would occur during the construction period along the LRT guideway and in the vicinity of transit station construction sites. Construction of the 185th Avenue park and ride lot would generate high noise levels within 150 feet of the construction site, but this noise would not affect the Heritage Loop residences located outside of the 150 foot zone. Truck traffic on 185th Avenue would temporarily increase noise levels by three dBA above the ambient noise levels; however, the increase would not adversely affect residents or students at McKinley School.

After construction, the Sunset LRT system would be consistent with the FHWA criterion sound level of 67 dBA (Leq) and supplemental level of 62 dBA (Leq). Existing residential sites on 179th in the Liberty Bell Drive neighborhood would be exposed to peak passby noise levels of 65 dBA, which would be discernible in the backyards of these sites. (Normal conversation occurs at approximately 65 dBA.) Existing residential sites would not be exposed to noise associated with the 185th Avenue transit center and maintenance yard. The Sunset LRT system would be consistent with DEQ regulations as these regulations apply to existing noise sensitive properties. However, future noise sensitive properties, not as yet developed, could be exposed to noise conditions inconsistent with the DEQ regulations (OAR 340-35-035).

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

SYSTEMWIDE. The scope of construction related noise impacts under the Multnomah LRT Alternative would be slightly greater than those under the Sunset LRT. The reason for this difference is that the Multnomah LRT alignment passes through more residential land uses and less open space and highway right-of-way than the Sunset LRT alignment.

Operations noise impacts of the Multnomah LRT Alternative would be variable, depending on the degree of quiet or noise prevailing in a particular section of the alignment before the LRT action. Quiet zones such as Becker Drive, Elm Avenue, and Liberty Bell Drive would undergo an audible change in noise characteristics because of Multnomah LRT operations. Other zones, such as the commercially developed Macadam Avenue strip, would be insignificantly affected by the operation of Multnomah LRT.

DOWNTOWN PORTLAND. Construction of LRT guideway in the Downtown would have significant but temporary noise effects, similar to those associated with the Sunset LRT. Construction noise would be subject to regulation by the Portland Office of Noise Control. The Multnomah LRT after construction would have an insignificant (less than three dBA) noise impact. The Multnomah LRT would not cause exposures of residential or sensitive non-residential sites to noise levels that exceed the FHWA criterion of 67 dBA (Leq) or supplemental level of 62 dBA (Leq).

PORTLAND TO BEAVERTON. Maximum impacts would occur at the condominiums on Landing Drive, isolated residential and non-residential sites in Stephen's Gulch, sites adjacent to Multnomah Boulevard, apartments near Allen/Scholls Ferry and sites in the Becker/Elm neighborhood. The affected sites would benefit from implementation of noise control ordinances of the City of Portland (see Appendix D).

After construction the Multnomah LRT during the peak hour would expose the backyards of 21 additional residential sites to sound levels (Leq) between 62 and 67 dBA. The residential sites are located betweeen Scholls Ferry Road and Multnomah Boulevard, in the Oregon Electric right-of-way. Exposures to the FHWA and supplementary sound criteria could be avoided by restricting light rail vehicle speeds through this section of the alignment (see Mitigation Measures). The perimeter of two other residential sites, one at Allen Boulevard west of Scholls Ferry and one at Multnomah Boulevard east of 28th, would be exposed to sound levels (Leq) between 62 and 67 dBA. This is not considered a significant impact, because the only outdoor uses exposed between 62 and 67 dBA sound levels would be the parking lots of the apartments at these sites. Residential sites in the Oregon Electric right-of-way, and those on the western side of Elm Avenue, at Allen Boulevard west of Scholls Ferry, and at

Multnomah Boulevard east of 28th also would be exposed to peak sound levels of 74 dBA from light rail vehicle passbys. The time averaged sound level (L10) corresponding to these peak levels would be 60 dBA, which is consistent with the DEQ regulation OAR-340-35-035A. Any speed restrictions implemented to minimize exposure to the FHWA criterion sound level also would minimize exposure to peak passby noise.

BEAVERTON. Residential and sensitive non-residential sites in Beaverton would be exposed to short term construction noise levels of 80 to 87 dBA. The tunnel alignment option (M-2) would be associated with temporary exposure of the Beaverdam Road apartments to short term noise levels of 88 dBA during construction. Other alignment options (M-1/S-2 and M-3) would not expose sensitive sites to construction noise. In particular, commercial activities in the central business district would not be disrupted by construction noise. Operations related noise would be insignificant because of low operating speeds of light rail vehicles in the central business district. The Multnomah LRT system would be consistent with FHWA and DEQ noise guidelines and regulations.

WESTERN WASHINGTON COUNTY. Noise impacts of the Multnomah LRT in western Washingon County would be the same as those described for the Sunset LRT.

MITIGATION MEASURES

The following mitigation measures will minimize construction and transit operations related noise impacts. Because construction would cause a major noise impact under each of the build alternatives, considerable attention is given to measures that would mitigate construction noise. Table 3.8-4 presents selected mitigation measures that can minimize noise from construction equipment.

ALTERNATIVE 1: NO BUILD

No mitigation required.

ALTERNATIVE 2: BUS SERVICE EXPANSION

CONSTRUCTION NOISE. Measures should be implemented to moderate the temporary noise impacts from construction of transit centers, park and ride lots, and bus priority treatments on trunk routes.

- All construction vehicles and equipment will be properly muffled and equipped with acoustical enclosures.

- The contractor will limit hours of construction operations and related travel to normal working hours (e.g., between 8 a.m. and 6 p.m.), where practical.

- TRI-MET and/or METRO will inform the public of proposed construction timelines to minimize potential annoyance related to construction noise. This is particularly important in neighborhoods such as Fairfield Street/116th Avenue that would be located within a few hundred feet of construction sites.

TABLE 3.8-4 NOISE MITIGATION MEASURES FOR CONSTRUCTION EQUIPMENT

EQUIPMENT	MITIGATION MEASURE	NOISE LEVEL (dBA) BEFORE	AFTER	DISTANCE (FEET)
Pile Driver	Muffler on exhaust and sound barrier the leads	103	95	25
Pavement Breaker	Muffled	105	100	3
Diesel Drive Electric Welder	Muffler plus acoustical enclosure	93	76	23
Air Compressor (Diesel Driver)	Muffled	105	85	3
Air Tracked Drill	Acoustical enclosure	104	83	23
Chain Saw				
Gasoline	None	113	113	3
Electric	None	86	86	3
Sinker Drill	Acoustical enclosure	95	78	15
Earth Movers				
Front loader	Muffler	79	75	50
Back hoe	Muffler	85	75	50
Dozer	Muffler	80	75	50
Grader	Muffler	85	75	50
Truck	Muffler	91	75	50
Paver	Muffler	89	80	50
Material Handlers				
Concrete mixer	Muffler	85	75	50
Crane	Muffler	83	75	50
Jack Hammer	Muffler or acoustical enclosure	88	75	50

Sources: Urban Mass Transportation Administration, 1974; U.S. EPA, 1971

TRANSPORTATION NOISE. The following measure should be implemented:

- TRI-MET will seek funds for bus retrofits for noise.

ALTERNATIVE 3: SUNSET BUSWAY

CONSTRUCTION NOISE. Mitigation measures are the same as those listed for Bus Service Expansion, and also include the following:

- Impacts from construction noise would be unavoidable at the Sylvan School if construction occurs during the school session. However, the Sylvan School will be closed by the Portland School Board beginning in the 1982-83 school year and may not be reopened (Portland School Board, 1981).

TRANSPORTATION NOISE. The following measures will be implemented:

- Study the cost effectiveness of a sound barrier in the vicinity of 116th Avenue in the preliminary engineering phase.

- Study the need for and cost effectiveness of acoustical treatment of the Beaverdam Road apartments during preliminary engineering.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

CONSTRUCTION NOISE. Construction noise mitigation measures are the same as described for Bus Service Expansion and in Table 3.8-4.

TRANSPORTATION NOISE. All of the mitigation measures presented for Bus Service Expansion apply to the Sunset LRT alternative. In addition, the following measure will be implemented:

- Study the cost effectiveness of incorporating into the LRT design a noise wall in the vicinity of 116th Avenue in Central Beaverton (North Entry alignment option only) and in the vicinity of Liberty Bell Drive/179th in western Washington County. (The alternative cost of land buffers should be considered in the study of western Washington County).

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

CONSTRUCTION NOISE. Measures to be implemented are the same as those for Bus Service Expansion.

TRANSPORTATION NOISE. The following measures will be implemented:

- Study the cost effectiveness of sound walls along Becker Drive backyard property lines and along the perimeter of Elm Avenue backyard property lines during preliminary engineering.

- Study the cost effectiveness of soundproofing the apartment buildings located on Multnomah Boulevard at 28th Avenue and the Royal Pine Apartment on Allen Boulevard west of Scholls Ferry Road.

- Study cost effectiveness of incorporating into the LRT design a noise wall in the vicinity of Liberty Bell Drive/179th in western Washington County.

- Study the cost effectiveness of acoustic walls in western Washington County compared to land buffers and no acoustic treatment.

- Study during preliminary engineering the feasibility of instituting light rail vehicle speed limitations in the Oregon Electric right-of-way. The noise benefits of various speed limitations are presented in Table 3.8-5.

TABLE 3.8-5 EFFECT OF VEHICLE SPEED ON LIGHT RAIL VEHICLE NOISE

SPEED (MPH)	LEQ(dBA) AT SPECIFIED DISTANCE FROM TRACK		PEAK SOUND (dBA) AT 100 FEET FROM TRACK
	35 FEET	100 FEET	
55	67	58	74
45	65	56	72
35	63	54	68
25	60	51	64

3.9 AIR QUALITY

EXISTING SETTING

The Westside Corridor is located in the Portland/Vancouver Air Quality Maintenance Area (AQMA). The AQMA contains subareas that are not in attainment of the federal secondary particulate (TSP) standard, the federal and state ozone standards, and the federal eight-hour carbon monoxide (CO) standard. Nonattainment refers to those areas that, by virtue of their air pollutant emission trends, violate the National Ambient Air Quality Standards (NAAQS). The applicable NAAQS and standards for the State of Oregon which apply to the Westside Corridor are shown in Table 3.9-1.

The Clean Air Act, as amended in 1977, requires all designated air quality nonattainment areas to prepare State Implementation Plans (SIP) which provide for attainment and maintenance of federal air quality standards. In the METRO area, there are currently approved SIP's for ozone and carbon monoxide. These plans were adopted in April, 1979 and did not include specific transportation control measures. Consequently, each of the build alternatives covered in this DEIS is in conformance with the current SIP. Revised SIP's for both pollutants, which may include transportation control measures, will be adopted by the State of Oregon in July, 1982. METRO and the City of Portland recently completed an analysis for the 1982 CO SIP submittal. The analysis concluded that the only potential CO hot spots in the region through 1987 would be in the central business district (CBD) of Portland (since this was a regional analysis which only included committed projects likely to be built through 1987, isolated "hot spots" associated with the development of new projects were not identified). Transportation control measures to be enacted by the City of Portland will bring the Portland CBD to attainment of the CO standard by December 1985 and the project alternatives covered in this DEIS will be in full conformance with these new transportation control measures.

At this time, analysis is being performed by METRO and DEQ to determine the region's attainment date for the federal ozone standard. The results of this analysis will be incorporated in the 1982 ozone SIP. Preliminary analysis suggests that the region will attain the ozone standard by 1987.

Existing air quality of the Westside Corridor is indicated by archival air quality data collected by the Oregon Department of Environmental Quality (DEQ) and also by air quality data collected by Earth Metrics Incorporated. DEQ operates a 33 station air pollution and meteorological surveillance network within the Portland/Vancouver AQMA. Two Downtown Portland sites include the Continuous Air Monitoring Site (CAMS) on Burnside Road, where a variety of pollutants are monitored on a routine basis, and the CO monitoring site at 4th and Alder. In addition, a high volume (HIVOL) sampler, used for obtaining samples of TSP and lead, operates continuously at Beaverton City Hall, and ozone is monitored routinely at the Carus site in Canby. A summary of the ambient quality measured at DEQ monitoring stations in the Westside Corridor is presented in Table 3.9-2.

To supplement archival air quality data, Earth Metrics Incorporated, in November and December 1980, performed air quality monitoring in the Westside Corridor, establishing baseline levels for CO, TSP, and lead. The air monitoring program was conceived and performed with assistance from DEQ and ODOT.

TABLE 3.9-1. AMBIENT AIR QUALITY STANDARDS FOR OREGON

POLLUTANT	AVERAGING TIME	FEDERAL STANDARDS PRIMARY (HEALTH)	FEDERAL STANDARDS SECONDARY (WELFARE)	OREGON STANDARDS
Total Suspended Particulate	Annual Geometric Mean	75 $\mu g/m^3$	60 $\mu g/m^3$	60 $\mu g/m^3$
	24 hours[a]	260 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
	Monthly[b]			100 $\mu g/m^3$
Ozone	1 hour	235 $\mu g/m^3$[c]	235 $\mu g/m^3$[c]	160 $\mu g/m^3$[c]
Carbon Monoxide	8 hours[a]	10 mg/m^3	10 mg/m^3	10 mg/m^3
	1 hour[a]	40 mg/m^3	40 mg/m^3	40 mg/m^3
Sulfur Dioxide	Annual Arithmetic Average	80 $\mu g/m^3$		60 $\mu g/m^3$
	24 hours[a]	365 $\mu g/m^3$		260 $\mu g/m^3$
	3 hours[a]		1300 $\mu g/m^3$	1300 $\mu g/m^3$
Nitrogen Dioxide	Annual Arithmetic Average	100 $\mu g/m^3$	100 $\mu g/m^3$	100 $\mu g/m^3$
Hydrocarbons (Nonmethane)	3 hours[a]	160 $\mu g/m^3$	160 $\mu g/m^3$	160 $\mu g/m^3$
Lead	Monthly			3 $\mu g/m^3$
	Calendar Quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	

[a] Not to be exceeded on more than one day per year.

[b] 24 hour average not to be exceeded more than 15 percent of the time.

[c] A statistical standard, but basically not to be exceeded more than an average one day per year based on the most recent three years of data.

[d] The federal standards were revised in February, 1979, and the state standard changed from photochemical oxidant to ozone in June, 1979.

Source: DEQ, 1981

TABLE 3.9-2. VIOLATIONS OF AIR POLLUTION STANDARDS AT WESTSIDE CORRIDOR AIR MONITORING STATIONS, 1976-1980

DAYS EXCEEDING STANDARDS AT LOCAL MONITORING STATIONS						
STATION/POLLUTANT	STANDARD	1976	1977	1978	1979	1980[d]
CARUS[a]						
Ozone	State	17	42	34	8	5
	Federal	4	15	9	1	0
CAMS[b]						
Carbon Monoxide	Federal (8 hour)	25	44	36	21	19
Nitrogen Dioxide	Federal (annual)	60.7	66.6	40.2	64.7	52.0
Sulfur Dioxide	State (24 hour)	0	0	0	0	0
	Federal (24 hour)	0	0	0	0	0
TSP	State (24 hour)	2	0	2	4	9
	Federal (primary)	0	0	0	1	4
BEAVERTON[c]						
TSP	State (24 hour)	2	1	2	3	5
	Federal (primary)	0	0	0	2	1
4th-ALDER						
Carbon Monoxide	Federal (8 hour)	32	14	9	5	11

[a] Carus site is located on Spangler Road in Canby.

[b] Continuous Air Monitoring Site is located at 718 W. Burnside.

[c] Beaverton Station is located at 4950 S.W. Hall.

[d] Includes data through October, 1980.

Source: DEQ, 1981.

OZONE. Violations of the federal ozone standard in Portland have decreased from 15 days in 1977 to none in 1980 (Table 3.9-2). Reactive hydrocarbons are of particular concern as precursors of photochemical oxidants, because hydrocarbons combine with nitrogen dioxide in the atmosphere in the presence of sunlight to form ozone. In 1980 approximately 48 percent of the hydrocarbon emissions in the Portland/Vancouver AQMA originated from automobile emissions (DEQ, 1980). Air quality planning efforts by METRO include strategies for reducing regional emissions of hydrocarbons to provide compliance with state and federal standards.

PARTICULATES. The Portland/Vancouver AQMA is designated as a nonattainment area for the secondary federal particulate standard. Approximately 63 percent of the TSP emissions in the Portland/Vancouver AQMA originate from motor vehicles (DEQ, 1979). Other typical sources of TSP include various industries and fugitive dust from construction or agricultural activities.

Violations of the secondary TSP standard at the CAMS site in Portland numbered two days in 1978, four days in 1979 and nine days in 1980 (Table 3.9-2). A general increase in particulate pollution since 1976 in the Portland area has been attributed to general population growth and an increase in wood heating (DEQ, 1979). The large increase in the number of TSP violations in 1980 can be attributed to ashfall from eruptions of Mt. St. Helens.

CARBON MONOXIDE. Violations of the CO (eight hour) standard at the CAMS site in Portland decreased from 36 days in 1978 to 21 days in 1979 and 19 days in 1980; at the 4th/Alder site, violations increased from 5 in 1979 to 11 in 1980. Although violations of federal standards for CO do occur in Portland, the long term trend is one of general improvement of air quality in terms of CO. Recent analysis by METRO and the City of Portland indicates that the entire region should comply with the CO standard by December 1985.

Maximum eight hour CO concentrations in the Westside Corridor during November and December 1980 were at the Canyon Road site, where levels of 11.5 mg/m3 and 10.4 mg/m3 were measured on December 15 and 16. These are both in violation of the federal and state eight hour CO standard of 10.0 mg/m3. These dates also correspond to the dates of the highest CO concentrations measured elsewhere in the region during the winter of 1980/1981. DEQ recorded maximum eight hour CO concentration of 12.3 mg/m3 on the 15th and 12.5 mg/m3 on the 16th at the CAMS site; 18.9 mg/m3 on the 15th and 13.3 mg/m3 on the 16th at the 4th and Alder monitoring site in Downtown Portland, all in violation of the state and federal eight hour standard.

IMPACTS

Air quality impacts of the Westside Corridor build alternatives would not be adverse and some impacts would be slightly beneficial depending on the alternative. Implementation of any of the build alternatives would not cause violations of the federal carbon monoxide standard at any receptor sites. Implementation of any of the build alternatives will have a beneficial effect on carbon monoxide emissions in the greater Portland area, including the CBD. The build alternatives also would have a beneficial impact on regional hydrocarbon emissions (a major precursor of ozone) and, therefore, are in conformance with the forthcoming ozone element of the SIP.

Construction impacts include temporary localized increases in TSP at major construction sites and emissions from construction related traffic. Excavation and soil redistribution sites would have high potential for dust and related TSP concentrations.

Operational impacts of the various transportation alternatives include the effects of altered traffic patterns on air pollutant emissions and local CO concentrations. Systemwide emissions of CO, NOx, reactive hydrocarbons and TSP were determined for the 1981 base year and projected for 1988 and 1995 under each alternative as shown in Table 3.9-3. The emissions inventory is based on Westside Corridor VMTs, and emission factors (METRO, 1981) as derived from data concerning vehicle speeds, mixes and operational mode. The forecasted emissions and concentrations reflect the impacts of the Westside transit improvements on travel and land use. Emissions factors for 1988 and 1995 are corrected for a program of biennial inspection and maintenance. The year of worst air quality (determined as the year of worst case emissions for respective air pollutants) in all cases was the 1981 base year.

Future CO concentrations, projected at locations where transit stations or centers would exist under the various build alternatives, are presented in Table 3.9-4. The projection year is 1988, which is the year of expected worst (CO) air quality during the project lifetime. The prediction methodology employed an air dispersal model that translates weather conditions and traffic volumes into CO levels at specified receptor sites. As Table 3.9-4 indicates, local CO impacts of any of the alternative projects would be generally described herein as insignificant (in particular, less than 0.5 mg/m3 in all locations, except for two locations where increases would be less than 1.0 mg/m3).

ALTERNATIVE 1: NO BUILD

SYSTEMWIDE. In 1988 and 1995 emissions of CO, NOx, and hydrocarbons would be higher under the No Build than any of the build alternatives. However, future emissions would decrease relative to the 1981 base year, because of existing regulation of transportation related pollutants. Emissions in 1988 would be less than current emissions by 32.8 percent for CO, 19.4 percent for NOx and 38.1 percent for reactive hydrocarbons. By 1995, emissions would further decrease, relative to the base year, by 42.8 percent for CO, 21.0 percent for NOx and 54.0 percent for hydrocarbons. Because future emissions of NOx and hydrocarbon under the No Build Alternative would be less than 1981 emissions, it is expected that an improvement in ozone levels over the baseline situation also would occur. Since no construction of facilities would occur, there would be no construction related impacts on local or systemwide air quality.

DOWNTOWN PORTLAND. Analysis performed by the City of Portland for the 1982 carbon monoxide SIP shows that the entire Portland downtown area will attain the CO standard by 1985. This is due to stricter emission controls on automobiles and a Parking and Traffic Circulation policy which limits the number of allowable parking spaces in the downtown

TABLE 3.9-3. SUMMARY OF WESTSIDE CORRIDOR SYSTEMWIDE EMISSIONS[a,b]

ALTERNATIVE	1988 VMT AND EMISSIONS: VMT 10^6 MILES	1988: CO (10^3 kg/day)	1988: NOx (10^3 kg/day)	1988: HC (10^3 kg/day)	1988: TSP (10^3 kg/day)	1995 VMT AND EMISSIONS: VMT[d] 10^6 MILES	1995: CO (10^3 kg/day)	1995: NOx (10^3 kg/day)	1995: HC (10^3 kg/day)	1995: TSP (10^3 kg/day)
NO BUILD	3.1971	122.524	13.330	14.650	1.739	3.5656	70.089	10.527	6.746	1.925
BSE	3.1147	121.314	13.164	14.535	1.692	3.4009	67.819	10.215	6.520	1.836
SUNSET BUSWAY	3.1098	121.223	13.149	14.526	1.689	3.3910	67.689	10.187	6.513	1.831
SUNSET LRT	3.0821	120.577	13.031[c]	14.461	1.673	3.3356	66.436	9.966[c]	6.392	1.801
MULTNOMAH LRT	3.0861	120.655	13.044[c]	14.469	1.676	3.3437	66.582	9.990[c]	6.407	1.806

a 1981 base case emissions (in 10^3kg/day) based on 2.8285 VMT per day are 182.370 for CO, 16.530 for NO_x, 23.671 for HC and 1.527 for TSP.

b The emissions methodology employed is different from that used in the SIP, but has been approved by DEQ.

c No_x emissions from power plants used to generate electric energy needed to power light rail vehicles are not included.

d VMT for automobiles and trucks only.

Source: Earth Metrics Incorporated, 1981

TABLE 3.9-4. EIGHT HOUR CO LEVELS AT WESTSIDE CORRIDOR LOCATIONS (mg/m^3).

ROADWAY OR INTERSECTION	TRANSIT STATION[a]	NO BUILD CO CONCENTRATIONS		CHANGE IN 1988 BUILD ALTERNATIVE CO CONCENTRATIONS (RELATIVE TO NO BUILD)			
		1988	1995	BSE	Sunset Busway	Sunset LRT	Multnomah LRT
Downtown Portland							
18th/Columbia	18th Street	5.7	3.0	0	0	0	0
Harbor/Montgomery	South Waterfront	5.7	5.1	0	0	0	0
Portland to Beaverton							
Sunset Highway	Zoo/OMSI	8.0	4.7	-.2	-.2	-.4	-.3
Sunset/Canyon Ct/Skyline	Sylvan	9.6	6.7	-.5	-.5	-.9	-.5
Sunset/Barnes Road	Sunset/217	7.4	5.6	+.1	+.1	-.1	+.1
Walker Road/Highway 217	Walker Road	10.7	6.4	-.2	-.2	-.3	-.6
Gaines/Macadam	Gaines Road	6.2	3.5	-.5	-.5	-.5	+.7
Boundary/Macadam	Boundary Street	7.1	4.1	-.1	-.1	-.1	+.2
Nebraska/Macadam	Nebraska Street	7.2	4.1	-.1	-.1	-.1	+.2
Nevada Macadam	Nevada Street	8.5	4.4	-.2	-.2	-.2	+.3
Barbur/I-5/Terwilliger	Burlingame TC	9.4	5.1	-.2	-.2	-.2	-.2
25th/Multnomah	25th/Multnomah	5.6	3.0	0	0	0	0
35th/Multnomah	35th/Multnomah	5.8	3.2	0	0	0	0
45th/Multnomah	45th/Multnomah	6.4	3.4	-.3	-.3	-.4	-.2
Oleson Road	Oleson Road	6.8	4.4	-.2	-.2	-.2	0
Scholls Ferry/Allen	Scholls Ferry/Allen	7.7	3.9	-.5	-.5	-.5	-.5
Beaverton							
Broadway	Town Center	3.9	2.2	0	0	0	0
117th Avenue	Center Street	3.7	2.1	0	0	0	0
114th Avenue	114th Avenue	4.0	2.4	0	0	0	0
Cedar Hills Boulevard	Beaver Creek Centre	4.6	2.6	+.6	+.9	+.7	+.8
Farmington/Broadway	West Broadway	7.9	4.8	0	-.1	-.3	-.3
Farmington/Broadway	Beaverton TC	5.5	3.1	0	-.1	-.3	-.3
Hall/Watson	Beaverdam TC	5.3	3.0	+.2	+.2	+.3	+.2

(Continued)

TABLE 3.9-4 CONTINUED). EIGHT HOUR CO LEVELS AT WESTSIDE CORRIDOR LOCATIONS. (mg/m^3)

ROADWWAY OR INTERSECTION	TRANSIT STATION[a]	NO BUILD CO CONCENTRATIONS		CHANGE IN 1988 BUILD-ALTERNATIVE CO CONCENTRATIONS (RELATIVE TO NO BUILD)			
		1988	1995	BSE	Sunset Busway	Sunset LRT	Multnomah LRT
Western Washington County							
Terman/Murray	Murray Boulevard	3.7	2.1	0	0	0	0
158th Avenue	158th Avenue	4.1	2.4	-.1	0	+.1	+.1
170th/Baseline	170th Avenue	6.4	3.7	-.4	-.3	-.3	-.4
173rdAvenue	173rd Avenue	4.1	2.7	-.1	0	+.1	+.1
185th Avenue	185th Avenue	5.7	2.9	-.1	0	+.1	+.1

[a] These transit stations and centers would not be constructed under the No Build Alternative, but the CO concentrations were projected at locations where stations would exist under various build alternatives.

[b] Projections of CO are based on worst case wind speeds as determined from Canyon Road data (2.0 mph) and on a Pasquill Stability Class of D.

[c] Changes less than $\pm$ .5 mg/m^3 are insignificant and subject to projection error.

Source: Earth Metrics Incorporated, 1981

PORTLAND TO BEAVERTON. No Build concentrations of CO projected for 1988 and 1995 at major intersections in this segment of the Westside Corridor are presented in Table 3.9-4. None of the 1995 values approach the federal or state eight hour standards. Maximum concentrations of CO in 1988 would be 10.7, 9.4 and 9.6 mg/m3 at Walker Road/Highway 217, Barbur/Terwilliger near Interstate 5, and Sunset Highway/Canyon Court/Skyline Boulevard, respectively. Sensitive receptors in these areas, such as the Sylvan School, Burlingame Park, and nearby residential sites are sufficiently distant from the road so as not to be exposed to concentratons of CO greater than 9 mg/m3.

BEAVERTON. CO concentrations projected for locations in downtown Beaverton would not exceed state or federal standards. Local CO impacts on sensitive receptors would be insignificant.

WESTERN WASHINGTON COUNTY. None of the CO concentrations projected for locations in this portion of the Westside Corridor would exceed federal or state standards. Local CO impacts on sensitive receptors would be insignificant.

ALTERNATIVE 2: BUS SERVICE EXPANSION

SYSTEMWIDE. Emissions in 1988 and 1995 under the BSE Alternative would be slightly less than those associated with the No Build Alternative (Table 3.9-4). The relative decreases in emissions indicate that the BSE Alternative systemwide would have minor beneficial impact on air quality. These emission reductions reflect the decrease in automobile travel associated with transit expansion. Because future emissions of NOx and hydrocarbons under the Bus Service Expansion Alternative would be less than 1981 emissions, it is expected that an improvement in ozone levels relative to 1981 baseline also would occur. Construction related activities would not add significantly to systemwide TSP or other air pollutant emissions.

DOWNTOWN PORTLAND. Local CO levels would be similar to those associated with the No Build Alternative. CO levels on the extended bus mall would be approximately the same as those related to the No Build Alternative.

PORTLAND TO BEAVERTON. Traffic attracted to the Sunset/State Highway 217 Transit Centers would elevate CO levels slightly above those associated with the No Build Alternative (+ 0.1 mg/m3). Worst case CO levels in the Burlingame Transit Center area would be 9.2 mg/m3; however, this represents a 0.2 mg/m3 decrease at this site. Residential sites and Burlingame Park would not be exposed to CO levels that exceed the standards. Development of a 600 car park and ride at the Sunset/217 State Highway Transit Center would result in additional traffic, but the related CO level (7.5 mg/m3) would be below the standard. At the Walker Road site, the CO level in 1988 (10.5 mg/m3) would exceed the standard within 150 feet of State Highway 217 and 25 feet of Walker Road, but would be less than the concentration expected under the No Build Alternative. There are no residences or sensitive receptors in the area projected to exceed the CO standard.

BEAVERTON. Operation of either optional transit center would attract additional local traffic resulting in increases in CO concentrations relative to those associated with the No Build Alternative of +0.6 mg/m3. Resulting CO levels will be below the federal standard of 10 mg/m3.

WESTERN WASHINGTON COUNTY. CO concentrations in western Washington County under the BSE Alternative would be lower than those associated with the No Build Alternative by up to 0.4 mg/m3.

ALTERNATIVE 3: SUNSET BUSWAY

SYSTEMWIDE. Emissions in 1988 and 1995 under the Sunset Busway Alternative would be slightly less than those associated with the No Build or Bus Service Expansion Alternative (Table 3.9-4), with the exception of three sites where insignificant increases would occur. These emission reductions reflect the effect of increased use of mass transit. Because future hydrocarbon emissions would be less than 1981 emissions, it is expected than an improvement in ozone levels relative to the 1981 baseline also would occur. Construction related activities would not add significantly to systemwide TSP or other air pollutant emissions.

DOWNTOWN PORTLAND. Air quality impacts would be the same as those associated with the BSE Alternative.

PORTLAND TO BEAVERTON. Construction of the Sunset Busway would require earthmoving and soil redistribution that would contribute to local and temporary increases in TSP. With proper mitigation, increases in TSP would not approach federal or state standards and would not significantly affect sensitive receptors such as the Sylvan School, St. Vincent's Hospital, the Zoo, and residential sites. Increases in TSP would occur in close proximity to construction sites of the Sunset/State Highway 217 and Burlingame Transit Centers, transit stations and the Sylvan park and ride lot.

Eight-hour CO concentrations at the Sunset/State Highway 217 Transit Center and 600 space park and ride lot would increase, relative to the No Build, by 0.1 mg/m3 (Table 3.9-4). Eight-hour concentrations at the 53 space Sylvan park and ride lot would decrease, relative to the No Build by 0.5 mg/m3 to 9.1 mg/m3. Sensitive receptors near these sites, such as the Sylvan School (to be closed in the 1982-83 school year) or St. Vincent's Hospital, would not be exposed to CO levels that approach federal standards. At Walker Road/State Highway 217, levels in close proximity to the road and highway would be 10.5 mg/m3 in 1988, but would be less than the concentration expected under the No Build Alternative by 0.2 mg/m3. There are no residences or sensitive receptors near the forecast CO violation area.

BEAVERTON. Operation of either optional transit center or the transit stations would attract local traffic, but would not result in standard violation or CO increases greater than 0.2 mg/m3. An increase of 0.9 mg/m3 would occur at Beaver Creek Centre. Concentrations, however, would comply with federal standards. CO levels along the busway would comply with federal standards, being 3.7 to 7.8 mg/m3 in 1988.

WESTERN WASHINGTON COUNTY. Air quality impacts would be the same as those described for the BSE Alternative.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

SYSTEMWIDE. Projected emissions in 1988 and 1995 under the Sunset LRT Alternative would be less than for the No Build and slightly less than either of the bus service alternatives (Table 3.9-4). Reductions in emissions indicate that the effect of the Sunset LRT Alternative on systemwide air quality would be slightly beneficial. Emissions reflect the decrease in automobile travel associated with increased use of mass transit relative to the No Build Alternative. Because of the reduction in hydrocarbon emissions, it is expected that an improvement in ozone levels over the baseline also would occur, even though some NOx emissions would be generated by thermal power plants that provide electricity for light rail vehicles. (NOx emissions resulting from operation of light rail vehicles would be less than 0.5 percent of regional AQMA emissions). Construction related activities would not add significant TSP or other air pollutant emissions. There would be no violations of the federal CO standard at transit centers, stations, or park and ride lots as a consequence of the Sunset LRT. CO levels compared to levels under the No Build would be lower by up to 0.9 mg/m3 in close proximity to these facilities.

DOWNTOWN PORTLAND. The Sunset LRT Alternative would have lower emissions in Downtown Portland and would be consistent with SIP goals to attain and maintain the CO standard.

PORTLAND TO BEAVERTON. Future CO levels between Downtown Portland and Beaverton would be slightly less than those predicted for the No Build Alternative. Construction of the Sunset LRT would require earthmoving and soil redistribution that would contribute to local and temporary increases in TSP. With proper mitigation, increases in TSP would not exceed federal or state standards and would not significantly affect sensitive receptors such as the Sylvan School, St. Vincent's Hospital, the Zoo, and residential sites. Increases in TSP would occur in close proximity to construction sites of the Sunset/State Highway 217 and Burlingame Transit Centers, transit stations and the Sylvan park and ride lot. Within 150 feet of the Sunset Highway and State Highway 217 CO levels would be slightly lower (0.1 to 0.5 mg/m3) than CO levels that correspond to the No Build Alternative. This also would be true at the proposed Zoo/OMSI and Sylvan transit stations. At the proposed 600 car park and ride lot near Sunset Highway/State Highway 217, CO levels (eight hour) would decrease by 0.1 mg/m3 (compared to the No Build Alternative) to 7.3 mg/m3. At the proposed Walker Road transit station, CO levels would be slightly reduced by 0.3 mg/m3 to 10.4 mg/m3 in 1988. Relatively high CO levels at the Walker Road site would occur under the No Build Alternative and each build alternative, because of the high volume of traffic on State Highway 217 and not because of traffic on Walker Road. Residential sites, which are not located close to the road and highway, as is the proposed transit station, would not be exposed to CO levels greater than 9 mg/m3.

Construction of the tunnel option (with possible blasting) could create a small increase in particulate levels at the western portal of the tunnel. Any increase would be of a short duration and would not result in particulate levels approaching federal or state standards.

BEAVERTON. Traffic related to the proposed transit center and stations would result in CO levels of approximately 5.2 and 5.6 mg/m3 at the existing and Hall/Watson transit centers, respectively. This represents an increase of 0.3 mg/m3 at Hall/Watson and a decrease of 0.3 mg/m3 at the existing site. An increase of 0.7 mg/m3 would occur at Beaver Creek Centre. CO concentrations would still be within federal standards at these sites.

WESTERN WASHINGTON COUNTY. The proposed park and ride lots would cause CO levels to increase by 0.1 mg/m3. The highest CO concentrations would occur at 170th Ave, 6.1 mg/m3. Therefore, CO levels in proximity to the proposed park and ride lots and stations would be consistent with the federal CO standard.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

SYSTEMWIDE. Emissions in 1988 and 1995 under the Multnomah LRT Alternative would be less than those under the No Build and slightly less than those under either of the bus service alternatives (Table 3.9-3). The minor beneficial impact associated with the emissions reductions would result from increased use of mass transit under the Multnomah LRT relative to the other alternatives. Because of the reduction in hydrocarbon emissions, it is expected that an improvement in ozone levels over the baseline also would occur, even though some NOx emissions would be generated by thermal power plants that provide electricity for light rail vehicles. (NOx emissions resulting from operation of light rail vehicles would be less than 0.5 percent of regional AQMA emissions). Construction related activities would not add significant TSP or other air pollutant emissions.

DOWNTOWN PORTLAND. Impacts would be the same as those associated with the Sunset LRT Alternative.

PORTLAND TO BEAVERTON. Redistribution of large amounts of excavated material would be necessary for construction of structures at the Macadam Avenue/Taylor's Ferry Road intersection, at Terwilliger and Interstate 5 and at Capitol Highway. Blasting through dense rock formations may be required along Multnomah Boulevard near 50th Avenue and at Stephen's Gulch and may contribute to local and temporary increases in TSP. Increases in TSP also would be related to construction of the Sunset/State Highway 217 and Burlingame Transit Centers, transit stations, park and rides at Oleson Road and Scholls Ferry/Allen, and LRT guideway construction. With proper mitigation, increases in TSP would not approach federal and state standards.

There would be no violations of the federal CO standard at transit centers, stations, or park and ride lots as a consequence of the Multnomah LRT. CO levels compared to levels under the No Build Alternative generally would be lower by up to 0.6 mg/m3 near these facilities. At the proposed Burlingame transit center, CO levels would be reduced by 0.2 mg/m3 to 9.2 mg/m3 in 1988. At the Gaines/Macadam site CO levels would be increased by 0.7 mg/m3 to 6.9 mg/m3, the largest increase in this segment, but still within federal standards. There would also be increases in CO concentrations at other sites along Macadam Avenue; however, none would exceed federal standards.

BEAVERTON. Impacts would be the same as those related to the Sunset LRT Alternative except that entry into the downtown would involve different streets.

WESTERN WASHINGTON COUNTY. Impacts would be the same as those associated with the Sunset LRT Alternative.

MITIGATION MEASURES

ALTERNATIVE 1: NO BUILD

No mitigation measures are required.

ALTERNATIVE 2: BUS SERVICE EXPANSION

Construction mitigation measures to be studied during the preliminary engineering phase on paved areas are:

- Vacuum sweep paved areas onto which soils have been tracked by construction activities in a manner which does not stir up excessive dust. (Wire brush sweeping can create excessive dust as can vacuum sweeping with machines with faulty bags.)

- Apply spray bars or wheel washers (electronically activated) at access points to clean off truck wheels and under carriage before they leave the construction area.

- Spray water or apply dust palliatives to minimize wind blown dust.

- Cover all dump trucks hauling earth with some protective covering.

Operation. Mitigation measures to be studied are:

- Study the cost effectiveness of improving local circulation around proposed transit centers to limit any predicted increases in CO levels to 0.5 mg/m3 relative to the No Build Alternative.

- Study during preliminary engineering, design options for the Walker Road site that would keep waiting areas outside the area subject to air quality violations.

ALTERNATIVE 3: SUNSET BUSWAY

The same measures as those recommended for the BSE Alternative are to be implemented for the Sunset Busway Alternative.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

The same measures as those recommended for the BSE Alternative are to be implemented.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

The same measures as those recommended for the BSE Alternative are to be implemented.

3.10 ENERGY

EXISTING SETTING

The transportation system of the Westside Corridor is totally dependent on petroleum based energy resources. Automobiles consume approximately 76 percent of the total transportation energy; medium commercial trucks account for 21 percent of the daily total, and bus transit for three percent. Table 3.10-1 summarizes transportation energy consumption in the Corridor.

In Oregon, electricity is generated by regional, federal and utility owned hydroelectric dams, thermal and coal fired power plants, and the Trojan Nuclear Plant. The existing trend is toward more thermal generation, especially to meet peak electricity demand.

TABLE 3.10-1. EXISTING TRANSPORTATION ENERGY CONSUMPTION IN THE WESTSIDE CORRIDOR (BOE)

	1980 Daily Energy Consumption, Barrels of Oil			
VEHICLE CLASSIFICATION	PROPULSION	MAINTENANCE	TOTAL	PERCENT OF TOTAL
Automobiles	3,740	630	4,370	76
Standard Buses	140	50	190	3
Commercial Vehicles	710	500	1,210	21
	4,590	1,180	5,770	100

Sources: METRO, 1981
TRI-MET, 1980
Earth Metrics Incorporated, 1981

IMPACTS

Table 3.10-2 summarizes the construction energy, operations energy and payback period impacts for each Westside Corridor alternative. Construction energy was calculated on the basis of individual construction materials (e.g., asphaltic concrete, aggregate, track) and construction activities (e.g., paving, grading, placing). Construction energy also includes energy associated with the manufacture of transit vehicles. Operations energy is defined as energy used for vehicle propulsion and maintenance. Throughout the analysis Barrels of Oil Equivalent (BOE) is used as a common measurement for energy use. Calculations were based on forecasts of daily vehicle miles traveled (VMT) by automobiles, commercial vehicles, and transit vehicles, and on assumptions of future vehicle fuel economies and traffic flow conditions.

TABLE 3.10-2 SUMMARY OF WESTSIDE CORRIDOR ENERGY IMPACTS BY ALTERNATIVE

ALTERNATIVE	CONSTRUCTION ENERGY (BOE)[a]			1995 DAILY OPERATIONS ENERGY (BOE)[b]			DAILY SAVINGS RELATIVE TO NO BUILD		PAYBACK PERIOD[c] (YEARS)
	STRUCTURES	TRANSIT VEHICLES	TOTAL CONSTRUCTION	PROPULSION	MAINTENANCE	TOTAL OPERATIONS	(BOE)	%	
No Build	-	-	-	3,956	1,497	5,453	-	-	-
Bus Service Expansion	26,020	29,080	55,100	3,930	1,501	5,431	22	d	10
Sunset Busway	127,670	24,780	152,450	3,920	1,496	5,416	37	d	17
Sunset LRT	180,840	62,760	243,600	3,895	1,454	5,349	104	2	9
Multnomah LRT	305,500	83,800	389,300	3,932	1,457	5,389	64	1	24

[a] Based on the least energy intensive suboptions for each alternative.

[b] Operations energy includes vehicle propulsion and maintenance energy. Assumes an average 1995 automobile fleet fuel economy of 25 mpg.

[c] Payback period depends on the 1995 automobile fleet fuel economy (25 mpg).

[d] Less than 0.5 percent.

Source: Earth Metrics Incorporated, 1981

Fuel economies in 1995 were assumed to average 25 miles per gallon (mpg) for automobiles, 7.1 mpg for commercial vehicles, 4.5 mpg for standard buses, and 3.8 mpg for articulated buses. Light rail vehicle fuel economy was assumed to average 7.0 kilowatt hours per car mile. Electricity generation and transmission losses were assumed to be 67 percent.

The impacts of growth and development on travel are reflected in vehicle miles traveled. The impacts of travel flow conditions were generally addressed in the methodology, although detailed computations were not performed. Table 3.10-3 summarizes the impacts on energy use for each alternative, based on forecasted growth and development patterns.

ALTERNATIVE 1: NO BUILD

Without increased transit service, auto use in the Corridor will increase in proportion to population and employment growth. Operations energy efficiencies caused by slightly shorter average trip lengths in 1995 than today would be offset by increased levels of congestion on the Corridor's road system. The No Build Alternative exhibits the highest level of vehicle miles traveled and operations energy consumption of the five alternatives. No energy would be expended for construction purposes for this alternative.

ALTERNATIVE 2: BUS SERVICE EXPANSION

Increased transit use, relative to the No Build, would result in a five percent reduction in auto miles traveled. This energy savings would be largely offset by a 75 percent increase in bus miles traveled. In total, daily operations energy would be reduced by 0.4 percent. Over 55,000 BOE of energy will be required to implement the BSE Alternative, over one-half of which is used to manufacture the vehicles. Forecasts indicate that under this alternative it would take approximately 10 years for the operations energy savings (relative to the No Build) to offset the construction energy requirements.

ALTERNATIVE 3: SUNSET BUSWAY

Construction of the Busway would consume approximately 100,000 additional BOE of energy beyond that used in the Bus Service Expansion option. Running buses on an exclusive guideway would result in only a one percent reduction in transit operations energy relative to the Bus Service Expansion Alternative. Increased transit ridership, relative to the BSE, would result in a three percent reduction in auto miles traveled. A comparison of the Busway and BSE indicates that the Busway's incremental operations energy savings would not offset the incremental construction energy expenditure. The energy payback period of the Sunset Busway would be 70 percent longer than that of the BSE.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

The energy requirements of constructing the Sunset LRT would be greater than those associated with the Sunset Busway because of the LRT's longer guideway length and additional transit stations. Construction energy requirements

TABLE 3.10-3. DAILY OPERATIONS ENERGY CONSUMPTION BY VEHICLE CLASSIFICATION IN THE WESTSIDE CORRIDOR IN 1995

ALTERNATIVE	VEHICLE CLASSIFICATION	VEHICLE MILES TRAVELED	DAILY ENERGY CONSUMPTION (BOE)	DAILY SAVINGS RELATIVE TO NO BUILD (BOE)	DAILY SAVINGS RELATIVE TO NO BUILD (PERCENT CHANGE)
NO BUILD	Auto	3,281,000	3626	-	-
	Truck	284,600	1605	-	-
	Std. Bus	22,600	172	-	-
	Art. Bus	5,200	50	-	-
	LRT	0	0	-	-
	TOTAL	3,593,400	5453		
BUS SERVICE EXPANSION	Auto	3,116,000	3443	183	-5
	Truck	284,600	1605	0	0
	Std. Bus	21,600	164	8	-5
	Art. Bus	25,500	219	(+169)	+338
	LRT	0	0	0	0
	TOTAL	3,447,700	5431	22	-0.4
SUNSET BUSWAY	Auto	3,106,000	3432	194	-5
	Truck	284,600	1605	0	0
	Std. Bus	21,500	163	9	-5
	Art. Bus	25,200	216	(+166)	+332
	LRT	0	0	0	0
	TOTAL	3,437,300	5416	37	-0.7
SUNSET LRT	Auto	3,050,000	3371	255	-7
	Truck	284,600	1605	0	0
	Std. Bus	24,900	189	(+17)	+10
	Art. Bus	8,700	83	(+33)	+66
	LRT	8,400	101	(+101)	-
	TOTAL	3,376,600	5349	104	-1.9
MULTNOMAH LRT	Auto	3,059,000	3380	246	-7
	Truck	284,600	1605	0	0
	Std. Bus	27,100	206	(+34)	+20
	Art. Bus	7,000	67	(+17)	+34
	LRT	10,900	131	(+131)	-
	TOTAL	3,388,600	5389	64	-1.2

Source: Earth Metrics Incorporated, 1981
METRO, 1981

would depend upon the specific suboptions in Downtown Portland and Beaverton. There are six suboptions in Downtown Portland. The least energy consuming would be the Montgomery/12th/4th/5th option (15,200 BOE) while the Columbia/18th/5th/6th suboption would require the greatest energy expenditure (17,500 BOE).

The Sunset LRT Alternative also has a proposed optional tunnel through the West Hills. This suboption would require a significant construction energy expenditure that would not generate corresponding operations energy savings compared to the nontunnel alignment.

There are four light rail alignment suboptions in Central Beaverton: S-1/S-2 North Entry, S-1/S-2 South Entry, S-3 North Entry and S-3 South Entry. Energy costs associated with construction of these suboptions would range from 20,800 to 24,200 BOE under S-3 South Entry and S-1/S-2 North Entry, respectively. These energy costs are based on construction of the Broadway/Beaverton-Hillsdale Highway transit center under S-1/S-2 North and South Entry options and construction of the Hall/Watson transit center under S-3 North and South Entry options.

The construction energy consumption range for the nontunnel Portland and Beaverton suboptions are small in comparison to the overall construction energy need. Therefore, the energy differences between the suboptions are considered insignificant for decision making purposes.

The Sunset LRT exhibits the lowest auto miles traveled and total vehicle miles traveled of the five alternatives. The daily operations energy savings relative to the No Build would be 102 BOE, or two percent of the Corridor total. The operations energy savings would offset the construction energy expenditure in approximately nine years, the shortest payback period of the alternatives that require construction. It should be noted that the Sunset LRT Alternative would use about 205 BOE (four percent) less daily petroleum-based operations energy than the No Build. The daily electrical energy requirements of the Sunset LRT (58,500 kilowatt hours) is roughly equivalent to a Downtown Portland office building. Typical LRT substations are rated at one megawatt DC continuous, which is roughly one-quarter of one percent of the AC distribution substation capacity. The DC can surge to 4.5 megawatts for a maximum of 15 seconds. The impact of LRT loadings on local electrical conditions is negligible.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

The Multnomah LRT Alternative would be the most energy intensive alternative to construct. Two LRT alignment suboptions are proposed for Downtown Portland: Columbia/12th/4th/5th and Columbia/12th/5th/6th. Construction energy would total 12,900 BOE in Downtown Portland and would not differ significantly between the suboptions. There are four light rail alignment suboptions in Central Beaverton: M-1/S-2, M-2 and M-3. (Option M-2 is the tunnel alignment.) Energy costs associated with construction of the Multnomah LRT options in Central Beaverton would range from 20,800 to 57,000 BOE under M-1/S-2 and M-2, respectively.

The Multnomah LRT exhibits the second lowest daily use of operations energy of the five alternatives, 64 BOE (one percent) less than the No Build. However, it would take 24 years of operations savings to offset the initial outlay of energy for construction. This would be the longest payback period of any of the alternatives.

Petroleum-based operations energy would be 195 BOE (3.5 percent) less than the No Build. The Multnomah LRT's daily electrical energy requirement (76,300 kilowatt hours) would be greater than that of the Sunset LRT, but is not viewed as a significant demand on the region's electricity supply.

MITIGATION MEASURES

No mitigation measures are recommended. However, in preliminary engineering, TRI-MET will investigate transit vehicles (bus and LRT) that provide maximum fuel economy ratings, subject to tradeoffs between:

- Fuel economy and amenities for passenger comfort (seating, air conditioning, sound insulation).

- Fuel economy and automatic transmission gear ratios/shifting speeds.

- Fuel economy and maintenance energy costs (oil changes, brake wear, major parts).

3.11 GEOLOGY, HYDROLOGY, AND BIOLOGY

EXISTING SETTING

Field investigations and consultations were performed in accordance with Executive Order 11990 (Wetlands), Executive Order 11988 (Floodplain Management), and Section 7 of the Rare and Endangered Species Act of 1973. The existing 100-year floodplain and wetlands in the Westside Corridor are described in the following discussion. No rare or endangered species were identified in the corridor.

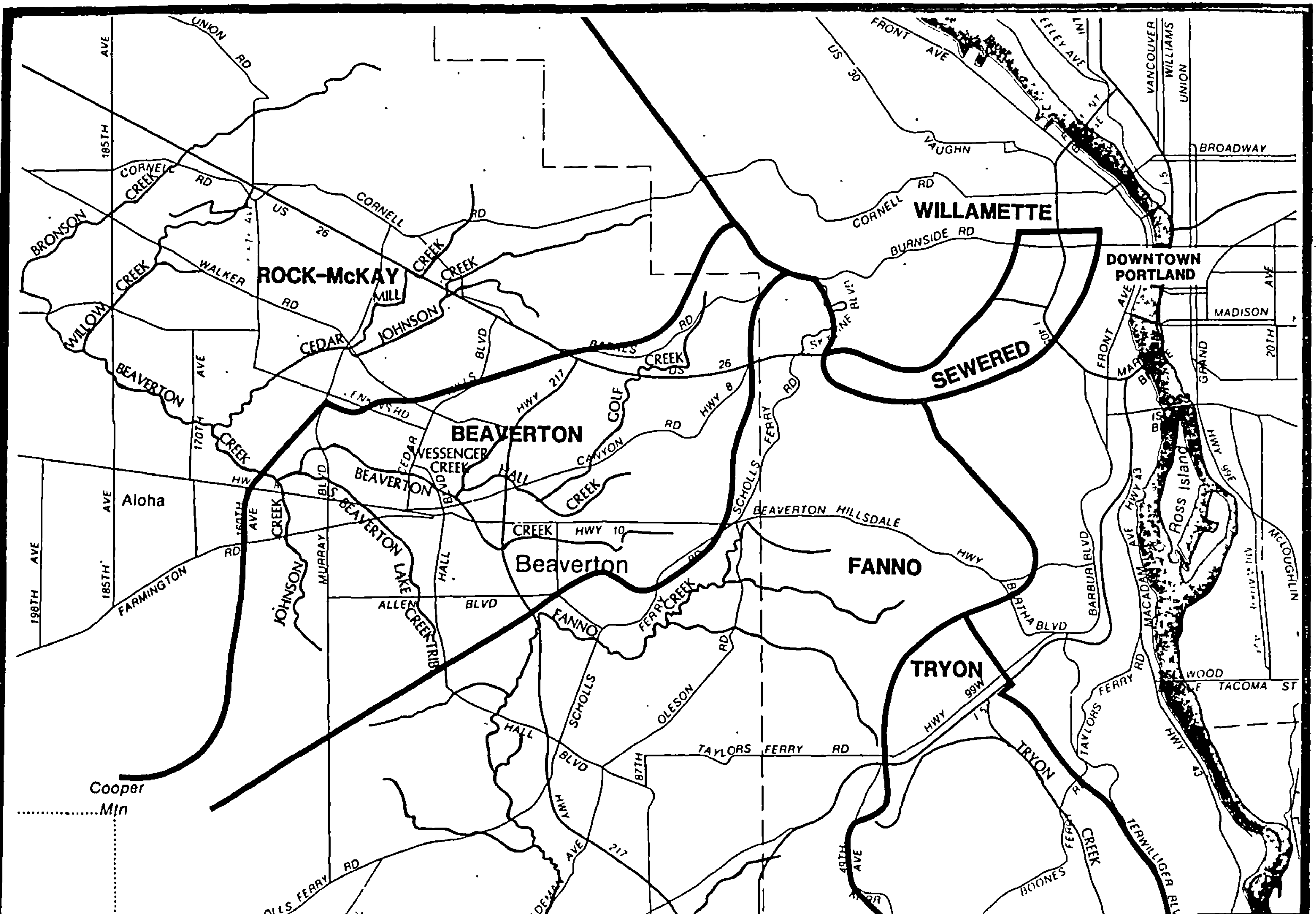
GEOLOGY AND SOILS. Geologic hazards in the Westside Corridor exist principally on steep slopes prone to landslides and soil erosion. Notable slide risks exist along the Sunset Highway, between the Vista tunnel and the Sylvan area, and in Stephen's Creek ravine, west of Macadam Avenue near the Terwilliger bridge. Because of poor drainage or steep slopes (see Figure 3.11-1), these areas also are subject to soil erosion, as are the land along Wessenger Creek (also called the north fork of Hall Creek) and the Beaverton Creek floodplain.

HYDROLOGY AND WATER QUALITY. Major drainage features of the Westside Corridor include the Willamette River, Fanno Creek, Beaverton Creek (and its tributaries), and Rock Creek (and its tributaries). Three drainage processes act in these areas: tributary, overland, and sewered drainage. West of the Tualatin Mountains, the Westside Corridor is drained by numerous tributaries of Fanno Creek, Beaverton Creek, and Rock Creek. East of the Tualatin Mountains, the Westside Corridor is drained primarily by overland flow into the Willamette River. The Stephen's Gulch area is drained by Stephen's Creek. The south side of the Sunset Highway west to the Sylvan area has sewered drainage. Figure 3.11-1 illustrates the major drainage features of the Westside Corridor.

Figure 3.11-2 illustrates floodplains in the Westside Corridor. Increased urbanization along the banks of the Willamette River and in the Beaverton Creek floodplain has increased the potential for periodic flooding of developed areas. The Beaverton Creek 100-year floodplain is characterized by periodic minor flooding. The 100-year floodplain is at 181 feet elevation. Approximately 340 acres of the 100-year floodplain lie within the Beaverton city limits. Much of the floodplain is currently undeveloped, but is zoned for commercial and moderately dense residential use.

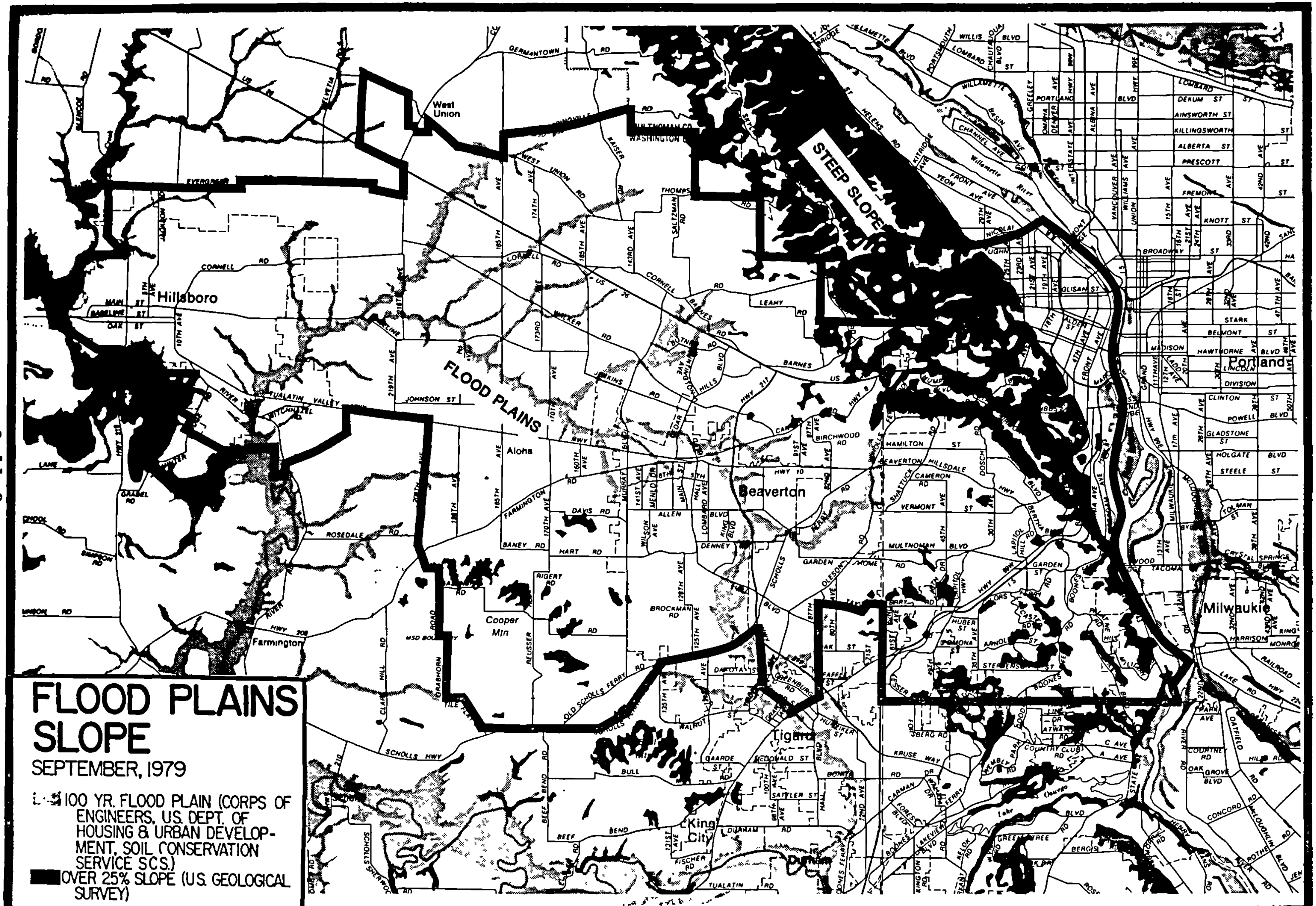
The existing floodplain includes much of Central Beaverton and land north of Canyon Road and the Tualatin Valley Highway. The City of Beaverton and the Beaverton Creek Drainage Improvement Task Force have proposed several improvements to minimize the effects of a 100-year flood. No adopted maps of this drainage program are available, since the matter is still under evaluation. Recommended improvements, including replacement of culverts, conduits, and stream channel modification are proposed to lower the water level in the floodplain, to minimize the size of the floodplain and alter floodplain boundaries. (City of Beaverton, 1981).

Relationship of Streamcourses and Urbanization. All of the creeks described thus far have been altered by the process of urban development. Alterations include changes in course, channelization, and culverting, each of which may



WESTSIDE CORRIDOR

FIGURE 3.11-1
MAJOR DRAINAGE BASINS OF THE WESTSIDE CORRIDOR



WESTSIDE CORRIDOR

FIGURE 3.11-2 WESTSIDE FLOOD PLAINS AND STEEP SLOPES

be necessary to allow road construction or other development. Secondary effects of urbanization on streamcourses include changes in peak flow and floodplain characteristics. In particular, Beaverton Creek has been highly modified in the urbanized portion of its drainage basin.

Water Quality. Fanno, Willow, Cedar Mill, and Beaverton Creeks historically have had poor water quality. Many of the water quality problems in these creeks can be attributed to higher storm flows brought on by increased urbanization and runoff. Often these creeks are in violation of water quality and waste treatment standards established by the Oregon Department of Environmental Quality (DEQ) for the Tualatin River Basin.

BIOLOGY. Most of the Westside Corridor is urbanized or landscaped; however, several wetlands and other natural areas exist in the corridor (see Figure 3.11-3). Wetlands are defined as lowlands covered with shallow or intermittent waters and do not include the permanent waters of streams (DOT, 1979). Wetland areas are of particular ecological importance because they are valuable for wildlife habitat, flood and erosion control, and aesthetics. Natural areas are defined as areas that are undisturbed by urbanization or that are of otherwise substantial habitat and aesthetic value.

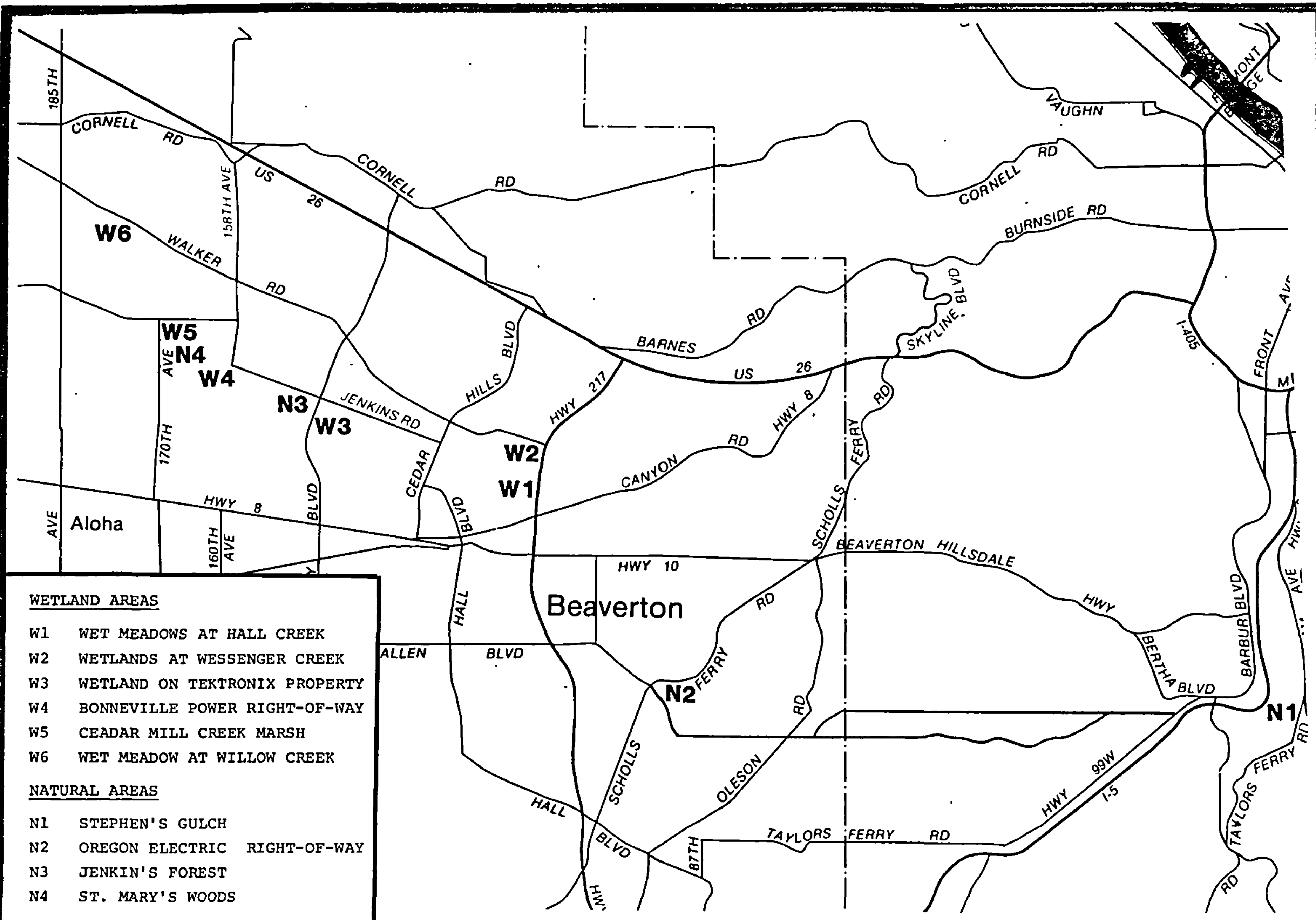
Existing wetland areas were identified by field reconnaissance that focused on the land in proposed transitway alignments. Such lands were found within the proposed transitway alignments in small portions of the Beaverton, Hall, Willow, and Cedar Mill Creek floodplains. Table 3.11-1 summarizes wetlands identified in proposed transitway alignments.

Other natural areas support a variety of vegetation and wildlife. St. Mary's Woods (approximately 400 acres) and Jenkin's Road Forest (approximately 100 acres) have been surveyed by the Oregon Natural Heritage Program of the Nature Conservancy as part of their Oregon Natural Areas Data Summary. A proposal has been submitted and approved for a 222 acre regional park within St. Mary's Woods by the Tualatin Hills Park and Recreation District. Funding for the park was approved by voters in June, 1980. Negotiations for property acquisition are presently underway (Keating, 1981). The abandoned Oregon Electric right-of-way from 76th Avenue to Elm Street consists of a cleared, ten foot path within the 60 foot right-of-way with a variety of trees and shrubs. Stephen's Gulch consists of riparian habitat dominated by western red cedar, red alder, and black cottonwood, and forest habitat of big leaf maple, Douglas fir, and western hemlock. The ravine suppports a variety of birds, small mammals, reptiles, and amphibians. Based on the field reconnaissance and consultation of maps provided by the U.S. Fish and Wildlife Service, no rare, threatened, or endangered species of plants or wildlife are known to exist in the proposed transitway alignments.

IMPACTS

Analysis methodologies and findings reflect early consultation with the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, State of Oregon Fish and Wildlife Department, and the Metropolitan Service District. Other agencies and literature consulted are listed in the references of this report.

EXECUTIVE ORDER 11988. Executive Order 11988 requires avoidance of significant encroachment upon the 100-year floodplain by federal actions unless no



WESTSIDE CORRIDOR

FIGURE 3.11-3
WESTSIDE CORRIDOR WETLANDS AND OTHER NATURAL AREAS

TABLE 3.11-1. WETLANDS LOCATED IN PROPOSED TRANSITWAY ALIGNMENTS

SITE NUMBER	DESCRIPTION	ALIGNMENT	AREA OF WETLAND IN THE PROPOSED RIGHT-OF-WAY a
W1	Wet meadows located adjacent to Hall Creek (south fork).	Sunset Busway/LRT (South Entry)	Less than 0.1 acre
W2	Wetlands adjacent to Wessenger Creek. Plants include cattails, sedges, and reeds. Undisturbed habitat.	Sunset Busway/LRT (North Entry)	2.0 acres
W3	Small wetlands area between Beaverton Creek and Burlington Northern Railroad immediately east of Murray Boulevard.	LRT	0.1 acre
W4	Wet meadow in Bonneville Power right-of-way immediately east of St. Mary's Forest.	LRT	0.1 acre
W5	Marsh in St. Mary's Forest at Cedar Mill Creek.	LRT	Less than 0.1 acre
W6	Wet meadow (sedges, rushes) adjacent to Willow Creek.	LRT	Less than 0.1 acre

a All acreages are estimates projected at the worst case.

Source: Earth Metrics Inc., 1981
METRO, 1981

practicable alternative exists. A significant encroachment is one that results in one or more of the following impacts: 1) considerable probability of loss of human life; 2) likely future damage associated with the encroachment that would be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility; and 3) a noticeable adverse impact on natural or beneficial floodplain values. The Bus Service Expansion Alternative, the Sunset Busway, Sunset LRT and Multnomah LRT would involve minor encroachments on the fringe of the proposed 100-year floodplain. Final evaluation of the significance of floodplain encroachments will be made during preliminary engineering of the preferred alternative, based on proposed revisions in the 100-year floodplain and the design of the preferred alternative alignment.

EXECUTIVE ORDER 11990. Executive Order 11990 requires federal agencies to avoid undertaking or providing assistance for new construction located in wetlands unless there is no practicable alternative to such construction and the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. The wetlands assessment finds that direct adverse effects would range from less than 0.5 to 2.4 acres for the Sunset Busway, Sunset LRT, and Multnomah LRT Alternatives, and would not occur for the No Build and BSE Alternatives. The Sunset Busway and LRT would require crossings of Beaverton, Wessenger, and Hall Creeks, which would involve generally minor depletion of wetlands. The S-1/S-2 combined North Entry option would pass adjacent to Wessenger Creek and would remove up to 2.0 acres of wetlands (W2). The S-3 South Entry option would do the same. The S-1/S-2 combined South Entry option would avoid conflicts with the Wessenger Creek wetland; each would require three crossings of Hall Creek and one of Beaverton Creek. The Sunset Busway and LRT North Entry options would require only one crossing of each of Hall and Beaverton Creeks. The Multnomah and Sunset LRT alternatives also would have slight adverse impacts on the wetlands located near Murray Boulevard (W3) and the Bonneville Power right-of-way (W4), by removing 0.1 to 0.25 acres of wetlands.

RARE AND ENDANGERED SPECIES ACT. No listed, legislatively protected, rare or endangered species are known to exist in the project area. Coordination with the U.S. Fish and Wildlife Service has been performed.

ALTERNATIVE 1: NO BUILD

There would be no transportation related construction; therefore, no geology, hydrology, or biology impacts would occur as a result of the No Build Alternative.

ALTERNATIVE 2: BUS SERVICE EXPANSION

GEOLOGY AND SOILS. The BSE Alternative would not affect geology or soils. Because no guideway construction will occur for the BSE Alternative, it would not entail cutting and filling. No change in landslide hazard would occur for this alternative.

HYDROLOGY AND WATER QUALITY. The BSE Alternative would not alter streamcourses or drainage, and it would not affect flood hazard. The existing Beaverton Transit Center lies outside of the 100-year floodplain of Beaverton Creek. The optional Hall/Watson Transit Center would encroach upon the proposed 100-year floodplain fringe, depending on the precise boundary changes under the Beaverton floodplain management program. Final evaluation of significance of the potential encroachment will be made during preliminary engineering of the preferred alternative. Public transportation actions, such as the BSE Alternative, would have a slightly beneficial effect on water quality through reducing private automobile use.

BIOLOGY. The BSE Alternative would remove an insignificant amount of forest and open field habitat at the proposed 158th Avenue park and ride lot. This alternative would not remove any wetlands. Habitat and water quality preservation ultimately will depend on other actions, including urbanization in the Westside Corridor.

ALTERNATIVE 3: SUNSET BUSWAY

GEOLOGY AND SOILS. To construct the busway, fill would be needed near the Sylvan neighborhood of U.S. Highway 26 and on the west side of State Route 217. Fill losses during construction by the action of wind, rain, or equipment represent a potential adverse impact on soils that could be mitigated. Other construction impacts would include loss of ground cover adjacent to the guideway which would induce soil erosion. Construction of the busway would not affect the landslide prone areas in the neighborhood of the Washington Park Zoo. After construction, erosion could occur in areas of exposed soil near the new busway. Particularly sensitive locations would include the crossing of Golf, Wessenger, and Hall Creeks. These would be prone to erosion of exposed soils near culverts placed during the construction phase.

The busway would have impervious paved surface in the amount of approximately 24 acres; most of this new impervious surface would be located next to the existing U.S. Highway 26 pavement, outside of the Beaverton Creek floodplain. Stormwater runoff from the busway could tend to accelerate soil erosion but would be mitigated by minor drainage management techniques.

HYDROLOGY AND WATER QUALITY. Construction of the busway would temporarily increase turbidity in Golf, Wessenger, and Hall Creeks. These creeks would be particularly sensitive in summer, because summer is a time of low streamflows.

After construction, creek crossings of Wessenger and Beaverton Creeks (North Entry options) and of Hall and Beaverton Creeks (South Entry options) would require sizing of culverts for consistency with the City of Beaverton's forthcoming flood management controls. New impervious surface added by the busway in the drainage basin would add to peak stream flows.

In the Sunset Busway, Sunset LRT, and Multnomah LRT, the transit facilities would cross and encroach into the 100-year floodplain. On the North Entry Option the transit facility will enter the floodplain south of Walker Road and parallel Beaverton Creek. In this location, the transitway will extend approximately 1800 to 1900 lineal feet in the floodplain until it reaches 117th Street and Center Street and approximately one to two feet of fill would be required for this distance. The encroachment in this area would be minor and would not deplete significant amounts of storage in the floodplain. After 117th Street, the transitway will be at grade and in the floodplain as this whole area of Central Beaverton is in the 100-year floodplain. Therefore, the transitway facility will be subject to flooding in Central Beaverton to the same extent as all of Beaverton is subject to flooding in this area. In the North Entry Option, where it is necessary to cross Beaverton Creek between 117th and Hall Boulevard, additional filling of one to ten feet may be required. This amount of fill may alter floodplain storage capacity, although it would still only affect a small portion of the total floodplain (ODOT, 1982).

On the South Entry Option, the transit facility paralleling Highway 217 will extend approximately 1400 lineal feet in the floodplain until it reaches 117th

Street and approximately one to two feet of fill would be required for this distance. The encroachment in this area would be minor and would not deplete significant amounts of storage in the floodplain. After 117th Street the transitway will be at grade and in the Cental Beaverton 100-year floodplain. In Central Beaverton, the transitway and all other uses are subject to flooding. From 117th Street to Hall Boulevard, the transit facility is in the floodplain for approximately 1200 lineal feet. Where the alignment crosses Beaverton Creek, additional filling of one to ten feet may be required. This amount of fill may alter floodplain storage capacity, although it will only affect a small portion of the total floodplain (ODOT, 1982).

Because the final transit alignment is not known and the final Beaverton floodplain boundary and drainage improvements are still under evaluation, it is not possible to quantify exactly how much fill will be added to the floodplain. Preliminary analysis indicates that while some fill materials will be added to the floodplain, it is not expected to greatly deplete the flood storage area nor is it expected to greatly impact any of the other floodplain encroachment criteria. A final floodplain encroachment impact determination, however, will have to be made during preliminary engineering.

The S-1/S-2 Combined North Entry option and S-3 South Entry option each would have two stations within the existing 100-year floodplain. The S-1/S-2 Combined South Entry option would have one station within the existing 100-year floodplain. The S-3 North Entry option would have one station in the floodplain fringe. The proposed Hall/Watson Transit Center would lie inside both the existing and proposed 100-year floodplains.

<u>BIOLOGY</u>. During construction, temporary water quality impacts would adversely affect fish habitats in streams adjacent to the busway. The impact would not be significant.

Busway impacts would include losses of some forest and wetland habitats and related wildlife. The busway would require removal of some forest habitat adjacent to U.S. Highway 26; however, the loss will be insignificant, because the busway would be located very close to U.S. Highway 26.

The S-1/S-2 Combined North Entry and S-3 North Entry options would adversely affect the habitat value of the Wessenger Creek drainage area. Culverting and filling could eliminate up to two acres of this 2.5 to three acre wetland habitat. The potential impact on two acres of wetland area is considered a worst case impact on the amount of acreage that could be eliminated depending on construction practices. The action of trucks, construction equipment, and drainage modifications would have the potential to permanently alter this portion of the wetland habitat of Wessenger Creek. While this alternative would specifically impact aesthetic and habitat values in the Wessenger Creek area, other habitats of similar quality in the corridor will still exist. The associated removal of standing water would render the area unsuitable for waterfowl; in the long term, new vegetation species will prevail, followed by the appearance of new wildlife species.

The S-1/S-2 Combined South Entry, S-3 North Entry, and S-3 South Entry options would decrease the habitat value of the Hall Creek riparian zone. The riparian zone is a narrow band within the 1.9 acres of the Hall Creek drainage area that will be crossed by the busway. Vegetation removal and division of the riparian zone into isolated chunks would diminish the value as a wildlife habitat; however, this impact could also result from future urbanization. The S-1/S-2 Combined North or South Entry options would also remove open field habitat in the undeveloped Beaverton Creek floodplain south of Canyon Road. However, this impact would be insignificant because the area is not prime wildlife habitat and is adjacent to development and culverting.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

GEOLOGY AND SOILS. Fill would be needed to construct the Sunset LRT in the Sylvan neighborhood, in other portions of the alignment adjacent to U.S. Highway 26, and on the west side of State Route 217. No fill would be removed from the Beaverton Creek floodplain (PB/LTK, 1980). Fill losses during construction, by the action of wind, rain, or equipment, represent an adverse impact on soils that could be mitigated. Other construction impacts would include temporary loss of ground cover, a loss which would induce soil erosion. Erosion control measures could be implemented, particularly in landslide prone areas in the neighborhood of the Washington Park Zoo, to minimize the potential impact to an insignificant level.

Erosion could occur in areas having soils disturbed by construction of the light rail line. Particularly sensitive locations would include the crossings of Golf, Wessenger, Hall, Cedar Mill, and Willow Creeks. These would be prone to erosion on exposed banks, especially near culverts placed during the construction phase. This potential impact would be insignificant after mitigation.

The Sunset light rail line would add to the Westside Corridor approximately five acres of impervious surface area. Most of this new surface would be associated with transit stations and transitway structure, a small fraction of which would be located inside the proposed Beaverton Creek 100-year floodplain. The trackbed ballast itself would not be an impervious surface, having drainage qualities similar to those of ordinary Westside Corridor soils (ODOT, 1980). Soil erosion caused by additional stormwater runoff from impervious surfaces of the light rail system would be insignificant.

HYDROLOGY AND WATER QUALITY. Construction of the Sunset LRT would temporarily increase turbidity in Golf, Wessenger, Hall, Cedar Mill, and Willow Creeks. These creeks would be particularly sensitive in summer because of low streamflows.

After construction, the Sunset light rail line would require drainage modifications to Beaverton, Hall, and Wessenger Creeks west of Central Beaverton. As described for the Sunset Busway Alternative, the Sunset light rail line South Entry options would require multiple crossing of Hall Creek and one crossing of Beaverton Creek. The Sunset light rail line North Entry options would require one crossing of Hall and Beaverton Creeks. West of Central Beaverton, the light rail line would cross Cedar Mill and Willow Creeks. Creek crossings would require culverts or trestles, but would not result in any significant drainage or floodplain impact if coordinated with the City of Beaverton flood management strategies for the Beaverton Creek floodplain. Impervious surfaces and fill material associated with the Sunset LRT in the Beaverton Creek drainage basin would tend to increase flood levels downsteam. This effect would be insignificant because the amount of added impervious surface would be minor.

The following stations would lie in the proposed floodplain fringe and would be underwater during the 100 year flood:

S-1/S-2 Combined North Entry. Center Street at 117th Avenue (floodplain fringe); Tektronix at 141st Avenue.

S-1/S-2 Combined South Entry. Center Street at 114th Avenue (floodplain fringe); Tektronix at 141st Avenue.

S-3 North Entry. Center Street at 117th Avenue (floodplain fringe); Hall Boulevard at Beaverdam Road (timed transfer station); Tektronix at 141st Avenue.

S-3 South Entry. West side of 117th Avenue south of Center Street; Hall Boulevard at Beaverdam Road (timed transfer station); Tektronix at 141st Avenue.

Standing water would be less than three feet deep in fringe portions of the Beaverton Creek floodplain during the 100-year flood (City of Beaverton, 1980). Elevated transit station platforms or guideway would not be inundated. As discussed in the Sunset Busway Alternative, final evaluation of the significance of storage depletion due to encroachments in the 100-year floodplain will be made during preliminary engineering of the preferred alternative.

As indicated in the Land Use Section (Section 3.1), future growth and development is already planned in Beaverton and in the floodplain areas. This alternative could facilitate growth in the floodplain and vicinity. Development in the floodplain, however, would be subject to land use regulations and guidelines of the City of Beaverton. Presently the city's land use regulatons would allow industrial, commercial, and public facility uses in the floodplain. In the Peterkort and 185th Avenue (185th Study Area) areas, land use plans (including the 185th overlay plan) do not show new land development proposed directly in the floodplain.

Water quality after the construction phase would not be significantly affected by the Sunset LRT. The light rail line would not generate petroleum and asbestos road pollutants that are generated by automobiles. In the long term, the Sunset light rail line could benefit water quality by slowing the growth of private automobile use and related water contamination.

BIOLOGY. The Sunset LRT, during construction, could temporarily increase turbidity in streams adjacent to the alignment. Biology impacts would be the same for the light rail line and busway between Downtown Portland and Central Beaverton. The Sunset light rail line would cause some loss of habitat in the Wessenger, Hall, and Beverton Creek drainage areas. The S-1/S-2 Combined North Entry and S-3 North Entry options would adversely impact the waterfowl habitat value of the Wessenger Creek drainage area (2.8 acres are filled). The S-1/S-2 Combined South Entry and S-3 South Entry options would diminish the habitat value of part of the Hall Creek riparian zone (narrow band of less than one acre) for a variety of wildlife, but this impact could be insignificant because of the disturbed nature of this area.

West of Central Beaverton, the Sunset light rail line would remove some forest habitat in Jenkin's Forest and St Mary's Woods, as well as minor amounts of riparian habitat at the crossings of Cedar Mill and Willow Creeks. Loss of forest habitat in Jenkin's Forest would result from development of a park and ride station on Murray Boulevard. West of 158th Avenue the so-called northern light rail alignment would eliminate open field habitat within the right-of-way. This is a relatively undisturbed portion of the Willow Creek drainage basin; however, the impact can be considered insignificant, or even slightly beneficial, because of the relatively small scale of the loss and potential for open space preservation through planned development adjacent to the alignment.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

GEOLOGY AND SOILS. Fill would be needed to construct the Multnomah LRT in the Multnomah Boulevard segment of the alignment. No fill would be removed from Stephen's Creek ravine or the Beaverton Creek floodplain, except for that removed from the fringe of the Beaverton Creek floodplain to construct a cut and cover section under the M-2 option. Fill losses by wind, rain, or equipment during construction represent an adverse impact on soils; however, it could be mitigated. Other construction impacts could be loss of ground cover and related soil erosion. Construction of the Multnomah light rail line could adversely affect unstable slopes in Stephen's Creek ravine by removing ground cover. Also, construction would cause soil losses on the steep slopes of segments of Multnomah Boulevard; Fanno Creek would be a vehicle of soils lost east of 45th Avenue. These impacts would be mitigated to insignificant levels. After construction, erosion would occur where ground cover was removed. Particularly sensitive locations would be creek crossings and steep slopes. Fanno, Beaverton, Cedar Mill, and Willow Creek would be prone to soil erosion near new culverts placed during the construction phase; also, Stephen's Creek ravine would be subject to erosion. Measures to mitigate these effects could reduce impacts to insignificant levels.

The Multnomah LRT would add to the Westside Corridor approximately 12 acres of impervious surface area. Six acres of the total would be for the widening of Multnomah Boulevard to accommodate the light rail line. The remainder would be a consequence of transit stations and transitway structures. The trackbed ballast itself would not add impervious surface to the Westside Corridor, because trackbed has drainage qualities similar to ordinary soils (ODOT, 1980). Soil erosion caused by stormwater runoff from new impervious surfaces would be insignificant provided sound drainage management is incorporated in the light rail line design. The Macadam Avenue segment of the alignment would not be associated with significant new impervious surface, stormwater runoff, or erosion, because it is presently highly urbanized.

HYDROLOGY AND WATER QUALITY. Soil and fill losses during construction would temporarily increase turbidity in Stephen's, Fanno, Beaverton, Cedar Mill, and Willow Creeks. After construction, the Multnomah LRT would not impact drainage with respect to the Willamette River. It would have insignificant impacts on drainage into Stephen's Creek and Fanno Creek. In the Stephen's Creek ravine, management of overland drainage would necessitate ditches, culverts, or possibly drainage pipes. In the Fanno Creek drainage basin the light rail line would require a bridge or culvert over Fanno Creek at 86th Avenue. Also, the M-2 tunnel option in downtown Beaverton would require special drainage features.

The Multnomah LRT would necessitate drainage modifications to Beaverton Creek in Central Beaverton and to Cedar Mill and Willow Creeks west of Central Beaverton. The M-3 option would cross Beaverton Creek and its floodplain at two locations east of Hall Boulevard. The M-1/S-2 combined option and M-3 tunnel option would avoid crossings of Beaverton Creek and most of its floodplain. The M-2 tunnel option would require drainage features that affect the cost of this option. West of Central Beaverton, the light rail line will cross Cedar Mill and Willow Creeks. Creek crossings will require culverts or trestles as described for the Sunset LRT.

Impervious surfaces, fill material, and culverts associated with the light rail line in the Beaverton Creek drainage basin would tend to increase flood levels downstream. This effect would be amplified to the extent that creek channels and culverts are sized to eliminate overbank flooding. The City of Beaverton is studying flood management strategies for the Beaverton Creek floodplain. The impact of the Multnomah LRT would be insignificant in comparison to floodplain management concepts proposed by the City of Beaverton.

Encroachment into the proposed Beaverton Creek 100-year floodplain would not entail flood hazards to light rail line facilities. For each option, the following transit station sites would be within the proposed 100-year floodplain.

M-1/S-2 Combined. Tektronix at 141st Avenue.

M-2 Tunnel. Tektronix at 141st Avenue (tunnel would cross fringe of 100-year floodplain).

M-3. West side of 117th Avenue south of Center Street; south of Broadway near Fred Meyer (floodplain fringe); Hall/Watson (timed transfer station); Tektronix at 141st Avenue. Standing water would be less than three feet deep in the fringe of the floodplain during the 100-year flood. The light rail line probably would not remove significant storage in the floodplain.

The Multnomah light rail line and transit stations on Macadam Avenue would lie outside the Willamette River 100-year floodplain. As discussed in the Sunset Busway Alternative, final evaluation of the significance of storage depletion in the Beaverton Creek 100-year floodplain will be made during preliminary engineering of the preferred alternative. This alternative has the same growth inducing impacts discussed in the Sunset LRT Alternative.

Water quality after the construction phase would not be significantly impacted by the Multnomah LRT. The light rail line would not generate the petroleum and asbestos road pollutants generated by automobiles. In the long term, the Multnomah light rail line would slightly benefit water quality by slowing the growth of private automobile use and related water contamination.

BIOLOGY. During construction, potential increases in stream turbidity would have an insignificant effect on fish if proper precautions are taken. The Multnomah LRT would eliminate some natural habitat and related wildlife. In Downtown Portland and Beaverton, and in the Macadam Avenue segment of the light rail line, impacts to natural habitats would be insignificant.

The Multnomah LRT would entail significant losses of habitat in Stephen's Creek ravine, the Oregon Electric right-of-way, and riparian zones of several creeks. The riparian habitat along Stephen's Creek would be particularly sensitive to enduring impacts related to the loss of vegetation in the ravine. In the Oregon Electric right-of-way, brushy areas would be lost, including elder, hazelnut, and other deciduous trees. The riparian habitat at the light rail line crossing of Fanno Creek also would be reduced. In the Beaverton Creek drainage basin, only option M-3 would entail losses of riparian habitat at the light rail line crossings of Beaverton Creek. Options M-1/S-2 and M-2 would not entail losses of riparian habitat. No options would impact wetlands habitat. West of Central Beaverton, the Multnomah LRT would have the same impacts on natural habitat and wildlife as the Sunset LRT.

MITIGATION MEASURES

ALTERNATIVE 1: NO BUILD

None are necessary.

ALTERNATIVE 2: BUS SERVICE EXPANSION

The following measure will be implemented:

- Coordinate with the City of Beaverton during preliminary engineering with regard to floodplain management and boundaries.

ALTERNATIVE 3: SUNSET BUSWAY

GEOLOGY AND SOILS. During preliminary engineering consider measures to minimize soil erosion. For example:

- Design cut and fill slopes to best accommodate soil qualities.

- Water down areas of exposed soil in the construction zone.

- Seed and mulch exposed soil outside of the construction zone.

- Place hay bales at the base of slopes to act as temporary fillers and energy dissipators.

- Mulch exposed soil.

- Revegetate exposed soil (particularly on slopes).

- Revegetate riparian zones with native grasses such as reed canary grass. Coarse grass and beach grass are appropriate on the creek bank; tall fescue is appropriate on the higher ground.

HYDROLOGY AND WATER QUALITY. During preliminary engineering develop a drainage plan to be incorporated into the Sunset Busway design. The following general design features may be developed in the plan:

- Use earth berms above cut slopes to direct stormwater runoff laterally.

- In very steep slopes (40 to 70 percent) ditch and culvert to direct runoff.

- Consult the City of Beaverton on culvert sizing for Wessenger and Hall Creeks. (The City of Beaverton presently is studying flood management strategies.)

- For the Sunset Busway north entry options, study the feasibility of using a trestle design across the Wessenger Creek drainage basin. This could be expensive at $100 per square foot.

- Make final determination of floodplain encroachment during preliminary engineering and consider feasible mitigation measures if floodplain encroachment is significant.

BIOLOGY. Study the feasibility of the following measures during preliminary engineering:

- Construct the S-1/S-2 Combined South Entry option of the S-3 South Entry option on the terraces immediately south of Hall Creek. This would preserve a significant amount of riparian vegetation.

- Adopt protective procedures as part of site preparation and construction guidelines to preserve vegetation and wildlife habitat.

- Plan to keep as many mature trees and as much riparian habitat as practical.

- Develop a replanting scheme based on these principles:

  During preliiminary engineering, replant indigenous shrub and understory species in impacted floodplain fringes.

  Plant bare streambanks with vegetation to minimize sediment input.

  Plant native riparian vegetation (such as willows) near impacted creeks.

- During preliminary engineering METRO and TRI-MET will coordinate further with the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Oregon Fish and Wildlife Department, and U.S. EPA to determine the status of wetlands affected by the busway alignments and to adopt mitigation measures designed to protect, preserve, and enhance wetlands to the fullest extent practicable.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

GEOLOGY AND SOILS. Same as the Sunset Busway.

HYDROLOGY AND WATER QUALITY. Same as the Sunset Busway.

BIOLOGY. Same as the Sunset Busway.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

GEOLOGY AND SOILS. Same as the Sunset Busway.

HYDROLOGY AND WATER QUALITY. During preliminary engineering develop a drainage plan that considers the following elements in addition to those described for the Sunset Busway Alternative:

- Use silt catchments, wiers and other methods to reduce sediment input to the Willamette River, Stephen's and Fanno Creeks.

- Avoid interfering with the existing sewer line at the bottom of Stephen's Creek.

BIOLOGY. Same as the Sunset Busway.

3.12 PUBLIC SERVICES AND INFRASTRUCTURE

EXISTING SETTING

This section identifies community services: schools, police and fire services; private utility systems; and railroad rights-of-way within the Westside Corridor.

COMMUNITY SERVICES. Elementary and secondary schools are provided by local school districts. Police protection and fire prevention services are provided by the local jurisdictions.

UTILITIES. Utility services are provided by a combination of public and private utility companies. Water is supplied by the Cities of Portland and Beaverton, the West Slope Water District (WSWD), and Tektronix. Sewer service is provided by the Cities of Portland and Beaverton, the Unified Sewerage Agency and Tektronix. Portland General Electric (PGE) and Tektronix provide electricity, the Northwest Natural Gas Company provides natural gas and the City of Portland and Pacific Power and Light Company provide steam energy. Communication facilities are available from Pacific Northwest Bell Company, General Telephone, and Western Union. Other services (cable TV, etc.) are made available through individual private utilities.

RAILROADS. Railroad facilities within the Westside Corridor are operated by the Southern Pacific Transportation Company (SP) and the Burlington Northern Railroad (BN). Southern Pacific plans to abandon their Jefferson Street Branch which parallels Macadam Avenue and currently provides daily service. Service in the Beaverton Industrial Park is offered daily, while service on the main branch line through Beaverton consists of three to five trains per day.

Burlington Northern operations in central Beaverton will switch to the SP tracks if current plans develop on schedule. West of Cedar Hills Boulevard, BN has industrial spurs on both sides of the main track. The present utilization of track through Beaverton is a combination of local switching and through trains:

- A local out of Beaverton to Hillsboro operates 3 to 5 days/week
- A local out of Beaverton to Salem operates 5 days/week
- Trains #397 and #398 are through trains, one northbound and one southbound, between Portland and Albany.

The two locals take care of the industrial switching in Beaverton. The projections for BN train movements through Beaverton show a continued annual increase. The only access the BN system has to the Salem/Eugene area is through Beaverton.

IMPACTS

The infrastructure impacts identified in this section refer to those dislocations or alterations of community services, public and private utilities, and railroad rights-of-way anticipated to occur during construction or operation of the alternatives.

COMMUNITY SERVICES. Street closures during construction or operation of the alternatives could increase response times of emergency vehicles. However, no specific location is expected to be impacted significantly and service delivery would generally continue to be good.

Population growth induced by transitway development could conceivably add to school population and financially burden school districts. School District #48 (western urban Washington County) covers the area in which the greatest amount of residential growth is projected to occur. The school district plans on a ten year basis and has land reserved for future school construction. Over the long term, the school district will negotiate for sites on a development by development basis. No significant problems caused by residential growth are foreseen by the school district (White, 1981).

UTILITIES. Most of the utility impacts occur within dedicated public rights-of-way, and are the result of one or more of the following conditions:

- direct disruption or intrusion of required utility clearance zones;

- the need to strengthen utilities where crossed by the busway or LRT line to prevent collapse under the loads imposed by bus or LRT operations;

- the need to protect iron or steel pipelines against ionic corrosion, when they are crossed by an LRT line;

- the need to relocate utility facilities to allow future maintenance access without interrupting busway or LRT line operations.

The costs associated with the infrastructure impacts of railroads and public utilities do not represent adverse impacts as these have been planned for and included in the project cost impacts. Table 3.12 summarizes and compares the estimated utility impact costs for the build alternatives. The adverse impacts are the costs to utilities for displacements of privately owned infrastructure. It is standard policy that the private utility will incur some of the costs. However, the precise amount is handled individually based on policy decisions (Tashima, 1981).

RAILROADS. Potential impacts on railroads occur wherever the busway or LRT alignment coincides with the railroad alignment, crosses the railroad tracks, or otherwise encroaches upon the railroad's required clearance envelope. As mentioned above, all railroad displacement costs are included in project costs estimates and do not represent adverse impacts.

ALTERNATIVE 1: NO BUILD

The No Build Alternative would have no impact on public services and infrastructure. However, with increased traffic congestion more demands may be made on police services to direct traffic and respond to accidents. Response times of emergency vehicles would be expected to increase.

ALTERNATIVE 2: BUS SERVICE EXPANSION

Confusion and congestion around construction sites and street closures could temporarily increase response times of emergency vehicles; however, improved future traffic flow would facilitate police and fire services. Increased activity around busway stations and transit centers could result in increased vandalism and other disturbances requiring additional policing of public areas. There would be no impact on railroad rights-of-way.

TABLE 3.12 TOTAL UTILITY COSTS: PUBLIC AND PRIVATE COMPONENTS

ALTERNATIVE	UTILITY COST (THOUSANDS OF DOLLARS) a	
	PUBLIC	PRIVATE
No Build	0	0
Bus Service Expansion	0	0
Sunset Busway	1,322	750
Sunset LRT	6,987	7,453
Multnomah LRT	13,058	10,158

a All costs are for the low cost option alternatives and costs do not include a contingency; costs based on estimating procedures described in the paragraph above.

Source: TRI-MET (1981)

ALTERNATIVE 3: SUNSET BUSWAY

Same as the Bus Service Expansion.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

Impacts on police and fire services would be the same as for the Bus Service Expansion Alternative. Police and fire personnel should be prepared to respond to catastrophic events such as a train derailment.

The Sunset LRT would cause a slight interference with the railroad to Tektronix. A track-to-track crossing in combination with a minor railroad realignment would eliminate railroad service to one building. A shift in the function of the building would eliminate the problem.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

Impacts on police and fire services would be the same as for the Bus Service Expansion Alternative. The Multnomah LRT Alternative would have the greatest impact on railroads since LRT operations along the Multnomah alignment would utilize Southern Pacific's Jefferson Street branch line right-of-way between Bancroft Street and the intersection of Taylor's Ferry Road along Macadam Avenue. Since the railroad company's freight service operations are not compatible with LRT operations using the same tracks, the railroad operations would have to be eliminated. This would be accomplished by sale of the branch line to TRI-MET. Estimated costs of the purchase are included in project costs. Businesses currently using branch line freight service may have to be relocated, compensated for loss, or shift operations to truck freight if practical. If required, specific compensation will be made according to the policies discussed in Section 3.5. Similar economic impacts to business would occur where the LRT alignment crosses spur tracks along the Burlington Northern trackage in Beaverton. A slight southerly relocation of the Burlington Northern mainline track west of Cedar Hills Boulevard to about 185th Avenue will also be necessary. The Multnomah LRT Alternative would have the greatest total infrastructure impact cost.

MITIGATION MEASURES

The costs associated with the infrastructure impacts of railroads and public utilities do not represent adverse impacts as these costs have been planned for and included in project cost analyses. The adverse impacts on utility infrastructure are the costs to private utilities for displacements of privately owned infrastructure. To mitigate adverse impacts, a public policy decision regarding distribution of these costs will have to be reached by appropriate parties (Tashima, 1981; Wertz, 1981).

3.13 SHORT TERM CONSTRUCTION IMPACTS

This section will describe the impacts and inconveniences that would occur during the construction phase under each of the transportation alternatives. This chapter will focus on the land use and traffic impacts of construction. The air quality, noise, energy, and other construction impacts have been discussed elsewhere in the DEIS and will not be repeated here.

The most intense construction activity will occur at major earthwork and structural building sites. These sites will have the highest concentrations of construction workers, equipment, excavation trucks and delivery vehicles. In general, the greater the amount of earthwork and structural work, the greater the potential for construction impacts. Major construction sites and estimates of the amounts of excavation and fill material by alignment segment are listed in Table 3.13-1. Figure 3.13-1 depicts the geographic boundaries of the segments. Table 3.13-2 indicates the number of construction days per segment by type of construction activity.

The equipment used for busway or LRT construction will consist primarily of scrapers, bulldozers, front end loaders, backhoes, graders, jack hammers, compressors, ballast tampers, road pavers, rollers, welding machines, and cranes. Land use impacts would involve the use of vacant parcels for construction materials and activities, use of streets and parking lots for operation and storage of construction equipment, and the general disruption of day-to-day activities near the construction area. Construction of any of the proposed alternatives will disrupt local travel patterns and reduce existing traffic levels of service. There will be essentially six types of traffic impacts including: disruption of traffic due to construction on an existing street; increased truck traffic on local streets; obstruction of traffic caused by double parked or queued construction trucks and equipment; increased traffic at peak hour caused by commuter trips by construction workers; impeded access to adjoining properties; and reduction in available parking. Certain impacts could be partially mitigated through careful planning and timing, but others would be unavoidable. In some cases, rerouting of traffic on local and regional roadways may be required.

ALTERNATIVE 1: NO BUILD

No construction of facilities would occur under the No Build Alternative; therefore, there would be no construction related impacts on land uses or traffic.

ALTERNATIVE 2: BUS SERVICE EXPANSION

SYSTEMWIDE. Construction activity under the BSE Alternative would be limited to expansion or construction of transit centers and shelters, Transit Mall extensions and road widenings. Only the Transit Mall extensions and road widenings in the downtown would require extensive use of heavy equipment.

Limited earthwork and soil redistribution required by BSE construction will involve less construction related traffic than other build alternatives. Commuting construction crews will not significantly add to peak hour traffic. There would be periods at the major construction sites when either trucks delivering materials (such as concrete) or construction equipment would

TABLE 3.13-1 EXCAVATION AND FILL MATERIAL VOLUMES FOR CORRIDOR SEGMENTS AND AT MAJOR CONSTRUCTION SITES UNDER THE BUILD ALTERNATIVES

Segment Number*		Excavated Material (cubic yards)	Borrowed Fill (cubic yards)
1. Sunset Busway			
1S-Overpass ramping, retaining walls		4,843	181,658
2S-Earth work		51,779	28,306
3S-Sylvan overpass/underpass		44,235	-0-
4S-Earthwork, underpass (Camelot Court)		117,748	-0-
5S-Underpasses(Sunset/Highway 217)		67,437	-0-
6S-Wilshire Street Underpass		30,887	-0-
S-1/S-2	North-Beaverton	13,628	29,838
	South-Beaverton	25,146	3,880
S-3	North-Beaverton	18,147	29,838
	South-Beaverton	29,665	3,880
2. Sunset LRT			
1S-Overpass ramping, retaining walls		4,843	181,658
1S-(Tunnel)		37,111[a]	18,558
		5,263[b]	-0-
2S-Earth work		51,779	28,306
3S-Sylvan overpass/underpass		44,235	-0-
4S-Earthwork, underpass (Camelot Court)		117,748	-0-
5S-Underpasses (Sunset/Highway 217)		67,437	-0-
6S-Wilshire Street Underpass		30,887	-0-
S-1/S-2	North-Beaverton	19,554	29,838
	South-Beaverton	31,072	3,880
S-3	North-Beaverton	21,110	29,838
	South-Beaverton	32,628	3,880
9-Relocate tracks		55,000	-0-
3. Multnomah LRT			
1M		23,260	-0-
2M-Street relocation (Macadam)		29,230	-0-
3M-Overpass ramping		22,980	-0-

(Continued)

TABLE 3.13-1 EXCAVATION AND FILL MATERIAL VOLUMES FOR CORRIDOR SEGMENTS AND AT MAJOR CONSTRUCTION SITES UNDER THE BUILD ALTERNATIVES(Continued)

Segment Number*	Excavated Material (cubic yards)	Borrowed Fill (cubic yards)
4M-Earthwork (Stephen's Gulch)	110,070	-0-
5M-Capitol Highway overpass	95,646	-0-
6M	38,010	-0-
7M Arctic	83,597	-0-
Perimeter	37,614	-0-
M-1-Beaverton	11,556	-0-
M-2-Beaverton	23,650	-0-
M-3-Beaverton	18,297	-0-
9-Relocate tracks	55,000	-0-

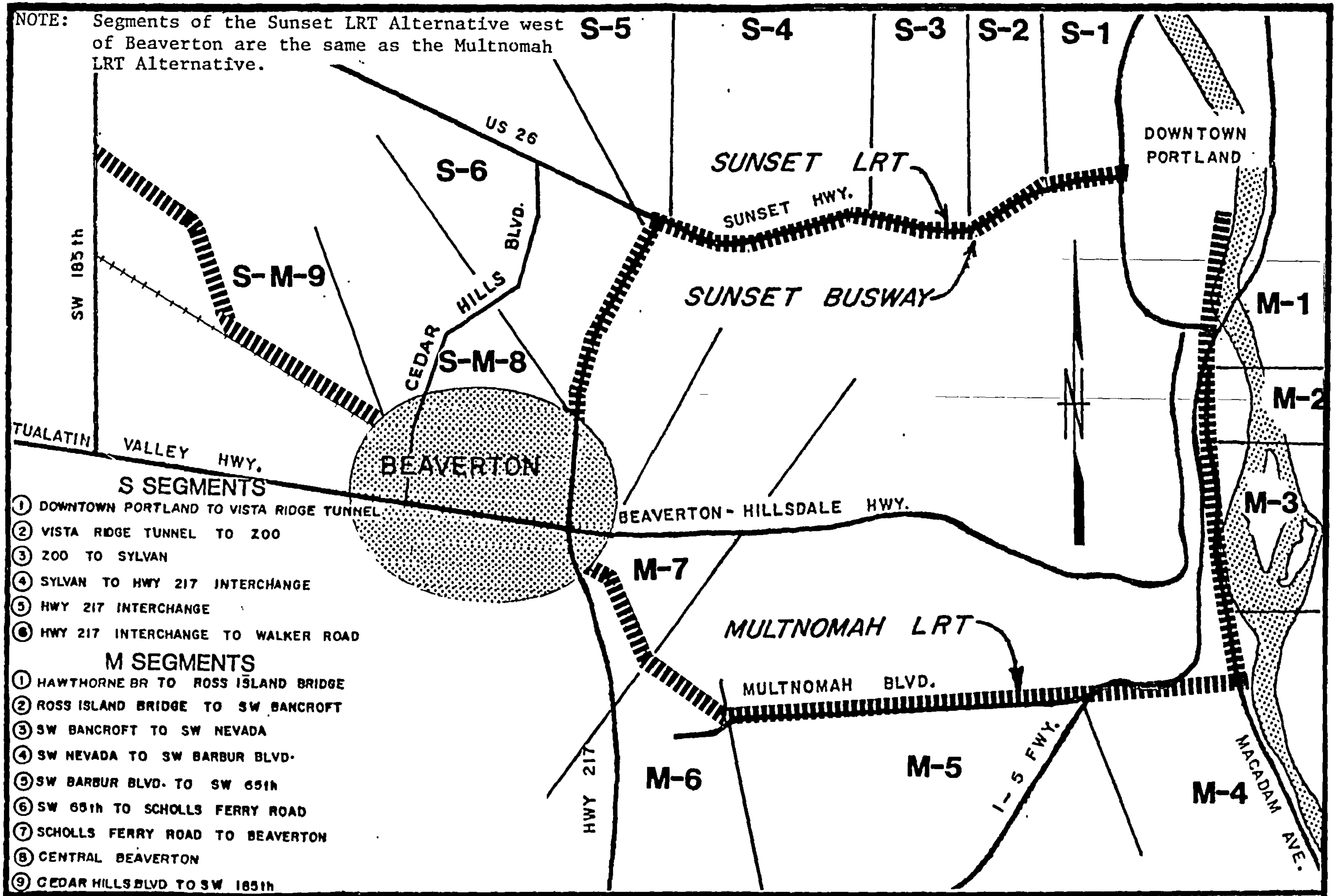
* See Figure 3.15-1

[a] Tunnel spoils

[b] Non-Tunnel spoils

[c] Notation is same used in ODOT (1980)

Source: TRI-MET, (1981a)



WESTSIDE CORRIDOR

FIGURE 3.13-1

WESTSIDE CORRIDOR SEGMENTATION MAP

TABLE 3.13-2. CONSTRUCTION DAYS PER SEGMENT AND ACTIVITY

ALTERNATIVE AND SEGMENT*	SEGMENT CONSTRUCTION	GRADING	TRACKWORK	PAVING	STRUCTURES	STREET AND TRAFFIC CON-TROL MODIFICATIONS	UTILITY MODIFICATIONS	LRT-RELATED FACILITIES
Sunset Busway:								
CBD	20							
1	99	34		9	40	6	12	
2	59	17		8	31	1	1	
3	79	17		8	48	3	2	
4	99	26		11	58	3	2	
5	86	21		6	58	0	1	
6	46	9		6	24	2	4	
8	26	6		10	4	6	1	
System Support Facilities	145							
Sunset LRT (Tunnel):								
CBD	203		26	45			56	
1	47	11		1	35			
2	55	14	10	3	26	1	2	
3	70	14	7	5	40	3	3	
4	86	18	13	3	44	7	2	
5	78	17	8	3	50	2	1	
6	39	7	5	2	20	6	8	
8	39	4	19	4	3	6	9	
9	31	4	20		2	2	8	
System Support Facilities	125							125
Multnomah LRT								
CBD	157		20	35			88	
1	16	2	5	1	3	1	3	
2	48	8	4	8	17	4	6	
3	23	3	8	2	2	4	5	
4	181	27	9	5	119	5	14	
5	102	13	13	18	10	7	40	
6	39	5	11	5	9	3	6	
7	32	4	12	3	2	3	8	
8	23	1	11	2		5	3	
9	31	4	20		2	2	2	
System Support Facilities	125							125

* See Figure 3.15-1

be stopped for extended periods of time in one travel lane. This would reduce the operating capacity of the roadway and traffic safety would be slightly impaired. Limited use of excavation trucks in downtown Portland, at transit centers and park and ride sites will cause similar problems. In addition, construction during the Transit Mall extensions may require bus re-routing.

DOWNTOWN PORTLAND. Land use impacts related to extension of the Transit Mall and widening of Front Avenue from Morrison to Taylor would be minor. Although the total number of streets affected is roughly equivalent to that of the construction of the existing Transit Mall, the economic and land use disruption will be considerably less. The existing mall was built in a continuous stretch through the most intensive office and retail core in downtown. The extensions to the north and south will be considerably less disruptive to businesses, traffic and pedestrian activity in downtown than the original mall construction. City streets would be needed for storage of construction material and equipment. Parking in the downtown would be required for commuting construction employees. Problems associated with equipment storage, noise and dust would not interfere with the normal commercial and business function of the CBD.

PORTLAND TO BEAVERTON. Construction of the climbing lane along the north side of the Sunset Highway would require closing the adjacent highway travel lane during non-peak hours. Construction of the transit center at the Highway 217 interchange will occur during the interchange reconstruction period and will cause no significant additional impact.

BEAVERTON. If the existing transit center is selected as the long-term site, construction impacts would be minimal. The adjacent railroad storage area, which is planned to be turned over to the City of Beaverton, can be used for storage and staging, thereby minimizing the use of local streets for this purpose. Given its shape and location, construction of the Hall/Watson transit center option will cause some disruption of traffic on both Hall and Watson, the major north-south arterial in Beaverton. The vacant land area east of Hall can be used for storage and staging. If the transit center construction can be synchronized with adjacent land development, the additional incremental disruption of the transit center construction would be minor.

WESTERN WASHINGTON COUNTY. BSE construction is primarily related to transit centers and park and ride lots. Little excavation is required in this segment. Conflicts between transit center construction and commercial, industrial and residential uses would not occur. Commuting workers will not significantly add to peak hour traffic but double parked trucks may create local, temporary congestion.

ALTERNATIVE 3: SUNSET BUSWAY

Sunset Busway construction will require 660 working days over a 33 month period. The impacts are the same as described in the BSE with the following additions.

PORTLAND TO BEAVERTON. Table 3.13-1 indicates the use of large volumes of excavated material and fill in busway construction, requiring extensive amounts of grading and paving (Table 3.13-2). Vacant areas near Sunset/217 and Sylvan can be used for storage of construction material and equipment and as parking lots for construction employees.

Commuting construction workers, delivery trucks and excavation trucks will all add to existing traffic congestion. Earthmoving required for construction of overpasses/underpasses and the busway itself (see Table 3.13-1) requires the use of a considerable number of excavation trucks. Double parked trucks and equipment would occur on almost all local streets immediately adjacent to the construction site. This type of impact would be particularly prevalent during the excavation and concrete pouring aspects of the construction when queues of four and five trucks would be present throughout the day.

Construction traffic to and from Sunset Highway sites will have to use the highway. One lane of the highway adjacent to the construction site(s) would be closed to general traffic during non-peak hours in order to provide adequate access for construction traffic. In this way, construction traffic can be kept out of the residential area just west of the highway.

BEAVERTON. The use of properties adjacent to construction sites as open air storage sites for material and equipment will cause some unsightliness and may not be compatible with many commercial activities.

Construction through Central Beaverton should occur in a manner similar to that described for Downtown Portland in the BSE. Canyon Road, the Beaverton-Hillsdale Highway, Broadway, Farmington Road, the Tualatin Valley Highway, and Highway 217 will provide good access to construction sites and keep construction traffic out of residential areas. Congested traffic levels currently exist in Beaverton at Broadway/Hall, Canyon/Cedar Hills, Center/Hall and 114th/Canyon, and congestion would slightly increase with commuting construction workers, delivery and excavation. Lack of arterial access to sites between Walker Road and downtown Beaverton would create construction site access problems under any of the Beaverton options. Congestion created by double parked trucks described above will occur in Beaverton.

WESTERN WASHINGTON COUNTY. Same as Bus Service Expansion Alternative.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

Sunset LRT construction will require 780 working days over a 39 month period. The impacts are the same as described in the BSE with the following additions.

DOWNTOWN PORTLAND. Impacts would be similar to those under the Sunset Busway except the introduction of equipment and crews necessary for trackwork and transit station construction will add to the duration and magnitude of the impacts (Table 3.13.2).

In Downtown Portland the construction period will be approximately ten times longer than for the all bus alternatives. The magnitude of the disruption would be similar to that experienced during the Banfield LRT construction period. LRT construction would be similar to Transit Mall construction with only a short segment (three or four blocks) under construction at a time. It is likely that only construction related traffic will be allowed to use the street in blocks where construction is occurring. However, there are parallel streets nearby to absorb the diverted traffic and at least one lane of traffic would be preserved on streets crossing the segment under construction.

PORTLAND TO BEAVERTON. In this segment, the Sunset LRT tunnel option would be constructed under existing residential areas. However, geological conditions and the depth of cover would cause minimal risk to these areas (Foundation Sciences, Inc., 1980). Potential cosmetic damages (plaster/stucco cracking) could occur to residences in proximity to the tunnel and the intrusion of construction equipment would be disruptive. The Jefferson Street option would require the construction of a small elevated structure between S.W. 14th and S.W. 18th which would increase construction impacts in this segment. West of downtown, travel lanes on the Sunset Highway adjacent to construction activities would be closed to non-construction related traffic during non-peak hours.

BEAVERTON. As in Downtown Portland, only construction related traffic would be allowed to use the street in blocks where construction is occurring, causing other traffic to use nearby roadways. Construction of the LRT optional alignments south of Canyon Road would create additional congestion on Farmington Road, Broadway and nearby parallel streets. Construction of the S1/S2 option through the downtown district could be particularly disruptive to the small businesses along Broadway. Special measures would be negotiated with area businessmen to ensure that access would be maintained to minimize business disruption. The construction impacts of the S-3 option would not be significantly more disruptive than those described for the Sunset Busway.

WESTERN WASHINGTON COUNTY. Existing vacant property could be utilized for equipment and material storage. Considerable open space would allow construction activity to occur without causing significant traffic congestion. Since the alignment does not follow existing roadways, parked trucks would not block traffic. Construction site access problems would exist since arterial access to the alignment is poor or totally absent and there are no parallel streets nearby. The transitway, as it is graded, will become the construction site access route.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

Multnomah LRT construction would require approximately 780 working days over a 39-month period. Off-line transit centers and the Sunset climbing lane construction impacts would be identical to those described for the BSE Alternative.

DOWNTOWN PORTLAND. Impacts would generally be the same as for the Sunset LRT in Downtown Portland.

PORTLAND TO BEAVERTON. Construction of the Multnomah LRT would require extensive excavation. Grading and paving (Table 3.13-2) would require large equipment. Vacant land for equipment storage would not be as plentiful as on the Sunset alignment but vacant lots do exist in the transit station construction areas at South Waterfont, Gaines Street, Burlingame Transit Center and Multnomah/45th. Construction of the LRT guideway along Multnomah Boulevard could compound an already unsafe pedestrian situation and restrict property access to existing commercial uses. Loss of parking and noise impacts of construction activity on Macadam Avenue could result in a reduction in public use of Willamette Park during construction.

Construction would generate additional traffic due to commuting construction workers, delivery vehicles and trucks. Currently, the intersections at Virginia/Macadam and Barbur/Bertha are congested. Double parked delivery vehicles and queues of trucks at major excavation sites will contribute to traffic congestion. Particular areas of concern are Multnomah Boulevard, where the alignment follows the roadway and on Macadam Avenue where the alignment parallels nearby. Traffic flow on Macadam Avenue would be impeded by the considerable number of trucks entering and leaving the area and activities associated with overpass construction. Construction of the LRT guideway on Multnomah Boulevard would temporarily impede property access.

Construction related access impacts would occur primarily as a result of trucks double parking on surrounding streets while waiting to approach the construction sites or from queues of trucks along the alignment itself. Due to poor access to the alignment in Stephen's Gulch, the transitway would become the construction site access route.

BEAVERTON. Impacts would be similar to those listed under the Sunset LRT, with the exception of the tunnel option which would require considerable cut and cover and be more disruptive than the at-grade option.

WESTERN WASHINGTON COUNTY. Impacts would be the same as under the Sunset LRT Alternative.

MITIGATION MEASURES

ALTERNATIVE 1: NO BUILD

No mitigation measures are required.

ALTERNATIVES 2, 3, 4, & 5: BUS SERVICE EXPANSION, BUSWAY, LRT ALTERNATIVES

- Publish a brief notice explaining the construction phasing in different areas;

- Designate one person to explain the construction process and to be available to respond to citizen questions;

- Remove on street parking on one side of all streets less than 40 feet wide where trucks queue;

- Route trucks through the construction right-of-way rather than on existing streets where possible;

- Require all construction workers to park in equipment storage yards of the construction right-of-way and remain off local streets;

- Establish construction hours least disruptive to business and residential traffic (preferrably during non-peak hours), by mutual agreement with each community.

3.14 UNAVOIDABLE ADVERSE IMPACTS

Sections 3.1 through 3.13 in Chapter 3 and Chapter 4 describe the significant environmental effects caused by the Westside Corridor Transportation Alternatives. In some cases, suggested mitigation measures can be incorporated into the facility planning and design to reduce the adverse impacts. In other cases, adverse impacts can be reduced but not eliminated, and are therefore determined to be unavoidable. The unavoidable impacts caused by the alternatives are summarized by the following points.

- The Sunset Busway, Sunset LRT and Multnomah LRT Alternatives would require encroachment into the 100-year floodplain of Beaverton Creek.

- All build alternatives (all alternatives except No Build) would cause loss of natural habitat.

- The Sunset Busway, Sunset LRT and Multnomah LRT Alternatives would result in wetlands loss at stream crossings and stream course relocations.

- Displacement of existing residences and businesses would occur under the Sunset Busway, Sunset LRT and Multnomah LRT Alternatives. The BSE Alternative would result in displacement of businesses only.

- The Multnomah LRT Alternative would create neighborhood disruption in the Multnomah, Maplewood, Garden Home/Raleigh Hills, and Vista Brook districts during construction of the transitway through existing residential areas along Multnomah Boulevard and Oregon Electric Right-of-Way (abandoned).

- Since acquisition of private property for right of way would be necessary for all the build alternatives, a reduction of private property on local tax rolls would occur.

- The Sunset Busway, the Sunset LRT and the Multnomah LRT Alternatives would each require use (property taking) of Section 4(f) parklands.

- No direct adverse impact on historic properties identified on the national register of historic places. Adverse indirect effects to locally important historic sites would occur under all build alternatives.

- Certain temporary construction impacts would be unavoidable for all build alternatives, such as noise, local increases in dust and other particulates, and traffic disruption (all alternatives, except No Build).

3.15 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

The development of a major transportation improvement program in the Westside Corridor has been a long-term objective of the regional and the local jurisdictions. The need for major transportation improvement investment has been documented in studies conducted since the mid 1970's. For instance, local land use planning to achieve long-term productivity has been predicated on 1) an Urban Growth Boundary containing urban development, and 2) a transportation system supportive of goals and policies established during adoption of local comprehensive plans. Without an improved transportation system in the Westside, the continued productive and orderly growth of the urban community served by the highway system and transit network would be seriously constrained.

The short-term uses of the environment required to achieve this long-term productivity would include temporary construction impacts to environmental quality; commitment of irretrievable energy, labor and capital; and community disruption. Long-term benefits to the productivity of the natural and physical environment would also include improvements in air quality (for all alternatives compared to no build) and energy efficiency (due to increased transit patronage).

3.16 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Certain types of resource consumption are irreversible or irretrievable, once committed to an alternative use considered in this report. Irretrievable resources include energy, land, capital, construction materials and labor. The use of these resources is considered permanent; however, their permanent utilization for one of the alternatives transportation facilities does not imply that they have been used unproductively.

ENERGY

Energy consumed during construction and operation of the alternatives would be an irretrievable commitment of resources. A combination of electrical energy and/or energy derived from petroleum products would be necessary for construction and operation. Energy demand for construction would vary according to the type and magnitude of construction underway. Energy for system operation would also vary depending on the modal split of passenger trips and other factors. The detailed energy analysis in Section 3.10 describes energy consumption impacts. All of the build alternatives would provide net energy savings compared to the No Build Alternative, so over time construction consumption could be balanced by operations savings.

LAND

Much of the land required for the build alternatives lies within existing rights-of-way; i.e., Sunset Highway, Highway 217, Multnomah Boulevard, and the Oregon Electric Railroad (now abandoned). Consequently, the build alternatives would not be consuming large amounts of land designated for other uses. Nonetheless, all the build alternatives require varying amounts of right-of-way acquisition. The land acquisition and facility construction would require irreversible transformation of land use to transportation purposes. A small portion (less than two acres) would be in wetlands. The amount of wetlands used varies between alternatives. The potential for consuming wildlife habitats in the wetlands also occurs with the build alternatives. Additionally, the build alternatives would consume some designated parkland areas for transportation purposes. In all cases, however, the parkland through which the transportation facility would pass is not currently in active park use. Future use of these areas, however, would be limited by the transportation improvements. Once a transportation facility is constructed, the right-of-way it uses is considered permanently committed (although joint development for non-transportation uses may be possible under special circumstances).

CAPITAL

Capital required for construction would be irretrievably committed.

CONSTRUCTION MATERIALS

Construction materials irretrievably committed for the build alterntives include cement, concrete, aggregate, lumber, steel and landfill. Much of this material can be obtained locally; however, steel will probably have to be imported.

LABOR

Design and construction of an alternative would create a large, but short-term demand for labor. Labor required for construction would represent an irretrievable commitment of human resources. Labor supply in the four county area should be sufficient to meet the estimated demands. Labor requirements for operation and maintenance of the transportation system also would represent a long-term commitment of human resources.

Chapter 4
HISTORIC PROPERTIES AND PARKLAND

4.1 POTENTIAL 4(f) INVOLVEMENT, PARKS AND OPEN SPACES

4.1.1 BACKGROUND

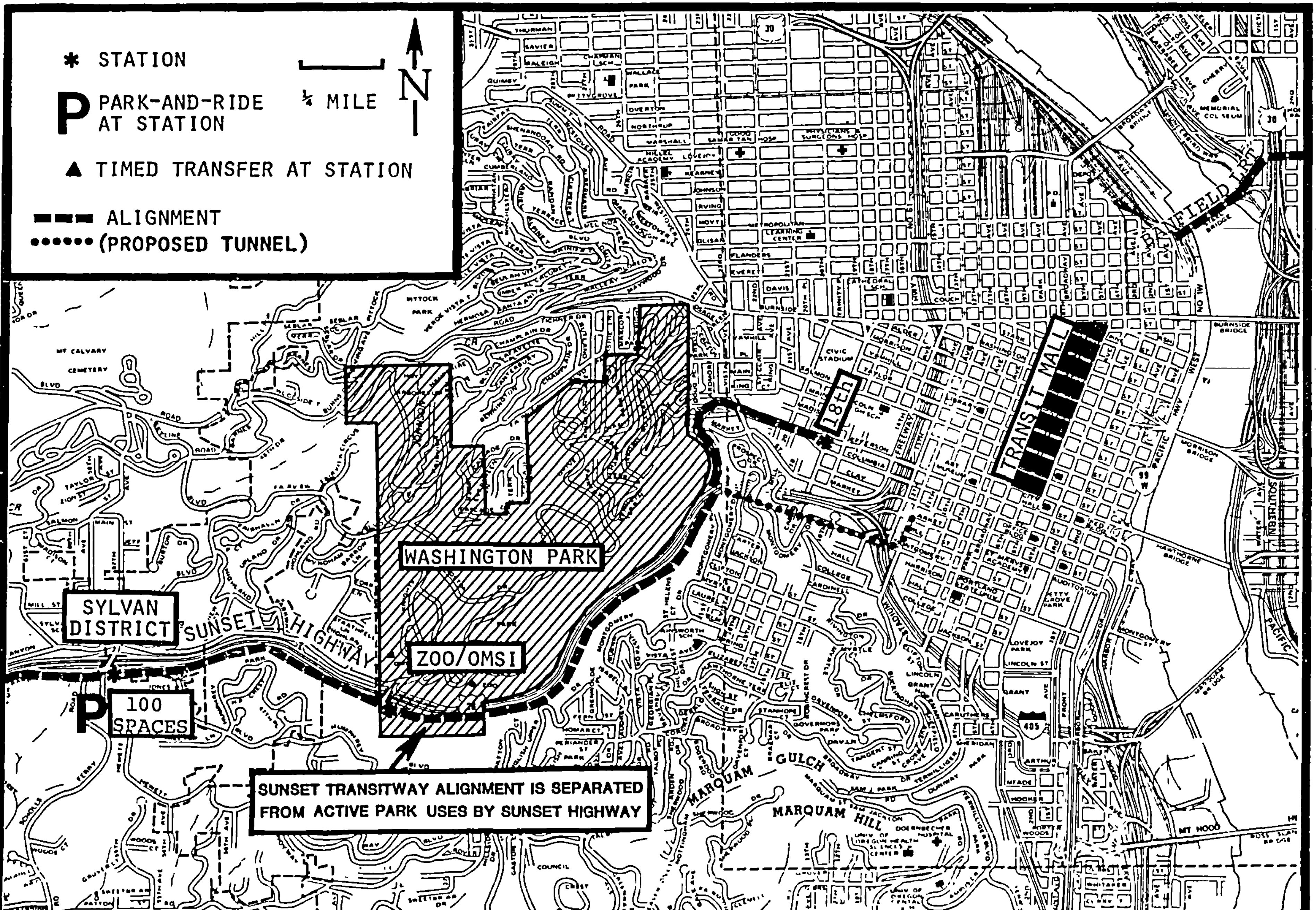
Section 4(f) originated in the 1966 Department of Transportation Act (49 U.S.C. 1653(f)). Its mandate is to make special efforts to "preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites". No program or project which requires the use of an historic site or any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance can be approved unless 1) there is no feasible and prudent alternative and 2) the project includes all possible planning to minimize harm. This protection is provided by a Section 4(f) evaluation, a detailed description of pertinent resources affected, impacts from project alternatives, and mitigation measures to minimize adverse effects. The Section 4(f) evaluation is circulated to federal, state, and local agencies with jurisdiction over affected resources for their consultation and comment. After receipt of all comments a determination must be made by the lead federal agency that there is "no feasible and prudent alternative" and that all possible mitigation measures are included.

Section 4.1 discusses potential impacts of the Westside Corridor transportation alternatives on public parks and recreation areas. Potential impacts on historic and archaeological sites, which must also be considered under Section 4(f), will be addressed in Section 4.2 of this DEIS, Potential 106 Involvement, Historic Properties. The Oregon Natural Heritage Program has indicated that there are no wildlife or waterfowl refuges in the Westside Corridor Study Area.

4.1.2 DESCRIPTION OF SECTION 4(f) LANDS

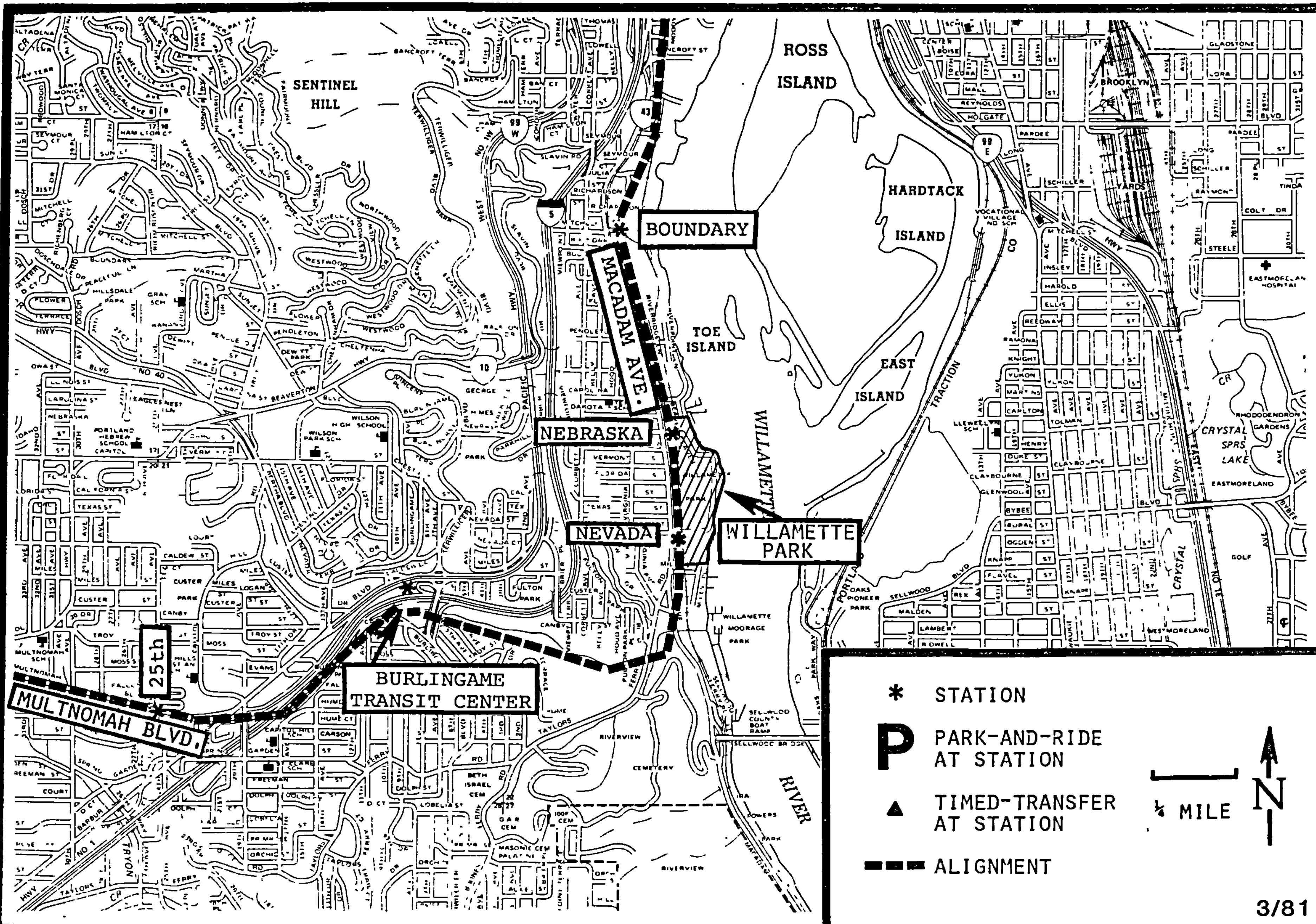
The selection of public parks and recreation lands to be considered for potential 4(f) involvement was based on two criteria: 1) is the land located within the areas of potential environmental impact under one or more of the five Westside Corridor alternatives; and 2) does the land have national, state or local significance. Evaluations of these criteria for parks and recreation land were performed by the City of Portland Bureau of Parks and Recreation or the Tualatin Hills Park and Recreation District (THPRD) as appropriate. Field reconnaisance was performed by Earth Metrics Incorporated.

Using the above criteria, parks and recreation areas protected by Section 4(f) which would be impacted include Washington and Willamette Parks (Figures 4.1-1 and 4.1-2). Under the Sunset Busway and Sunset LRT Alternatives, direct use of Washington Park would be required; under the Multnomah LRT Alternative land



WESTSIDE CORRIDOR

FIGURE 4.1-1 LOCATION OF WASHINGTON PARK WITH RESPECT TO THE SUNSET ALIGNMENT



WESTSIDE CORRIDOR

FIGURE 4.1-2 LOCATION OF WILLAMETTE PARK WITH RESPECT TO THE MULTNOMAH ALIGNMENT

from Willamette Park would be used. Both of these parks are in the City of Portland and maintained by the Parks Bureau. A letter from the Superintendent of Parks describing the significance of these 4(f) impacts is included in Appendix F.

WASHINGTON PARK. Although it is technically a Portland city park, Washington Park receives heavy regional use. Over 2.5 million people visit the park each year and 4.75 million are expected for the year 2000. During the summer months, from 56 to 68 percent of these visitors travel from areas outside the Portland metropolitan area, with more than half from out of the state.

The park occupies 138 acres and is the largest park in the study area. It has a variety of recreational, cultural and educational facilities including basketball and tennis courts, ball fields, a large amphitheatre, picnic areas, recreational trails, forested areas, the International Rose Test Gardens and the Shakespeare Garden. The Hoyt Arboretum comprises another 214 acres of Washington Park. Additional acreage (108) within park boundaries is occupied by a variety of institutions not directly controlled by the Portland Parks Bureau: the Washington Park Zoo and the Zoo Railway, the Oregon Museum of Science and Industry, the Western Forestry Center, TERA One (Total Energy Resource Application, a prototype house illustrating energy conservation techniques), and the Japanese Gardens.

Principal access to the park from the south is provided at the Zoo/OMSI exit by U.S. Highway 26 (S.W. Canyon Road), a regional arterial, and from the north at various points along W. Burnside Street, a major city street. The park may also be entered via S.W. Park Place on the east and S.W. Skyline Boulevard on the west.

WILLAMETTE PARK. Willamette Park is a regional river recreation facility and part of the Willamette Greenway Project of the State of Oregon. The boat ramp in the north part of the park is one of only two public boat landings in Portland and the only facility on the west bank of the Willamette River in the area. The south end of the park contains softball and soccer fields, two horseshoe courts and a covered picnic area. Four tennis courts and playground equipment occupy the center section. Also, two large parking lots and several paved pathways are located in the 30 acre park.

Summer use is heavy with as many as 1890 vehicles entering the park on a single day in 1979 (Portland Parks Bureau). Much of this vehicular traffic is associated with boat trailers, but the other recreational uses also attract vehicles. There is some pedestrian use from nearby neighborhoods; the park commands an excellent view of the river and of the Cascade Mountains to the east and is a favorite spot for joggers. The only access for vehicles is from S.W. Macadam Avenue at Nebraska Street. Pedestrian access is provided at both S.W. Nebraska and Nevada Streets. The nearest park providing comparable facilities (excluding the boat launch) is Fulton Park approximately one half mile to the southwest. The nearest facility of comparable size and use character is Sellwood Park to the east across the Willamette River.

Westside parks which were evaluated and determined not to have 4(f) impacts include Roxbury Park, St. Mary's Woods, Burlingame Park and Vista Brook Park. Letters are on file at Metro discussing the parks that are not affected.

Other areas examined and determined not to have Section 4(f) impacts were: Stephen's Creek ravine (privately owned) along the Multnomah alignment between Taylor's Ferry Road and the Burlingame interchange of Interstate 5, the Oregon Electric right-of-way between S.W. 67th Avenue and Scholls Ferry Road, and Collins Circle at S.W. 18th and Jefferson. The Stephen's Creek ravine was not considered for potential 4(f) involvement because it is not presently used for recreational purposes or designated for future recreational use. The Oregon Electric right-of-way, while publicly owned by Washington County, has not been designated for recreational use and is presently being preserved as a potential transportation route to Portland. This intention is discussed in a letter from Washington County. Collins Circle is a landscaped traffic circle approximately one-half acre in size. Although maintained by the Portland Parks Bureau, it is not officially designated as a park or used for recreational purposes. The environmental effects of the Westside Corridor Alternatives on Stephen's Creek ravine and on the Oregon Electric right-of-way and Collins Circle are considered in other Sections of this DEIS.

4.1.3 POTENTIAL IMPACTS OF ALTERNATIVES ON SECTION 4(f) LANDS

According to DOT regulations, a Section 4(f) impact is defined as 1) direct physical taking of the Section 4(f) property or 2) in unusual circumstances, serious indirect impacts, such as severe increases in noise, visual intrusion, or access obstruction. This Section 4(f) discussion, therefore, identifies both direct and indirect effects of each alternative.

The requirements of Section 6(f) of the Land and Water Conservation Fund Act provide the following:

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary of the Department of the Interior, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

Willamette Park was developed primarily with federal funds and therefore is subject to 6(f) involvement.

Table 4.1-1 summarizes the direct and indirect impacts on Willamette and Washington Parks by alternative. For the purposes of this section of the Draft EIS, direct effects result from the direct physical taking of property and indirect effects are those related to changes in access, noise levels, air quality, and visual intrusion.

Noise and air quality effects of each alternative on Section 4(f) lands have been evaluated and no substantial increases in noise or air pollutant levels have been found at either Washington or Willamette Parks. Construction impacts would include temporary increases in noise and dust near the proposed transitway, but are not considered to be severe and are mitigable. Permanent impacts relating to increased noise and air pollutant emissions will primarily result from additional bus traffic on existing roadways and on the proposed busway (under the Sunset Busway Alternative). Light rail vehicles would be insignificant sources of local air pollutants. The criterion for noise annoyance used in this Section 4(f) analysis was the FHWA peak hour standard (67 dBA of the Leq scale) in at least part of the park where this noise standard is presently not exceeded.

TABLE 4.1-1. COMPARISON OF THE DIRECT AND INDIRECT EFFECTS OF THE WESTSIDE ALTERNATIVES ON SECTION 4(f) PARKS AND RECREATIONAL AREAS

ALTERNATIVE	PARK OR RECREATION AREA AFFECTED	
	WASHINGTON	WILLAMETTE
1. No Build	0	0
2. Bus Service Expansion	0	0
3. Sunset Busway	D, AI	0
4. Sunset LRT	D, AI	0
5. Multnomah LRT	0	D, AI V

0 = No Effect D = Direct Use AI = Increased Access
AD = Decreased Access V = Visual Impact N = Noise Intrusion

Source: Earth Metrics Incorporated, 1981

Similarly, the determination of a significant air quality effect was made where a predicted increase in the carbon monoxide level would result in a new violation of the federal standard (CO concentrations above 10 mg/m3 average over an eight hour period). Neither of these criteria were exceeded in Washington and Willamette Parks. Sections 3.8 and 3.9 contain detailed discussions of noise and air quality effects of each of the alternatives. This analysis indicates that there may be some additional passby noise annoyance but not at levels which exceed federal standards.

ALTERNATIVE 1: NO BUILD

Since no major transportation developments will occur under this alternative, its implementation would have no significant direct or indirect effects on 4(f) parklands.

ALTERNATIVE 2: BUS SERVICE EXPANSION

No direct impacts to 4(f) parks or recreation areas will occur under the Bus Service Expansion Alternative. Access to parks and recreation areas along existing or proposed bus routes would generally be increased since the number of buses on Westside roadways would be doubled. There would be no decrease in access to any 4(f) parklands. Adverse visual, audial and air quality effects caused by the increase in bus traffic and by transit facilities would be insignificant.

ALTERNATIVE 3: SUNSET BUSWAY

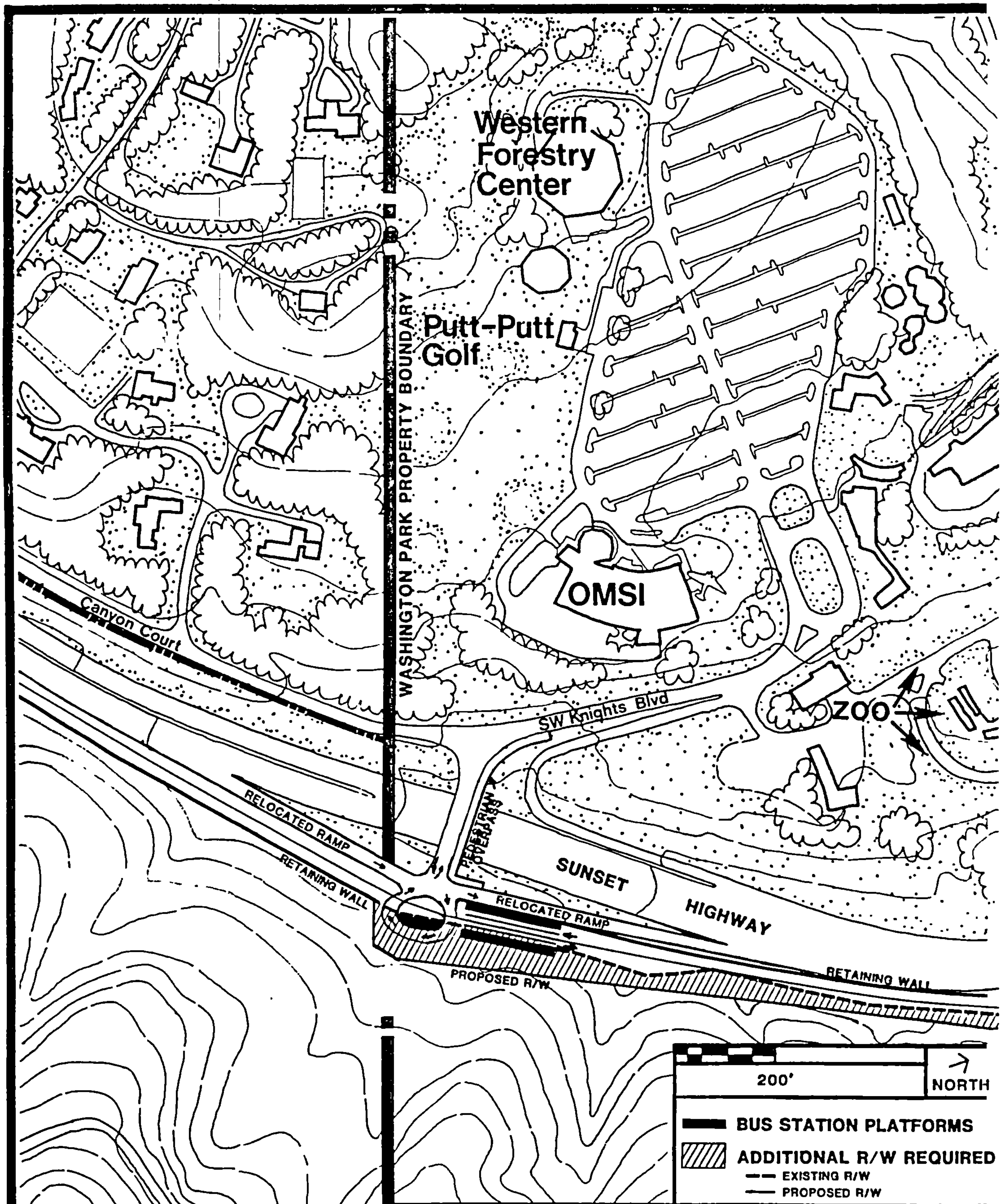
WASHINGTON PARK. Udner the Sunset Busway Alternative, a station would be constructed within Washington Park south of U.S. Highway 26 (Figure 4.1-3). Parkland (3.5 acres) would be required for the busway alignment and the proposed Zoo/OMSI station. No park and ride lot would be associated with the proposed station. In general, the construction of the Zoo/OMSI station would benefit park users by providing increased access.

None of the land south of Highway 26 is currently being used for recreational purposes, nor does the Portland Parks Bureau have any plans to develop this area (except for a minor foot trail) because of the steep grade (Figure 4.1-4, Plates 1 and 2). However, the Washington Park Master Plan does designate a portion of the area south of U.S. Highway 26 as a site for a possible future light rail transit stop, and the parks bureau has expressed interest in the possibility of developing either a bus or LRT station at the Zoo/OMSI location. This proposed direct use of parkland does not represent a significant adverse impact to park usage or character (see letter in Appendix F).

The busway would be within the narrow Sunset Canyon corridor already committed for transportation purposes. The busway alignment would pass through the southernmost corner of Washington Park not used or planned for recreational purposes (Washington Park Master Plan).

Park visitors would generally benefit from the increased access provided by the busway and station. Presently there is very poor public transit access to the park (Nelson, 1981). Some problems relating to pedestrian safety and parking may arise with the increased number of pedestrian trips between the proposed station area and the main park entrance. Existing walkways require pedestrians from both the north and the south sides of U.S. Highway 26 to cross the highway off ramp and also to walk down and then back up a steep grade. This undesirable situation will be intensified to the extent that pedestrian traffic from Highway 26 to Washington Park is increased. Visual, air and noise impacts would be minimal since transit facilities would be located south of Highway 26 and obscured from the major park facilities by park vegetation and the Oregon Museum of Science and Industry building (Figure 4.1-4, Plate 3). East of the station, along the Washington Park boundary, the alignment would not be visible due to depressed grade of alignment and dense vegetation between park users and Highway 26.

The lack of available parking for station users may also adversely impact Washington Park patrons. Park authorities estimate that currently about 100 spaces in the main parking lot are occupied daily by vehicles not associated



WESTSIDE CORRIDOR

FIGURE 4.1-3
IMPACTS OF THE SUNSET BUSWAY ALTERNATIVE ON WASHINGTON PARK

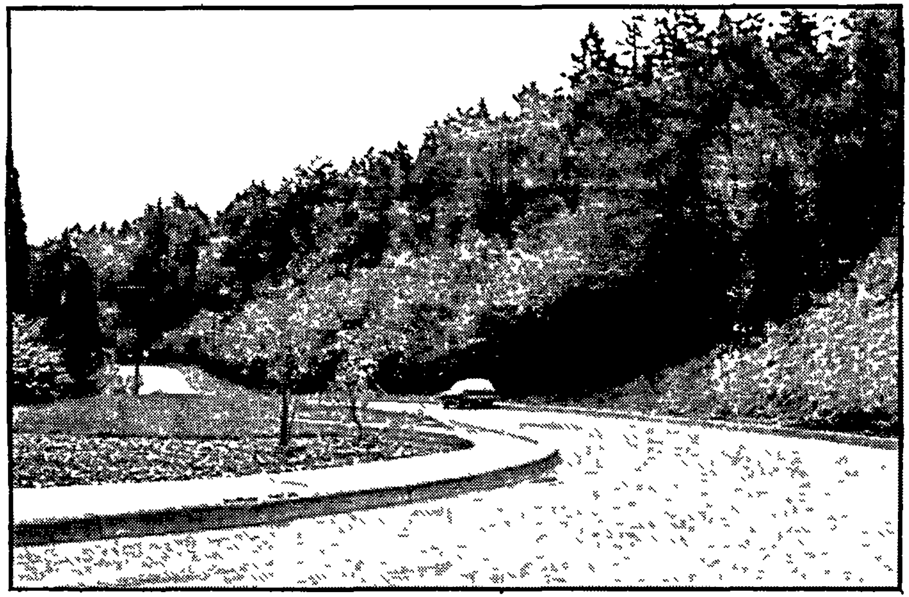


Plate 1

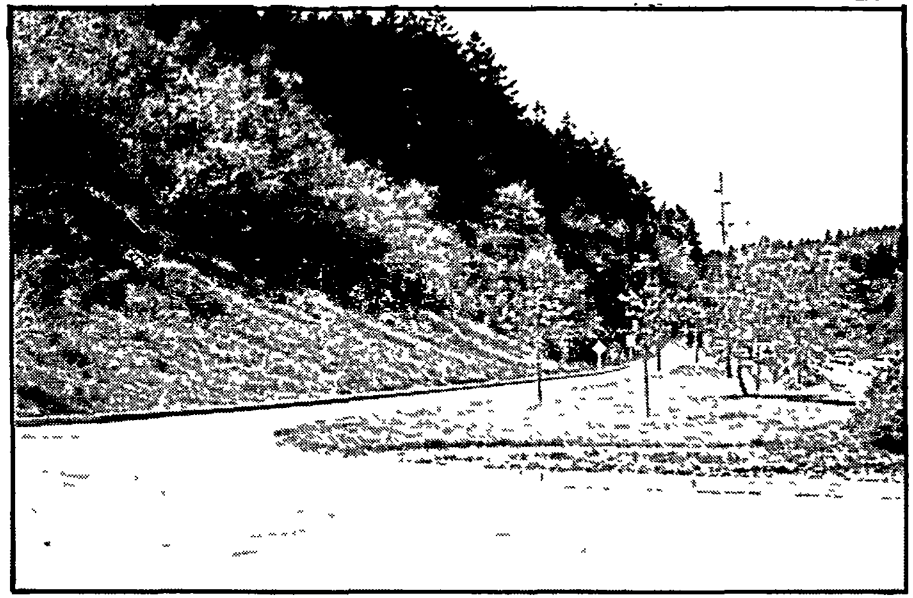


Plate 2

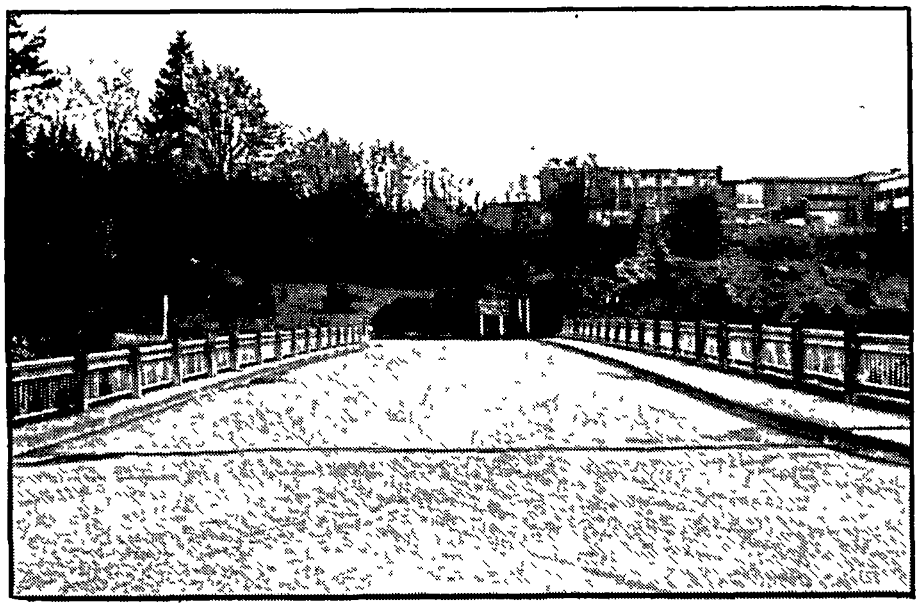


Plate 3

PLATE

1. Portion of Washington Park south of Highway 26, looking east along on ramp from the south side of the Zoo Road overpass. The area shown is the site for the Zoo/OMSI station under both the Sunset Busway and LRT alternatives.

2. Off ramp heading from Highway 26 to the south side of the Zoo Road overpass in Washington Park, looking west along Highway 26. The steep slope in this area may be seen here and in Plate 1.

3. Washington Park looking north across the Zoo Road overpass from the south side of Highway 26. Major Park facilities are well shielded from highway traffic.

WESTSIDE CORRIDOR

FIGURE 4.1-4

PHOTOGRAPHS OF WASHINGTON PARK

with park use. These vehicles belong to area residents who drive to the Washington Park parking area, park their cars there and then carpool into Portland to work. Park officials have initiated ticketing and towing procedures to alleviate the problem; however, construction of a station at this site without providing additional parking could aggravate the existing parking problems, thereby impeding automobile access to the park.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

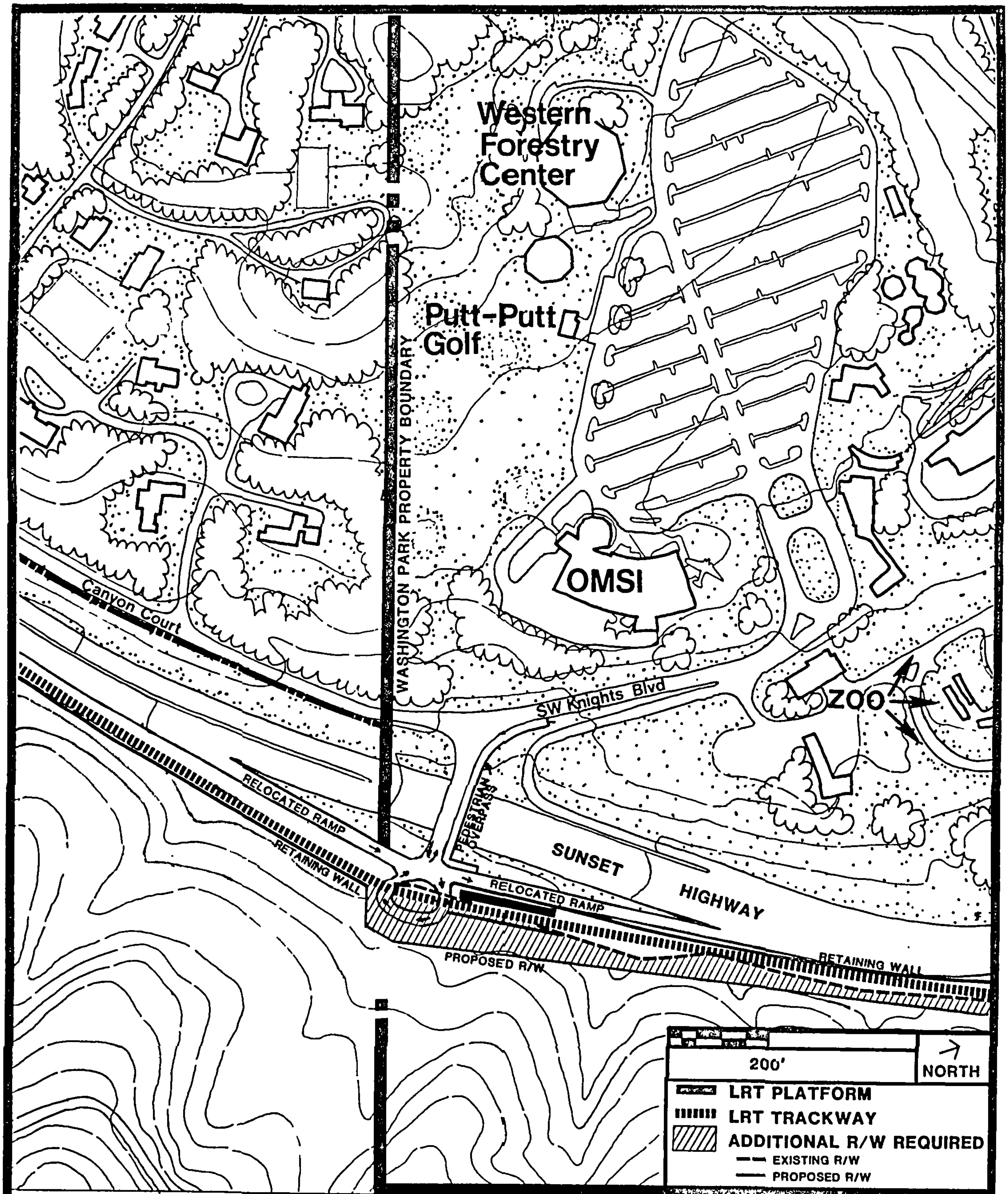
WASHINGTON PARK. Direct and indirect impacts to Washington Park would be similar under the Sunset LRT Alternative to those of the Sunset Busway Alternative. The location of the proposed Zoo/OMSI station is the same for both the Sunset Busway and LRT Alternatives (Figures 4.1-5). The amount of additional land required for right-of-way purposes is 3.5 acres for the surface alignment and 4.4 acres for the tunnel option.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

WILLAMETTE PARK. Direct use of land in Willamette Park would be needed for the construction of two stations located partially within the park boundaries: (the Nebraska Street station and the Nevada Street station) and the placement of electrical poles (Figure 4.1-6). No park facilities are located within the proposed areas of direct use (Figure 4.1-7, Plates 1 and 2). Several large trees (diameter at shoulder height of two feet or more) are located in or near the Nevada Street station area. The Portland Parks Bureau has indicated that the proposed use of parkland in Willamette Park does not constitute a significant direct impact, because the area proposed for acquisition is not used as an active park area (See Appendix F); it forms a transition area between industrial uses to the west and park activities to the east. The amount of land required for the proposed alignment totals 1.2 acres. The land requirements assumed are a 15 foot easement into Willamette Park for LRT pole placement and a slope easement. In addition to land requirements, the Multnomah LRT would take a minor amount of air space above the park. The air space is not involved in any active park use. Air space requirements range from a two foot overhang into the park for track use to a seventeen foot overhang at the platform area. The station platform would be roughly 30 feet above Willamette Park at its highest point.

Potential sources of indirect impact include the two station areas mentioned and the portion of the Multnomah alignment which runs adjacent to the park along the Southern Pacific right-of-way. Multnomah LRT will introduce new visual and noise sources to the Willamette Park area. These impacts will be minor. No shielding presently exists between the park and adjacent buildings fronting on Macadam. Views from Willamette Park to the west consist primarily of small manufacturing and office buildings. The area affected by the Multnomah LRT is not involved in any active park use. The area represents basically a buffer zone between the parking lot and the railroad track.

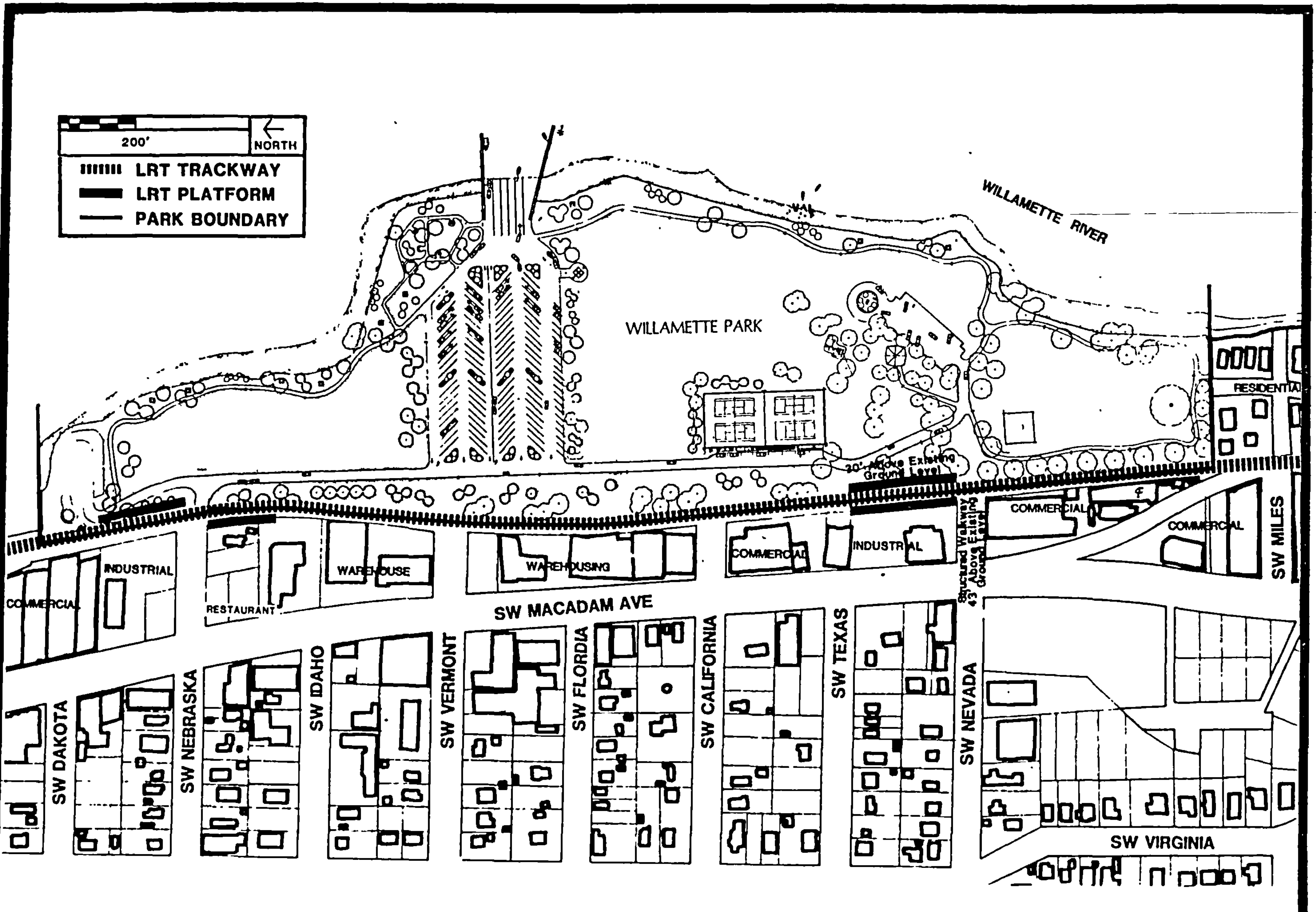
The Southern Pacific Railroad currently operates only one train daily along these tracks, so the Multnomah LRT Alternative would create a significant increase in traffic along this segment. During the peak hour, LRT vehicles would operate on a three minute headway in each direction; however, this peak frequency does not correspond to the times of greatest park use. LRT traffic would present a slight safety problem to park users and make access, both



WESTSIDE CORRIDOR

FIGURE 4.1-5

IMPACTS OF THE SUNSET LRT ALTERNATIVE ON WASHINGTON PARK



WESTSIDE CORRIDOR

FIGURE 4.1-6 IMPACTS OF MULTNOMAH LRT ALTERNATIVE ON WILLAMETTE PARK: NEBRASKA STREET STATION PLAN/ NEVADA STREET STATION PLAN

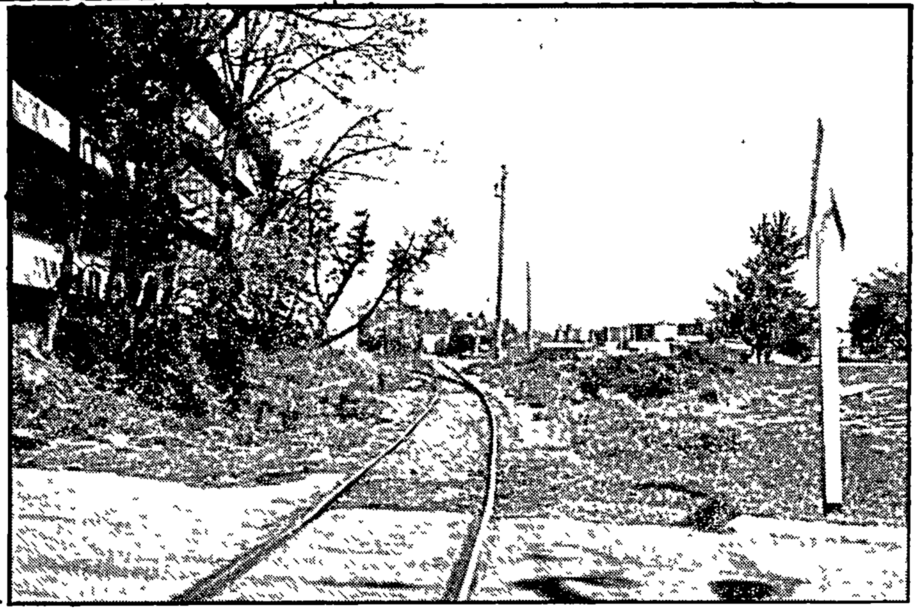


Plate 1

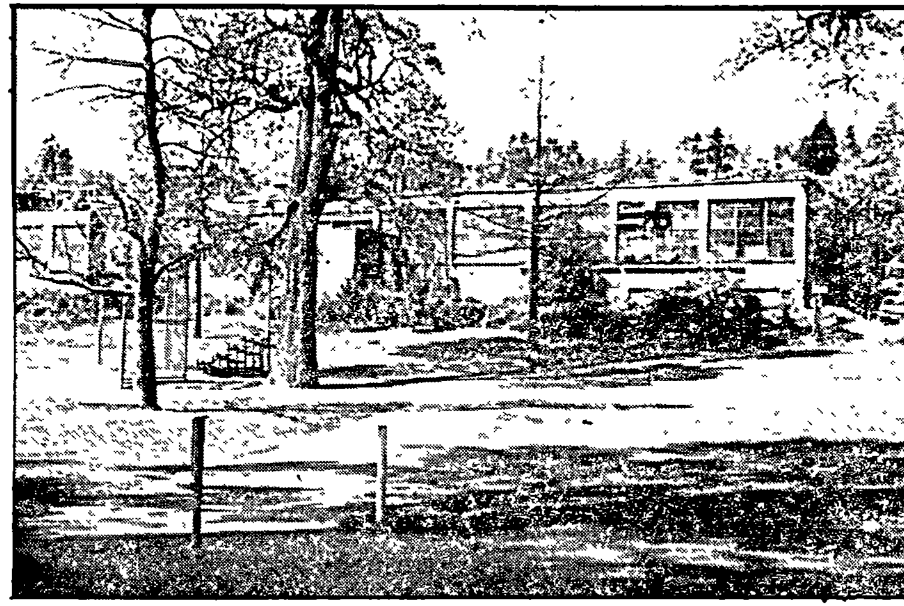


Plate 2

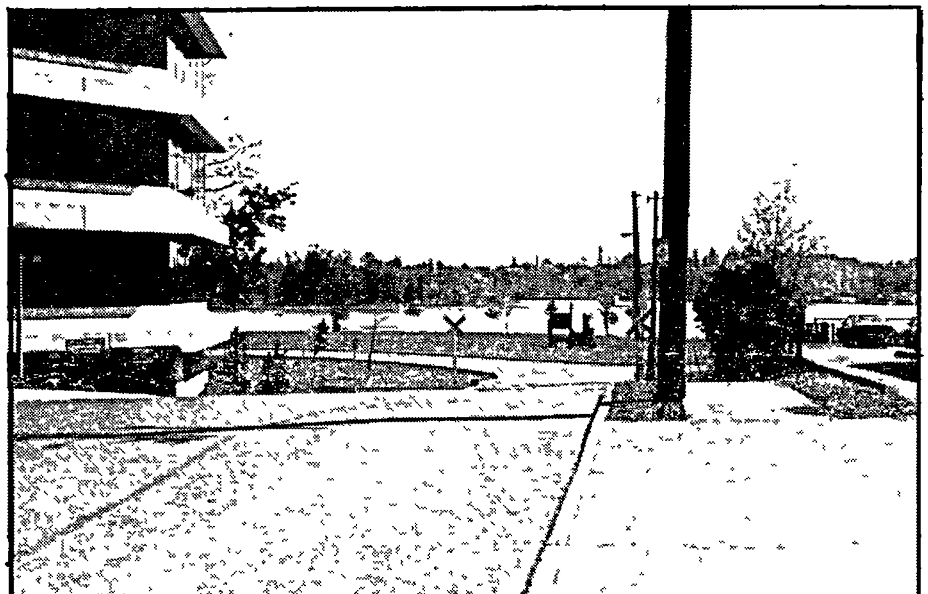


Plate 3

PLATE

1. Proposed site of Nebraska Street Station in Willamette Park, looking north from the main park entrance. No facilities are located within the area of proposed use.

2. Willamette Park/Nevada Street Station area looking southwest from the south parking area. Facilities which may need to be relocated, the existing visual setting and Nevada Street pedestrian access are illustrated.

3. Willamette Park main entrance looking east along S.W. Nebraska Street. The Multnomah LRT Alternative may result in decreased pedestrian and vehicular access at this site.

WESTSIDE CORRIDOR

FIGURE 4.1-7

PHOTOGRAPHS OF WILLAMETTE PARK

pedestrian and vehicular, slightly more difficult during the peak hour. Traffic flow during the peak hour would be slightly impeded at the S.W. Nebraska Street entrance. During the off peak hour the Multnomah LRT would improve access to the park by providing non-auto owners the opportunity to use park facilities. Generally, access to the park would be slightly improved. No significant changes in air quality are expected.

4.1.4 EVALUATION FOR FEASIBLE AND PRUDENT ALTERNATIVES

Of the five alternatives addressed in this Alternatives Analysis DEIS, only the No Build and Bus Service Expansion Alternatives avoid direct conflict with 4(f) park and recreation lands. The Sunset Busway, the Sunset LRT and Multnomah LRT Alternatives each involve direct use of land in one park.

When parkland is impacted by transportation project options, the issue of feasible and prudent alternatives must be evaluated. The final 4(f) determination must be made subsequent to the DEIS, following receipt of public comments and mandated consultation with interested groups and agencies. To understand the issue of prudent and feasible alternatives in the Westside Corridor, one must take note of its basic topography; in particular, the grades and soil conditions which are experienced in traversing the West Hills. Between Downtown Portland and Beaverton there are only three existing routes through the Hills: Beaverton-Hillsdale Highway, Multnomah Boulevard and Sunset Highway.

BEAVERTON-HILLSDALE HIGHWAY/BARBUR BOULEVARD. Beaverton-Hillsdale Highway was eliminated as an alignment option during Phase I of Alternatives Analysis. Beaverton-Hillsdale Highway is a principal arterial characterized by moderately intensive strip commercial development and multi-family units along its entire length. The inclusion of LRT or buslanes would require right-of-way acquisition ranging from 50 feet to 300 feet and station areas. The displacement impact would be severe. Sixty-eight buildings (36 residential and 32 commercial) would be directly taken for right-of-way. These displacement impacts do not include businesses and residences which would have to be taken due to loss of access. While precise estimates of these dislocations are not available, the Phase I analysis estimated the total takings as over 100.

Access to Beaverton-Hillsdale Highway from Downtown Portland would be via Barbur Boulevard. Barbur Boulevard is a principal arterial notched into the relatively steep grades of the West Hills. The facility was recently widened to insert a median reversible bus lane. This widening, which was minor, required extensive use of retaining walls in many cases right beneath homes and multi-family complexes.

Barbur Boulevard is a major regional auto facility serving the southwest corridor. Although it is generally two lanes in each direction, at a key location it offers only one through lane for traffic. Therefore, construction of LRT or another buslane would require widening which would necessitate cutting deeper into the steep grade and unstable soils. This was considered unwise geotechnically during the reconnaisance engineering. Many of the homes and apartment units would also have to be displaced. Precise estimates of the takings were not performed during Phase I, but the magnitude of the dislocations was considered major. In summary, the severity of the displacements and the geotechnical impacts of a Beaverton-Hillsdale Highway alignment eliminated it from further consideration.

MULTNOMAH BOULEVARD/MACADAM AVENUE. No parkland is impacted along Multnomah Boulevard by the Multnomah LRT option. However, parkland is impacted in the segment between Downtown Portland and Multnomah Boulevard. In this segment there are only two basic routes: Barbur Boulevard and Macadam Avenue; both were examined during Phase I Alternatives Analysis. Multnomah Boulevard is further south than Beaverton-Hillsdale Highway, so the above discussion of Barbur Boulevard applies to this alternative as well. In addition, the widening between Beaverton-Hillsdale Highway and Multnomah Boulevard would necessitate replacing two large timber trestles and the elimination of access at numerous intersecting neighborhood streets. For these reasons the Barbur Boulevard approach to Multnomah Boulevard was eliminated from further consideration during Phase I.

Within the Macadam corridor two alignments were analyzed during the reconnaisance engineering stage: the one evaluated in this DEIS and one in the median of Macadam Avenue. While the Macadam median alignment would have avoided use of Willamette Park, it was determined to be an imprudent investment and eliminated from further consideration for the following reasons:

- Twenty-two of the approximately 65 commercial buildings along Macadam Avenue would either be demolished or have portions of the building removed. These impacts would be particularly severe at Nevada, Nebraska and Boundary Streets. In almost all cases, the impacted buildings would be modern office or retail establishments.

- The Macadam median alignment would require drastic alterations to the soon to be completed Macadam Avenue improvement project. Ten existing left-turn locations would be eliminated, thereby impeding access to business and severely hampering traffic flows.

- Use of the median alignment would have necessitated an engineering profile which would have blocked views of Mt. Hood from portions of the Corbett-Terwilliger neighborhood. The view of Mt. Hood is an integral part of the basic character of this neighborhood, and loss of this vista would not be acceptable to the community. The alignment evaluated in this DEIS allowed the trestle work to be further south, away from major neighborhood vistas.

In summary, by process of elimination of the few choices available between Downtown Portland and Multnomah Boulevard, the alignment evaluated in this DEIS was determined to be the only alignment which could potentially be a feasible and prudent investment.

SUNSET HIGHWAY. The Sunset Highway represents the third route between Portland and Beaverton. Because the Washington Park boundary straddles both sides of the highway, any alignment using the Sunset Highway passage must utilize parkland. The option of using the north side of the Sunset Highway was eliminated because it would have affected a slide area which has recently been stabilized after over ten years of effort. Furthermore, it would have brought the transitway alignments closer to the active uses section of the park. The south side alignment evaluated in this DEIS is separated from the active use portion of the park by a six-lane highway and is determined to be the only potential feasible and prudent investment along this route.

4.1.5 MEASURES TO MINIMIZE HARM TO SECTION 4(f) LANDS

The measures presented below are intended to ensure that all possible planning, appropriate to this stage of decision making, takes place to minimize adverse effects.

Mitigation measures to minimize harm to 4(f) park and recreational lands are listed below by alternative. The mitigation measures address direct taking, access, audial and visual effects.

ALTERNATIVE 1: NO BUILD

No mitigation is required.

ALTERNATIVE 2: BUS SERVICE EXPANSION

No mitigation is required.

ALTERNATIVE 3: SUNSET BUSWAY

WASHINGTON PARK. No mitigation of the small direct impact to Washington Park is necessary. The actual taking from Washington Park will be kept as small as possible, consistent with safe design practices. To mitigate any adverse indirect impact, the following measures will be implemented:

- Landscape the area around the Zoo/OMSI station during the construction phase.

- Develop improved pedestrian access from the station area to the main park facilities by constructing a new, more level walkway and providing signalization at pedestrian crossings.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

WASHINGTON PARK. Mitigation measures for Washington Park under the Sunset LRT Alternative are the same as those under the Sunset Busway Alternative because of the similarity of potential impact.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

WILLAMETTE PARK. The following measures will be developed in conjunction with the Portland Parks Bureau to mitigate impacts resulting under the Multnomah LRT Alternative.

- Alternate transit station sites to Nebraska Street will be studied during preliminary engineering as an option to reduce any potential conflicts with park uses.

- A parking management plan will be implemented if the Willamette Park parking facilities are inappropriately used by transit riders for park and ride uses.

- The construction of the Multnomah LRT alignment adjacent to Willamette Park will include in its final design a replanting, regrading and landscape plan. The landscape plan will be designed to reduce the potential visual impacts of the LRT facility.

- If additional steps are necessary to mitigate impacts to Willamette Park, the lead agency will coordinate with the Portland Parks Bureau and the Department of the Interior to identify and select replacement property to substitute for any direct land taking from Willamette Park.

- Preserve as many of the large mature trees as possible. Replace removed trees by planting saplings nearby.

- Provide new pedestrian access at Nevada Street station (grade separated, ramp to park) and vehicular access maintained at Nebraska Street to accommodate traffic associated with recreational use of the river.

4.1.6 COORDINATION

Several agencies have been contacted to provide input to this discussion of potential 4(f) involvement for the Westside Corridor Alternatives. A preliminary list of existing and proposed public parks and recreation areas within the areas of potential environmental impact was prepared by Earth Metrics Incorporated for each of the two park districts concerned. The City of Portland Bureau of Parks and Recreation and the Tualatin Hills Park and Recreation District were contacted to review the appropriate list and to prepare statements addressing the significance of these recreation areas. The park districts also provided descriptive information for each of the parks and recreation areas.

Information on potential 4(f) and 6(f) involvement has also been made available to the Departments of Interior (DOI) and Housing and Urban Development (HUD). Preliminary comments received from these agencies have not identified any additional impacts, alternatives or mitigation measures. Comments from the Department of Housing and Urban Development were received by telephone communication (Safranski, 1981).

This exchange constitutes early consultation with the DOI and HUD. Coordination with these federal agencies will continue throughout the selection process whereby a single alternative will be chosen. The final Section 4(f) evaluation, prepared subsequent to the selection of the preferred alternative, will include determinations made by the Secretary of Transportation as to whether there are feasible and prudent alternatives to the use of Section 4(f) lands and whether all possible planning to minimize harm to 4(f) lands has been included in the proposed action. In addition, if the Multnomah LRT is selected, it will also be necessary to obtain approval of the use of Willamette Park from the Secretary of the Department of Interior (DOI). This is because the park was developed with federal funds administered by DOI and is, therefore, subject to the requirements of Section 6(f) of the Land and Water Conservation Fund Act.

4.2 POTENTIAL SECTION 106 INVOLVEMENT, HISTORIC PROPERTIES

4.2.1 BACKGROUND

Section 106 of the National Historic Preservation Act of 1966, as amended, and Executive Order 11593 "Protection and Enhancement of the Cultural Environment" require that impacts of federally assisted projects be examined for all historic districts, sites, buildings, structures, or objects, and archaeological sites listed or eligible for inclusion in the National Register of Historic Places. The Act also requires that federal agencies afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on undertakings that affect such properties. The ACHP has established procedures for the "Protection of Historic and Cultural Properties" (36 CFR, part 800). This section of the Draft EIS documents compliance with the Section 106 process and the procedures of the ACHP with regard to the potential impacts of the Westside Corridor Alternatives on historical and archaeological resources.

In addition to this chapter, a Cultural Resources Technical Memorandum for the Westside Corridor Alternatives Analysis is available to those seeking more detailed information. Any additional findings which may arise from the ongoing Section 106 evaluation will be included in the Final EIS after selection of a preferred alternative.

The identification of historic and archaeological sites and the subsequent impact and mitigation analysis was conducted for downtown Portland and Beaverton resources (Earth Metrics Inc., 1981). The evaluation of historical and archaeological resources in the remaining areas of the Westside Corridor was conducted in 1980-81 (Cultural Resources Management, Inc., 1980-81).

4.2.2 IDENTIFICATION OF ARCHAEOLOGICAL AND HISTORICAL RESOURCES

The methods for the identification of archaeological and historical resources followed the guidelines in 36 CFR Part 66, Appendix B, "Guidelines for the Location and Identification of Historic Properties Containing Scientific, Prehistoric, Historic, or Archaeological Data", (Federal Register, Vol. 43, No. 19, p.5380). The methods included literature searches; file searches of inventoried cultural resources at the State Historic Preservation Office, the State Museum of Anthropology at the University of Oregon, and the City of Portland Bureau of Planning Library; interviews and correspondence with individuals and institutions knowledgeable about Portland and Washington County history and archaeology; and a 15 day field inspection of the proposed alignments.

DETERMINATIONS OF ELIGIBILITY

Pursuant to federal legislation protecting cultural resources, rules in 36 CFR Part 800.4 (a) (Federal Register, Vol. 44, No. 2, January 30, 1979, p.6074) require Determinations of Eligibility to complete the task of identifying National Register historic and cultural properties. A preliminary evaluation of the National Register potential of the sites (Cultural Resources Management, Incorporated) was conducted using the eligibility criteria as stated in 36 CFR Part 60.6 (Federal Register, Vol. 41, No. 6, p.1595). National

Register potential of Portland historical sites will be assessed during the Portland Historic Inventory Project currently being conducted by the Portland Planning Bureau. Determinations of Eligibility for Inclusion in the National Register will be prepared for properties which appear to be eligible, or for which there are questions regarding eligibility, for the National Register as required under Section 106 subsequent to the selection of a preferred alternative.

Sites were also evaluated for significance with respect to state and local guidelines. Other significance designations include: Portland Landmarks, Historical Districts and Conservation Districts; sites listed on the Statewide Inventory; and sites of historic or architectural significance to a particular neighborhood.

ARCHAEOLOGICAL RESOURCES

No major archaeological sites were identified within the study area. However, the Tualatin Plains were the former territory of the Tualatin band of the Willamette Valley Kalapuya Indians, and many habitation sites are documented in the archaeological literature (Zenk, 1976). Thus, there is some potential for the discovery of buried remains during construction.

In urban areas, such as Portland and Beaverton, previous construction has already disturbed sites which may have existed at one time. Because this disturbance is at least as deep as the construction zone, the potential for intact sites is low in these areas; it is possible that material remains below these zones.

In less urbanized areas, where subsurface materials have been disturbed to a lesser extent, the potential for the discovery of buried artifacts is greater. Thus, based on available ethnographic information, the portions of the Tualatin Plains east of Beaverton and along the Sunset and Multnomah alignments west of Beaverton to S.W. 185th Avenue are potential archaeologically sensitive areas. Because sites which would otherwise be identifiable without excavation can be masked by vegetation or other surface alterations, and because of the small amount of professional archaeological work done in the study area, prior to this investigation most of the known archaeological sites in Washington County have been discovered through ground disturbing activities, such as plowing and construction.

No major historical archaeological sites are anticipated. Fort Vancouver and French Prairie, the major historical sites of the area, are not near the proposed project area. No mention of historical archaeological sites near the project area dating from the early settlement of the Tualatin Plains or of riverfront Portland was found in the literature.

HISTORICAL RESOURCES

East-west transportation routes between Portland and the Tualatin Plains of Washington County have been limited by Portland's West Hills. Both early pioneers and modern transitway engineers have recognized favorable grade conditions near Washington Park and Fulton. Consequently, the Multnomah and Sunset alignments follow two of the oldest transportation corridors in Portland. The historic sites identified along these alignments represent diverse aspects of Portland's commercial development and settlement history.

Portland's historic resources include buried cobblestones, historic districts, and conservation districts as well as buildings and neighborhoods. City Ordinance 141548 directs permittees for street excavations to report buried cobblestones to city officials. Cobblestones are usually found along old street car lines, such as Jefferson Street and the northern part of Macadam Avenue. City ordinances also define historic districts and conservation districts (Cultural Resources Technical Memorandum, Earth Metrics, 1981). Portland's two historic districts, the Skidmore Old Town District and the Yamhill District, are located within the downtown Portland study area (see Figure 4.2-1). The proposed Multnomah alignment runs six blocks east of Lair Hill, a Conservation District.

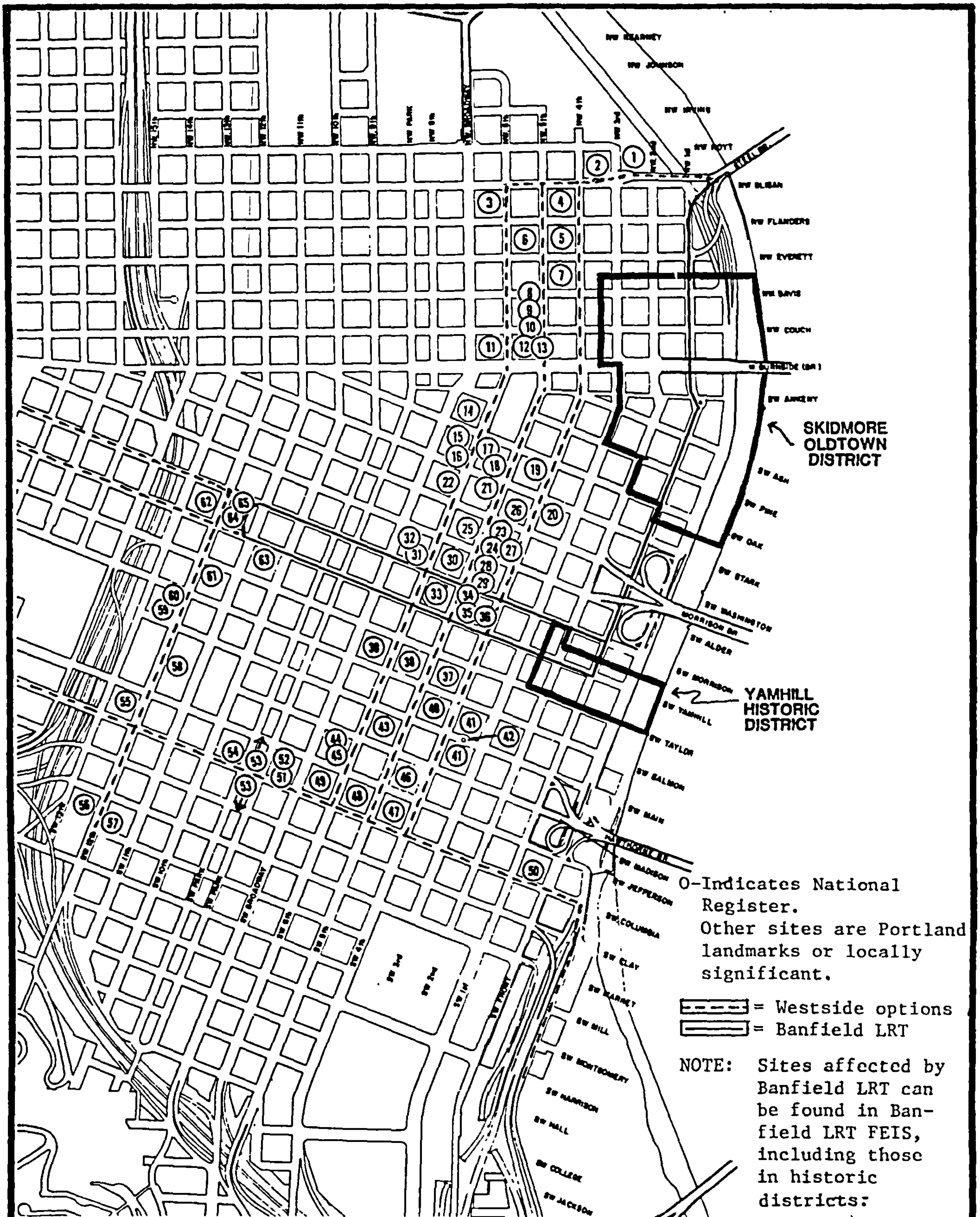
The preservation of designated Portland Landmarks, Historic Districts and Conservation Districts is the responsibility of the Portland Historical Landmarks Commission. Major proposals which may impact these historic sites and districts are reviewed by the commission. As with the Banfield LRT project, an agreement reached between the Landmarks Commission and the Tri-County Metropolitan Transportation District stipulates design and operation characteristics required for the use of light rail vehicles within a Historic District, including specifics on: paving materials; the design of shelters, street furniture, and supports for lighting and overhead electrification; street planting; and vehicle speeds and headways. The agreement also states that noise, loss of access, diversion of traffic into the Historic Districts and loss of parking will be minimized through appropriate alignment design, associated traffic controls and vehicle selection.

PORTLAND CBD. The Portland CBD contains 38 properties listed on the National Register and several additional city landmarks. The preliminary evaluation performed by Cultural Resources Management, Inc. did not identify any additional sites potentially eligible for the National Register.

National Register properties and Portland Landmarks that are located adjacent to one or more of the Westside project alternatives are listed in Table 4.2-1. In addition, the table lists other locally significant structures and historic sites within the Downtown Portland area, as noted in the revised Cultural Resources Technical Memorandum (Earth Metrics, Inc., 1981).

WEST OF THE PORTLAND CBD. Sixty one historic buildings or structures lie within one quarter mile of the proposed transit facilities west of downtown Portland. Of these, six are listed on the National Register and 15 are Portland Landmarks. Three sites appear to be eligible for the National Register, and 19 other properties need indepth research and site study to determine National Register potential. The remaining 26 sites are either of state or local historic significance (or both), but do not appear to meet the eligibility criteria for a National Register listing. Historic sites near the Sunset and Multnomah alignments outside of downtown Portland are listed in Table 4.2-2. The maps in Figures 4.2-2 through 4.2-11 show the relation of these sites to the alignments. Detailed descriptions of historic sites are contained in the Cultural Resources Technical Memorandum (Earth Metrics, 1981), on file at METRO.

There are other potential and existing historic and/or conservation districts outside of the Portland CBD. The existing district includes the Lair Hill



WESTSIDE CORRIDOR

FIGURE 4.2-1

HISTORIC SITES AND ALIGNMENT OPTIONS (COMPOSITE) IN DOWNTOWN PORTLAND

TABLE 4.2-1. HISTORIC RESOURCES ADJACENT TO EACH OF THE WESTSIDE CORRIDOR DOWNTOWN PORTLAND ALIGNMENT OPTIONS

Figure Reference 4.2-1	Figure Reference	SITE	On National Register	Westside Corridor Downtown Alignment Option: SUNSET Columbia/12th/4th/5th	SUNSET Columbia/18th/4th/5th	SUNSET Columbia/18th/5th/6th	SUNSET Columbia/12th/5th/6th	SUNSET TUNNEL Montgomery/12th/5th/6th	SUNSET TUNNEL Montgomery/12th/4th/5th	MULTNOMAH Columbia/12th/4th/5th	MULTNOMAH Columbia/12th/5th/6th
1		Two story brick building, 510 N.W. Third Avenue.		X	X	X	X	X	X	X	X
2		Hunt Transfer Company, 321 N.W. Glisan Street.		X	X	X	X	X	X	X	X
3		Oregon Cracker Company, 616 N.W. Glisan Street.	X			X	X	X			X
4		Povey Glassworks Factory, 408 N.W. Fifth Avenue.		X	X	X	X	X	X	X	X
5		Three story brick building, 310 N.W. Fifth Avenue.		X	X	X	X	X	X	X	X
6		Hood Hotel (Biltmore Hotel), 302-318 N.W. Sixth Ave.				X	X	X			X
7		Kalberer Hotel, 234 N.W. Fifth Avenue.		X	X	X	X	X	X	X	X
8		Three story brick building, 125-135 N.W. Fifth Ave.		X	X	X	X	X	X	X	X
9		Three story brick building, 115 N.W. Fifth Avenue.		X	X	X	X	X	X	X	X
10		Four story concrete building, 107 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
11		Nickel Theatre, 9-13 N.W. Sixth Avenue.				X	X	X			X
12		Apostolic Faith Building, 16-34 N.W. Sixth Avenue.				X	X	X			X
13		Structure, 5 N.W. Fifth Avenue.		X	X	X	X	X	X	X	X
14		Hotel Garages, Inc., 600 block S.W. Ankey Street.				X	X	X			X
15		Wells Fargo Building, 309 S.W. Sixth Avenue.				X	X	X			X
16		United States National Bank, 321 S.W. Sixth Avenue.	X			X	X	X			X
17		Old Bank of California (Security Bank), 330 S.W. Sixth Avenue.	X			X	X	X			X

TABLE 4.2-1. HISTORIC RESOURCES ADJACENT TO EACH OF THE WESTSIDE CORRIDOR DOWNTOWN PORTLAND ALIGNMENT OPTIONS (Cont'd)

Figure Reference 4.2-1	SITE	On National Register	Westside Corridor Downtown Alignment Option: SUNSET Columbia/ 12th/4th/5th	SUNSET Columbia/ 18th/4th/5th	SUNSET Columbia/ 18th/5th/6th	SUNSET Columbia/ 12th/5th/6th	SUNSET TUNNEL Montgomery/ 12th/5th/6th	SUNSET TUNNEL Montgomery/ 12th/4th/5th	MULTNOMAH Columbia/ 12th/4th/5th	MULTNOMAH Columbia/ 12th/5th/6th
18	Structure, Northwest corner S.W. Fifth Avenue and Stark Street.		X	X	X	X	X	X	X	X
19	Henry Building, Southwest corner S.W. Fourth Ave. and Oak Street.		X	X				X	X	
20	Railroad Exchange Building (Builder's Exchange Building, Huber's Restaurant), 320 S.W. Stark St.	X	X	X				X	X	
21	Old First National Bank, 409 S.W. Fifth Avenue.	X	X	X	X	X	X	X	X	X
22	Equitable Building, 421 S.W. Sixth Avenue.	X			X	X	X			X
23	Wilcox Building, 506 S.W. Sixth Avenue.				X	X	X			X
24	Exchange Building, 514 S.W. Sixth Avenue.				X	X	X			X
25	Lipman-Wolfe and Company, 521 S.W. Fifth Avenue		X	X	X	X	X	X	X	X
26	Swetland Building, Southeast corner of S.W. Fifth Avenue and Washington Street.		X	X	X	X	X	X	X	X
27	Yeon Building, 522 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
28	Failing Building (Gevurtz Building), 620 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
29	Kress Building (J.C. Penney Building), 638 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
30	Meier and Frank Building, 621 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X

TABLE 4.2-1. HISTORIC RESOURCES ADJACENT TO EACH OF THE WESTSIDE CORRIDOR DOWNTOWN PORTLAND ALIGNMENT OPTIONS (Cont'd)

Figure Reference 4.2-1	Figure Reference	SITE	On National Register	Westside Corridor Downtown Alignment Option: SUNSET Columbia/ 12th/4th/5th	SUNSET Columbia/ 18th/4th/5th	SUNSET Columbia/ 18th/5th/6th	SUNSET Columbia/ 12th/5th/6th	SUNSET TUNNEL Montgomery/ 12th/5th/6th	SUNSET TUNNEL Montgomery/ 12th/4th/5th	MULTNOMAH Columbia/ 12th/4th/5th	MULTNOMAH Columbia/ 12th/5th/6th
31		Northwestern Bank Building, 621 S.W. Morrison Street.				X	X	X			X
32		Selling Building, 610 S.W. Alder Street.				X	X	X			X
33		Pioneer Courthouse (Pioneer Post Office), 520 S.W. Morrison Street.	X	X	X	X	X	X	X	X	X
34		Corbett Building, 430 S.W. Morrison Street.		X	X	X	X	X	X	X	X
35		Goodenough Building, 730 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
36		Fred Meyer Building (Portland YMCA) 411-415 S.W. Yamhill Street and 721-735 S.W. Fourth Avenue.		X	X				X	X	
37		Georgia Pacific Building, 900 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
38		Public Service Building, 920 S.W. Sixth Avenue.				X	X	X			X
39		Hilton Hotel, 921 S.W. Sixth Avenue.				X	X	X			X
40		Multnomah County Courthouse, 1021 S.W. Fourth Ave.	X	X	X	X	X	X	X	X	X
41		Chapman Lowndale Squares, between S.W. Salmon and Madison Streets and Third and Fourth Avenue.		X	X				X	X	
42		David P. Thompson Fountain (Elk Statue), Center of Main Street between Third and Fourth Avenues.		X	X				X	X	

TABLE 4.2-1. HISTORIC RESOURCES ADJACENT TO EACH OF THE WESTSIDE CORRIDOR DOWNTOWN PORTLAND ALIGNMENT OPTIONS (Cont'd)

Figure Reference 4.2-1	SITE	On National Register	Westside Corridor Downtown Alignment Option: SUNSET Columbia/12th/4th/5th	SUNSET Columbia/18th/4th/5th	SUNSET Columbia/18th/5th/6th	SUNSET Columbia/12th/5th/6th	SUNSET TUNNEL Montgomery/12th/5th/6th	SUNSET TUNNEL Montgomery/12th/4th/5th	MULTNOMAH Columbia/12th/4th/5th	MULTNOMAH Columbia/12th/5th/6th
43	Standard Insurance Company Plaza, 1100 S.W. Sixth Avenue.		X	X	X	X	X	X	X	X
44	Ambassador Apartments, 1209 S.W. Sixth Avenue.	X			X	X	X			X
45	University Club, 1225 S.W. Sixth Avenue.				X	X	X			X
46	Portland City Hall, 1220 S.W. Fifth Avenue.	X	X	X	X	X	X	X	X	X
47	First Interstate Bank (First National Bank), 1300 S.W. Fifth Avenue.		X	X	X	X	X	X	X	X
48	Equitable Building, 1300 S.W. Sixth Avenue.		X	X	X	X	X	X	X	X
49	Oregonian Building, 1320 S.W. Broadway Avenue.		X	X	X	X	X	X	X	X
50	Evans Products (Ben Franklin Plaza), 1 S.W. Columbia Street.								X	X
51	Ladd Carriage House, 715 S.W. Columbia Street.	X	X	X	X	X	X	X	X	X
52	First Christian Church - Disciples of Christ, 1314 S.W. Park Avenue.		X	X	X	X	X	X	X	X
53	South Park Blocks, Between S.W. Salmon and Market Streets on Park Avenue.		X	X	X	X	X	X	X	X
54	Christian Science Church, 935 S.W. Columbia Street.		X	X	X	X	X	X	X	X
55	Grace Bible Church, 1431 S.W. 12th Avenue.						X	X		

TABLE 4.2-1. HISTORIC RESOURCES ADJACENT TO EACH OF THE WESTSIDE CORRIDOR DOWNTOWN PORTLAND ALIGNMENT OPTIONS (Cont'd)

Figure Reference 4.2-1	SITE	On National Register	Westside Corridor Downtown Alignment Option: SUNSET Columbia/ 12th/4th/5th	SUNSET Columbia/ 18th/4th/5th	SUNSET Columbia/ 18th/5th/6th	SUNSET Columbia/ 12th/5th/6th	SUNSET TUNNEL Montgomery/ 12th/5th/6th	SUNSET TUNNEL Montgomery/ 12th/4th/5th	MULTNOMAH Columbia/ 12th/4th/5th	MULTNOMAH Columbia/ 12th/5th/6th
56	Fruit and Flower Nursery (Day Nursery), 1609 S.W. 12th Avenue.						X	X		
57	Robert Howard Residence, 1632 S.W. 12th Avenue.	X					X	X		
58	Fried Durkheimer Residence, 1134 S.W. 12th Avenue		X			X	X	X	X	X
59	First Church of the Nazarene, Northwest corner of S.W. Main Street and 12th Avenue.		X			X	X	X	X	X
60	First Unitarian Church, 1011 S.W. 12th Avenue.	X	X			X	X	X	X	X
61	First Baptist Church, 909 S.W. 11th Avenue.		X			X	X	X	X	X
62	Terminal Sales Building, 1220 S.W. Morrison Street		X	X	X	X	X	X	X	X
63	Central Library, 801 S.W. 10th	X	X	X	X	X	X	X	X	X
64	Tilbury-Rothman Building, 1123 S.W. Yamhill.			X	X	X	X	X	X	X
65	Mayer Building, 1122-1138 S.W. Morrison			X	X	X	X	X	X	X

Conservation District; potential districts include the Corbett and Multnomah Conservation Districts (in the vicinity of, but not within, the Multnomah LRT Alternative) and the Kings Hill Conservation District (in the area of the Sunset Busway and Sunset LRT alignment) (Ferriday, 1981).

DETERMINATIONS OF EFFECT

The Advisory Council on Historic Preservation (ACHP) has established criteria (36 CFR 800.3) to be used in determining whether an undertaking has an effect on those properties included, or eligible for inclusion, in the National Register of Historic Places. Impacts of the Westside Alternativies on historic and archaeological properties were assessed based on the definitions of effect and adverse effect outlined by the ACHP.

The preliminary discussion of impacts presented below is intended to aid in the decision making process of the alternatives analysis. Formal Determinations of Effect and Preliminary Case Reports will be prepared for affected sites as required under Section 106 following selection of the preferred alternative. A letter from the State Historic Preservation Office (Figure 4.2-12) indicates that they approve of the methodology used in the 106 evaluation and generally endorse the analysis of impacts and mitigation measures used.

NUMBER ON FIGURE	HISTORIC SITE	National Register	Portland Landmark	Statewide Inventory	Local Significance	Potential National Register	National Register Potential Uncertain
	Sunset Alignment, Portland to Beaverton (Figure 4.2-2 and 4.2-3						
1.	Zion Lutheran Church, 1015 S.W. 18th Avenue.		X		X		
2.	William R. MacKensie House, 1131 S.W. King Avenue.	X	X				
3.	Wallace McCamant House, 1040 S.W. King Avenue.		X				
4.	Town Club, 2115 S.W. Salmon Street.		X				
5.	L. Allen Lewis House, 2164 S.W. Park Place.		X				
6.	Levi Hexter House, 2326 S.W. Park Place.	X	X				
7.	J.N. Barde House, 2400 S.W. Park Place		X				
8.	Haseltine Row Houses, 1914, 1916, 1924 and 1926 S.W. Madison Street.				X		
43.	Goose Hollow Inn, northwest corner of S.W. 19th Avenue and Jefferson Street.				X		
9.	Vista Avenue Viaduct, spans Jefferson Street on Vista Avenue.				X		
10.	Jacob Kamm House, 1425 S.W. 20th Avenue.	X	X				
11.	Lincoln House, S.W. 20th Avenue.		X				
11.	Cast Iron Columns, S.W. 20th Avenue and Jefferson Street.				X		
12.	Druhot-McDougall House, 1903 S.W. Cable Street		X				X
13.	Cable Street Houses, S.W. Cable Drive south of Sunset Highway				X		
14.	Market Street Houses, S.W. Market Street between 15th and Vista Avenues				X		
15.	Prospect Drive Houses, S.W. Prospect Drive between Montgomery and Market Drives.				X		
16.	Nathan Jones Cemetery S.W. Grant Street and Hewelt Boulevard, Sylvan				X		

(CONTINUED)

NUMBER ON FIGURE	HISTORIC SITE	National Register	Portland Landmark	Statewide Inventory	Local Significance	Potential National Register	National Register Potential Uncertain
	Multnomah Alignment, Portland to Beaverton (Figure 4.2-4 through 4.2-14 and 4.2-10).						
17.	Jefferson Street Substation, 37 S.W. Jefferson Street.	X	X				
18.	Visitors Information Center, 1020 S.W. Front Avenue.		X	X			
19.	Epsey Boarding House, 2601 S.W. Water Avenue.	X	X	X			
20.	Granary of the U.S. Brewing Co., S.W. Harbor Drive.					X	
21.	I.B.M. Building, 2000 S.W. First Avenue.				X		
21.	Boy Scout Building, 25 S.W. Front Street				X		
21.	Harrison Building, 1800 S.W. First Avenue				X		
22.	Johnson Cabin Marker, opposite 3420 S.W. Macadam Avenue, on medium between I5 and Macadam.				X		
23.	Holt-Saylor-Liberto House, 3625 S.W. Condor Avenue.	X	X				
24.	Milton W. Smith House, 0305 S.W. Curry Street.		X				X
25.	Stowell Block; Corbett and Kelly Avenues and Whitaker and Curry Streets			X			X
26.	Allied Door Co., 4118 S.W. Macadam.				X		
27.	Rono Building, S.W. Kelly Avenue north of Seymore Street.				X		
28.	Johns Landing, 4800 S.W. Macadam Avenue.				X		
29.	The Landing, 5200 S.W. Macadam Avenue.				X		
30.	Art Factory 7035 S.W. Macadam Avenue.				X		
31.	Trinity Presbyterian Church, 6437 S.W. Virginia Street.				X		
32.	Joseph Webber House, 7415 S.W. Virginia Street.				X		
33.	Austin House 7543 S.W. Fulton Park Place.				X		
34.	Ferryman's Watch House, 7410 Macadam Avenue.				X		
35.	Thomas Building, 7912 S.W. Multnomah Boulevard					X	

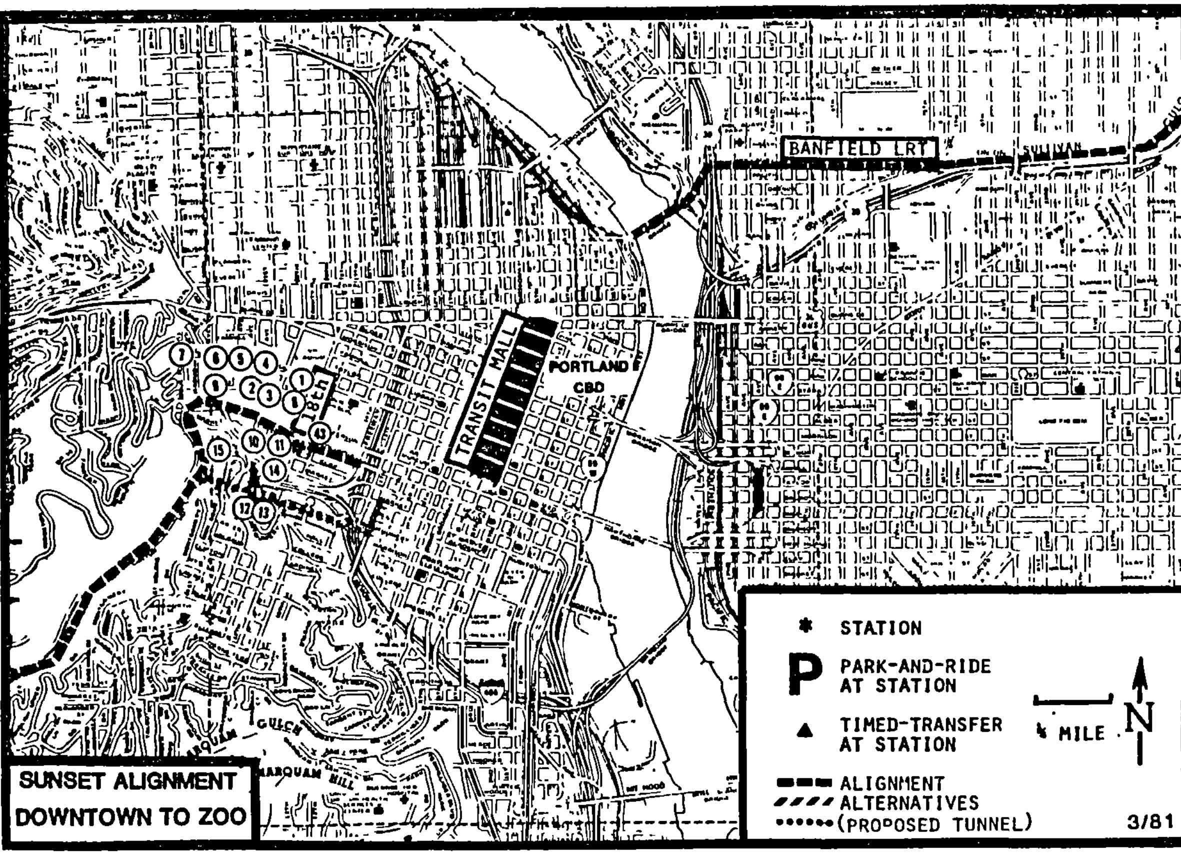
TABLE 4.2-2. SUMMARY OF SIGNIFICANCE OF HISTORIC RESOURCES ALONG ALIGNMENTS OUTSIDE THE PORTLAND CBD C

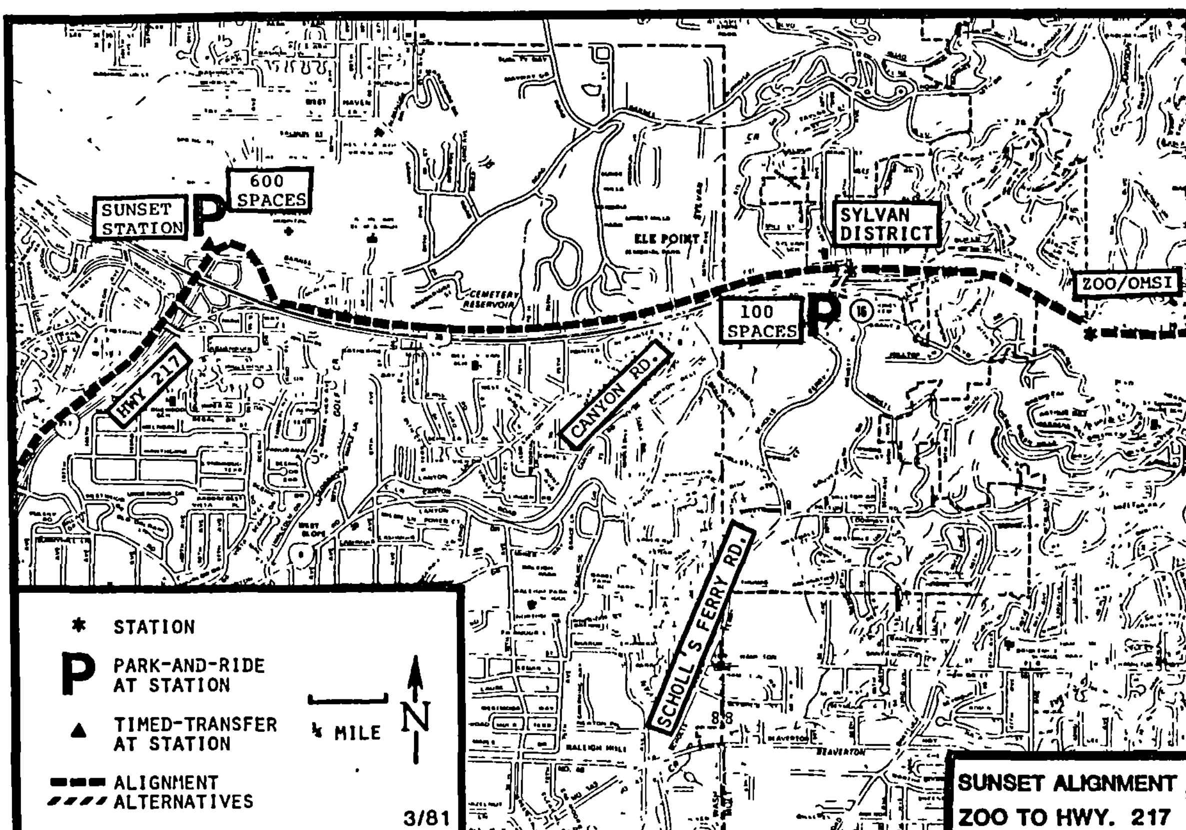
NUMBER ON FIGURE HISTORIC SITE.	National Register	Portland Landmark	Statewide Inventory	Local Significance	Potential National Register	National Register Potential Uncertain
37. Brick Commercial Structure, 7820-7822 S.W. Capitol Highway				X		
38. Aaron Frank Estate, 7514 S.W. Hunt Club Lane						X
50. Structure at 5500 S.W. Lombard Avenue, Beaverton				X		X
51. Structure at 5655 S.W. Lombard Avenue, Beaverton				X		X
53. Structure at 5320 S.W. Lombard Avenue, Beaverton				X		X
Sunset and Multnomah Alignments, Beaverton and West of Beaverton (Figures 4.2-7 through 4.2-11).						
44. Structure at 12375 S.W. Broadway Street, Beaverton.				X		X
45. Structure at 13150 S.W. Farmington Road, Beaverton.				X		X
46. Structure at 4500 S.W. Watson Avenue, Beaverton.				X		X
47. Structure at 4915 S.W. Lombard Avenue, Beaverton				X		X
48. Structure at 4875 S.W. Angel Avenue, Beaverton				X		X
49. Structure at 12750 S.W. Fourth Street, Beaverton				X		X
52. Structure at 5270 S.W. Lombard Avenue, Beaverton				X		X
54. Structure at 5125 S.W. Lombard Avenue, Beaverton				X		X
55. Structure at 4985 S.W. Lombard Avenue, Beaverton				X		X
56. Structure at 12050 S.W. Lombard Avenue, Beaverton				X		X
57. Structure at 5170 S.W. Angel Avenue, Beaverton				X		X
58. Structure at 12600 S.W. Farmington Road, Beaverton				X		X
39. Trachsel House (1), 17600 N.W. Walker Road, Beaverton				X		

(CONTINUED)

TABLE 4.2-2. SUMMARY OF SIGNIFICANCE OF HISTORIC RESOURCES ALONG ALIGNMENTS OUTSIDE THE PORTLAND CBD (CONTINUED)

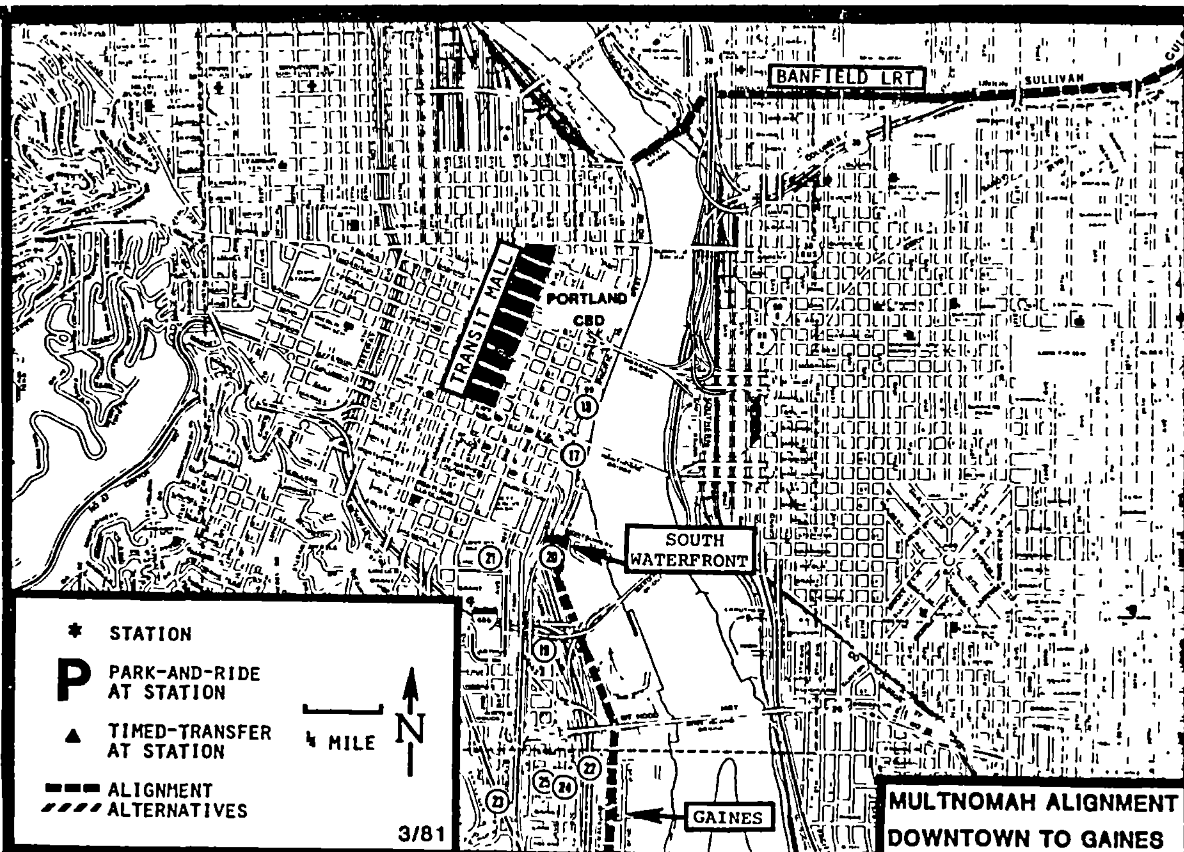
NUMBER ON FIGURE / HISTORIC SITE.	National Register	Portland Landmark	Statewide Inventory	Local Significance	Potential National Register	National Register Potential Uncertain
40. Trachsel House (2), 17330 N.W. Walker Road, Beaverton				X		
41. Strueger Barns, 540 N.W. 173rd Avenue, Beaverton				X		
42. Tuller-Keehn Farm, 17415 N.W. Walker Road, Beaverton					X	
TOTALS	6	15	3	42	3	19

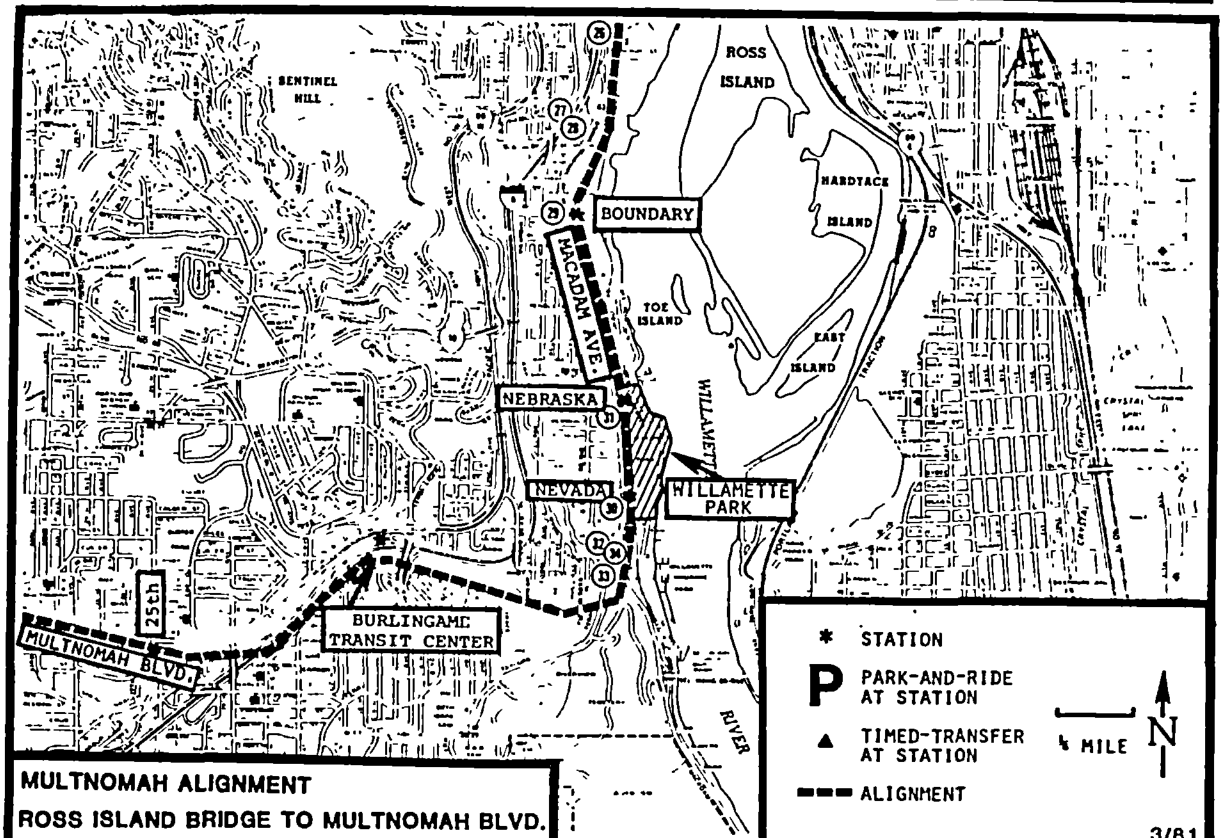




WESTSIDE CORRIDOR

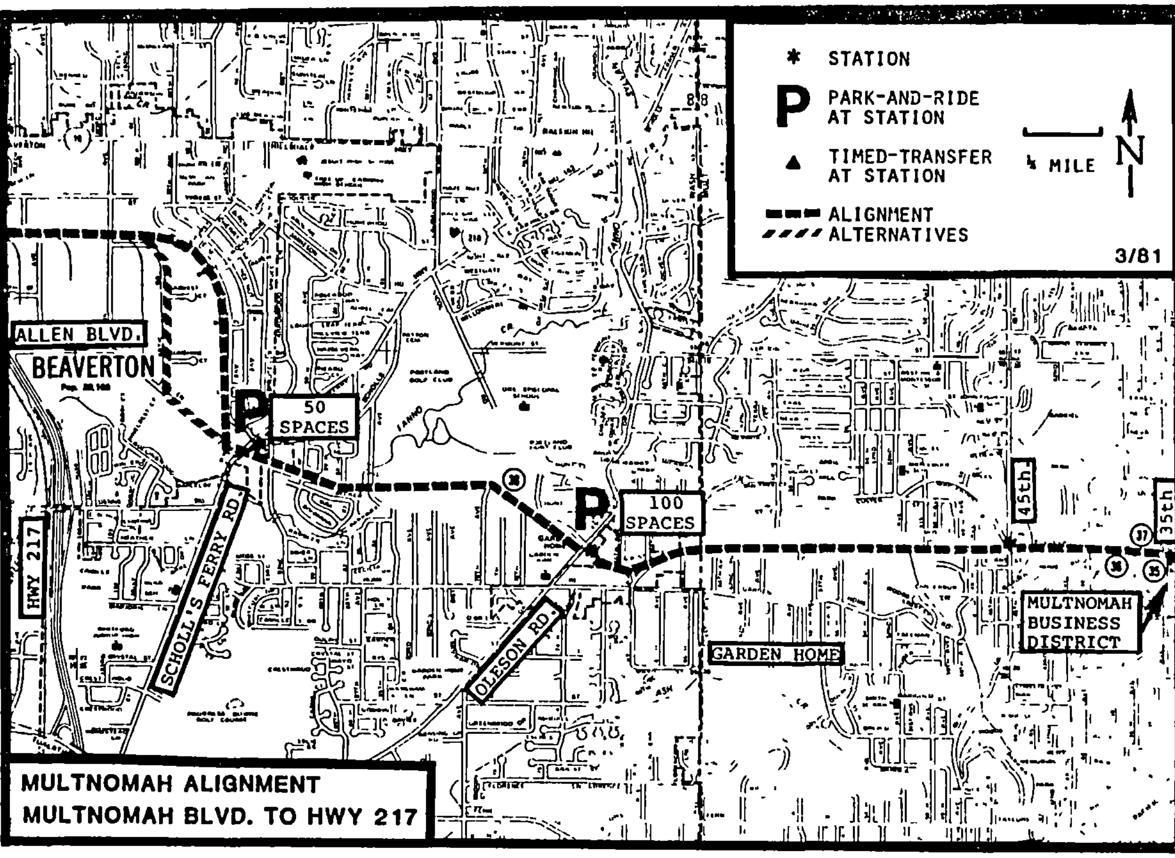
FIGURE 4.2-2 & 4.2-3: MAPS OF HISTORICAL RESOURCES (See TABLE 4.2-2 For Historical Status)

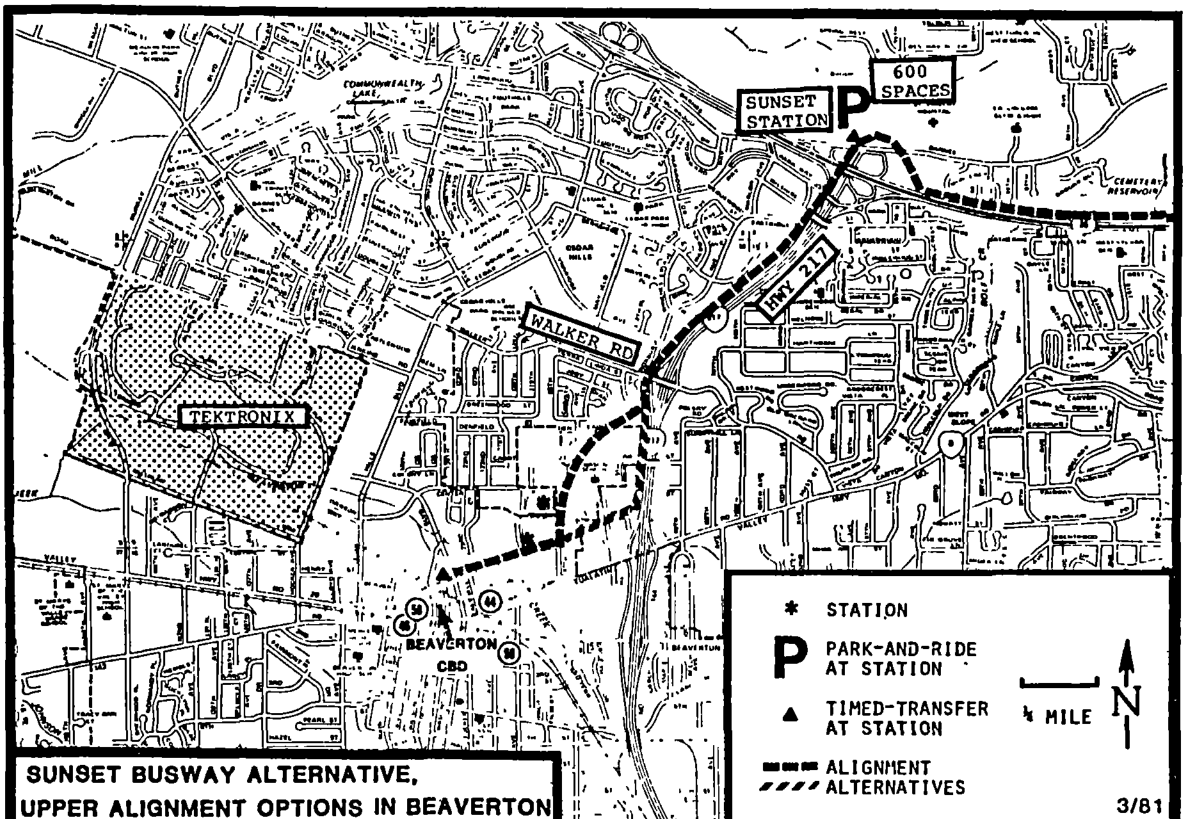




WESTSIDE
CORRIDOR

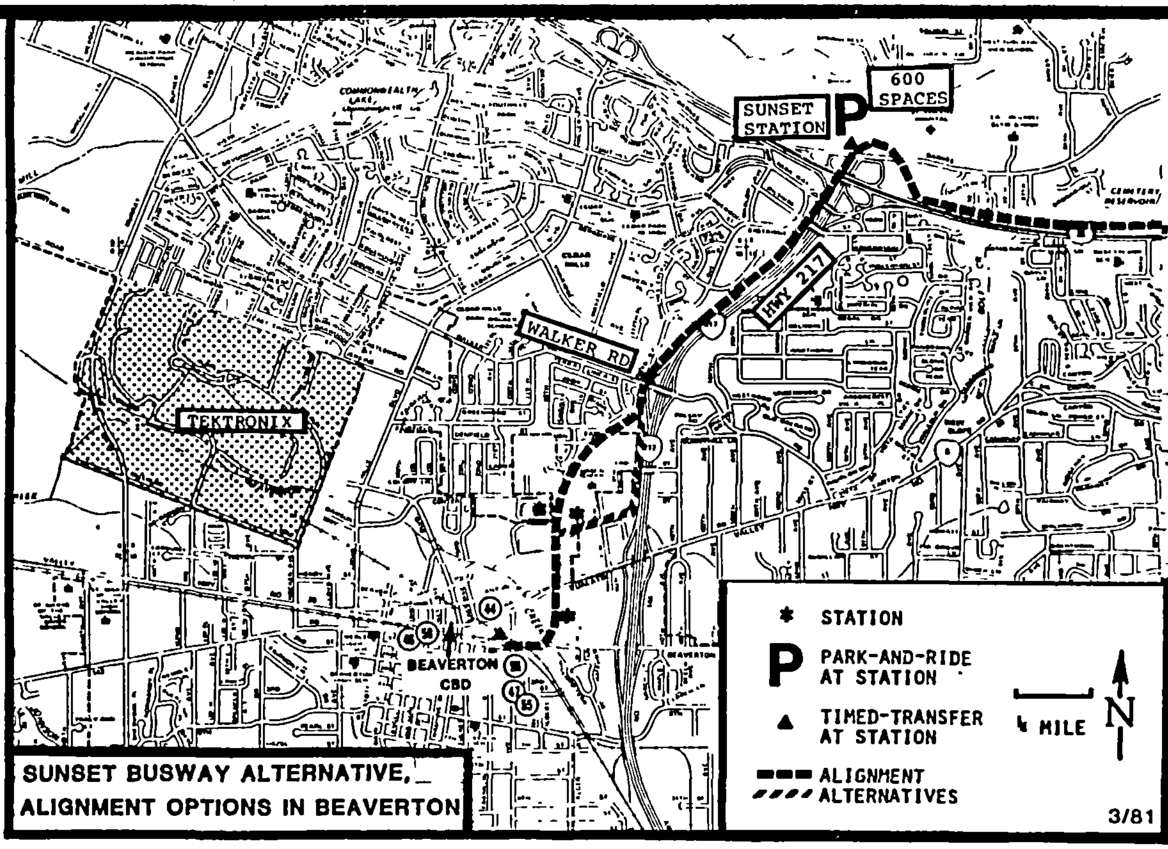
FIGURES 4.2-4 & 4.2-5:
MAPS OF HISTORICAL RESOURCES:
(See Table 4.2-2 For Historical Status)

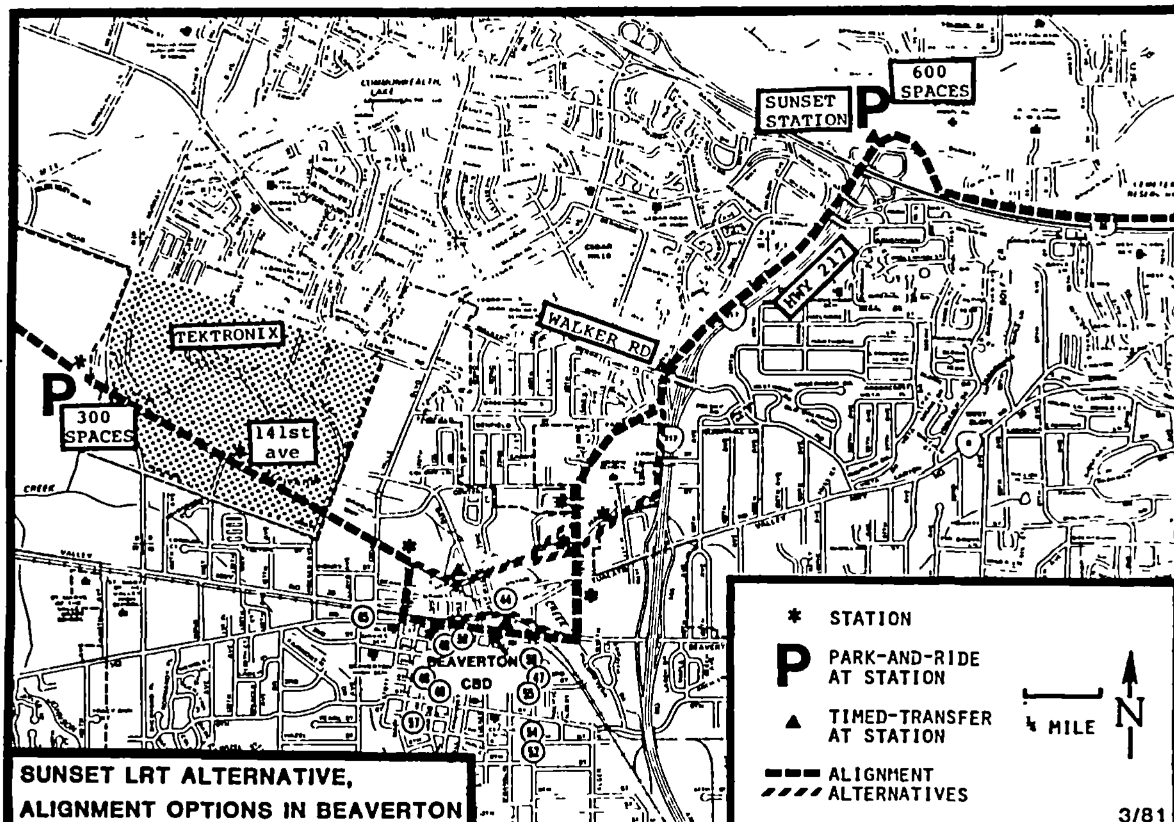




WESTSIDE CORRIDOR

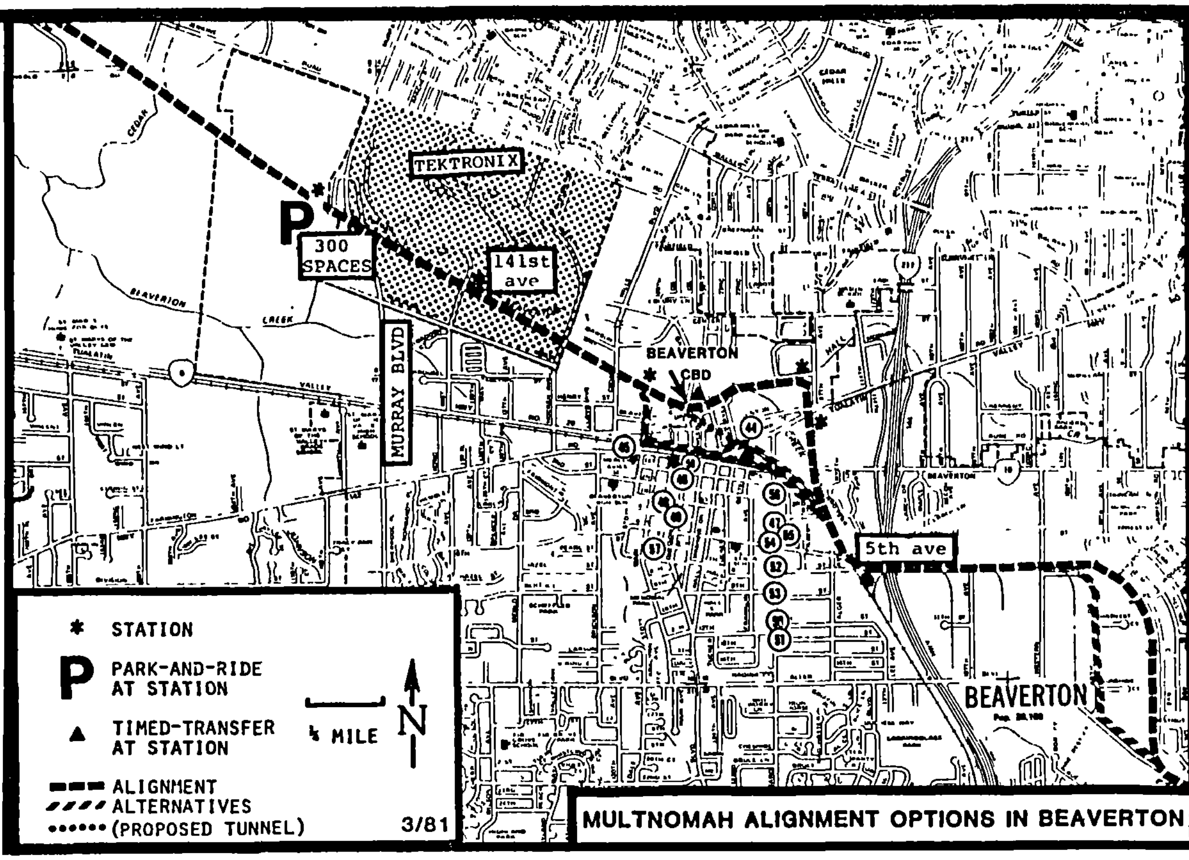
FIGURE 4.2-6 & 4.2-7
MAPS OF HISTORICAL RESOURCES
(See Table 4.2-2 For Historical Status)



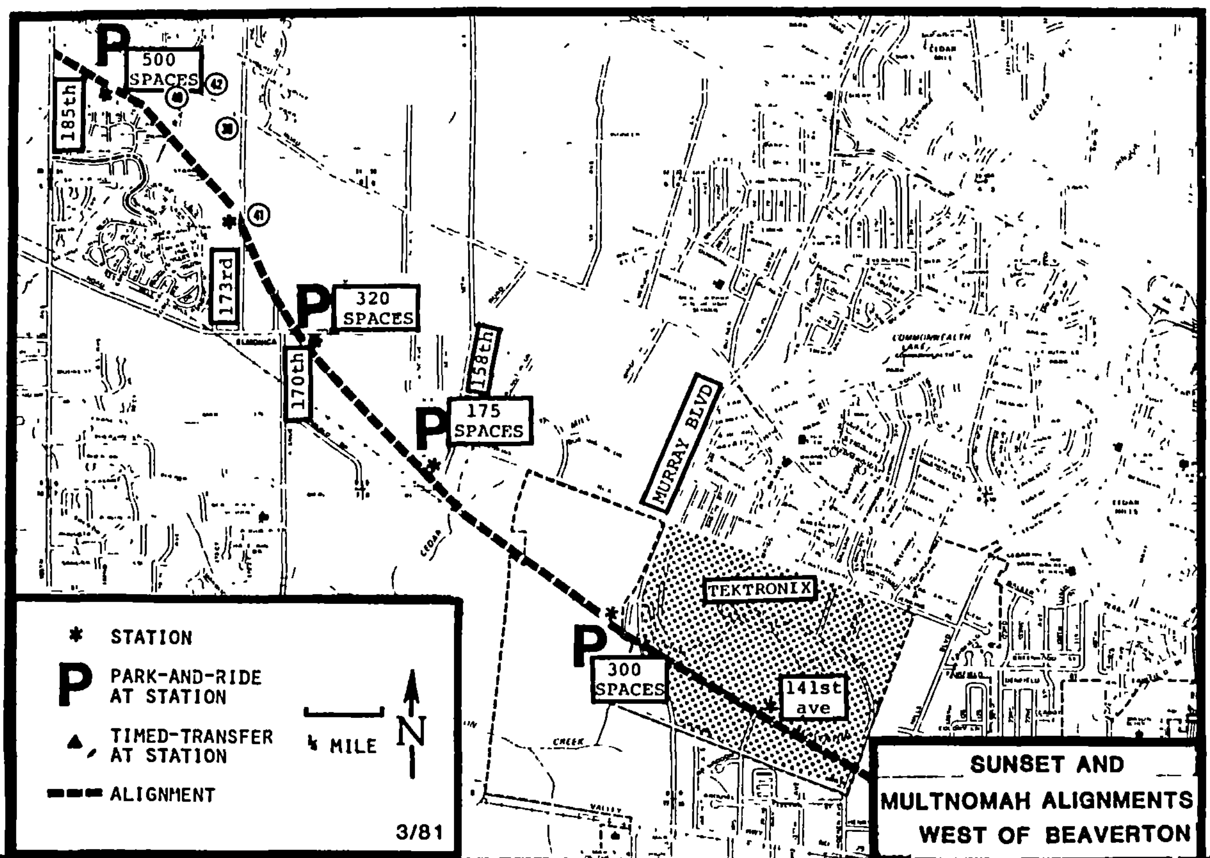


WESTSIDE CORRIDOR

FIGURE 4.2-8 & 4.2-9:
MAPS OF HISTORICAL RESOURCES
(See Table 4.2-2 For Historical Status)



MULTNOMAH ALIGNMENT OPTIONS IN BEAVERTON



SUNSET AND MULTNOMAH ALIGNMENTS WEST OF BEAVERTON

WESTSIDE CORRIDOR

FIGURES 4.2-10 & 4.2-11:
MAPS OF HISTORICAL RESOURCES
(See Table 4.2-2 For Historical Status)

FIGURE 4.2-12. LETTER FROM STATE HISTORIC PRESERVATION OFFICE

VICTOR ATIYEH
GOVERNOR

Department of Transportation

STATE HISTORIC PRESERVATION OFFICE

Parks and Recreation Division

525 TRADE STREET S.E., SALEM, OREGON 97310

August 24, 1981

In Reply Refer to
File No

MR STEVE SIEGEL
METROPOLITAN SERVICE DISTRICT
527 SW HALL ST
PORTLAND OR 97201

Dear Mr. Siegel:

This will confirm that the State Historic Preservation Office has had an oppo rtunity to review Chapter 4 of the EIS Section 106 determinations which is part of the Preliminary Draft EIS on the Westside Corridor Transportation Alternatives between Portland and Beaverton in Multnomah and Washington Counties, respectively.

After reviewing the list of sites and buildings identified to date, we affirm our prior approval of the methodology used in identifying potentially significant archeological and historical properties in the project area.

After reviewing the potential effects both direct and indirect, of each of the project alternatives upon projects listed or eligible for inclusion in the National Register of Historic Places, we believe that the analysis of impacts and mitigation of impact options are on the right track.

When the preferred project alternative has been selected, and when detailed information concerning the sites and buildings of potential significance to be affected are available, we shall, upon request, provide specific comments concerning elgibility and effect pursuant to the regulations governing protection of historic and cultural properties (36 CFR Part 800) authorized by Section 106 of the National Historic Preservation Act of 1966 (P.L. 89-655) 16 U.S.C. 470-470M.

We appreciate the opportunity to offer these preliminary comments, and we hope they will be helpful.

Sincerely,

D. W. Powers III, Deputy
State Historic Preservation Officer

DWP:EWP:kc

cc: Kay A. Ransom
Julia Follansbee

Form 734 3122

ARCHAEOLOGICAL RESOURCES

In general, adverse impacts to archaeological resources are caused by modification of surface or subsurface soils. The procedures used to interpret an archaeological site depend largely upon the integrity of the site. Thus, facilities requiring substantial grading have a greater potential for creating adverse effects than those that require less grading. Indirect impacts to archaeological sites can result from induced growth and accompanying ground disturbance near transit facilities.

HISTORIC RESOURCES

For the purposes of this Draft EIS, direct impacts to historical resources include demolition, removal to a new site and physical alteration. Indirect impacts are those relating to air quality, noise and vibration, changes in access, visual intrusion and induced development. Table 4.2-3 summarizes the potential direct and indirect impacts on historical sites by alternative. Only those indirect effects that may represent alterations of the existing environment are listed.

Potential direct impacts to historic resources are limited to five sites under the Multnomah LRT Alternative and one site under the Sunset LRT Alternative. None of the other alternatives will directly affect any historic sites.

The assessment of noise and air quality impacts to historic resources were based on the analyses contained in Sections 3.8 and 3.9, respectively, of this Draft EIS. No significant air quality impacts are expected at any of the historical sites. Significant air quality effects were defined as increases resulting in new violations of the federal standard for eight hour CO levels.

Additional noise intrusion may result from increased bus traffic on existing roadways and on the proposed busway (under the Sunset Busway Alternative). Light rail vehicles may also contribute but added noise will be minor. None of the historic sites will experience operational noise levels above the FWHA standard for sensitive receptors (67 dBA on the Leq scale) under any of the alternatives.

Access to historic sites near proposed stations and bus routes will generally be increased under any of the build alternatives. None of the inventories indicate any significant decreases in access to historical sites.

Specific visual effects on historical resources depend to a large extent on final design characteristics of the transitway facilities, which are not available at this stage of the analysis. Generally, facilities expected to create visual changes are new roadway segments under the Sunset Busway Alternative, the Multnomah LRT structure south of Nevada Street and transit centers and park and ride stations under each of the build alternatives. Overhead electrical lines for light rail vehicles, station areas without large parking lots, LRT traffic, and increased bus traffic on existing roadways are expected to have only minor visual impact.

Predicted impacts resulting from transitway induced development are necessarily general. The effects of induced growth will be most noticeable near proposed transit centers, station areas and along portions of the fixed guideways that pass through presently undeveloped areas.

TABLE 4.2-3. NUMBER OF HISTORIC SITES SIGNIFICANTLY AFFECTED BY THE TRANSPORTATION ALTERNATIVES

TYPE OF EFFECT / ALTERNATIVE	NUMBER OF LISTED OR ELIGIBLE NATIONAL REGISTER PROPERTIES AFFECTED[a] DIRECT/INDIRECT	NUMBER OF PORTLAND LANDMARKS AFFECTED DIRECT/INDIRECT	NUMBER OF LOCAL HISTORIC RESOURCES AFFECTED DIRECT/INDIRECT
1. No Action	0/0	0/0	0/0
2. Bus Service Expansion	0/0	0/0	0/0
3. Sunset Busway	0/0	0/1	0/4
4. Sunset LRT	0/1	0/1	1/6
5. Multnomah LRT	0/3	0/0	5/5

[a] Includes potentially eligible properties under research.

ALTERNATIVE 1: NO BUILD

The No Build Alternative would not significantly affect historical resources beyond a general decrease in accessibility.

ALTERNATIVE 2: BUS SERVICE EXPANSION

No direct impacts to historic sites will result from the limited facilities construction proposed under the BSE Alternative. Indirect effects relating to the operation of increased bus service in the Westside Corridor will be insignificant.

ALTERNATIVE 3: SUNSET BUSWAY

Construction of the Sunset Busway and associated facilities will not directly impact historical resources. Within the Portland CBD, effects will be the same as those under the BSE Alternative.

Between Downtown Portland and Beaverton, six sites may be subjected to increases in noise levels resulting from increased bus traffic on S.W. Jefferson and Columbia Streets. These are: The Haseltine Row Houses, Goose Hollow Inn, the Vista Avenue Viaduct, the Jacob Kamm House, the Lincoln House and the adjacent east iron columns. These properties, with the exception of the Jacob Kamm House, would also be exposed to views of the busway. Future development encouraged by construction of the busway may eventually lead to demolition or alteration of nearby historic sites or changes in their neighborhood setting, for example increased building densities or a shift from residential to commercial land uses.

Impacts to specific sites in downtown Beaverton depend greatly on the final choice of alignment options and suboptions. Generally adverse effects will be limited to minor additional noise and visual impacts under the Sunset Busway Alternative. These impacts will not represent a significant alteration of the present urban setting for Beaverton sites. The structure at 12375 S.W. Broadway is near the existing Beaverton Transit Center, but examination of available engineering information indicates that this site will not be altered or taken (Lackey, 1981).

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

No direct taking or structural alteration of Portland CBD historic properties is expected to result from the improvements proposed under the Sunset light rail transit alternative. Historic sites which may be subjected to indirect effects of the downtown alignment options are listed by options in Table 4.2-1. Adverse indirect effects will be associated with slight increased noise levels and visual effects by light rail transit facilities and vehicle traffic. Downtown noise levels will be slightly decreased from those of the BSE or Sunset busway alternatives to the extent that buses are replaced by quieter light rail vehicles. Because of the urban setting of downtown properties and because light rail transit vehicles are not out of character with Portland's historic setting (ODOT, 1978), noise and visual impacts are not expected to be significant.

In Downtown Portland, the new trackage associated with the Sunset LRT will not travel through established historic districts. However, the Sunset LRT will use portions of the trackage constructed as part of the Banfield LRT which does pass through the historic district. The addition of the Sunset LRT will not add more light rail vehicles through the historic district (operational parameters are outlined in the Banfield LRT agreement relating to historic districts). The Sunset LRT and Multnomah LRT will provide through routing capabilities (to the eastside via the Banfield LRT), not solely return routing in the downtown area. The operational parameters established for the Banfield LRT will continue to apply to trackage in the downtown historic districts after construction of the Westside LRT options. A second set of tracks will be constructed in downtown as part of both LRT Alternatives which will permit operation of half the amount of trains on any one set of tracks. This routing capability will allow the selected Westside Corridor Alternative to meet the objectives of the Banfield LRT Historic District agreement.

Between Downtown Portland and Beaverton, the effects of the Sunset LRT Alternative would be similar to those of the Sunset Busway Alternative with the following differences. The light rail transitway and the 18th Street station would be visible from historic sites in the vicinity. Noise levels along Columbia and Jefferson Streets would be slightly lower than the predicted levels under the No Build Alternative, thus eliminating adverse noise impacts in this area.

In Beaverton, impacts of the Sunset LRT Alternative on historic resources are the same as those described for the Sunset Busway Alternative.

Of the four sites located along the Sunset Alignment west of Beaverton, one, the Strueger Barns, is located close to the alignment. The site is not eligible for the National Register. Disposition of the Barns will depend on final transitway design characteristics of the Sunset LRT Alternative. Remaining sites would experience some noise intrusion but will not exceed standards. The Trachsel House at 17600 N.W. Walker Road would also be exposed to visual effects from the proposed 185th Avenue park and ride station. Induced urbanization along the alignment may compromise the historical integrity of all remaining sites and may eventually result in their destruction. Development may be detrimental to the Tuller-Keehn farm because the farm's historical significance is derived from the fact that it has survived relatively intact in its original location near two contemporary farmhouses.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

Within the Portland CBD, the effects of the Multnomah LRT Alternative on historic resources will be the same as those described for the Sunset LRT Alternative.

Between Downtown Portland and Beaverton, construction of the Multnomah LRT would potentially directly impact (removal or demolition) three historic sites; the Johnson Cabin marker, the Allied Door Company Warehouse and the Ferryman's Watch House. These sites are not on or eligible for the National Register. The Capitol Highway overpass at Multnomah Boulevard will be partially reconstructed to accommodate the light rail transitway in addition to the existing paved lanes.

Some increases in noise levels will occur at the Art Factory, Trinity Presbyterian Church and the Aaron Frank Estate. Increases will not exceed standards. The Art Factory, along with four other historic sites, may also be subjected to visual intrusion by various facilities. These include: the Granary of the U.S. Brewing Company which will be near the South Waterfront Station, Johns Landing near the proposed transitway on S.W. Macadam Avenue, the Landing Condominiums near the proposed Boundary Street Station, the Art Factory near the Nevada Street station, and the Thomas building near the 35th Avenue station on Multnomah Boulevard. In general, the historic character of the properties along Multnomah Boulevard will not be significantly altered.

Impacts to Beaverton historic sites will be the same under the Multnomah LRT Alternative as under the Sunset Busway Alternative.

West of Beaverton, effects will be identical to those of the Sunset LRT Alternative.

MITIGATION MEASURES

Properties listed on or eligible for the National Register are protected under Section 106 and measures to mitigate or avoid adverse effects must be developed in coordination with the ACHP. Mitigation measures for Portland Landmarks are subject to the approval of the Portland Historical Landmarks Commission.

Properties on the Statewide Inventory and neighborhood landmarks are not as well protected. Proposed mitigation of adverse effects for these properties will be reviewed by the State Historical Preservation Office and neighborhood organizations.

The mitigation measures presented below are preliminary. Following circulation of the Draft EIS, these measures will be revised to reflect the views of federal, state and local agencies having jurisdiction. Mitigation measures presented in the Final EIS will result from agreements reached with these agencies.

ALTERNATIVE 2: BUS SERVICE EXPANSION

No mitigation measures are necessary because no significant adverse impacts have been identified.

ALTERNATIVE 3: SUNSET BUSWAY

No mitigation measures to historic properties in Downtown Portland or Beaverton are required. To mitigate adverse visual impacts from historic sites along S.W. Jefferson and Columbia Streets, TRI-MET will plant visually attractive low maintenance landscaping along the busway in this area.

Mitigation of impacts to the Jacob Kamm House, the Lincoln House and the cast iron columns may not be necessary. The owner of these properties has sold the land but not the structures. The Kamm House will probably be moved and the Lincoln House might be razed; no information was available concerning the columns. Inquiries regarding plans for these structures can be addressed to the City of Portland Bureau of Planning.

ALTERNATIVE 4: SUNSET LIGHT RAIL TRANSIT

No mitigation of adverse impacts for Beaverton sites is required. The following measures will mitigate the impacts of the Sunset LRT Alternative on historic sites in other areas.

In Downtown Portland: As discussed in impacts, dual alignment proposed in downtown will mitigate impacts on the Historic District.

The following measures will mitigate direct and indirect impacts west of Beaverton to 185th Avenue.

- Avoid, if feasible, physical alteration or demolition of the Strueger Barns, or investigate the possibility of removal to a nearby site.

- Investigate the need for landscaped barrier along the portions of the alignment near the four locally identified historic sites in this area.

- If the four sites west of Beaverton are found eligible for the National Register, reevaluate impacts at time of final design.

ALTERNATIVE 5: MULTNOMAH LIGHT RAIL TRANSIT

Mitigation measures for Downtown Portland and the area west of Beaverton are the same as those listed for the Sunset LRT Alternative. No mitigation measures in Beaverton are required. The following measures will mitigate direct and indirect impacts between Downtown Portland and Beaverton.

- Move the Johnson Cabin marker to a new, more accessible location within the boundaries of the Johnson claim.

- Avoid demolition or physical alteration of the Allied Door Company Warehouse and the Ferryman's Watch House. If avoidance is impractical, investigate the feasibility of removal of these structures to nearby sites.

- Plan any alterations made to the Capitol Highway overpass to follow the design and curvature of the existing structure as closely as possible.

COORDINATION

The methodology used (Cultural Resources Management, Inc.) for the archaeological and historical surveys of the Westside Corridor study area was submitted to the State Historic Preservation Office (SHPO) for comment. SHPO has approved this methodology (Powers, 1980, see Figure 4.2-12).

Subsequent to the selection of the preferred alternative, the SHPO and the Portland Planning Bureau Special Projects Section will be contacted for information regarding properties potentially eligible for the National Register which may be affected by construction of the selected alternative. Based on the SHPO recommendations, Determinations of Eligibility will be requested from the Department of the Interior and Determinations of Effect and Preliminary Case Reports will be prepared as appropriate.

Section 106 requires that federal agencies afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on undertakings that affect properties listed, or eligible for inclusion, in the National Register. Also, the Portland Historical Landmarks Commission must be informed of impacts to designated Portland Landmarks, Historic Districts and Conservation Districts. Comments from the ACHP and the Landmarks Commission on the proposed action will be formally solicited subsequent to the selection of a preferred alternative. The ACHP will be informed of SHPO judgment concerning National Register eligibility and findings of adverse effect during the consultation process.

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Division of State Lands
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TRI-MET
METRO
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City of Beaverton
City of Hillsboro
Washington County

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Terwilliger Community League
SW Neighborhood Information, Inc.
South Burlingame Neighborhood Association
Sylvan Neighborhood Association
Upper Highlands Neighborhood Association
SW Hills Residential League
Goose Hollow Foothills League
Vista Brook Preservation League
Royal Woodlands Neighborhood Association
Community Planning Organization #1
Community Planning Organization #3
Community Planning Organization #6
Community Planning Organization #7
NW District Association
NW Industrial Neighborhood Association
Westside Corridor Steering Group
Beaverton Transitway Advisory Committee
Westside Corridor Citizens Advisory Group

MISCELLANEOUS

Portland Chamber of Commerce
Beaverton Chamber of Commerce
Hillsboro Chamber of Commerce
Beaverton Downtown Merchants Association
Oregon Environmental Council

LIBRARIES

Multnomah County Library
Beaverton Library
Washington County Cooperative Library Services

GLOSSARY

Air Pollutant (also, air contaminant): Smoke, dust, fumes, or odors in the ambient air that have potential for harmful effects.

Alluvium: An unconsolidated, terrestrial sediment composed of sorted or unsorted sand, gravel, and clay that have been deposited by water.

Ambient Air: Surrounding air which exists and is breathed.

Annualized Energy: Total energy consumed annually for operation and construction of an energy system, expressed in barrels of oil equivalent (BOE) or British Thermal Unit (BTU) per day. One time energy consumption, including that for project construction and vehicle manufacture at the time of replacement, is annualized by dividing it by the project's useful lifetime or 40 years, whichever is lower.

AQMA: Air Quality Maintenance Area. An area having the potential to violate a national or state ambient air quality standard, based upon expected growth and development in that area.

Archival Air Quality Data: Results of past monitoring of the air pollution and meteorology in an area, typically used in comparisons with ambient air quality standards.

Area Source: A general classification of the origin of an air pollutant, (e.g., park and ride lots are area sources of CO emission).

Artifacts: Any portable object used and/or modified by man (particularly during prehistoric times).

At Grade Crossing: Any intersection of two or more flows of traffic at the same elevation (possibly involving more than one mode of transportation).

Atmospheric Stability: A measure of the capacity of the ambient air to disperse air pollutants, unstable air dispersing them more readily than stable air. (Pasquill stability designations A through F refer to increasingly stable air.)

Averaging Time (also, exposure time): The duration of exposure to a given concentration of an air contaminant, specified in ambient air quality standards, (e.g., the two national CO standards of 10 mg/m3 and 40 mg/m3 specify averaging times of eight hours and one hour).

Average Daily Traffic (ADT): The total volume of traffic during a given time period (in whole days greater than one and less than a year) divided by the number of days in that time period.

Background Concentration: The air pollutant level that would exist at a site in the absence of air pollution sources in the neighborhood of the site. (Different from Modeled Concentration.)

Bag Sampling: In this study, collecting ambient air in plastic bags for laboratory analysis of CO concentration. (Different from Continuous Monitoring.)

Baseline Energy Consumption: Energy consumption, usually for a no build alternative, that is used as a reference against which energy consumption for a build alternative is compared.

Bbl: Barrels of oil (one bbl equals 42 U.S. gallons).

BOE: Barrels of oil equivalent. A measurement applied to energy consumption other than oil to assist in comparisons.

Brushy Woodland Habitat: A habitat characterized by dense stands of deciduous trees and shrubs. Birds, small mammals, and reptiles are common. This habitat type is often found in cleared areas that have not been maintained.

BTU: British Thermal Unit. An energy unit equal to the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit. One therm equals 100,000 BTU.

BTU per Passenger Mile: The energy content of fossil fuels or other fuels required to propel one passenger one mile. The reciprocal, passenger miles per BTU, is sometimes used as a measure of energy efficiency. Seat miles per BTU is a measure of potential efficiency resulting from maximum vehicle occupancy.

Busway: A roadway which is used exclusively for buses.

CBD (Portland Central Business District): An area of major retail, financial and service activities concentrated in the downtown section of Portland. This constitutes census tracts 51, 53, 54, 56, and 57. This is generally the area encompassed by the Interstate 5 and Interstate 405 freeway loop in the downtown area.

Clean Air Act: A federal law enacted to insure that the National Ambient Air Quality Standards are attained and maintained. The legislation was passed by Congress in 1963, last amended in 1977, and is pending reauthorization in 1982.

CO: Carbon monoxide. A colorless, odorless, tasteless gas and one of the criteria air pollutants released from automobile exhaust.

Concentration (also, level): A measure of the amount of an air pollutant in the ambient air, having the units of mass per volume.

Construction Energy: In transportation analysis, the energy used to build stations, terminals, roadbeds, trackbeds, vehicles, and other equipment and facilities. Construction energy includes the energy content of materials and the energy used to haul and place them.

Continuous Monitoring: Determining air pollutant concentrations at a field site without significant delay between the time of sampling and the time of recording results. (Different from Bag Sampling.)

CPO (Community Planning Organizations): Community Planning Organizations are geographically divided areas charged with the responsibility of developing community plans which are a part of the overall Washington County comprehensive planning process.

Criteria Air Pollutants: Those air pollutants which have been recognized by the EPA as potentially harmful and for which standards have been set to protect the public health and welfare. The criteria air pollutants are carbon monoxide, sulfur dioxide, particulate, nitrogen dioxide, ozone, hydrocarbons, and lead.

dBA: The sound level obtained through use of A-weighting characteristics specified by the American National Standards Institute (ANSI) Standard S1.4-1971. The unit of measure is the decibel (dB), commonly referred to as dBA when A-weighting is used.

Default Value: In this analysis, an energy factor or other numerical assumption that will be used in the absence of a more detailed or specific value.

Disturbed Habitat: A habitat in which naturally occurring ecological processes and species interactions have been significantly disrupted by the direct or indirect results of human presence and activity.

Ecologically Significant Area: An area valued locally for its rare or sensitive habitat existing in a relatively undisturbed, natural state and supporting indigenous species.

Efficiency: In energy systems, the quotient of energy outputs to energy inputs, being in the range from zero to one (e.g., the efficiency of U.S. electric power generation plants is approximately 0.3). In transportation systems, the degree of goal attainment measured relative to cost, indicative of the productivity of a given level of investment.

Elasticity: In economic analysis, the sensitivity of the demand or supply of a commodity to changes in another variable (e.g., the price elasticity of gasoline is the ratio of the percent change in consumption to percent change in price).

Emission: A release into the ambient air of air contaminants.

Emission Inventory: A listing by emission source of the amounts of air pollutants released into the atmosphere (generally, in tons or kilograms per day).

Emission Source: The origin of an air pollutant (e.g., automobiles and trucks are sources of carbon monoxide, hydrocarbons, and nitrogen oxides).

Emission Standard: A limitation on the release of an air contaminant into the ambient air (e.g., the federal government limits CO, HC, and NOx emission per mile of travel in new automobiles).

Endangered Species: According to the Federal Endangered Species Act of 1973, endangered species are any species in danger of extinction throughout all or a significant portion of its range, other than a species of Class Insecta determined by the Secretary of the Interior to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.

Energy: The capability of doing work. Forms of energy include kinetic, potential, thermal, electromagnetic, and nuclear. One form of energy may be converted to another (e.g., in hydroelectric plants, the conversion is from potential to kinetic to electromagnetic energy).

Energy Content of Materials: A total energy value equal to the sum of the latent energy of a material and the energy used in its manufacture.

Energy Factor: A number that when multiplied by the appropriate usage units (e.g., vehicle miles, tons, dollars) yields a measure of energy consumption (e.g., 0.050 gallons per vehicle mile x 10 miles = 0.5 gallons consumed for propulsion).

Energy System: The network of major and minor routes, vehicles, facilities, and other energy consuming entities that are considered in an energy analysis.

Equity: The incidence and fairness of the distribution of costs and impacts among population subgroups.

Facilities Energy (also, station energy): A portion of operational energy that includes the energy to operate parking lots, administration buildings, and other facilities. It does not include propulsion or maintenance energy.

Feeder Bus Station: A station that provides lateral transportation service that will be able to transfer to a transit mode.

Forest or Woodland Habitat: A habitat type generally dominated by Douglas fir, Western red cedar and Western hemlock frequently with a hardwood understory. The ground cover is generally lush. Birds and small mammals abound and larger mammals are common in large stands.

Gaussian Model: A type of air dispersal model that is used to predict air pollutant concentrations based upon knowledge of the emission source and of the meteorology in the area being studied.

HC: Hydrocarbons; specifically, non methane hydrocarbons that contribute to the formation of photochemical oxidants (commonly known as smog), primarily ozone.

High Volume Sampling (also, HIVOL sampling): Collecting particulates in the ambient air by drawing large volumes of air through porous filters.

Income Levels: As defined by METRO, household income is broken into the following categories (1977): low - $0 to 8,000; moderate - $8,001 to $20,000; upper - $20,001 and above.

Indirect Energy: A term used to denote all energy inputs for the constrution, operation, and maintenance of a system, exclusive of propulsion energy and parasitic loads within vehicles.
Indirect Source: An entity that does not directly emit pollutants but attracts emission sources such as automobiles and trucks. Shopping centers, stadiums, and highways are examples.

Induced Growth Energy: The energy used for travel, buildings, or other uses that develop after, and because of, the construction of a new transportation facility.

Induced Trips: Trips generated because of the construction of a new (transportation) facility. (Different from Shifted Trips.)

Joint Development: Opportunities for the development or redevelopment of adjacent parcels (in station areas) in a manner which would support both the transit investment and community objectives through the use of both public and private funds.

Kiss & Ride Station: A type of station that will provide temporary loading and unloading facilities for autos and/or buses. The station may be combined with feeder bus stations.

KW: Kilowatt, a unit of power.

KWH: Kilowatt hour, a unit of energy (usually electrical energy).

KWHE: A measure of electrical energy that accounts for the energy lost during generation and transmission.

L10: The sound level that is exceeded ten percent of the time (the 90th percentile) for the period under consideration. This value is an indicator of both the magnitude and frequency of occurrence of the loudest noise events.

L10(h): The hourly value of L10.

Land Development Pattern: The use, types and intensity of development. Land development patterns affect trip demand, average trip length, and, therefore, energy consumption.

Landscaped Habitat: A habitat in urban areas having limited native species. Vegetation generally consisted of mowed lawns and exotic trees and bushes.

Ldn: The day/night average noise level.

Leq: The equivalent steady-state sound level which in a stated period of time would contain the same acoustic energy as the time-varying sound level during the same period.

Leq(h): The hourly value of Leq.

Level of Service (LOS): A qualitative measure that represents the collective factors of travel under a particular volume condition. A measure of traffic congestion.

Light Rail Transit (LRT): A mode of mass transportation comprised of light rail vehicles which travel on steel tracks and are powered by electricity.
Line Haul Energy: Refers to propulsion energy consumed on major transportation routes (see Portal to Portal Energy).

Line Source: A general classification of the origin of an air pollutant, (e.g., highways and other roads are line sources of CO emission).

Load Factor: The average ratio of passengers to seats during some specified period of operation of a public transit route.

Maintenance Energy: A portion of operational energy that includes energy applied to repair and maintenance of vehicles, buildings, and other facilities in the energy system. It does not include propulsion or facilities energy.

Microgram Per Cubic Meter (abbreviated µg/m3 or mcg/m3): A unit of concentration equal to one thousandth of a gram per cubic meter.

Milligram Per Cubic Meter (abbreviated mg/m3): A unit of concentration equal to one millionth of a gram (or 1000 micrograms) per cubic meter.

Minority Groups: As defined by METRO, this includes Blacks, Hispanics and all other racial/ethnic groups other than Caucasian.

Modeled Concentration: An air pollutant level, excluding the background level, predicted by a model (see Background Concentration).

National Ambient Air Quality Standards (NAAQS): A federal limit on levels of atmosphere contamination necessary to protect the public from adverse effects on health (primary standards) and welfare (secondary standards).

National Historic Preservation Act of 1966: The act which established the National Register program and State Preservation programs, and set forth guidelines and regulations for grant programs and environmental review of projects involving federal funding.

National Register of Historic Places: The official list of the nation's cultural resources worthy of preservation.

Nonattainment Area: An area designated by the EPA as presently violating the National Ambient Air Quality Standards, based upon archival air quality data.

NOx: Oxides of nitrogen (nitrogen oxide and nitrogen dioxide). The pollutants released during high temperature combustion of fossil fuels (e.g., by diesel engines).

One Hundred Year Floodplain: An area of land susceptible to flooding during a storm occuring only once every 100 years.

Operational Energy: The energy used for vehicle propulsion, facilities, and maintenance for a specified period, usually one year.

Open Field Habitat: A habitat characterized by various species of perennial and annual grasses, forbs, small and large birds, small mammals and snakes.

This habitat is especially important in providing nesting sites and food for various song and predatory birds.
Ozone: A gas consisting of three oxygen atoms formed in reactions of non-methane hydrocarbons and nitrogen oxides in the presence of sunlight. One of the criteria air pollutants.

Park & Ride Station: Station that provides all day parking lot facilities for a varying number of cars. Park & Ride stations would be located near the fringe areas of the transit system where feeder bus service is sparse or nonexistent.

Particulates: See TSP, Total Suspended Particulates.

Passenger Mile: An amount of travel equivalent to one passenger traveling one mile.

Pasquill Stability Class: A category of atmospheric stability ranging from Class A (extremely unstable conditions) to Class F (moderately stable conditions).

Payback Period (also, breakeven period): The period found by dividing the construction energy consumption of a project by the forecast annual operational energy savings attributable to the project. Savings are measured against baseline energy consumption, and are the net of savings (losses) in propulsion, savings (losses) in maintenance, and savings (losses) in facilities.

Pb: Lead. A component of total suspended particulates released in the combustion of gasoline containing lead.

Peak Hour: The 60 minute period in a typical weekday which accommodates the largest number of automobile or transit patrons.

Photochemical Oxidants (Smog): Gaseous pollutants formed from reactions of HC and NOx in the presence of sunlight (e.g., ozone).

Point Sourcce: A general classification of the origin of an air pollutant, usually characterized as smokestacks.

Portal to Portal Energy: The propulsion energy consumed to gain access to major transportation routes or to transit (see Line Haul Energy).

Power: The time rate of energy use.

Propulsion Energy (also, direct energy): In transportation analysis, a portion of operational energy that includes fuels and electricity to propel vehicles and provide lighting, heating, and air conditioning within them.

Rare Species: A designation in the State of Oregon for species that are not presently threatened with extinction, but are limited to a restricted range or habitat or occur sparsely over a wider area. Listed species may be locally abundant but known at only a few sites or occur in small numbers scattered over a wide range.

Riparian Habitat: A habitat type associated with stream and lake margins and characterized by dense vegetation consisting primarily of willow, alder, and cottonwood species, supporting a wide variety of waterfowl, songbirds, amphibians and small mammals.

Runoff: The rain water which directly leaves an area in surface drainage, as opposed to the amount that seeps out as groundwater.

Seat Mile: An amount of potential travel equivalent to one seat traveling one mile.

Section 4(f) Land: Section 4(f) of the Department of Transportation Act applies to the following properties: any publically owned land from a public park, recreational area, or wildlife and waterfowl refuge or any land from an historic site used by the project.

Section 106: A portion of the National Historic Preservation Act of 1966 which establishes a review procedure of cultural resources which may be affected by projects receiving federal funds.

Sensitive Landscape Element: An individual object, landform, waterbody, structure, vegetation mass, or other visible form that is aesthetically important and is vulnerable (sensitive) to alteration of its character or views of it.

Sensitive Receptor: A local area or site which supports activities easily disrupted by audial or visual intrusions or distractions, such as a park, historic landmark, or residential neighborhood.

Shifted Trips: Trips that are redirected onto different routes compared to a base case, but that are not an addition to the number of base case trips (different from Induced Trips).

Signal Preemption: Traffic signal options which modify normal signal phasing for preferential treatment of transit vehicles.

SIP: State Implementation Plan. A plan required of each state by the Clean Air Act that describes how the state will attain and maintain the National Ambient Air Quality Standards.

Siting: Choosing a location for a bag sampling, continuous monitoring, HIVOL sampling, or other type of ammbient air measurement.

Smog: See Photochemical Oxidants.

Station Area: As defined by METRO, the area generally within a 1/4 mile radius of each designated station. Area size may vary from station to station depending upon natural or man made features or boundaries.

Threatened Species: According to the Federal Endangered Species Act of 1973, any species which is likely to become an endangered species within the foreseeable future, throughout all or a significant portion of its range.

Total Suspended Particulate (TSP): Air pollutants which consist of solid particles (dust, lead, salts, etc.) suspended in the atmosphere. A criteria air pollutant.

Transportation Accessibility: Both the ease of movement in a corridor and the proximity of regional residents to regional jobs.

Transportation Corridor (also corridor): The group of travel movements (or travel flows) between two or more locations. A corridor may have components, or sub corridors. A corridor includes all facilities, transit and highway, that may be used to accommodate the specified travel movement. In this analysis, the Westside Corridor is the transportation system under investigation. The corridor includes major routes (Route 26, Route 217, Tualatin Valley Highway, Multnomah Boulevard, Route 10, Interstate 5, Macadam Avenue), numerous minor routes, and the vehicles and facilities in the corridor.

Transportation Disadvantaged: Elderly (age 65 and older) and handicapped populations. For analysis of special transportation needs, those individuals exhibiting functional handicaps related to transportation (moderate and severe) and all able bodied elderly without drivers licenses are considered to be the target transportation disadvantaged population.

Transportation Mode: A form of transportation (e.g., automobile, bus, light rail transit, commuter rail, pedestrian, bicycle).

Trip Demand: The number and type (public or private origin and destination) of trips measured or calculated in a specified area having a given land development pattern. Trip demand also depends on prevailing economic, behavioral, and attitudinal conditions.

Trip Length: The number of miles per trip. This is usually an average number for a specified trip type, area, and analysis year.

Trunkline: A major bus route.

Ultimate Energy Source: The original energy form in the conversion chain from one form of energy to another (e.g., oil is an ultimate source of electricity).

Use of Section 4(f) Land: According to regulations of the U.S. Department of Transportation, use of Section 4(f) land is 1) acquisition of title or easement to land, or 2) in unusual circumstances, serious indirect impacts, such as a severe increase in noise, visual intrusion or access obstruction.

Vehicle Mile: An amount of travel equivalent to one vehicle traveling one mile.

Vehicle Occupancy: The number of persons per vehicle. Usually, an average number for a specified trip type, area, and analysis year.

View Opportunity Corridor: A visual corridor showing views of the surrounding landscape from the evaluated project or other significant viewpoints near the project.

Viewshed: An area from which a facility is generally visible from an array of points (individual viewpoints can be blocked by foreground obstructions, but still be within the general viewshed).

Visually Significant Areas: A local area that is found to be visually important to the community by virtue of its prominence, distinctive character, vulnerability to change, array of sensitive or high quality landscape elements (natural or built), or other appearance factors.

Walk-on Station: A station where the mode of arrival is by walking. This type of station will be targeted at high density residential and employment concentrations.

Wetland Habitat: A habitat in lowland areas covered with water for all or part of the year. It is generally dominated by various grasses and sedges and is especially important as waterfowl wintering or resting habitat. Freshwater wetland areas in Oregon are limited.

Wetlands: Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and similar areas.

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APPENDICES

APPENDIX A. LIST OF AGENCIES CONSULTED

The following agencies have been consulted during the course of the Westside Corridor Alternatives Analysis.

FEDERAL AGENCIES

Department of Housing and Urban Development
Department of the Interior
Environmental Protection Agency
Federal Highway Administration
Urban Mass Transportation Administration
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Geological Survey

OREGON STATE AGENCIES

Department of Environmental Quality
Department of Fish and Wildlife
Department of Transportation
Historic Preservation Office
Natural Heritage Program
Rare and Endangered Species Task Force

LOCAL AND REGIONAL AGENCIES

City of Beaverton Planning Office
City of Hillsboro Planning Department
City of Portland Neighborhood Planning Bureau
City of Portland Parks Bureau
City of Portland Planning Bureau
City of Portland Water Bureau
City of Portland Southwest Neighborhood Office
Corbett-Terwilliger Neighborhood Association
Goose Hollow Neighborhood Association
Metropolitan Service District
Multnomah County Department of Administrative Services
Multnomah Neighborhood Association
Multnomah County Planning and Environmental Services
Portland Historical Landmarks Commission
Tualatin Hills Park and Recreation District
Washington County

OTHER ORGANIZATIONS

Citizens Groups through the METRO Public Participation Program
The Nature Conservancy
Oregon Historical Society
Portland State University, Department of Anthropology
Washington County Historical Society

APPENDIX B. AVAILABILITY OF EIS TO THE PUBLIC

Copies of this document are available for public review at the following locations:

REGIONAL AGENCIES/GOVERNMENT

METRO - 527 S.W. Hall, Portland, OR 97201

TRI-MET - 4012 S.E. 17th Avenue, Portland, OR 97202

LIBRARIES

Multnomah County
801 S.W. 10th Avenue, Portland, OR 97205

Washington County Cooperative Library Services
P.O. Box 5129
Aloha, OR 97006

Beaverton
4550 S.W. Hall Boulevard
Beaverton, OR 97005

Hillsboro
775 S.E. 10th
Hillsboro, OR 97123

PLANNING DEPARTMENTS

Portland - 621 S.W. Alder, Portland, OR 97205

Beaverton - 4950 S.W. Hall, Beaverton, OR 97205

Multnomah County - 2115 S.E. Morrison, Portland, OR 97214

Hillsboro - 205 S.E. Second, Hillsboro, OR 97123

Washington County - 150 N. First, Hillsboro OR 97123

OTHER LOCATIONS

SW NEIGHBORHOOD OFFICE - 7780 S.W. Capitol Highway, Portland, OR 97219

NORTHWEST/WEST NEIGHBORHOOD OFFICE - 827 N.W. 23rd Ave., Portland, OR 97210

COMMUNITY PLANNING ORGANIZATIONS - Washington County, Extension Agent, Washington County Court House, Hillsboro, OR 97123

WASHINGTON COUNTY PUBLIC WORKS DEPT. - 150 N. First, Hillsboro, OR 97123

CONGRESSIONAL FIELD OFFICES - Congressman Les AuCoin, 1220 S.W. 3rd Portland, OR 97204; Senator Mark Hatfield, Pioneer Courthouse, Portland, OR 97205; Senator Bob Packwood, 1002 N.E. Holladay, Portland, OR 97232

PORTLAND COMMUNITY COLLEGE, Rock Creek Campus
17705 S.W. Springville Road
Beaverton, OR 97005

PORTLAND STATE UNIVERSITY
724 S.W. Harrison
Portland, OR 97201

APPENDIX C. SUMMARY OF AT-GRADE CROSSINGS AND ALIGNMENT INTERFERENCES AND MITIGATION MEASURES

LOCATION	POTENTIAL IMPACT	MITIGATION
SUNSET BUSWAY ALTERNATIVE		
Downtown Portland		
Old Jefferson Road underpass	Alignment conflict	Close
Portland to Beaverton		
Access to Canyon Court midway between Zoo and Sylvan interchange	Conflict with climbing lane	Close
S.W. Skyline Blvd: at North Sunset Highway. On/Off Ramps	At-Grade Crossing	Widen westbound off-ramp to Skyline Blvd.
S.W. 75th Avenue, south of Sunset	Conflict with freeway traffic	Close 75th south of Sunset Highway
S.W. 76th Avenue	At-Grade Crossing	Close 76th north of LRT Tracks
S.W. 79th Avenue	Conflict with freeway traffic	Extend Pointer Road between 75th and 79th on south side frontage road
S.W. 86th Avenue south side	Conflict with freeway traffic	Close 86th south of Sunset Highway
Wilshire Road	Alignment Conflict	Relocate southbound off-ramp
Beaverton		
Center Street	At-Grade Crossing	Gates
Canyon Road	At-Grade Crossing	Signal modification
Cabot Street overpass	Alignment conflict	Remove
S.W. 114th Avenue	At-Grade Crossing	Gates
S.W. 117th Avenue	At-Grade Crossing	Gates
S.W. Beaverdam Road/East Avenue	At-Grade Crossing right turn from Beaverdam to East Avenue	Close Beaverdam west of transitway alignment, cul-de-sac East Avenue south of transitway

(CONTINUED)

APPENDIX C. SUMMARY OF AT-GRADE CROSSINGS AND ALIGNMENT INTERFERENCES AND MITIGATION MEASURES (CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Beaverton (Continued)		
S.W. Hall Blvd.	At-grade crossing	Signal
Beaverton Hills Highway just north of Farmington	At-grade crossing	Protected grade crossing, signal
Lombard Avenue at Beaverton Hills Highway	Bus lane in Beaverton Hills Highway	Limited access, right turn only to Lombard northbound; Lombard southbound, local access only
Beaverton Hills Highway between Lombard and Broadway	Bus lane in roadway	Bus only
SUNSET LRT ALTERNATIVE		
In addition to the at-grade crossings and alignment interferences under the Sunset Busway Alternative:		
Downtown Portland		
Jefferson and Washington Park entrance Jefferson east of 18th	Alignment conflict tracks in Columbia	Signal Two way traffic on Jefferson and gates at 18th and Columbia
18th and Jefferson Circle	Tracks in Columbia	Signal modification at 18th and Jefferson
20th and Jefferson	Auto/LRT conflict	Gates
21st south of Jefferson	Auto/LRT conflict, tunnel option	Close
16th and Montgomery	Auto/LRT conflict	Signal
Portland to Beaverton		
Canyon Road: 70th Avenue to 700 ft. north of Sunset Highway	Tracks in roadway, intrusion on existing right-of-way	Relocate four lanes west of LRT
At Zoo/OMSI Station, south side Sunset on/off ramps	Track alignment, track in existing right-of-way	Relocate ramps
S.W. Canyon Court from Skyline to 1000 ft. east of Skyline	Track alignment (in roadway)	Relocate Canyon Court

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Portland to Beaverton, (Continued)		
S.W. Canyon Court: west of S.W. 61st Drive	Track in roadway	Relocate Canyon Court north of LRT
S.W. 78th Avenue	Tracks in roadway	Close 78th Avenue
S.W. 75th Avenue, north of Sunset Highway	Tracks in roadway	Close and provide access via private road or displace residences
At Walker Road, Highway 217 southbound off-ramp	Track alignment in existing roadway at-grade crossing of Walker Road	Relocate off-ramp
Beaverton		
Farmington Road at Beaverton Hills, Highway	At-grade crossing	Signal
Lombard Avenue/Beaverton Hills, Highway	Tracks in roadway LRT and auto conflict	Limited access, right turn only to Lombard northbound; Lombard southbound, local access only
Beaverton Hills, Highway between Farmington and Broadway	Tracks in roadway; space; LRT and auto conflict	Two way between Lombard and Farmington; bus only between Lombard and Broadway
Broadway/Beaverton Hills, Highway	At-grade crossing	Signal
East Avenue/Broadway	Tracks in roadway	Limited access, right turn only Broadway westbound to East Avenue northbound; left turn only East Avenue southbound to Broadway eastbound
Hall Blvd./Broadway	Tracks in roadway	Signal
West Avenue/Broadway	Tracks in roadway	Signal
Watson Avenue/Broadway	Tracks in roadway	Close Broadway from west of intersection to Mill
Broadway: Beaverton Hills, Highway to Watson	Tracks in roadway, space constraints	Modify circulation, one way eastbound east of Hall Blvd.; one way westbound west of Hall Blvd.

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Beaverton, (Continued)		
Broadway/Mill Street	Tracks in roadway	Close Mill between Canyon and Broadway
Canyon Blvd. at Mills	At-grade crossing	Signal
Beaverdam Road at Mill Street	At-grade crossing	Gates; relocate Mill east of LRT
Cedar Hills Blvd.	At-grade crossing	Signal
Karl Braun Drive (Hocken Avenue)	At-grade crossing	Gates
141st Avenue	At-grade crossing	Gates
117th Avenue	At-grade crossing	Gate
Beaverdam Road between Hall and Watson	Tracks in roadway (At-grade)	Cul-de-sac Beaverdam south of transitway
Watson	At-grade crossing	Signal
Western Washington County		
158th Street (Merlo Road)	At-grade crossing Possible sight distance problem	Gate
Baseline Road	At-grade Crossing	Gate
170th	At-grade crossing	Gate
173rd	At-grade crossing	Gate
MULTNOMAH LRT ALTERNATIVE		
In addition to at-grade crossings and alignment interferences under the Sunset LRT Alternative in Beaverton and Western Washington County:		
Portland to Beaverton		
Moody Avenue	At-grade crossing	Gates
Montgomery	At-grade crossing	Gates

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Portland to Beaverton, (Continued)		
Gibbs between Macadam and Moody	Tracks in roadway LRT/Auto conflict	Close Gibbs east of LRT alignment
Curry Street/Macadam	Tracks in roadway; retaining wall proposed	Close Curry at Macadam
Gaines/Macadam	At-grade crossing	Gates
Abernethy/Macadam	Tracks in roadway; retaining wall proposed	Close Abernethy at Macadam
Thomas/Macadam	Tracks in roadway; retaining wall proposed	Close Thomas at Macadam
Lowell/Macadam	Tracks in roadway; retaining wall proposed	Close Lowell at Macadam
Bancroft/Macadam	At-grade crossing of Bancroft	Signal on Macadam; Gates on Bancroft westbound
Macadam: Gibbs to Bancroft	Tracks in roadway (Macadam); retaining wall proposed along portions of segment	Reconstruct Macadam west of existing alignment
Boundary Street; south of Macadam	At-grade crossing	Gates
Hamilton Court/Macadam	At-grade crossing	Signal
Nebraska Avenue; south of Macadam	At-grade crossing; loss of access	Gates; new access way and parking lot
Private road associated with John's Landing Development	At-grade crossing	Gates
South access to Horatio's Restaurant	At-grade crossing	Gates
North access to Horatio's Restaurant	At-grade crossing	Close
Access to Rusty Pelican	At-grade crossing	Gates

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Portland to Beaverton, (Continued)		
Access off Macadam just south of Segment 3 north limit	At-grade crossing	Close
Pendleton Street	At-grade crossing	Signal at Macadam, gate
Multnomah Blvd. On/off ramps to I5	Tracks in Roadway Conflict LRT and auto	Close existing on ramp at Lind Avenue to auto traffic; modify existing off ramps
Terwilliger/I5 ramps	To northbound I5 from northbound I5 conflict LRT and auto	Relocate ramps
S.W. 22nd Avenue at Barbur	Tracks in median of Multnomah Blvd.; LRT/auto conflict	One way southbound, signal at Barbur
Driveway north side of Multnomah at 22nd Avenue	Auto/LRT conflict	Close driveway
S.W. 25th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Signal
S.W. 28th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only
S.W. 30th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only
S.W. 31st Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Signal
S.W. 34th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only
S.W. 35th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Signal
S.W. 36th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Portland to Beaverton, (Continued)		
S.W. 37th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only
Multnomah Blvd./Capitol Highway	Space constraints causing safety problems, space inadequate for two traffic lanes and LRT	Reconstruct Capitol Highway overpass to allow two auto lanes and two LRT tracks
Garden Home Road	At-grade access; LRT/auto conflict	Direct access to Multnomah Blvd., closed
S.W. 40th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only
S.W. 45th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Signal
S.W. 51st Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Limited access, right turns only
S.W. 56th Avenue	Tracks in median of Multnomah Blvd.; LRT/auto conflict	Signal
Near 57th; residential access from north side	LRT/auto conflict	Reconstruct one access
Multnomah Blvd.; 22nd Avenue to City of Portland Boundary	Inadequate space for two auto lanes and LRT	Widen Multnomah Blvd.
Near 59th; residential access from south side	LRT/auto conflict	Reconstruct access to 59th
S.W. 66th Avenue	Tracks in median of Multnomah Blvd. LRT/auto conflict	Limited access, right turns only
Multnomah Blvd. at S.W. 68th Avenue	At-grade crossing of Westbound lanes	Signal to control westbound traffic

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Portland to Beaverton, (Continued)		
Railroad Street: At S.W. 68th Avenue S.W. 69th Avenue	Tracks in Roadway	Close: 68th at Railroad Street 69th at Railroad Street 70th at Railroad Street Close: Railroad Street Reopen access from Oleson Road
S.W. 90th Avenue	At-grade crossing	Gate
S.W. 92nd Avenue/S.W. Allen Blvd.	At-grade crossing of S.W. 92nd to north side of Allen	Close S.W. 92nd north of LRT alignment
Allen Road: S.W. 92nd Avenue to Scholl's Ferry Road	Tracks occupy existing right-of-way	Relocate Allen Blvd.
Multnomah Blvd.: City of Portland Boundary to S.W. 68th	Inadequate space for two auto lanes and LRT	Widen Multnomah Blvd.
Oleson Road	Inadequate sight distance for at-grade crossing	Grade separate
S.W. Scholl's Ferry Road and Allen Blvd.	At-grade crossing of Scholl's Ferry Road	Signal
S.W. Allen Blvd.: From Scholl's Ferry Road west approximately 900 ft.	Tracks in roadway	Relocate Allen Blvd.
Residential access from north side of Allen	LRT/auto conflict	Close
Beaverton		
Artic Avenue Spurs (2)	At-grade crossings	Gates (2 sets)
Western Avenue	At-grade crossing	Signal
S.W. 5th Street (Beav.)	At-grade crossing	Gates
Beaverdam Road at East Avenue	At-grade crossing	Close Beaverdam Road west of transitway; cul-de-sac East Avenue south of transitway
Hall Blvd.	At-grade crossing	Signal
B-H Highway @ Lombard	Bus/auto conflict	Autos right turn only to Lombard northbound

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
SUNSET BUSWAY ALTERNATIVE		
Downtown Portland		
Old Jefferson Road underpass	Alignment conflict	Closed
Portland to Beaverton		
Access to Canyon Court midway between Zoo and Sylvan Interchange	Conflict with freeway traffic	Close
S.W. 75th Avenue, south of Sunset Highway	Conflict with climbing lane	Close
S.W. 76th Avenue	At-grade crossing	Close 76th north of LRT tracks
S.W. 86th Avenue south side	Conflict with freeway traffic	Close 86th south of Sunset Highway
Beaverton		
S.W. Beaverdam Road/East Avenue	At-Grade crossing right turn from Beaverdam to East Avenue	Close Beaverdam west of transitway alignment, cul-de-sac East Avenue south of transitway
SUNSET LRT ALTERNATIVE		
In addition to street closures under the Sunset Busway Alternative:		
Downtown Portland		
21st south of Jefferson	LRT/auto conflict	Closed
Portland to Beaverton		
S.W. 75th Avenue north of Sunset Highway	Tracks in roadway	Close and provide access via private road or displace residences
S.W. 78th Avenue	Tracks in roadway	Close 78th Avenue
Beaverton		
Watson Avenue/Broadway	Tracks in roadway	Close Broadway from west of intersection to Mill

(CONTINUED)

APPENDIX C. SUMMARY OF AT-GRADE CROSSINGS AND ALIGNMENT INTERFERENCES AND MITIGATION MEASURES

LOCATION	POTENTIAL IMPACT	MITIGATION
Beaverton, (Continued)		
Broadway/Mill St.	Tracks in roadway	Close Mill between Canyon and Broadway
MULTNOMAH LRT ALTERNATIVE		
In addition to the street closures under the Sunset LRT Alternative in Beaverton:		
Portland to Beaverton		
Gibbs between Macadam and Moody	Tracks in roadway; retaining wall proposed	Close Gibbs east of LRT Alignment
Curry Street/Macadam	Tracks in roadway; retaining wall proposed	Close Curry at Macadam
Abernethy/Macadam	Tracks in roadway; retaining wall proposed	Close Abernethy at Macadam
Thomas/Macadam	Tracks in roadway; retaining wall proposed	Close Thomas at Macadam
Lowell/Macadam	Tracks in roadway; retaining wall proposed	Close Lowell at Macadam
North access to Horatio's Restaurant	At-grade crossing	Closed
Access off Macadam just south of Segment 3 north limit	At-grade crossing	Close
Multnomah Blvd. on/off ramps to I5	Tracks in roadway conflict LRT and auto	Close existing on ramp at Lind Avenue to auto traffic; modify existing off ramps
Driveway north side of Multnomah at 22nd Avenue	LRT/auto conflict	Close driveway
Garden Home Road	At-grade access; LRT/auto conflict	Direct access to Multnomah Blvd., closed

(CONTINUED)

LOCATION	POTENTIAL IMPACT	MITIGATION
Portland to Beaverton, (Continued)		
Railroad Street: At S.W. 68th Avenue S.W. 69th Avenue S.W. 70th Avenue	Tracks in Roadway	Close: 68th at Railroad St. 69th at Railroad St. 70th at Railroad St. Close: Railroad Street Reopen access from Oleson Road
S.W. 92nd Avenue/S.W. Allen Blvd.	At-grade crossing of S.W. 92nd to north side of Allen	Close S.W. 92nd north of LRT alignment
Residential access from north side of Allen	LRT/auto conflict	Close
Beaverton		
Beaverdam Road at East Avenue	At-grade crossing	Close Beaverdam Road west of transitway; cul-de-sac East Avenue south of transitway.

APPENDIX D. SELECTED NOISE GUIDELINES AND REGULATIONS APPLICABLE TO THE WESTSIDE CORRIDOR PROJECT

FEDERAL HIGHWAY ADMINISTRATION (FHWA) GUIDELINES. The FHWA developed community noise compatibility guidelines for specific land use categories and indoor and outdoor activities. Thus, the guidelines reflect the relative need for quiet in a variety of situations. In the Westside Corridor, the guideline that pertains to residences, schools, and parks (Category B land uses) generally applies. It recommends a maximum outdoor Leq of 67 decibels. Leq is a community noise descriptor that averages sound on an energy basis.

DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) REGULATION. DEQ industrial or commercial noise standards are contained in Oregon Administrative Rules (OAR), Chapter 340, Division 35 (amended May, 1980). Table D-1 presents regulations pertinent to the Westside Corridor Project.

TABLE D-1. DEQ COMMERCIAL NOISE STANDARDS (OAR 340-35-035)

- Noise sources defined as industry and commerce must meet ambient noise standards measured at the nearest noise as residences, schools, churches, libraries and other places where people normally sleep. The definition for industry is very broad. The LRT system, LRT maintenance yards, and bus maintenance yards must comply with all sections of OAR-340-35-035.

- Additionally, industrial or commercial noise sources built on land that was previously not used for commercial or industrial purposes also must comply with OAR 340-35-035B (10 Decibel Rule). Any park and ride lots, bus lanes, or transit centers construction on such land must comply with OAR 340-35-035B.

OAR 340-35-035A controls the noise emission for new industrial or commercial noise sources which would include LRT operations. Allowable statistical sound levels in any one hour are as shown in Table D-2.

TABLE D-2. DEQ APPLICABLE NOISE STANDARDS

TIME	MAXIMUM PERMISSIBLE SOUND LEVEL (DB)		
	L1	L10	L50
7 A.M. to 10 P.M.	75	60	55
10 P.M. to 7 A.M.	60	55	50

OAR 340-35-035B (10 Decibel Rule) permits increases in ambient sound levels, L10 or L50, attributable to new industrial or commercial sources of at most 10 decibels. The 10 Decibel Rule would apply to railways and bus lanes, park and ride facilities, transit centers, and maintenance yards built on previously unused industrial or commercial sites. The rule would apply also to traffic associated with the park-and-ride lots and maintenance yards. The rule woud not apply to exclusive bus lanes or other highway alterations and improvements.

CITY OF PORTLAND NOISE ORDINANCE. The City of Portland Noise Ordinance is contained in Title 18 of the City Administrative Code (Ordinance No. 141882 passed and effective June 1976). Chapter 18.10.060 presents regulations concerning construction activities and equipment. These regulations prohibit noise levels above specified levels and restrict construction to the hours between 7 a.m. and 6 p.m. Chapter 18.10.060 follows in its entirety in Table D-3.

TABLE D-3. PORTLAND NOISE ORDINANCE CHAPTER 18.10.060

18.10.060 Construction activities and equipment. (a) Maximum sound levels: After January 1, 1977, no person shall operate any equipment or appurtenances thereto in commercial construction activities which exceeds 85 dBA, when measured at fifty feet (15.2 meters) from the source. This standard shall not apply to trucks (see Section 18.10.020), pile drivers, pavement breakers, scrapers, concrete saws and rock drills.

(b) Night, weekend and legal holiday limitation. From 6 p.m. to 7 a.m. the following morning, and 6 p.m. Saturday to 7 a.m. the following Monday, and on legal holidays, the permissible sound levels of Section 18.10.010 shall apply to all construction activities except by variance or for reasons of emergency. The exempted equipment of Section 18.10.060 (a) is not exempted during these hours. For purposes of this subsection, construction activities on a public road within a zone shall be considered as taking place on private property within that zone.

(c) The adjustments to permissible sound levels established in Section 18.10.010 (b) apply to subsections (a) and (b) above.

(d) All equipment used in commercial activities shall have sound control devices no less effective than those provided on the original equipment, and no equipment shall have an unmuffled exhaust.

(e) All equipment used in commercial construction activities shall comply with pertinent standards of the U.S. Environmental Protection Agency.

APPENDIX E. AIR QUALITY

METHODOLOGY. CO (eight hour) levels were simulated and projected for proposed sites of transit stations and centers in the Westside Corridor. Simulation and projection years were 1981, 1988, and 1995, CO (eight hour) concentrations for 1988 being linearly interpolated between those in 1981 and 1995. The CO model used was of the Gaussian variety, calibrated to be representative of worst case dispersal conditions in the Westside Corridor.

Verification of the CO model was based on co-measurements of CO (one hour) levels, traffic volumes, and methodology at Earth Metrics air monitoring site on Canyon Road in Beaverton. The location of the CO sampler, approximately 25 feet north of Canyon Road, and period of air sampling were described fully in the Air Quality Technical Memorandum (Earth Metrics Incorporated, 1981). Two verification data sets were examined: 1) approximately 18 data points from 11/28/80, 12/10/80, and 12/15/80; and 2) eight data points from the second worst day, 12/16/81. After adjustment of the model, the degree of linear fit between measured and modeled CO (one hour) levels was determined to be r = 0.97 and r = 0.64 for data sets 1) and 2), respectively. (An r = 1 would indicate perfect fit, and r =0 no fit.) The intercept of the linear regression equation for data set 2) was interpreted as the worst case CO (eight hour) background level. CO background level is the CO level that would prevail at the Canyon Road air monitoring site in the absence of traffic on Canyon Road. The worst case CO (eight hour) background level was estimated to be 5.5 mg/m3 for 1981.

ASSUMPTIONS. Simulations and projections using the CO model were based on inputs of dispersion meteorology, receptor locations, traffic volumes, and CO emission factors. In both cases, 1981 simulations and 1995 projections, CO (eight hour) levels were based on the following dispersion meteorology:

- Wind Speed: 2.0 mph
- Wind Direction: worst case (depends on receptor location)
- Pasquill Stability: Class D

Although worse dispersal conditions occur in the Westside Corridor during shorter periods than eight hours, these conditions were assumed to be representative of the worst case during an eight hour period.

Table E-1 summarizes receptor locations, traffic volumes, and CO emission factors used in the analysis. As stated previously, receptor locations were chosen to correspond with the proposed sites of transit stations and centers. Many of the receptor locations, therefore, are within 25 feet of a road or intersection. Traffic volumes used as input in the CO model were taken to be 55 percent of the Average Daily Traffic (ADT). In this manner, the ADT and CO emission factor were used to define the maximum CO source strength during an eight hour period. CO emission factors, also presented in Table E-1, were provided by METRO and account for cold starts and Portland's biennial vehicle inspection and maintenance program.

The CO model was applied to calculate the contribution of local traffic to CO (eight hour) levels. To these CO (eight hour) levels were added the assumed CO background levels. CO (eight hour) background levels of 3.6 mg/m3 in 1988 and 2.0 mg/m3 in 1995 were estimated by linear roll-forward of the CO (eight hour) background level of 5.5 mg/m3 in 1981. Modeled CO levels in Table 3.9-5 are the sum of local traffic and background components.

TABLE E-1. TECHNICAL ASSUMPTIONS FOR CO 1981 SIMULATION AND 1995 PROJECTION

ROAD OR INTERSECTION	RECEPTOR LOCATION (FEET)	AVERAGE DAILY TRAFFIC		CO EMISSION FACTOR (GRAMS/MILE)	
		1981	1995	1981	1995
18th/Columbia	25/25	3600/4100	4300/4900	72.9/72.9	19.4/19.4
Harbor/Montgomery	25/25	2300/450	22,700/5800	72.9/72.9	19.4/19.4
Sunset Hwy/Canyon Ct. (Zoo)	150/NA	75,000/NA	124,000/NA	38.6/NA	10.5/NA
Sunset Hwy/Canyon Ct./ Skyline	125/25/25	25,000/3160/9720	121,000/3800/10,750	38.6/52.5/52.5	10.5/16.5/14.2
Sunset Hwy/State Hwy 217	75/NA	25,000/NA	82,500/NA	38.6/NA	10.5/NA
Walker Rd/State Hwy 217	25/150	15,580/44,000	17,810/54,000	45.9/38.6	12.2/10.5
Gaines/Macadam	25/25	200/8900	600/13,500	72.9/72.9	19.4/19.4
Boundary/Macadam	175/200	2500/21,330	6750/31,000	72.9/72.9	19.4/19.4
Nebraska/Macadam	25/200	1550/21,800	3250/31,500	72.9/72.9	19.4/19.4
Nevada/Macadam	100/100	1650/22,300	1100/29,000	72.9/71.9	19.4/19.4
Barbur Blvd/I-5	75/175	20,300/67,500	26,300/91,500	45.9/38.6	12.2/10.5
25th/Multnomah	25/25	930/10,410	1000/12,500	61.2/45.9	16.5/12.2
35th/Multnomah	25/25	2230/9480	3700/12,500	61.2/45.9	16.5/12.2
45th/Multnomah	25/25	4290/11,040	5500/13,500	61.2/45.9	16.5/12.2
Oleson Road	25	12,040	12,500	61.2	16.5
Scholls Ferry/ Allen Blvd	25/25	12,410/9320	12,800/11,200	52.5/52.5	14.2/14.2
Broadway (Town Center)	200	4320	5500	72.9	19.4
117th Avenue	250	1440	3100	61.2	16.5

continued

TABLE E-1. TECHNICAL ASSUMPTIONS FOR CO 1981 SIMULATION AND 1995 PROJECTION (continued)

ROAD OR INTERSECTION	RECEPTOR LOCATION (FEET)	AVERAGE DAILY TRAFFIC		CO EMISSIONS FACTOR (GRAMS/MILE)	
		1981	1995	1981	1995
114th Avenue	50	950	3500	61.2	16.5
Cedar Hills Blvd	200	14,600	23,000	61.2	16.5
Farmington/Broadway					
West Broadway TS	50/50	12,770/2650	23,900/4000	61.2/61.2	16.5/16.5
Beaverton TC	75/75	5960/4320	10,500/5500	61.2/61.2	16.5/16.5
Hall/Watson (Beaverton TC)	100/100	7400/5700	10,000/8500	61.2/61.2	16.5/16.5
Terman/Murray	200/NA	2560/NA	4000/NA	45.9/NA	12.2/NA
158th Avenue	100	3850	10,000	52.5	14.2
170th/Baseline	NA/25	NA/7400	NA/12,000	NA/45.9	NA/12.2
173rd Avenue	25	600	4000	52.5	14.2
175th Avenue	25	9730	9500	61.2	16.5

THE CITY OF
PORTLAND
OREGON

DEPARTMENT OF PUBLIC SAFETY
CHARLES JORDAN
COMMISSIONER

BUREAU OF PARKS AND PUBLIC RECREATION
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December 9, 1981

Steven Siegel
Westside Corridor Project (Metro)
527 S.W. Hall
Portland, Oregon 97201

Dear Mr. Siegel:

This letter is written in response to the questions raised in your letter dated November 20, 1981 with regard to the potential impact of the LRT corridor on certain parks.

In checking with Joan Cassidy of the Bureau of Facilities Management and Carl Short of the Division of Streets and Structural Engineering, we have confirmed that Collins Circle is not park property but rather part of the street right-of-way. Its essential function is to facilitate movement of the public; it is not used as a park. Therefore, we would not object to its modification for the purpose of implementing a project to facilitate transportation. I would like to say, however, that considerable effort and expense was expended in 1974 to make the circle an attractive landscaped area. The Collins Foundation provided $32,000; therefore, it would be appropriate that any changes to the circle be discussed with the foundation so their contribution not be prematurely depreciated.

Concerning the impact on Washington Park of the line to be run on the south side of the Sunset Highway, we do not believe there would be any conflicts or negative impact. Because of the characteristics of the terrain, the Park Bureau does not envision any active park uses occurring on the south side of the Sunset Highway except for an eventual connection of a soft-surface trail between Council Crest and Washington Park. We would, of course, want to work closely with the project staff during the design stage.

The impact of the Multnomah LRT alignment adjacent to Willamette Park would have both positive and negative impacts. Some park property would be taken, but if the project were properly designed (refer below), the net usable park area could be enhanced. The improved access provided by the LRT to this park of regional interest would benefit the park greatly.

Willamette Park falls under the requirements of the Land and Water Conservation Fund Act, Section 6(f), which states:

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary (of Interior), be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

The encroachment of the Multnomah LRT into Willamette park is a 6(f) problem. We would suggest that the following mitigation measures be included in the DEIS to address the potential impacts to Willamette Park.

1. Alternate transit station sites to Nebraska Street will be studied during preliminary engineering as an option to reduce any potential conflicts with park uses.

2. A parking management plan will be implemented if the Willamette Park parking facilities are inappropriately used by transit riders for park and ride uses.

3. The construction of the Multnomah LRT alignment adjacent to Willamette Park will include in its final design a replanting, regrading and landscape plan. The landscape plan will be designed to reduce the potential visual impacts of the LRT facility.

4. If additional steps are necessary to mitigate impacts to Willamette Park, the lead agency will coordinate with the Portland Parks Bureau and the Department of the Interior to identify and select replacement property to substitute for any direct land taking from Willamette Park.

I hope this answers your questions. Please let me know if we can be of further assistance.

Sincerely,

William V. Owens

William V. Owens
Superintendent of Parks

WVO:FRH:lw

cc: Steve Iwata, Bureau of Planning