FOREST GROVE TRANSIT-ORIENTED DEVELOPMENT PLAN AND IMPLEMENTATION STRATEGY

Final Report

October 2011

ACKNOWLEDGEMENTS

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Front Cover:
Artist Rendering of Laurel Street at 26th Avenue -
Looking southeast towards proposed Urban Plaza

Parametrix, Urbsworks, Johnson Reid, Nelson\Nygaard, SERA. 2011. Forest Grove Transit-Oriented Development Plan and Implementation Strategy.

Final Report.

Portland, Oregon. October 2011.

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The contents of this document do not necessarily reflect views or policies of the State of Oregon.

The *Forest Grove Transit-Oriented Development (TOD) Plan and Implementation Strategy* was commissioned in late 2010 as a pilot project intended to assess the viability of land use strategies to promote high-capacity transit (HCT) service connecting Forest Grove to Hillsboro and points east and develop a path forward to help the City fulfill that vision.

The plan and implementation strategy addresses Metro's system expansion policies for HCT and the Oregon Department of Transportation's (ODOT) Transportation Planning Rule requirements to plan for transit supportive uses, densities, and facilities to provide convenient bicycle and pedestrian access and circulation. This project evaluated and recommended changes to land use, building design, transit and multi-modal transportation facilities. The objective is to support transit-oriented development, and create more complete communities centered on key transportation infrastructure assets. This plan recommends an integrated land use and transportation strategy for consideration through the City's comprehensive plan update scheduled for completion in 2012.

The strategy resulted in a Final Preferred Alternative that includes a conceptual alignment and station locations within Forest Grove for a MAX light rail extension west from Downtown Hillsboro, via Cornelius, along the Portland and Western Railroad (PNWR) corridor.

The strategy outlines a series of priority recommendations that the City should implement to actualize the Final Preferred Alternative in the regional and statewide planning context. A description of the Final Preferred Alternative is included in this strategy, and features slight alterations from earlier versions of the Preferred Alternative featured in previous deliverables. These revisions are based on feedback heard from project stakeholders as well as findings made in previous reports. Additional background is also provided on the original project alternatives and the process by which they were assessed, using an assortment of qualitative and quantitative scoring criteria, and how Alternative I was refined and advanced as the Preferred Alternative.

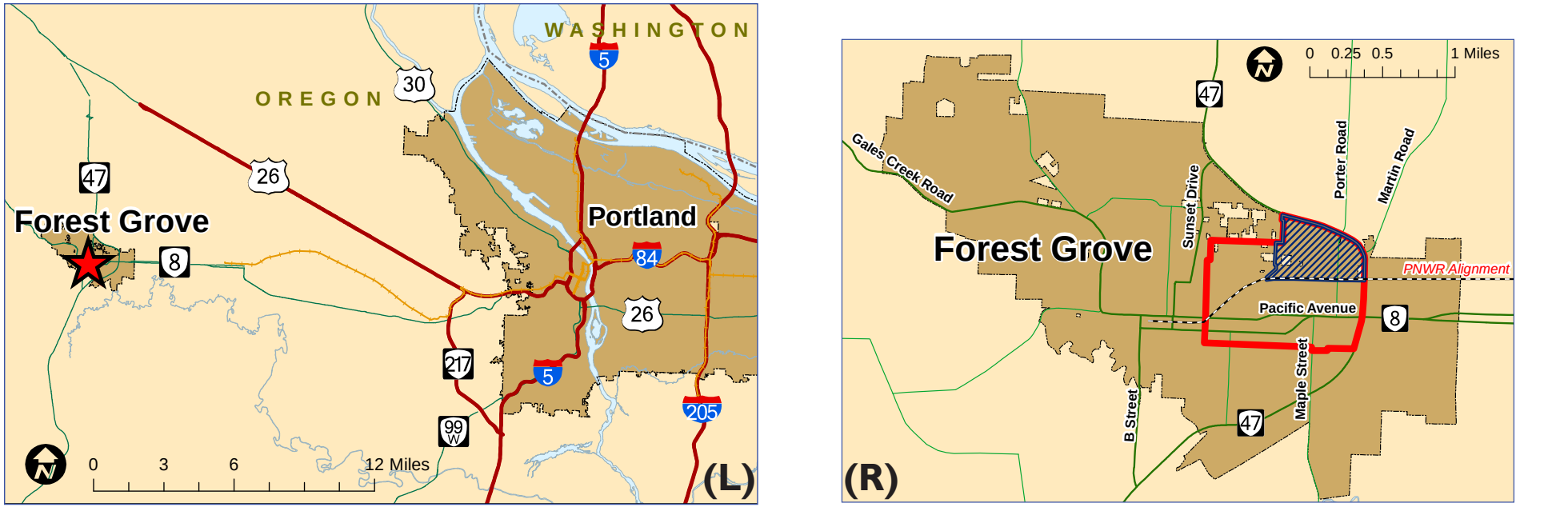


Figure | **1** | *Forest Grove in Metropolitan Portland **(L)**; Focus Study Area (Blue) and Project Study Area (Red) **(R)***

In 2009, the Metro *High Capacity Transit System Plan (HCT System Plan)* identified Study Corridor #12, Hillsboro to Forest Grove, as a Developing Regional Priority Corridor, which is the third priority tier of corridors considered by Metro for advancement and future implementation. As a third priority tier, Study Corridor #12 was placed behind nine other regional corridors deemed better suited for HCT development. This report includes a list of fundamental strategies to help the City identify future opportunities for development, adopt policy and zoning changes that would help support the proposed new HCT service, and in turn, promote the corridor within the *HCT System Plan* framework to bring about accelerated implementation. This strategy includes building a new neighborhood at the site of a chiefly undeveloped portion of land located along Oregon Route 47 (OR 47) in the northeast part of the City, hereby referred to as the Focus Study Area. The Focus Study Area is located within a larger Project Study Area, one that encompasses a greater portion of the city east of the Town Center and includes the Pacific Avenue commercial corridor and numerous industrial sites in the vicinity of 23rd Avenue and Elm Street (see Figure 1).

The following lists the strategies necessary for advancing HCT Study Corridor #12:

Strategies Necessary for Advancing HCT Study Corridor #12

1. Complete a Corridor Refinement Plan and continue to build local and regional partnerships to support HCT Study Corridor #12.
2. Create the density necessary to support HCT in the City of Forest Grove.
3. Continue to build local political support for HCT through education and planning and working with local partners including Pacific University, Woodfold and Tuality Hospital.
4. Develop financing mechanisms to assist in the creation of new utilities in the Focus Study Area and the potential relocation of existing substations and utility lines.
5. Create the appropriate development pattern to respond to Metro System Expansion Policies and guidance for corridor advancement.
6. Improve the pedestrian and bicycle system around and through the Project Study Area to support TOD.
7. Explore methods to improve the overall real estate market in Forest Grove to better facilitate TOD, including strategies to attract new employers.
8. Create public policies that support the density necessary for TOD, including updates to the zoning code, street standards and subdivision requirements.
9. Work with ODOT to determine the appropriate connections to OR 47 and railroad crossings.
10. Continue to support and work to improve the current transit service and access in Forest Grove to increase transit ridership.

Over the course of a year, the project team has collaborated with the City of Forest Grove to develop this strategy to guide future transit-supportive policy and development. The strategy began with an assessment of existing conditions in Forest Grove – particularly in the Focus Study Area – based on a review of existing plans such as the *Comprehensive Plan*, *Rail Vision Study*, *Draft Transportation System Plan*, and *Commercial Corridor Study* as well as the current zoning code. This assessment of existing conditions also included making site visits to the Focus Study Area and Town Center to evaluate the extent of undeveloped land that has TOD potential. This analysis informed the Needs, Opportunities, and Constraints phase of the project, which noted the availability of flat, vacant acreage and a right-of-way (ROW) suitable for HCT as clear opportunities for the City to leverage, while the lack of utilities serving the area and ODOT restrictions on access to OR 47 presented constraints to future implementation. These findings were developed in conjunction with a report on best TOD practices around the country that the City could follow as a guide.

Land use and transportation alternatives were then developed that combine a potential HCT alignment and stations with a TOD program for the Focus Study Area, one that incorporates compact, mixed-use, pedestrian-friendly development. The alternatives were evaluated using performance criteria devised by Metro to help prioritize regional HCT corridors and was presented to the Corridor Working Group (CWG) comprised of City of Forest Grove staff, major property owners, as well as representatives from City of Hillsboro, City of Cornelius, TriMet, Metro, ODOT, Oregon Department of Land Conservation and Development, Pacific University, Tuality Healthcare, Jennings-McCall Center, and a community advocate for affordable housing. The CWG met periodically throughout the duration of the study.

A Preferred Alternative was advanced that took elements from each of the earlier proposed designs. Important tactics for future implementation were generated which include establishing a corridor-wide study with Cornelius and Hillsboro and implementing a new TOD zone that enables the proposed development plan. Ultimately, the City Council and Planning Commission participated in a work session and provided constructive feedback on the Preferred Alternative that has been integrated into this document for further deliberation as part of the future corridor study.

The keys to the eventual success of the TOD Plan and Strategy are the implementation actions necessary to ensure the success of the Final Preferred Alternative. Many of these implementation actions are the responsibility of the City, but other actions are the responsibility of other agencies and the City will need to create partnerships to successfully implement them. Table 1 describes each action item, the responsible party and the priority for action. Priority 1 actions are recommended for completion in the next 1 to 3 years. Priority 2 actions are to be completed within 3 to 5 years and Priority 3 actions are on an extended timeframe of 6 years or greater.

Table | 1 | *Implementation Matrix*

	Implementation Action	Responsible Party	Priority	Comments
1	Conduct a corridor-wide study with the City of Hillsboro and City of Cornelius to determine the feasibility of implementing HCT west from downtown Hillsboro along the PNWR corridor.	City with Hillsboro and Cornelius	1	Partner with Metro and TriMet to determine best approach.
2	Continue to build local (Hillsboro and Cornelius) and regional partnerships to support HCT Study Corridor #12	City	1	Contingent on agreement between partners to advance HCT corridor following study.
3	Build local political support for HCT through education and planning and working with local partners including Pacific University, Woodfold and Tuality Hospital, neighbors and others.	City	1	City must continue to devote staff time for this effort
4	Continue to support and work to improve the current transit service and access in Forest Grove to increase transit ridership.	City with TriMet	1	
5	Revise Comprehensive Plan/Map from Industrial in the Focus Study Area to Mixed Use as depicted in the Final Preferred Alternative	City	2	This represents a significant City policy choice
6	Update the Zoning Code to implement the new Comprehensive Plan designation including: Community Commercial zone, creation of new TOD Mixed Use zone, incentive zoning (density, land use), urban design guidelines (ex: materials, mass, height, setback, orientation, driveways, appearance, ground-floor transparency).	City	2	
7	Revision of Metro Employment and Industrial Lands map, *Urban Growth Management Functional Plan*	City with Metro	2	Needs more coordination with Metro
8	Monitor freight rail service demand along the PNWR corridor.	City	2	

	Implementation Action	Responsible Party	Priority	Comments
9	Collaborate with ODOT to determine the appropriate connections to OR 47 and railroad crossings.	City	2	Plan and zone change will require more detailed traffic analysis
10	Formulate realistic capital cost estimates for TOD- and transit-related infrastructure investments.	City	2	Costs will depend on outcome of corridor study
11	Develop financing mechanisms to assist in the creation of new utilities in the Focus Study Area and the potential relocation of existing substations and utility lines.	City	2	Likely a significant City cost that will not be captured by development
12	Improve the pedestrian and bicycle system around and through the Focus Study Area to support TOD.	City	2	
13	Update *Regional Transportation Plan*, *High Capacity Transit System Plan*	Metro	2	Will require additional analysis and depends on Plan changes
14	Explore methods to improve the overall real estate market in Forest Grove to better facilitate TOD, including strategies to attract new employers.	City	2 & 3	
15	Advance the creation of a Corridor Refinement Plan in accordance with 2035 RTP policy and infrastructure recommendations and/or future RTP efforts.	City with Metro	3	
16	Request promotion of HCT Study Corridor #12 during future RTP update or as part of an RTP amendment (if between RTP updates) drafted by Corridor Working Group.	City	3	
17	Create the appropriate development pattern to respond to Metro System Expansion Policies and guidance for corridor advancement.	City	3	This action is contingent on Comprehensive Plan and zoning changes
18	Work proactively with TriMet and neighboring jurisdictions on a feasible HCT transit operations strategy serving Forest Grove.	City	3	
19	Phase out freight rail operations on the PNWR corridor after lineside industries on 23rd Avenue are relocated elsewhere.	City	3	May require some City intervention

Priority Recommendations For Advancement

The Implementation Report provided a blueprint for how the City of Forest Grove can achieve its HCT aspirations by collaborating with local, regional and state jurisdictions. Three tiers of actions are included in this overall strategy. The implementation actions of highest priority include initiating a corridor-wide study with the City of Cornelius and City of Hillsboro to gauge the practicability of implementing HCT between Hillsboro and Forest Grove (Action #1 in Table 1). This corridor study would measure the compatibility of HCT with local land use objectives, assess traffic impacts, and develop recommendations for transit mode, alignment and possible stations along the route. It would be completed before any plan or zone changes occurred within the Focus Study Area.

If the results of the study readily illustrate the implementation of HCT along the corridor as a worthwhile and feasible goal within the next 10-15 years, and the jurisdictions are in agreement with those findings, then an Intergovernmental Agreement or Memorandum of Understanding would be entered into as outlined in Metro's *HCT System Expansion Policy Implementation Guidance*. This guidance, adopted by Metro Council in July 2011, is meant to provide a refined, systematic approach for HCT system expansion policy and is intended to prepare local jurisdictions for potential future transit investments and illustrate how local communities can build their capacity to support HCT. The guidebook provides direction for communities who wish to advance a particular corridor to a higher tier that would allow more immediate consideration for implementation within the regional planning process either during periodic updates to the *Regional Transportation Plan* (RTP) or through an RTP amendment between updates. While not a funding guarantee, the implementation guidance will help inform future decisions in advancing the next HCT corridor when resources become available, or at the next RTP update. The corridor study is the first important step in demonstrating to Metro the local political will and transit-supportive policies and zoning that are integral to advancing the Hillsboro to Forest Grove study corridor.

Other important actions include:

1. Continuing to build local political support for HCT through education and planning as well as working with local partners such as Pacific University, Jennings-McCall Center, Woodfold (formerly Woodfold-Marco), and Tuality Hospital;

2. Modifying the Comprehensive Plan/Map from Industrial to Mixed Use as depicted in the Final Preferred Alternative;

3. Working with Metro to revise the Employment and Industrial Lands map in the *Urban Growth Management Functional Plan*; and

4. Monitoring the level of freight service along the PNWR line that bisects the community.

This study has identified the ROW along the rail corridor as an ideal location for HCT from both a service coverage and cost-effectiveness standpoint. The City will need to have ongoing discussions with ODOT about the appropriate location and timeframe for opening new crossings across the rail ROW as it is owned by the agency's Rail division. Likewise, the need for new connections from the Focus Study Area to OR 47 will also require ODOT cooperation as they maintain access control to the west of the roadway.

If the City of Forest Grove moves forward with changing its Comprehensive Plan map, then an update to the Development Code will be required. The update would require establishing a new transit-oriented mixed-use zone, establishing design guidelines based on urban form (such as materials, mass, height, setback, orientation, driveways, appearance, and ground-floor transparency), as well as offering incentives for developers that reach specific targets set by the City for density, height, and land use. While the current Community Commercial zone enables a mix of land uses (including residential buildings with ground-floor retail), the institution of a robust TOD zone together with other policy changes would ensure that desired land-use outcomes, such as the proposed development plan outlined in the Implementation Report and included in this document, are realized in the Focus Study Area. The City has endeavored to propose three new TOD zones for use in the Focus Study Area and other locations in Forest Grove:

- **TOD-MR (Mixed-Use Residential)** encompasses an area generally within walking distance of planned HCT stations. The TOD-MR zone is meant to promote a

variety of housing types at densities capable of supporting HCT service. Home occupations and limited retail uses are encouraged to promote a mixed-use neighborhood within the TOD-MR zone.

- **TOD-C (Commercial)** is meant to promote commercial development serving the needs of nearby residents, workers and pass-by traffic. Commercial uses are intended to be larger in scale than uses found within the Forest Grove Town Center and smaller in scale than uses along the Pacific Avenue corridor. Automobile serving uses are prohibited.

- **TOD-I (Industrial)** is designed to allow for limited specialty manufacturing and employment near residential and commercial areas. Development within in the TOD-I zone is intended to be compatible with surrounding residential areas. Uses within the TOD-I zone are encouraged to provide activities such as tasting rooms and small-scale outlet stores for products manufactured on-site to add interest.

This strategy introduces a definitive TOD vision (Figure 2) for the Focus Study Area that incorporates the implementation of HCT along the PNWR west from Hillsboro to the Forest Grove Town Center. Three stations would be included (from west to east): at the Town Center, Elm Street (Phased), and Laurel Street. A comprehensive new street grid would maximize connectivity in the area, and provide new access points to the Focus Study Area. New connections would be made along OR 47 at Laurel Street Extended and Martin Road Extended, while existing access at Oak Street would be closed. Of the 135 acres located within the Focus Study Area boundaries, 35 would be dedicated to mixed-use residential with some ground-floor commercial while approximately 10 acres would be devoted to large-format commercial uses while roughly 15 acres would serve industrial purposes (Table 2).

Laurel Street is envisioned as a north-south "Main Street" and serve as the focal point for small-scale neighborhood development in the Focus Study Area (see Figure 3). Utilization of streetscape design elements and traffic control mechanisms would work to calm automobile traffic speeds and contribute to pedestrian-friendly urban form. Laurel Street would connect the transit station area to OR 47 to the north and existing residential neighborhoods (and Pacific Avenue) to the south. In addition, Martin Road would be designated as a "Through Street" that acts as the primary facilitator of mobility through the Focus Study Area (see Figure 4). This street would likely feature the highest allowable speed limits within the area, connecting OR 47 to the east with existing residential neighborhoods to the west. Motorists traveling to and from the Focus Study Area (as well as any pass-through traffic) would likely utilize this street.

Furthermore, the assumption has been made that freight rail service would be completely phased out by the time HCT is implemented along the PNWR corridor, allowing for a greater number of rail crossings that would enhance connectivity and multimodal access within the Project Study Area. In addition to the existing crossings at Quince, Oak and Kingwood Streets, new public crossings would be constructed at Laurel and Maple Streets (currently there is a privately maintained crossing at Maple Street). Figure 5 provides a depiction of new access points across the PNWR ROW and to OR 47, as well as streets that would be prioritized for bicycle/pedestrian improvements to maximize these connections.

To facilitate the implementation of TOD as described in the Final Preferred Alternative, a conceptual development program was created that shows the anticipated amount and type of development on each block. This development

(Continued on Page 15)

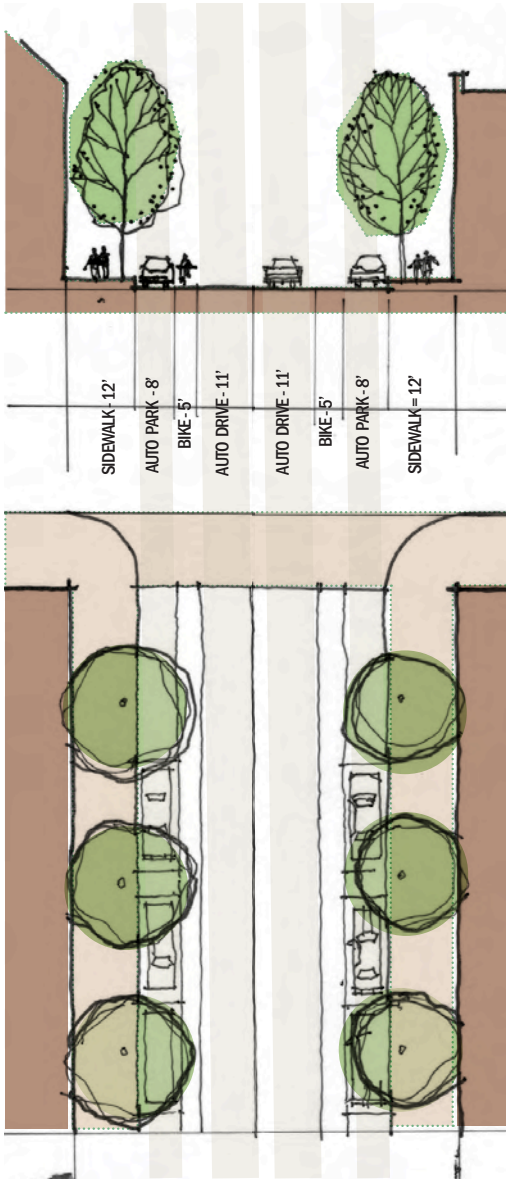
Table | 2 | *Preferred Alternative Land Uses by Acreage*

Land Use	Net Acreage
Mixed Use - Medium and High Density Residential, Commercial and Light Industrial	35.1
Large-Format Commercial	10.3
Open Space (Subtracted from Mixed-Use)	3.5
Industrial	14.7
Existing High-Density Residential (area west of Kingwood Street)	33.8
Substations	2.6
Other (Streets)	35
TOTAL ACREAGE OF FOCUS STUDY AREA	**135**

LEGEND

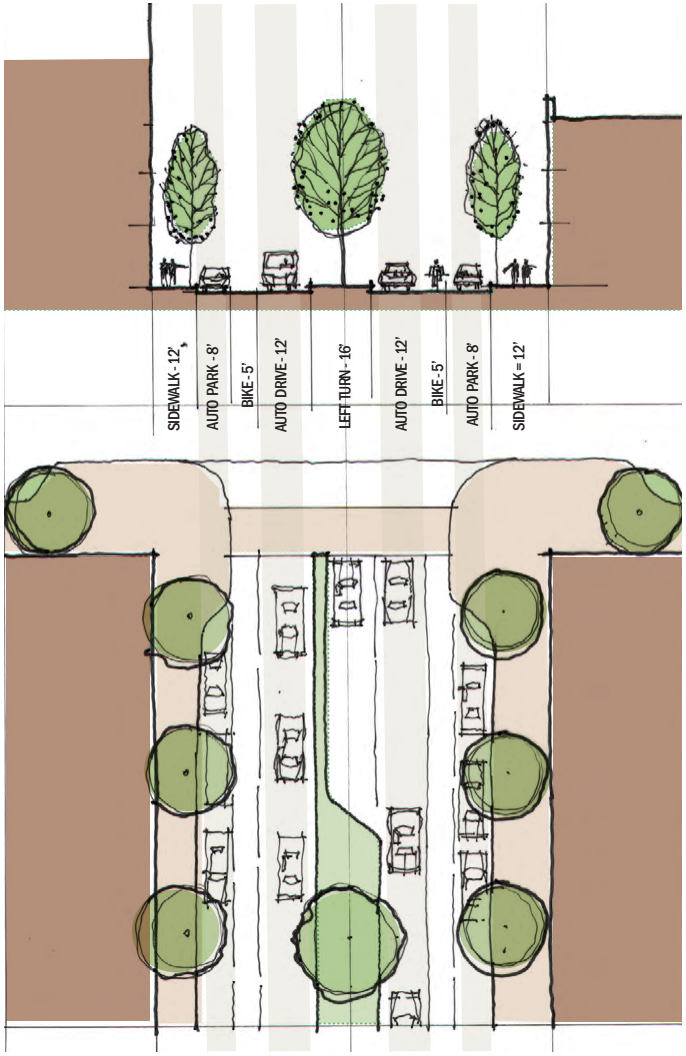
- Through Street
- "Main Street"
- Fixed-Rail Transit
- Mixed-Use Land Use
- Commercial Land Use
- Industrial Land Use
- Access point subject to ODOT approval

Figure | **2** | *Final Preferred Alternative*



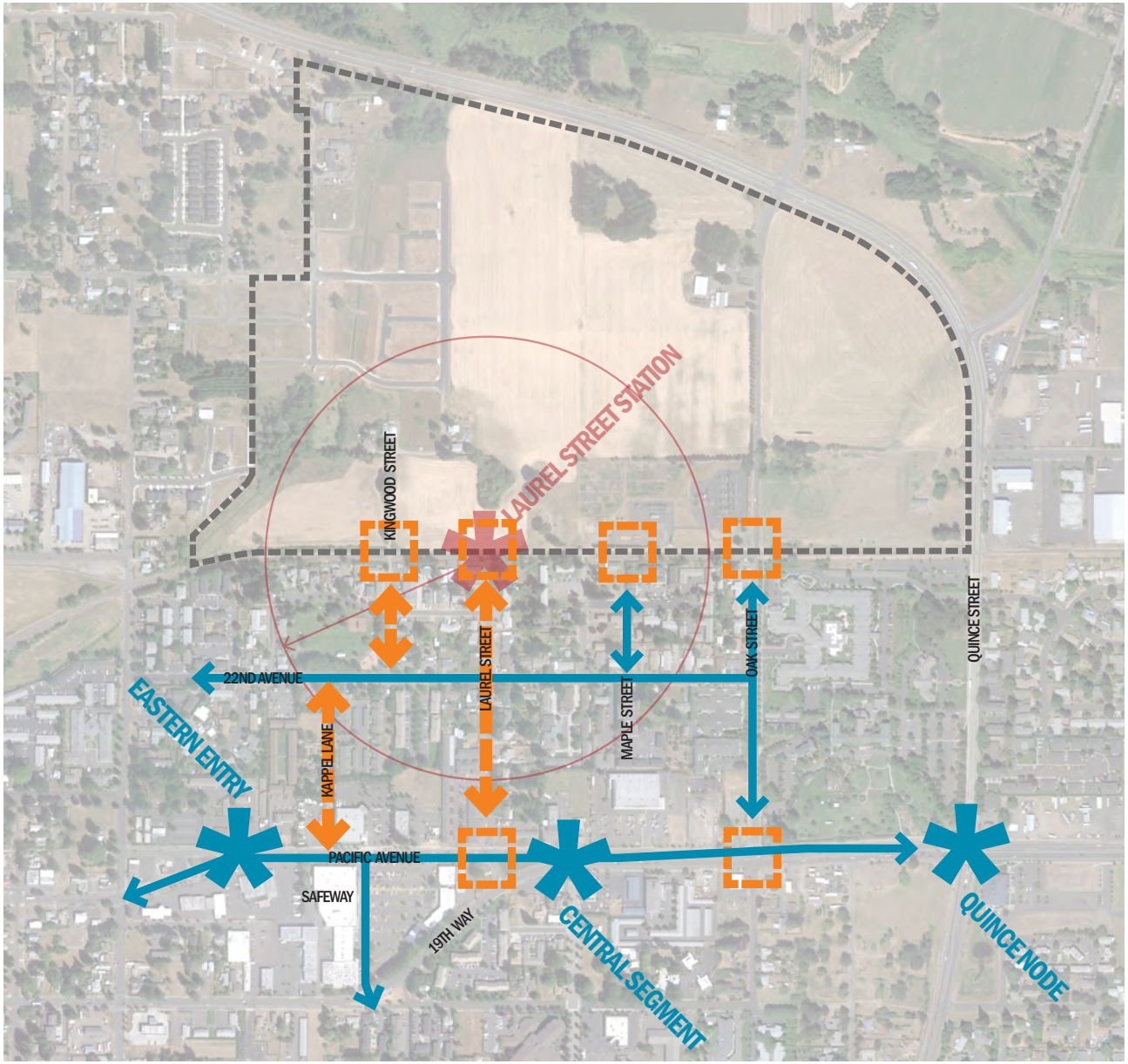
Main Street

Figure | 3 | *Laurel Street as "Main Street" Type - Section*



Through Street

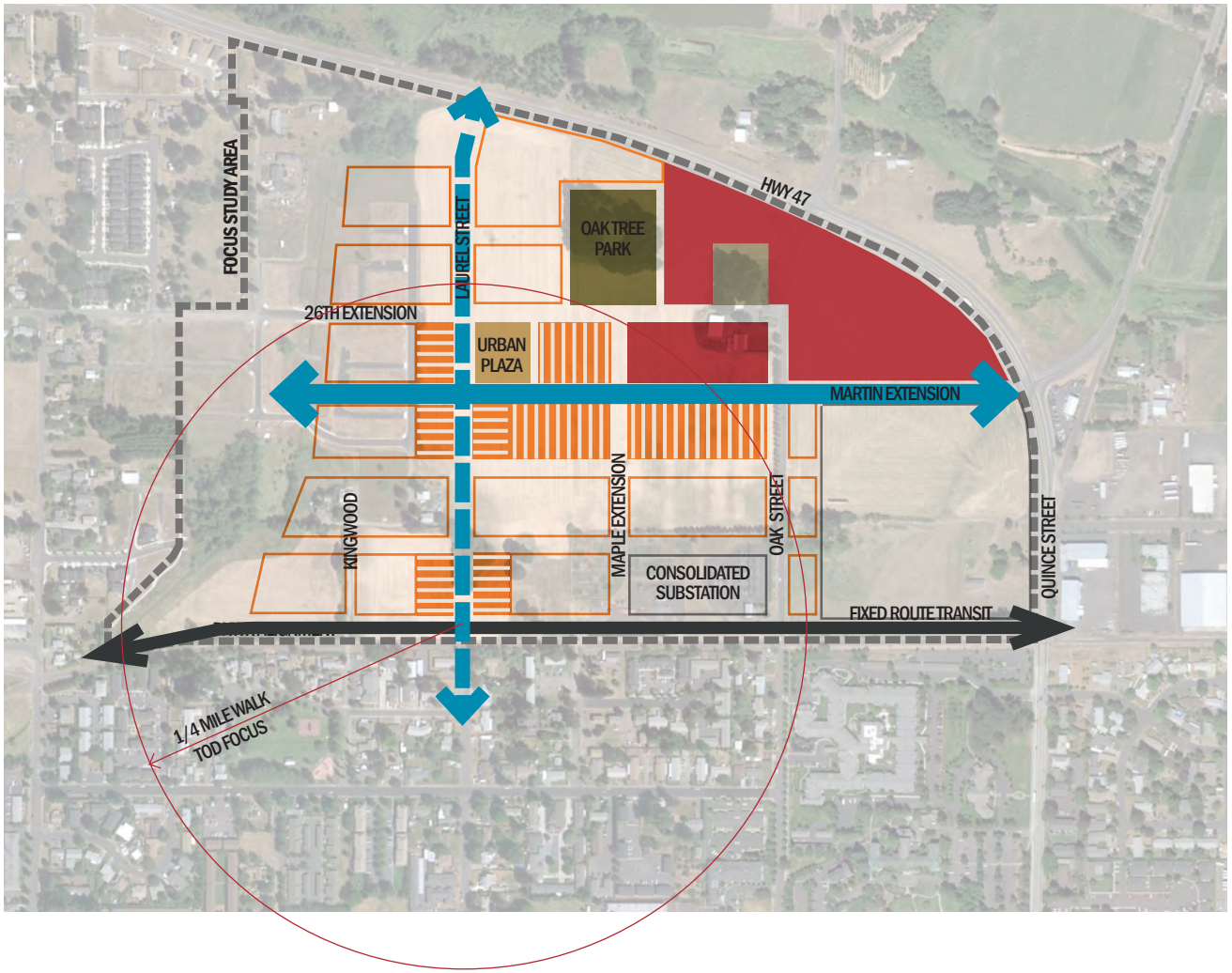
Figure | 4 | *Martin Road as "Through Street" Type - Section*



LEGEND

- Commercial Corridor Concept Nodes
- Proposed Laurel Street HCT Station
- Pedestrian crossing priority
- Streets with existing sidewalks
- Streets prioritized for pedestrian/bicycle improvements

Figure | 5 | *Focus Study Area Connectivity*



Street-Fronting Retail / Ground Floor Mixed-Use

9,500-15,000 square feet/acre possible
minimum amount: 19,880 square feet
maximum amount: 118,800 square feet

Large Format Retail

10.3 acres / 448,668 square feet
.25 FAR assumed, equalling 112,167 square feet maximum

Figure | **6** | *Retail Location, Mix, and Square Footage*

(Continued from Page 10)

program is also used to advise the Traffic Analysis Report. Land uses include mixed-use residential with ground-floor neighborhood retail adjacent to the transit station as well as large-format retail fronting OR 47 and industrial uses between Oak and Quince Streets. Figure 6 provides the location, mix, and square footage of retail within the Focus Study Area, Under the Final Preferred Alternative, the substations within the Focus Study Area would remain in place, although their associated transmission lines are relocated and the dimensions of the substations are slightly reduced through consolidation. Land that is currently occupied by a platted – but presently unbuilt – residential development located in the northwest corner of the Focus Study Area is also presumed to be available for use in this development plan. Additionally, an urban plaza has been located at the intersection of Martin Road and Laurel Street, while a park has been sited at Maple Street Extended and 26th Avenue where a large oak tree currently exists. See Figure 7 and Table 3 for more information on the development program and block key.

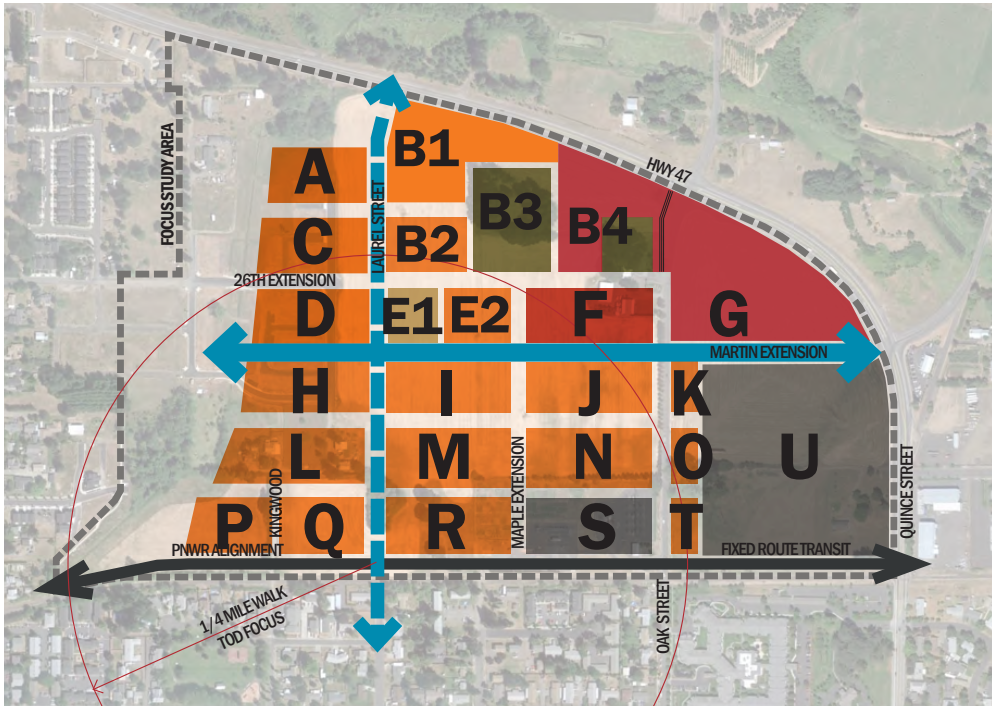


Figure | 7 | *Development Program Block Key*

Table 3 | *Final Preferred Alternative Development Program*

Townhouse Type A = 16 du/acre | 1,000 sf retail per unit (maximum)
Townhouse Type B = 40 du/acre | 1,000 sf retail per unit (maximum)
Townhouse Type C = 16 du/acre | 1,000 sf retail per unit (maximum)
Compact Attached/Detached = 24 du/acre
Mixed-Use Stacked Flats Type A = 24- 33 du/acre | 12,000 sf retail per acre
Mixed-Use Stacked Flats Type B = 24-35 du/acre | 1,800 sf retail/acre

Assumed Residential Occupancy: 2.5 persons/dwelling unit
Assumed Mixed-Use Employment Density: 30 jobs/acre
Assumed Retail Employment Density: 22 jobs/acre
Assumed Industrial Employment Density: 18.6 jobs/acre

Block	Square Feet (SF)	Acres	Total Number of Units		Mixed-Use Retail Range (SF)		Housing Type Assumptions (Units/Acre)		Notes
			Min	Max	Min	Max	Low	High	
A	66,125	1.52	24	36			16	24	
B1	96,267	2.21	35	53			16	24	
B2	69,000	1.58	42	63			16	24	
B3	95,832	2.20	0	0					Open space
B4	95,832	2.20	0	0	23,960	23,960			Large format retail at .25 FAR; remaining area: parking, landscaping, stormwater, tree preservation
C	77,625	1.78	29	43			16	24	
D	92,000	2.11	34	51	2,000	10,000	16	24	Townhouse live-work/office/retail or mixed use stacked flats/lofts
E1	57,499	1.32	0	0					Urban plaza
E2	57,499	1.32	21	53	2,376	15,760	16	40	Townhouse live-work/office/retail or mixed use stacked flats/lofts
F	115,000	2.64	0	0	28,750	28,750			Large-format retail at .25 FAR; remaining area: parking, landscaping, stormwater
G	237,838	5.46	0	0	59,460	59,460			Large-format retail at .25 FAR; remaining area: parking, landscaping, stormwater
H	117,875	2.71	43	65	2,000	10,000	16	24	Townhouse live-work/office/retail or mixed use stacked flats/lofts
I	115,000	2.64	42	106	4,752	31,520	16	40	Townhouse live-work/office/retail or mixed use stacked flats/lofts

Townhouse Type A = 16 du/acre | 1,000 sf retail per unit (maximum)
Townhouse Type B = 40 du/acre | 1,000 sf retail per unit (maximum)
Townhouse Type C = 16 du/acre | 1,000 sf retail per unit (maximum)
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Block	Square Feet (SF)	Acres	Total Number of Units		Mixed-Use Retail Range (SF)		Housing Type Assumptions (Units/Acre)		Notes
			Min	Max	Min	Max	Low	High	
J	115,000	2.64	42	106	4,752	31,520	16	40	Townhouse live-work/office/retail or mixed use stacked flats/lofts
K	26,400	0.61	10	24			16	40	
L	115,250	2.65	42	63			16	24	
M	115,000	2.64	42	63			16	24	
N	115,000	2.64	42	63			16	24	
O	26,400	0.61	10	24			16	40	
P	69,000	1.58	25	38			16	24	
Q	115,000	2.64	42	63	2,000	10,000	16	24	Townhouse live-work/office/retail or mixed use stacked flats/lofts
R	115,000	2.64	42	63	2,000	10,000	16	24	Townhouse live-work/office/retail or mixed use stacked flats/lofts
S	115,000	2.64	0	0					Substation
T	26,400	0.61	10	15			16	24	
U	640,332	14.70	0	0					Industrial
TOTALS	**2,887,174**	**66.28**	**579**	**993**	**132,050**	**230,970**			

CENTRAL MATTERS TO RESOLVE

The Final Preferred Alternative incorporates issues that were highlighted for continued study and consideration at a joint City Council and Planning Commission Work Session that took place at the City of Forest Grove Community Auditorium on September 19, 2011. Adaptations include the contemplation of a possible alternate station at Oak Street as opposed to Laurel Street after participants raised concerns that the Laurel station would not provide adequate service to existing businesses located nearby, such as Jennings-McCall Center and McMenamin's Grand Lodge (see Figure 8). In addition, the Oak station was deemed more accessible from OR 47. The decision on whether to pursue the Laurel or Oak station would likely coincide with the forthcoming corridor study with Cornelius and Hillsboro and may involve modifying the development plan by replacing projected industrial uses with mixed-use residential to better suit the logistics of the Oak station site. It may also depend on whether specialty door manufacturer Woodfold requires industrial-zoned land for its planned expansion into the Focus Study Area. Access points from the Focus Study Area to OR 47 will also be reassessed to determine if the current proposal to add connections at Laurel Street and Martin Road (while closing the existing Oak Street access) west of OR 47 provide the best option for enhancing mobility and access to the Focus Study Area, given the access control privileges held by ODOT.

Moreover, the need for a detailed market analysis has arisen from the desire to better understand the potential adverse impacts that future large-scale commercial zoning in the Focus Study Area could have on neighborhood businesses located in the Town Center area as well as existing commercial development along the Pacific Avenue corridor which features much of the large-format retail that has been proposed in one section of the Focus Study Area. Enhanced multimodal access from the HCT station (at Laurel or Oak Street) to adjacent neighborhoods to the south is seen as an optimal solution to preserving and facilitating commerce along Pacific Avenue. However, this depends principally on the status of freight service along the PNWR line, which will ultimately determine if railroad crossings can be added and/or enhanced along the corridor to provide these significant connections.

Figure | 8 | *Final Preferred Alternative HCT Alignment and Stations*

Metro HCT System Expansion Policy

The System Expansion Policies (SEP) framework found in Metro's *HCT System Plan* was developed to advance future regional corridors through a series of performance criteria. When considering potential transit corridors, the policies help guide ridership development, support the creation of TOD, support station area planning policies as well as guide strategic right-of-way acquisition.

Metro's SEP is designed to help guide actions by local jurisdictions that build a market for HCT and orient local investments and policy changes toward a supportive community environment. The table below identifies specific SEP measures that local jurisdictions are encouraged to assess and improve. The SEP does not set specific targets that guarantee advancement in regional priority status for HCT investment. Rather it sets a framework by which communities or corridor working groups (multiple communities) can track progress toward reprioritization occurring at every RTP cycle. A more robust set of criteria (Multiple Account Evaluation criteria used in the *HCT System Plan*) will be used for each RTP update.

The Final Preferred Alternative features the HCT alignment of Alternative 1 and the general development plan of Alternative 2, as presented in the Alternatives Evaluation Report. As a result, the Final Preferred Alternative will perform comparably with Alternative 1 in most of the 2040 Context Tool measures because it will not serve the Focus Study Area (which is projected to receive the highest development density and highest quality of new connections throughout the Project Study Area) as directly as Alternative 2. Furthermore, any new redevelopment, sidewalk retrofitting, or bicycle facility expansion south of the PNWR line is expected to occur piecemeal over an extended period of time. Instead, the Preferred Alternative will serve more of the existing population, which is likely to be lower-income. As a result, housing and transportation costs for these individuals will constitute a higher percentage of total income compared to the majority of new residents that would locate in the Focus Study Area TOD, who in all likelihood would be more affluent. The Preferred Alternative will also serve existing Pacific Avenue commercial development located to the south.

See Table 4 for a more detailed description of 2040 Context Tool criteria and the SEP scorecard for the Final Preferred Alternative. Comparisons are provided between the Final Preferred Alternative and Metro-designated town centers featured in the *State of the Centers Report* (May 2011) that contain TOD elements oriented around a existing or planned HCT line (including Orenco Station, Hollywood, Sunset Transit Center, Milwaukie and Lake Oswego). The report gives a Metro Context Score to each activity center profiled within that is a composite based on factors thought to contribute to the vibrancy, economic strength and diversity of an area, including access to transit, access to parks, density of sidewalks and bicycle routes, people per acre, average block size and availability of private amenities.

Table 4 | *Metro 2040 Context Tool Criteria and Findings*

Measure	Description	Findings	HCT-Served Town Centers
Density of People	Current households and jobs per net acre within ½ mile of the transit station	Based on block acreages and densities, the Final Preferred Alternative would feature net densities of 21.8 – 37.5 residents (or **8.7 – 15 households**)/acre. Generally, blocks located closer to the HCT stations will feature higher densities than those on the periphery of the Focus Study Area. Under buildout conditions, there would be a potential net worker density of 15.1 jobs/acre (for a total of **36.9 – 52.6 people per acre**). In the most optimistic projections, the Focus Study Area would achieve far higher residential and employment densities than currently estimated for the whole Project Study Area. See Appendix A and B for calculations concerning projected employment and residential density for the Final Preferred Alternative, which used housing occupation and land-use employment density assumptions provided by Johnson Reid.	***People/Acre (HH/Acre):*** Hollywood: 60.1 (12.1) Lake Oswego: 25.8 (8.7) Lents: 22.2 (7.2) Milwaukie: 16.9 (4.5) Orenco: 24.1 (10.5) Sunset: 39.2 (4.2)
Density of ULI Businesses	Number of Urban Livable Infrastructure (ULI) Businesses within ½ mile. (ULI refers to the range of urban amenities available, which can add value to an area in the form of higher achievable pricing for residential development.)	According to data provided by Metro, there are 24 businesses classified as Urban Living Infrastructure (amenities) within the Project Study Area. These are businesses that contribute to the liveability of an area and can include coffee shops, dry cleaners, and grocery stores. While the Project Study Area does not presently contain a sizable number of amenities, there is a slightly higher gross ULI density south of Pacific Avenue (**.09/acre**) compared to north (**.03/acre**). The TOD area in the Focus Study Area will likely feature new amenities in the form of large-format retail and neighborhood commercial located within mixed-use properties. The ULI density of the Focus Study Area is expected to outstrip amenity densities found elsewhere in the Project Study Area since the Focus Study Area is generally undeveloped and provides the greatest opportunity for higher density development.	***Amenities/Acre:*** Hollywood: .44 Lake Oswego: .3 Lents: .06 Milwaukie: .08 Orenco: .11 Sunset: .05
Transit Oriented Zoning	Assigning values to regional zoning classifications within ½ mile. (Examples of transit oriented zoning are mixed-use, high-density zones with no minimum parking regulations.)	Based on current Comprehensive Plan designations derived in the *1985 Forest Grove Comprehensive Plan*, 28% of the Project Study Area is zoned for commercial, the majority of which is Community Commercial and supports mixed-use development. 32% of the Project Study Area is dedicated for high-density residential, 27% is allocated for industrial uses, 8% is set aside for public/institutional uses, and the remainder is set aside for low- and medium-density residential and parkland. The enactment of new TOD zones would help foster growth in the Focus Study Area.	N/A (Metric not included in *State of the Centers Report*)

Measure	Description	Findings	HCT-Served Town Centers
Average Block Size	Density of acres of blocks within ½ mile	Implementing smaller block sizes as part of a highly connected street grid improves multimodal access and shortens walking distances between destinations in a TOD. Small block sizes may also be an indicator of higher transit mode split, as well. The Project Study Area contains existing block sizes at an average of 12.24 acres. If the blocks that comprise the Focus Study Area are removed, the average existing block size in the Project Study Area is 8.89 acres. The Final Preferred Alternative would feature average block sizes much smaller than the existing Project Study Area (average of 2.65 acres/block) due to the opportunity of constructing a highly connected street grid in the Focus Study Area.	N/A (Included in the tabulation of Metro 2040 Context Score, however this information is not provided in the *State of the Centers Report*.)
Sidewalk and Bicycle Facility Coverage	Completeness of sidewalk infrastructure within ½ mile and access to bicycle infrastructure measured as distance to nearest existing bicycle facility within ½ mile	The Laurel Station walkshed in the Final Preferred Alternative is meant to serve a large portion of Focus Study Area, where new TOD would feature the highest bicycle and sidewalk facility coverage throughout the Project Study Area, at or close to 100%. However, sidewalk and bicycle lane connectivity is sporadic in neighborhoods south of the PNWR line. According to an audit of sidewalk facilities by the City as well as analysis using ArcGIS, only 32% of roadways within the Project Study Area feature sidewalks on at least one side of the street. An even lower percentage of streets feature bicycle facilities (17%, consisting of lanes along Pacific and 19th Avenues).	N/A (Included in the tabulation of Metro 2040 Context Score, however this information is not provided in the *State of the Centers Report*.)
Transit Frequency	Transit frequency within ½ mile of corridor	TriMet bus line #57 is a Frequent Service line that travels along OR 8 from Beaverton to Forest Grove and is the only fixed-route transit service currently offered within the city. Depending on the fate of the #57 Frequent Service bus, a new HCT line along the PNWR railroad could potentially augment transit service within Forest Grove. However, it is probable that the HCT would likely supplant #57 service for at least some or its entire route within Forest Grove or at least reduce frequencies. In the case that #57 service is replaced, the PNWR alignment of the Final Preferred Alternative located a quarter-mile north of Pacific Avenue would serve existing communities within Forest Grove while containing the majority of the Focus Study Area within the ½ mile transit shed at Laurel Street.	N/A (Metric not included in *State of the Centers Report*)
Housing & Transport Affordability	Demonstrating that potential transit investment will serve communities with high rate of cost burdened households	American Community Survey (ACS 2009) data finds that the median household income for properties north of Pacific Avenue is $24,291 while for households south of Pacific Avenue it is $40,037 (unweighted average is **$32,164**). According to the Center for Neighborhood Technology (CNT), housing and transportation costs make up 55% of the median household income in the area south of Pacific Avenue, while these costs make up an astonishing 81% of the household income north of Pacific. The CNT has defined an affordable range for housing and transportation combining to consume no more than 45% of income. The Preferred Alternative is designed to serve these existing communities that feature a high rate of cost burdened households.	***Median HH Income:*** Hollywood: $38,215 Lake Oswego: $67,849 Lents: $49,340 Milwaukie: $48,115 Orenco: $75,054 Sunset: Not Provided

Measure	Description	Findings	HCT-Served Town Centers
Parking Requirements	Implement parking requirements in corridor that meet or exceeds Title 4 of the *Regional Transportation Functional Plan* (RTFP).	The City of Forest Grove has updated its Off-Street Parking Requirements in the *Development Code* to meet the requirements stipulated in Table 3.08-3 of Metro's *Regional Transportation Functional Plan*. Because reduced parking capacity is a hallmark of TOD, it is reasonable to conclude that requirements for parking will be stricter within the Focus Study Area than the Project Study Area as a whole. However, parking regulations are not necessarily contingent on adoption of the Final Preferred Alternative.	N/A
Local Funding Mechanisms	Implement funding mechanisms for corridor communities that could help fund capital or operations to support transit investment and station area development, including urban renewal, tax increment financing, local improvement district, parking fees, or other proven funding mechanisms.	The City of Forest Grove is interested in incorporating a number of funding mechanisms in order to establish a viable revenue stream for the project. These instruments include establishing an urban renewal district that could include the Project Study Area and implementing tax increment financing to capitalize on new development after HCT is built. The Final Preferred Alternative likely has little bearing on the availability of funding sources but can ease the cost of implementation due to its use of the PNWR ROW.	N/A
Equity	Looking at low-income, minority, senior and disabled populations within corridor.	Based on ACS data, the area to the north of Pacific Avenue is estimated to feature a higher proportion of minorities compared to the total population, as well as a roughly equal proportion of elderly. Households generally receive lower income north of Pacific, and are more likely to be renter-occupied and/or be below the poverty line. (**28% owner-occupied households south of Pacific; 39% north; 31% in Project Study Area**). Generally fewer vehicles are available for households located north of Pacific compared to south, as well. Furthermore, commuters living north of Pacific generally face longer commutes and use a means of transportation other than driving themselves to work compared to their counterparts to the south. Given examples from recent TODs in the Portland region, new residential development in the Focus Study Area may be more attainable for wealthier consumers than those residing currently within the Project Study Area. These consumers will likely have more vehicles available to them and earn higher incomes than the current median household income either north or south of Pacific Avenue. Therefore, the PNWR alignment of the Final Preferred Alternative would serve populations that arguably have the highest need (existing residents) for high-quality transit investment in addition to choice riders (new residents).	***Rate of HH Ownership:*** Hollywood: 36% Lake Oswego: 43% Lents: 51% Milwaukie: 39% Orenco: 22% Sunset: Not Provided

Description of Alternatives

Prior to the formulation of the Final Preferred Alternative, the project team identified three land-use and transportation alternatives, Alternative 1: PNWR Alignment, 2A: Northern Alignment (with Martin Road Option), and 2B: Northern Alignment (with PNWR Option) that addressed the City of Forest Grove's goal of bringing HCT to Forest Grove. All alternatives would feature mixed-use neighborhood retail/ residential, large-scale commercial and light industrial development.

Alternative 1, or "Constrained Alternative", assumes that most existing constraints and barriers to development would remain, including the existing substations, (rerouted) transmission lines, continuing freight service along the PNWR line, and a platted, though unbuilt, residential subdivision at the western end of the Focus Study Area. HCT would travel west from Hillsboro along the PNWR alignment throughout the Project Study Area before terminating in the Forest Grove Town Center. Intermediate stations would be provided at Laurel Street and Elm Street (Phased). Figures 9 and 10 provide the general HCT alignment throughout Forest Grove and Focus Study Area Illustrative Plan.

Figure | 9 | *HCT (PNWR) Alignment and Stations - Alternative 1*

Alternative 2, or "Unconstrained Alternative", assumes that the aforementioned constraints have been ameliorated to enable the highest possible development potential within the Focus Study Area. The HCT line would approach from the east along the PNWR line before deviating to the north, just west of Quince Street, to serve the heart of the Focus Study Area along an extended Martin Road. From here, there are two options: Option A would rejoin the PNWR line east of Hawthorne Street and continue towards the Town Center terminus. Option B would continue on a northerly path along Martin Road Extended before turning south on Cedar Street and rejoining PNWR ROW near Pacific Avenue. Intermediate stations would be provided at Laurel Street (Both A and B), Elm Street (Phased; A), and Douglas Street (Phased; B). Figures 11 and 12 provide the Focus Study Area Illustrative Plan and general HCT alignment throughout Forest Grove.

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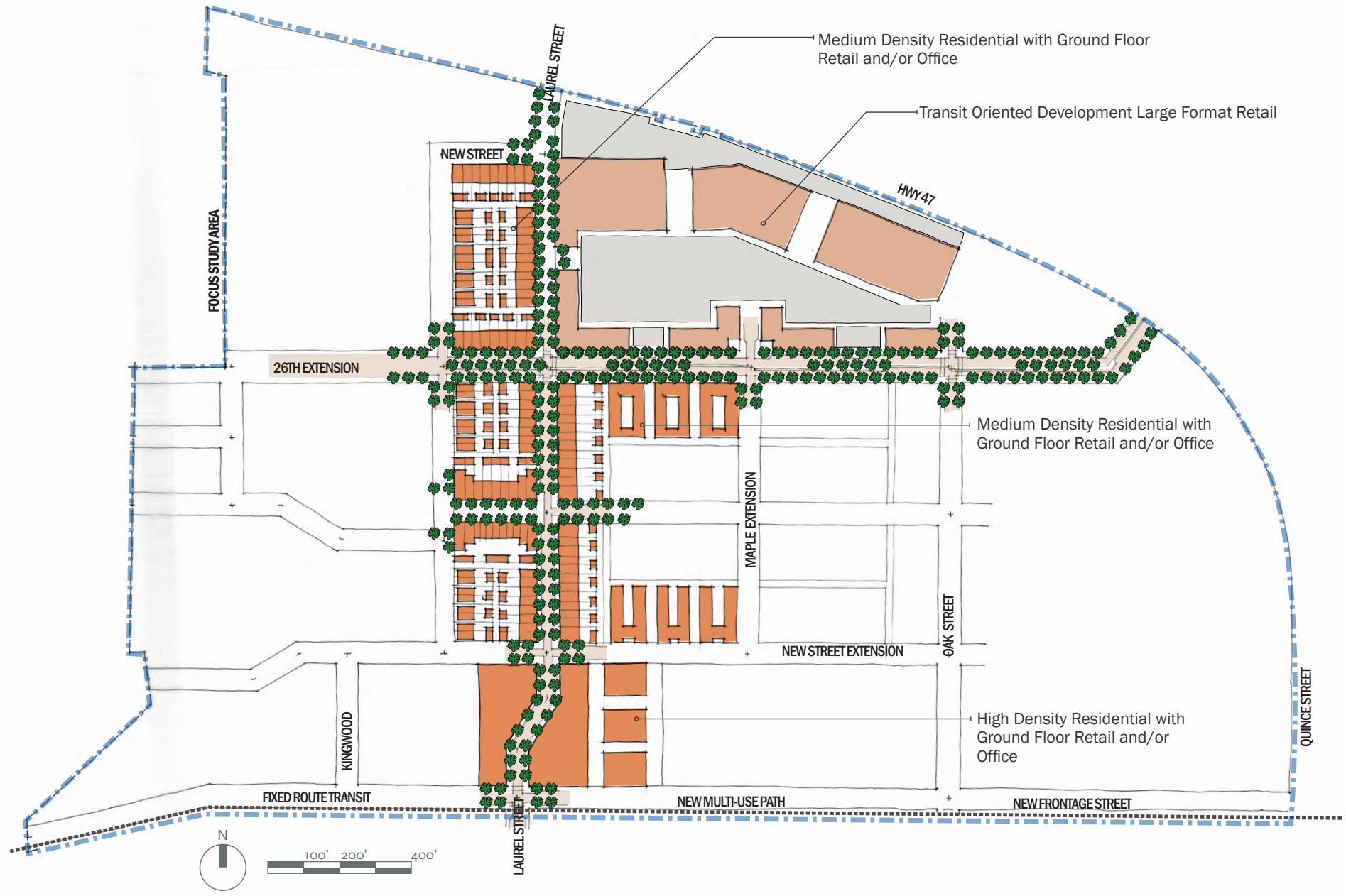

Figure | **10** | *Alternative I (PNWR) Illustrative Plan*

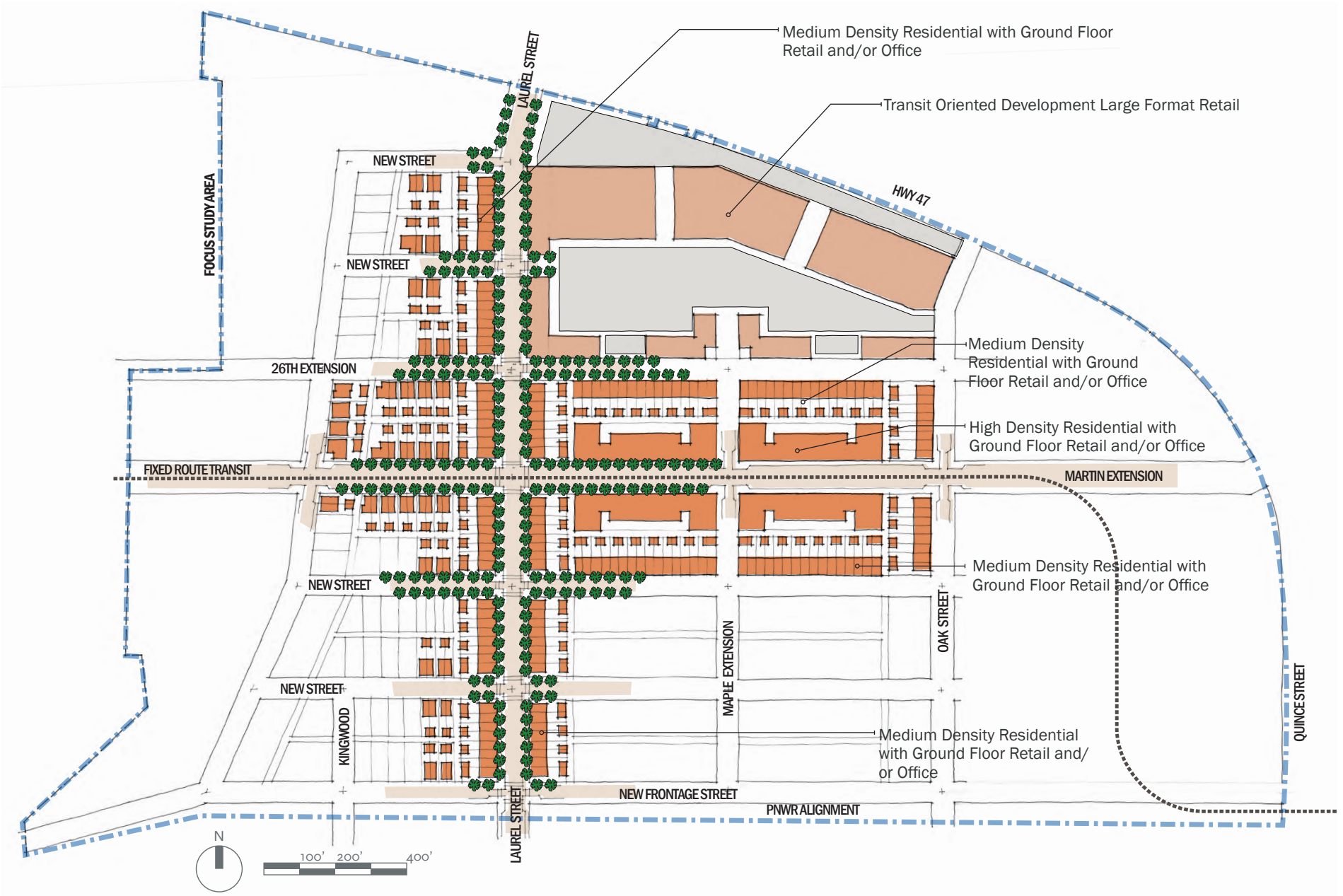

Figure | **11** | *Alternative 2 (Northern) Illustrative Plan*

Table 5 | *Issues Common to Alternatives*

Measure	Findings
Multiple-Use Track	The current PNWR track carries freight rail traffic to lineside industries in Forest Grove. An alignment using this ROW may potentially have to share the track with freight trains, which may subject the construction and operations of future HCT to the regulations set forth by ODOT's Rail Division and the Federal Railroad Administration. The Northern Alignment would divert from this ROW and serve the Focus Study Area more directly.
Number of Stations	Each alternative features the opportunity for two to three stations along the HCT alignment to serve Forest Grove, including the Focus Study Area and Town Center. However, there are variations in the location and phasing of the stations and their corresponding transit sheds.
Economic Development Potential	This is partially determined by the availability of vacant and underutilized properties within ½ mile of potential stations. Industrial and strip commercial buildings nearing the end of their functional lifespan may be a suitable option for redevelopment. The Northern Alignment may provide greater leverage to redevelop these sites than the PNWR Alignment, since there are fewer opportunities for redevelopment south of the PNWR line due to existing commercial and residential uses. However, much of the transit shed in Alternative 2 would be located outside the UGB, which preclude the possibility of new development for the foreseeable future.
Substations and Transmission Lines	Bonneville Power Administration (BPA) and the City of Forest Grove operate separate electric substations along Oak Street within the Focus Study Area, with transmission lines radiating from the northwest and northeast. Depending on the assumptions of project constraints, the alternatives considered the possibility of rerouting the transmission lines and/or relocating the substations outside of the Focus Study Area to increase the area's development potential (see Table 9).
Employment vs. Housing Balance	The jobs-housing balance for the Focus Study Area is not dependent on either alternative. Each alternative would feature community, large-format retail and industrial on the periphery of the Focus Study Area fronting OR 47, while the interior would feature neighborhood retail in mixed-use residential buildings.
Alignment	Each alignment considered has its benefits and drawbacks. The Northern Alignment would serve the heart of the Focus Study Area and allow for new development to surround the HCT on both sides, but would be further removed from current development along Pacific Avenue. The PNWR Alignment would better serve these existing residential and commercial uses south of the rail line but initiating new redevelopment opportunities in that area will be a slow, deliberative process.
Rail Crossings	The number and type of rail crossings is not dependent on which alternative is chosen. Regardless of where HCT is routed through the Focus Study Area, sustained freight traffic along the PNWR track will hamper access for automobiles, pedestrians, and bicycles traveling to and from existing neighborhoods to the south. However, routing HCT along the PNWR Alignment may hasten the discontinuation of freight traffic from the line and allow for greater freedom of instituting at-grade rail crossings than currently permitted by ODOT's Rail Division. This would help connect both sides of the tracks rather than isolate the new TOD away from established neighborhoods.
Industrial Replacement	Replacement of industry currently in the vicinity of 23rd Avenue is not dependent on either alternative, as all options considered could potentially allow for new industrial development between Oak and Quince Streets while freeing up land to the west for redevelopment.
Access to Oregon Route 47 and Street Connectivity	Street connectivity is expected to be optimal within the Focus Study Area under each alternative. Access points to OR 47, a major freight and bypass route, will depend on ODOT modifying access control privileges to provide multiple new entrances from the highway to the Focus Study Area while potentially closing Oak Street. HCT would run closest to OR 47 using the Northern Alignment.
Proximity to Pacific Avenue	The PNWR Alignment of Alternative 1 affords the greatest access to existing development along Pacific Avenue and other destinations such as the Jennings-McCall Center, McMenamin's Grand Lodge and Tuality Hospital.

(Continued from Page 23)

Ranking The Alternatives

As part of the Alternatives Evaluation phase of this study, the three alternatives were ranked according to criteria within Metro's SEP using the 2040 Context Tool that considered issues such as density of people, equity, housing and transportation affordability, and average block size, as well as the categories found in the "Issues Common to Alternatives" section of the Alternatives Development Report such as economic development potential, street connectivity, avoiding conflicts with existing freight rail operation and regulations, and traffic impacts. This assessment served to guide the City using a scoring system that resembles what Metro would use when establishing benchmark targets during the corridor prioritization process. Table 5 displays the findings for "Issues Common to Alternatives" that were made in the Alternatives Evaluation Report. The alternatives were also measured in regards to transportation system impacts that were determined by the Traffic Sensitivity Analysis included in this document. The strategy does not include capital expenditures for each alternative.

The alternative that scored highest was Alternative 2B, followed closely by Alternative 2A. Alternative 2B scored the highest due to the assumption that the Focus Study Area would feature the highest densities of people and amenities, highest quality pedestrian and bicycle connections, and the most transit-oriented zoning policies. The Northern Alignment for Alternative 2 would serve the Focus Study Area most directly and allow for new development to occur on either side of the corridor. Alternative 1 finished third, although it scored highest in the categories of equity, housing and transportation affordability, and proximity to destinations along Pacific Avenue.

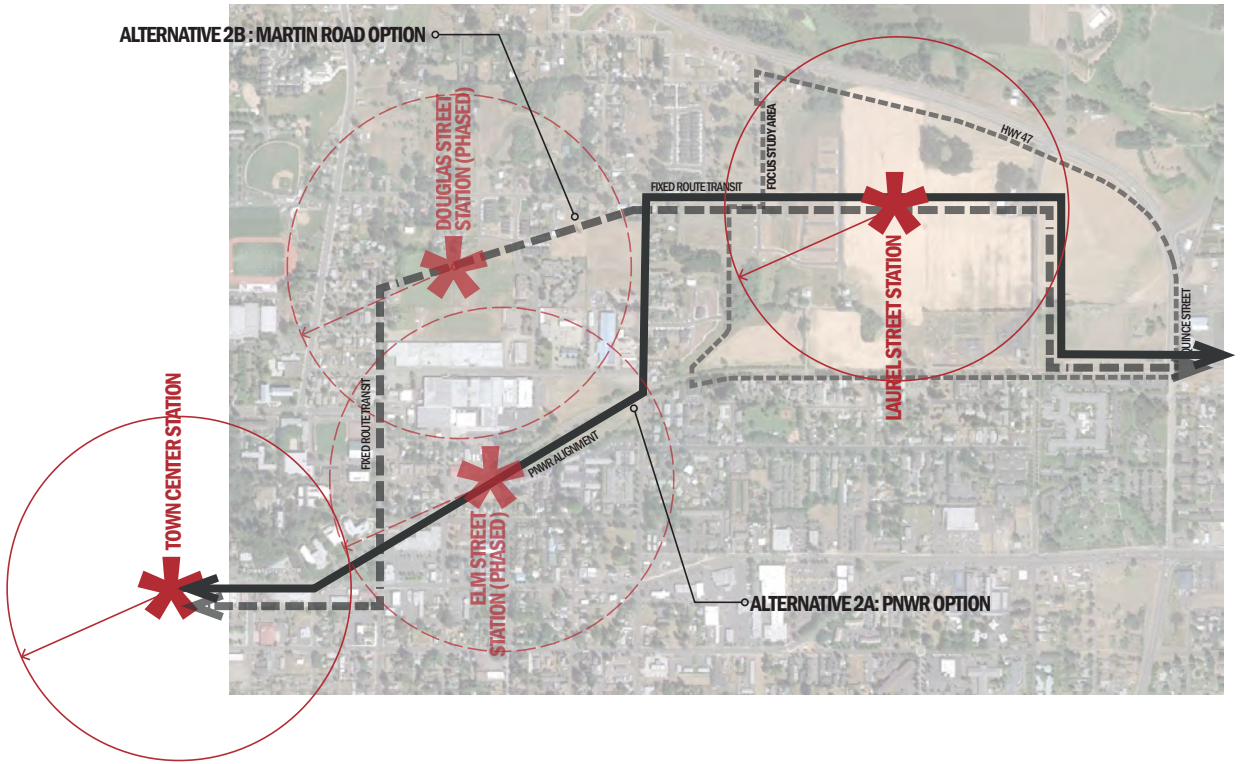

Figure | 12 | *HCT (Northern) Alignment and Stations - Alternative 2*

Between the completion of the Alternatives Development and Alternatives Evaluation reports, the project team decided to introduce a modified form of Alternative 1 as the "Preferred Alternative". This new alternative would include an extension of Martin Road as seen in Alternative 2. Martin Road retains the function of a "Through Street" while Laurel Street continues as a "Main Street". In addition, existing constraints such as the substation and the transmission lines would be removed from the Focus Study Area. Therefore, the development pattern (block sizes, number of blocks, land uses) and number of dwelling units would mirror those found in Alternative 2.

When considering many of the Metro SEP criteria, including those measuring higher density mixed-use development, Alternative 2 has an advantage since it more readily serves the mostly vacant Focus Study Area that is assumed

to develop into a robust TOD. The Northern Alignment along Martin Road would serve the TOD focus area more directly than Alternative 1, therefore Alternative 2 (Options A or B) would be best suited to meet many of the goals articulated in the SEP. However, in the interest of serving the highest number of transit-dependent riders (including the elderly and those living in cost-burdened households) the categories of *equity* and *housing and transportation affordability* have been identified as key criteria that should receive greater priority when determining which alternative to pursue as the City moves forward.

In addition to issues of equity and housing and transportation affordability, the Preferred Alternative addressed several other issues. First, there is the issue of TOD phasing. HCT built along the PNWR line would be able to serve existing neighborhoods immediately and more directly than Alternative 2, while development in the Focus Study Area is being ramped up. Alternative 2 would deviate from the PNWR line within the Focus Study Area and, as a result, would be less convenient for residents and patrons of establishments along Pacific Avenue; delay in construction of the TOD could result in a preponderance of undeveloped land directly adjacent to the station for many years following the advent of HCT. In addition, the quarter-mile transit shed for the Laurel Street station in Alternative 1 would serve a greater number of existing and future residents. The transit shed for the Alternative 2 Laurel station would encompass land outside of the urban growth boundary, which is not subject to development.

The stations of the Preferred Alternative would be identical to Alternative 1. The Laurel Street and Town Center stations would be built at the onset with a third station at Elm Street to be phased in at a later date as costs and development opportunities permit. See Figure 13 for a diagram of the earlier draft version of the Preferred Alternative.

Traffic Analysis

The assessment of traffic impacts associated with the various development alternatives and residential densities was conducted using a sensitivity approach. The primary objective was to identify the potential magnitude of impacts for each alternative, particularly in relation to the analysis, assumptions and project recommendations in the City's *Draft Transportation System Plan* (TSP) dated June 2010. The analysis focuses on the 2030 PM peak hour, and was conducted using the following steps:

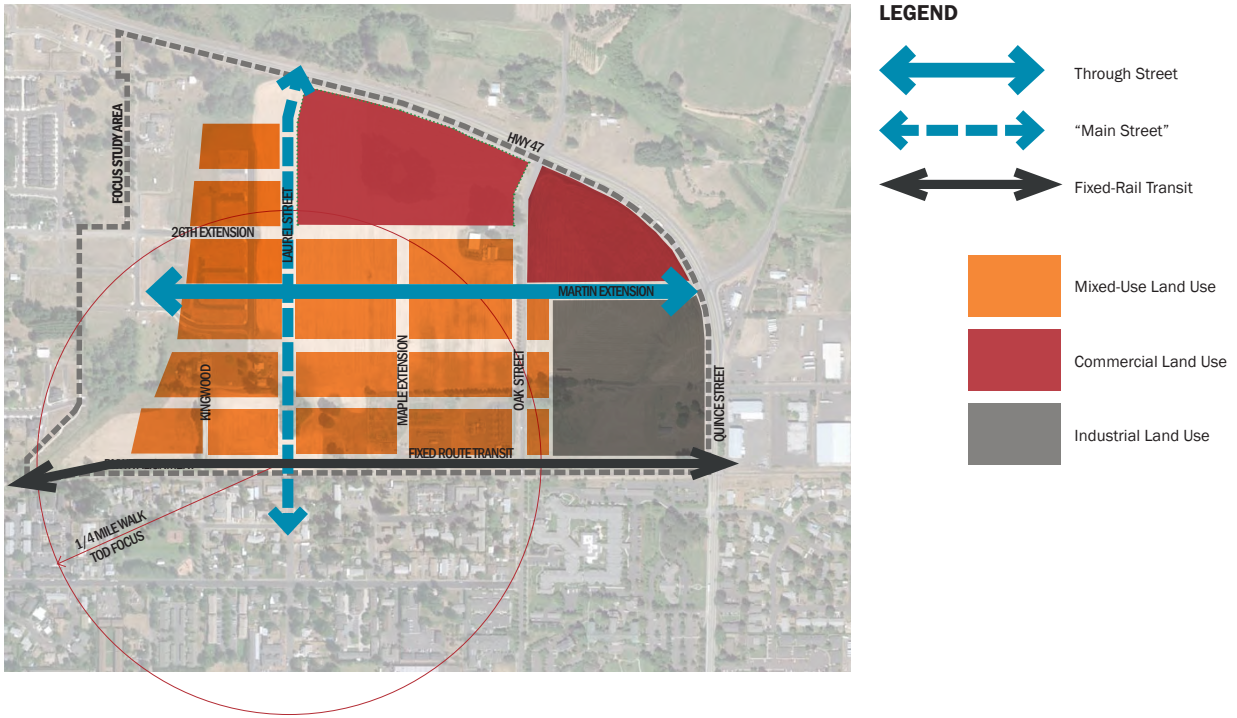

Figure | **13** | *Draft Preferred Alternative*

1. Anticipated 2030 PM peak hour congestion locations were identified based on output from the regional travel demand model used in preparation for the City's draft TSP (based on access management alternative 2 which includes a direct connection between the study area and Martin Road along with an east/west street through the TOD site connecting to Sunset Drive).

2. Anticipated 2030 PM peak hour intersection congestion was identified based on the analysis conducted for and documented in the draft TSP.

3. A comparison was made of trip generation in the study area for development based on the existing *Comprehensive Plan* versus each of the project site development alternatives.

4. This comparison was applied to the locations of anticipated congestion from the TSP and an indication of potential increases or decreases in expected congestion levels was identified.

No intersection or highway operations analysis was conducted for this effort. This level of analysis will be prepared in conjunction with the Recommended Land Use and Transportation Alternative as part of a future corridor-wide study effort.

2030 Congested Street and Roadway Segments

Review of output from the regional travel demand model (for access alternative 2) indicates that there are several street and highway segments near the study area that are expected to be congested during the 2030 PM peak hour. These include:

- Along westbound OR 8 through Cornelius, from approximately 19th Avenue to west of 10th Avenue (volume-to-capacity ratio [v/c] expected to exceed 1.00).[1]

- Along westbound OR 8 through Cornelius and Forest Grove, from west of 10th Avenue to approximately Mountain View Lane (v/c of 0.96 expected).

- Along westbound Pacific Avenue in Forest Grove, between Maple and Hawthorne Streets (v/c of 0.90/0.91 expected).

- Along southbound Quince Street (OR 47), between the railroad crossing and Pacific Avenue (v/c of 0.84 expected)

2030 Congested Intersections

Review of the draft Forest Grove TSP identified several intersections in the vicinity of the project site that are expected to experience significant congestion during the 2030 PM peak hour. These intersections include:

- OR 47 at Martin Road – expected v/c of >1.00 with level of service (LOS) F.

- OR 47 at 24th Street – expected v/c of > 1.00 with LOS F.

- OR 47 (Quince Street) at OR 8 (Pacific Avenue) – expected v/c of 0.93 with LOS F.

- OR 47 at 19th Street – expected v/c of > 1.00 with LOS F.

- Pacific Avenue at Maple Street – expected v/c of 0.87 with LOS C.

- Adair Street at Yew Street – expected v/c of > 1.00 or LOS F.

Comparison of Trip Generation for Alternatives

Table 6 summarizes the trip generation data for the original two land use alternatives. As indicated in the table, the daily traffic volumes anticipated with three of the four project alternatives are all expected to be higher than what is anticipated based on the existing *Comprehensive Plan* and current levels of transit service (upon which the analysis in the TSP is based). The exception would be Alternative 1, with minimum residential densities, where a 7 percent decrease in daily trip generation is expected.

[1] **Vehicle Volume-to-Capacity (v/c) Ratio:** Volume-to-capacity ratio is a conventional level-of-service measure for roadways, comparing roadway demand (vehicle volumes) with roadway supply (carrying capacity). A V/C Ratio of 1.0 or greater indicates that the roadway segment is operating at capacity and there is severe congestion as a result.

[2] **Level of Service (LOS):** Level of service is a term used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, delay, and safety. The level of service of a facility is designated with a letter, A to F, with A representing the best operating conditions and F the worst.

Alternative 1 with minimum residential densities would generate approximately 57 percent less traffic during the AM peak hour and 29 percent less traffic during the PM peak hour than could be expected with the existing *Comprehensive Plan*. With maximum residential densities, this alternative would generate about 41 percent less traffic in the AM peak hour and 9 percent less traffic during the PM peak hour.

Alternative 2 with minimum residential densities would generate about 48 percent fewer AM peak hour trips than would the existing *Comprehensive Plan*, with 18 percent fewer trips during the PM peak hour. With maximum residential densities, this alternative would generate about 27 percent less traffic in the AM peak hour, but 9 percent more traffic during the PM peak hour. This alternative and time period represents the only condition where site generated traffic volumes are expected to exceed the level of traffic that could be experienced based on build-out of the existing *Comprehensive Plan*.

Potential Impact of Project Alternatives on 2030 Congested Locations

As noted in the summary of trip generation discussed above, only one alternative is expected to contribute to a worsening of 2030 AM or PM peak hour traffic congestion over conditions with build-out under the existing *Comprehensive Plan*. When compared with the summary roadway segments and intersections that are expected to see significant congestion in 2030, each alternative would likely have a positive impact on reducing expected levels of congestion. Alternative 2 with maximum residential densities would likely see only a slight worsening of congestion at critical locations. This is because the total difference in PM peak hour traffic with this alternative in comparison to *Comprehensive Plan* build-out is very small at individual locations.

Table 6 | *Comparison of Trip Generation Estimates for Alternatives*

Time Period	Existing Comp. Plan	Alt. 1 - Constrained		Alt. 2 - Unconstrained	
		Min Density	Max Density	Min Density	Max Density
Daily	5,931	5,532 (-7%)	7,231 (+22%)	6,518 (+10%)	8,821 (+49%)
AM Peak Hour	690	296 (-57%)	405 (-41%)	360 (-48%)	507 (-27%)
PM Peak Hour	712	508 (-29%)	650 (-9%)	587 (-18%)	779 (+9%)

For example, in the outbound direction, traffic volumes would increase by 158 vehicles from the site, while inbound traffic would drop by 92 vehicles. Based on a zonal loading from the regional model, approximately 19 percent of these trips would use Martin Road, adding approximately 30 vehicles to the expected level of traffic traveling in the northbound direction and reducing the expected level of traffic traveling southbound on this road by 17 vehicles. Similarly, this alternative would add approximately 60 outbound vehicles to the intersection of Quince Street with Pacific Avenue, while reducing the inbound traffic by approximately 35 vehicles. This estimate is calculated based on the model, which shows that approximately 38 percent of the site traffic would travel through this intersection. The math is 38 percent times +158 for the outbound direction which equals +60 vehicles, and 38 percent times -92 for the inbound direction which equals -35 vehicles.

Table 7 | *Transportation Cost Estimates for Preferred Alternative*

Street Type	Location	Length through Study Area (Feet)	Cost
Through Street	East-West Through Street at Martin Road/26th Avenue	3,200	$5,992,000
Side Street	North-South Street at Laurel Street	2,100	$2,751,000
Side Street with Fixed-Route Transit	East-West at RR Tracks	3,500	$7,875,000
Neighborhood Route	East-West and North-South New Streets	12,360	$13,575,500
TOTAL ESTIMATED COST			**$30,193,000**

Table 8 | *Water and Sewer Cost Estimates for Preferred Alternative*

	Item	Amount	Unit Price	Cost Estimate
Water	12-inch Water Main	20,000 LF	$120 per LF	$2,400,000
	12-inch valves	40	$5,000 EA	$200,000
	Fire hydrant/valve	90	$2,000 EA	$180,000
			Contingency (40%)	*$1,112,000*
			Subtotal - Water	**$3,892,000**
Sewer	12-inch Sewer Main	18,500 LF	$100 per LF	$1,850,000
	Manholes	60	$5,000 EA	$300,000
			Contingency (40%)	*$860,000*
			Subtotal – Sewer	**$3,010,000**
TOTAL ESTIMATED COST				**$6,902,000**

'End-of-Line' Study

Given Forest Grove's location at the extreme western edge of the Urban Growth Boundary (UGB), it is plausible that any future application of HCT service west of Hillsboro (either by extension of MAX light rail or other modes) will likely terminate in Forest Grove instead of continuing beyond the city limits. Comparable with other end-of-the-line transit stations located in the postwar suburbs, the challenge herein lies in fostering pedestrian-oriented TOD in an environment characteristically accommodating to park-and-ride commuters replete with spatially inefficient parking facilities and other automobile-centric infrastructure.

To that end, an internal report was prepared that identifies several examples of "end-of-line" cities around the country - where existing high-capacity transit lines have been extended or are in the planning, design, or construction phase of the extension - to serve as examples for the City of Forest Grove. The examples are in suburban Dallas, Denver, Los Angeles, and San Francisco, and briefly describe transit service characteristics, provide a brief community overview, and summarize station area planning efforts and actual/planned TOD around the existing/future station areas. The findings from this memorandum informed the development and evaluation of project alternatives that were further described in the Alternatives Development and Alternatives Evaluation reports.

CAPITAL EXPENDITURES

Public infrastructure improvements are a critical component of new TOD investment, and include constructing streets, trails and other facilities to enable multimodal connections between surrounding uses and transit, utility capacity expansions necessary for higher intensity development, and public amenities such as streetscape improvements and landscaping. Based on the specifications of the Final Preferred Alternative, planning cost estimates have been made for new transportation utility upgrades based on the 4-mile length of new streets within the Focus Study Area. In addition, estimates have also been made with regards to relocating the transmission lines and consolidating the power substations on Oak Street in order to reduce the footprint of these constraints and limit their impact on future TOD projects.

Transportation

A number of local street improvements are designed to facilitate connections within the Focus Study Area and provide access to and from other locations in Forest Grove. The major improvements will involve extending Martin Road west from OR 47 to approximately Sunset Drive and extending Laurel Street north to intersect with OR 47. In addition, new access points across the PNWR will be established at Laurel and Maple Streets. The total transportation system cost for the Final Preferred Alternative is estimated at $30.19 million. No cost estimates have been included for HCT project elements not already associated with street construction (e.g., rail, stations, street crossing protection, etc.). Table 7 provides information on the general character of each street type, locations, and total length within the Focus Study Area.

Table 9 | *Transit Line Relocation Cost Estimates for Preferred Alternative*

New Transmission Line Segment	Length (in Feet)	Unit Price	Cost Estimate
OR 47	1560	$200 per FT	$312,000
Oak Street	1560	$200 per FT	$312,000
TOTAL ESTIMATED COST			**$624,000**

Water and Sewer Infrastructure

The Existing Conditions and Opportunities Report highlighted the limited extent of underground infrastructure within the Focus Study Area, which is currently undeveloped except for the substations and a small number of scattered residential units. There is an existing sewer line in the northwest reaches of the Focus Study Area, as well as water mains underneath much of Oak Street, Kingwood Street and the PNWR alignment east of the substations. At estimated costs of $139 per linear foot of water infrastructure and $116 per linear foot of sewer infrastructure, total expenditures for these utilities (including 40% contingency) would equal $6.9 million. Table 8 provides more detail on these outlays.

Transmission Lines

The BPA and Forest Grove substations on Oak Street have two transmission mainlines that emanate from the facilities, both of which traverse the Focus Study Area. While the substations and lines represent great constraints on future development in the area, the line that radiates to the northwest poses greater potential impact to future TOD investment because it segments the Focus Study Area and encroaches on land that has been envisioned as mixed-use residential. The northwest line is approximately 1,986 feet long within the Focus Study Area, while the northeast line is 1,206 feet long within the Focus Study Area. It is presumed that the northwest line would be relocated along Oak Street north before turning west onto OR 47. The northeast line would not be relocated because it would pass through industrial-zoned areas. Relocation of the electrical substation to increase developable land would likely cost several million dollars in addition to the cost estimates shown in Table 9.

Block	Housing Type(s) and Densities	Min # of Units	Max # of Units	Assumed HH Occupancy	Block Size (acres)	Number of Residents	Residential Density of Block (persons/ acre)
A	Townhouse (16 d/u) Compact Attached/ Detached (24 d/u)	24	36	2.5	1.52	60 - 90	39.5 - 59.2
B1	Townhouse (16 d/u) Compact Attached/ Detached (24 d/u)	35	53	2.5	2.21	88 - 133	39.8 - 60.2
B2	Townhouse (16 d/u) Compact Attached/ Detached (24 d/u)	42	63	2.5	1.58	105 - 158	66.5 - 100
B3	N/A (Open Space)	-	-	-	2.20	-	-
B4	N/A (Large-Format Retail)	-	-	-	2.20	-	-
C	Townhouse (16 d/u) Compact Attached/ Detached (24 d/u)	29	43	2.5	1.78	73 - 108	41 - 60.7
D	Townhouse (16 d/u) Mixed-Use Stacked Flats/Lofts (24 d/u)	34	51	2.5	2.11	85 - 128	40.3 - 60.7
E1	N/A (Urban Plaza)	-	-	-	1.32	-	-
E2	Mixed-Use Stacked Flats/Lofts (33, 35 d/u) Mixed-Use Townhouse (16, 40 d/u)	21	53	2.5	1.32	53 - 133	40.2 - 100.8
F	N/A (Large-Format Retail)	-	-	-	2.64	-	-
G	N/A (Large-Format Retail)	-	-	-	5.46	-	-
H	Townhouse (16 d/u) Mixed-Use Stacked Flats/Lofts (24 d/u)	43	65	2.5	2.71	108 - 163	39.9 - 60.1
I	Mixed-Use Stacked Flats/Lofts (33, 35 d/u) Mixed-Use Townhouse (16, 40 d/u)	42	106	2.5	2.64	105 - 265	39.8 - 100.4
J	Mixed-Use Stacked Flats/Lofts (33, 35 d/u) Mixed-Use Townhouse (16, 40 d/u)	42	106	2.5	2.64	105 - 265	39.8 - 100.4
K	Townhouse (16, 40 d/u)	10	24	2.5	0.61	25 - 60	41 - 98.4
L	Townhouse (16 d/u) Compact Attached/ Detached (24 d/u)	42	63	2.5	2.65	105 - 158	39.6 - 59.6

Block	Housing Type(s) and Densities	Min # of Units	Max # of Units	Assumed HH Occupancy	Block Size (acres)	Number of Residents	Residential Density of Block (persons/ acre)
M	Townhouse (16 d/u) Compact Attached/Detached (24 d/u)	42	63	2.5	2.64	105 - 158	39.8 - 59.8
N	Townhouse (16 d/u); Compact Attached/Detached (24 d/u)	42	63	2.5	2.64	105 - 158	39.8 - 59.8
O	Townhouse (16, 40 d/u)	10	24	2.5	0.61	25 - 60	41 - 98.4
P	Townhouse (16 d/u); Compact Attached/ Detached (24 d/u)	25	38	2.5	1.58	63 - 95	39.9 - 60.1
Q	Townhouse (16 d/u); Mixed-Use Stacked Flats/Lofts (24 d/u)	42	63	2.5	2.64	105 - 158	39.8 - 59.8
R	Townhouse (16 d/u); Mixed-Use Stacked Flats/Lofts (24 d/u)	42	63	2.5	2.64	105 - 158	39.8 - 59.8
S	N/A (Substation)	-	-	-	2.64	-	-
T	Townhouse (16 d/u); Compact Attached/Detached (24 d/u)	10	15	2.5	0.61	25 - 38	41 - 62.3
U	N/A (Industrial)	-	-	-	14.70	-	-
-	Remaining Land in Focus Study Area	-	-	-	68.71	-	-
Totals	**-**	**579**	**993**	**-**	**135 (Gross); 66.2 (Net); 35.1 (Residential Blocks)[1]**	**1443 – 2480**	**10.7 – 18.4 (Gross); 21.8 – 37.5 (Net); 41.1 – 70.7 (Residential Blocks)[2]**

[1] Gross acreage consists of entire Focus Study Area including streets. Net acreage excludes existing streets and the area of existing residential west of Kingwood Street. Residential Block acreage further excludes constraints such as substation and transmission lines, parks and open space, and commercial/industrial blocks that would not feature housing units.

[2] Gross Density assumes Gross acreage, Net density assumes Net acreage. Residential Block density assumes only the acreage of blocks that include housing.

Land Use	Total (Block) Land Acreage	Job Density Estimate (Per Acre)	Number of Employees
Mixed-Use (Neighborhood) Commercial	16.7	30	501
Large-Format (Community) Commercial	10.3	22	227
Industrial	14.7	18.6	274
Employment Land Totals	41.7	-	1002
Remaining Land Totals[1]	93.3	-	-
Overall Focus Study Area Totals	**135 (Gross); 66.2 (Net); 41.7 (Employment Block)[2]**	**-**	**1002**
Gross Job Density for Focus Study Area			**7.4/acre**
Net Job Density for Focus Study Area (Employment Block Job Density)			**15.1/acre (24/acre)**

[1] Remaining Lands include blocks reserved for single-use residential, streets, and existing land uses.

[2] Gross acreage consists of the entire Focus Study Area including streets. Net acreage excludes existing streets and the area of existing residential west of Kingwood Street. Employment Block acreage further excludes constraints such as substation and transmission lines, parks and open space, and blocks that would not feature employment uses (such as single-use residential blocks).