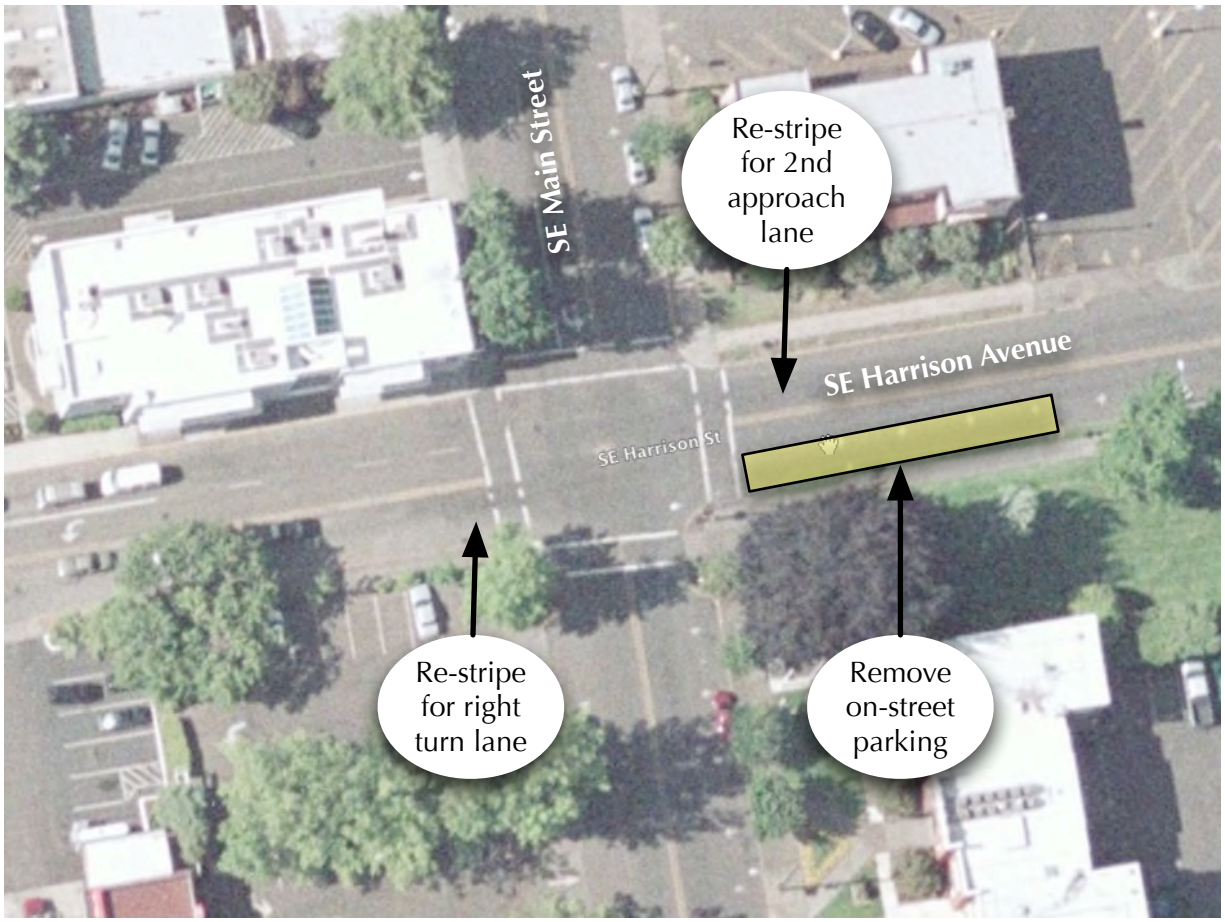
Appendix D

Conceptual Design Options

Archival Note: *Appendix D was created as part of the 2007 TSP update—it does not reflect the update process that was conducted in 2013.*

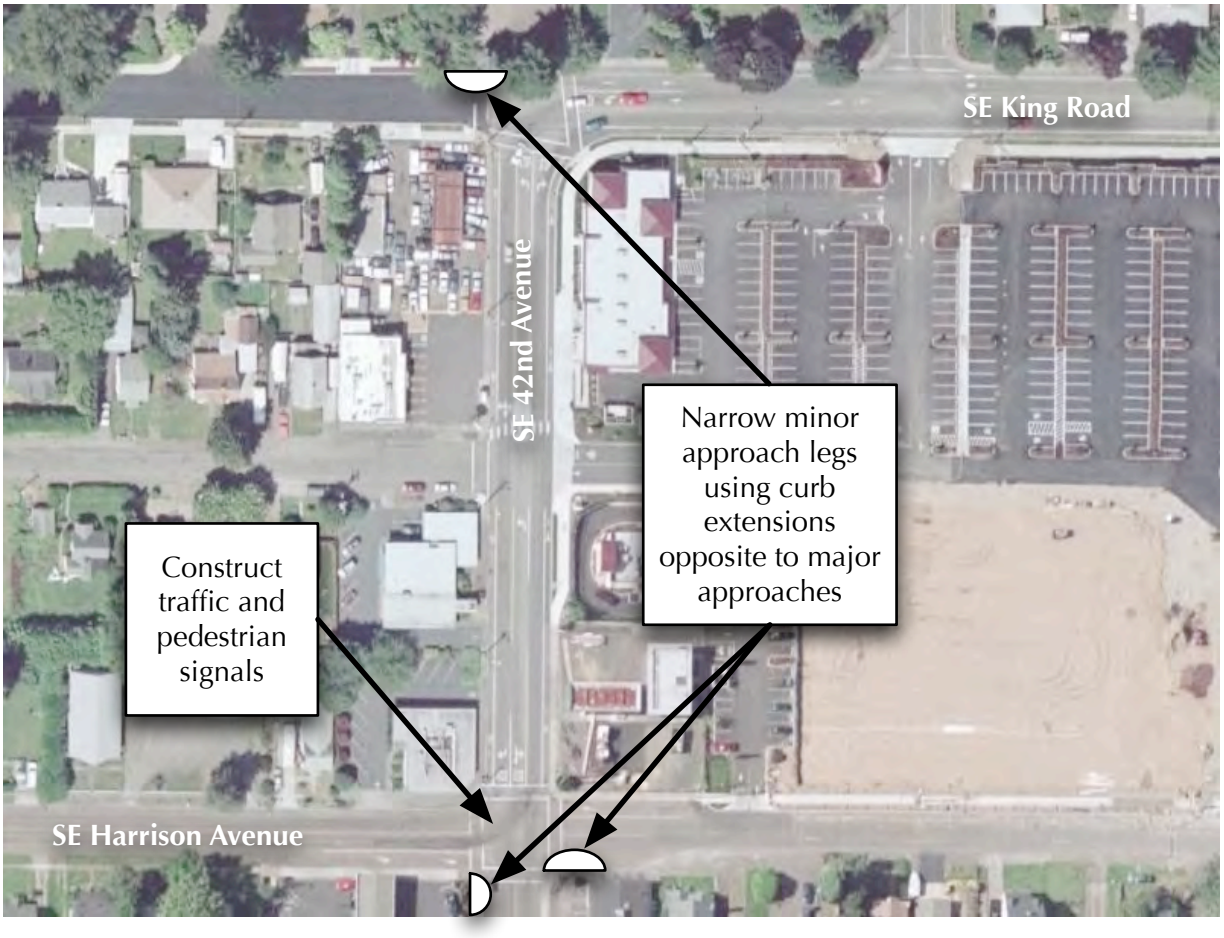
The Street Auto Network Working Group discussed the following design options during the TSP update process. These design options were developed to address current and/or future operational deficiencies at TSP study intersections.

1. SE Harrison Avenue / SE Main Street



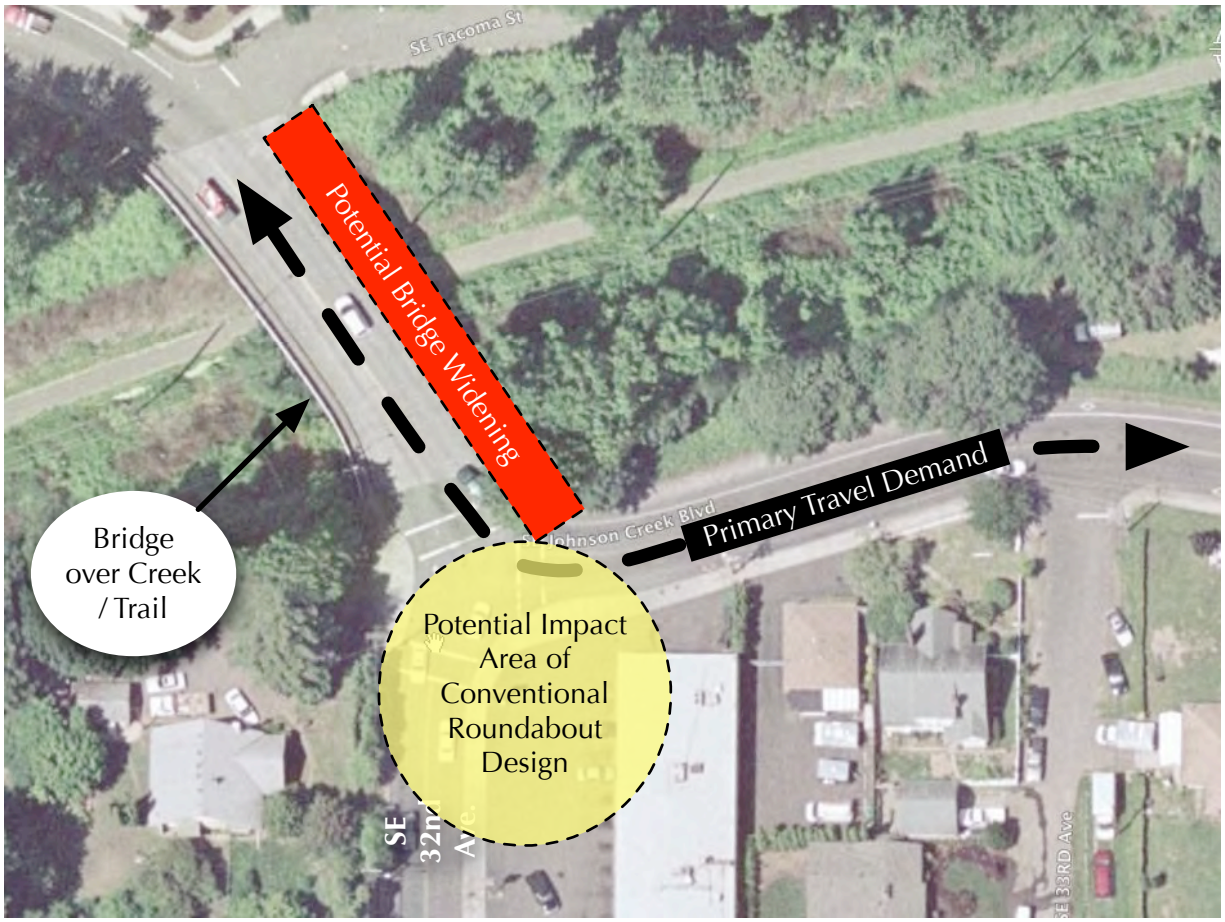
Measure of Effectiveness	Alt. 1: Reconfigure Existing Intersection	Alt. 2: Modify LOS Policy
Traffic Operations City standard = LOS D	Re-stripe Harrison Ave. approaches to provide space for right-turn lanes. Lanes line up with next block downstream.	No change
Safety	More lanes crossing crosswalk; could degrade pedestrian safety	No change
Cost	$	$
	PREFERRED	

2. SE Harrison Ave. / SE 42nd Avenue



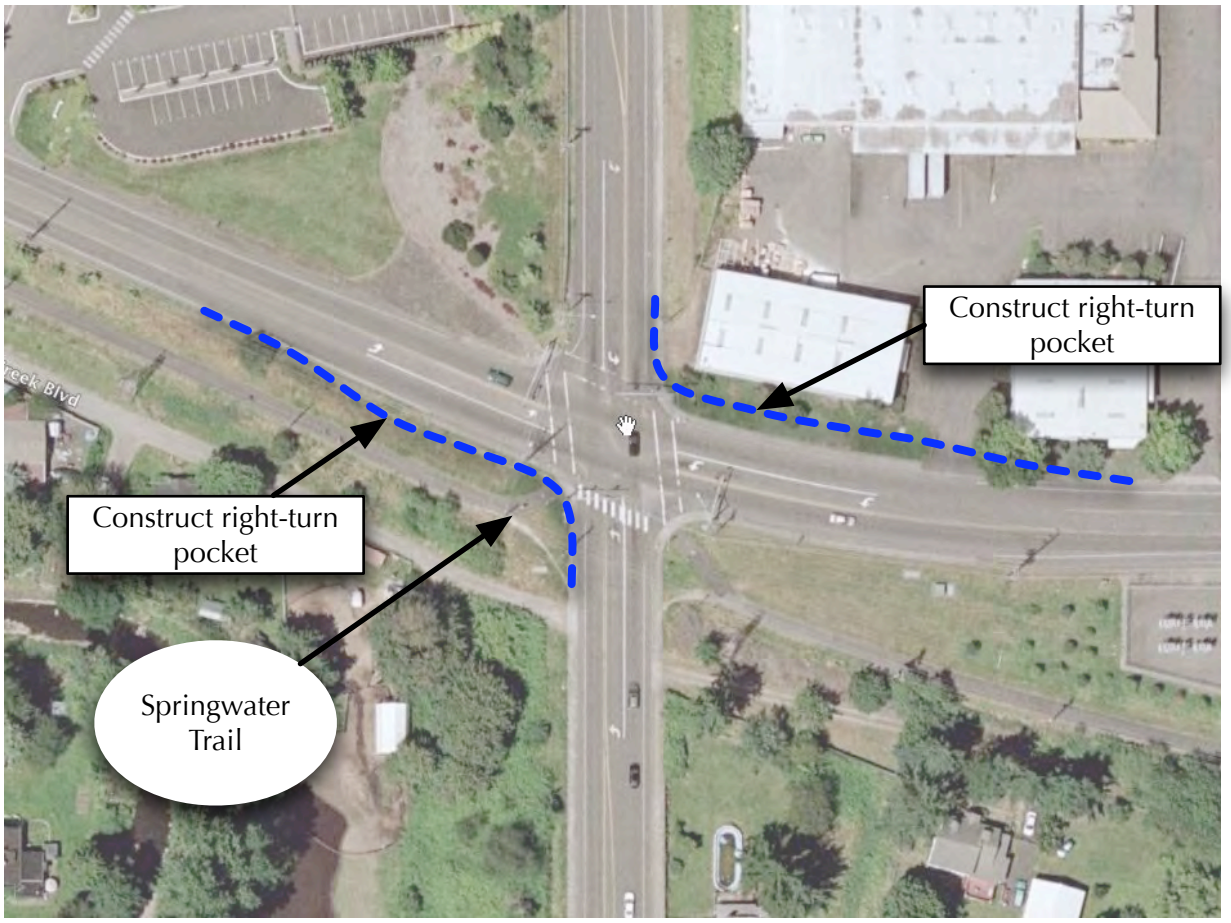
Measure of Effectiveness	Alt. 1: Do Nothing	Alt. 2: Install Traffic Signal	Alt. 3: Re-direct Through Route Traffic & Signals
Traffic Operations City Standard = LOS D	Significant vehicle queues and delays for major approaches (SB 42nd and EB Harrison) during peak hours.	Install traffic and pedestrian signals. No street widening required.	Install traffic and pedestrian signals. Modify Harrison / 42nd and King / 42nd to favor through route.
Safety	No change.	Pedestrian crossings should be safer and more convenient during peak hours.	Curb extensions on minor legs would shorten crossing area for pedestrians, and help to indicate through route.
Cost	None.	$$	$$$

3. SE Johnson Creek Blvd. / SE 32nd Avenue



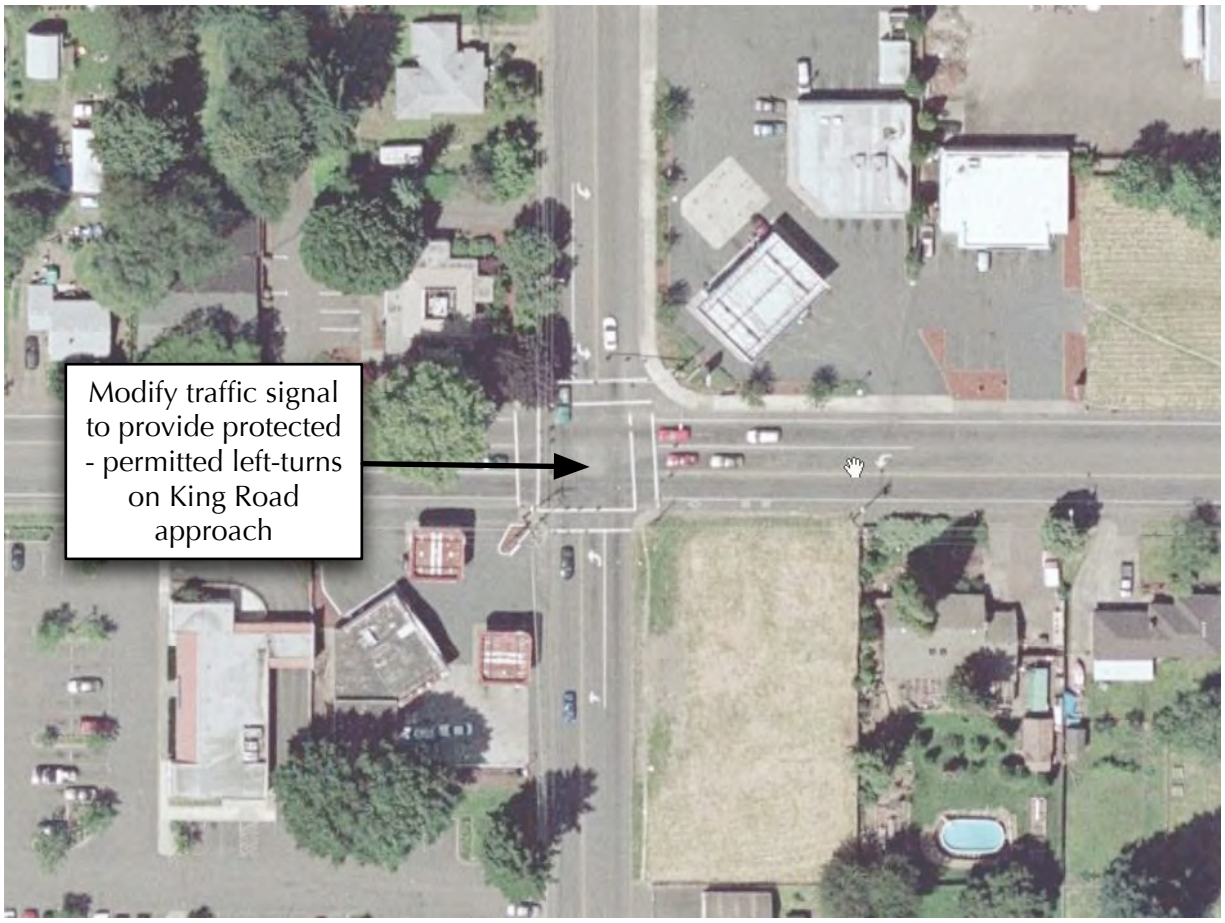
Measure of Effectiveness	Alt. 1: Roundabout	Alt. 2: Traffic Signal
Traffic Operations Portland Standard = LOS D	Design roundabout at existing intersection. Requires property acquisition and impacts to private building.	Install traffic and pedestrian signals at existing intersection. Requires additional EB approach lane beginning west of bridge and possible bridge widening
Safety	Effective design would substantially reduce vehicle queues and blockage of minor side streets. Proximity to bridge makes design more complex.	Effective design would reduce delays and vehicle queues.
Cost	$$$	$$$

4. SE Johnson Creek Blvd. / SE Linwood Avenue



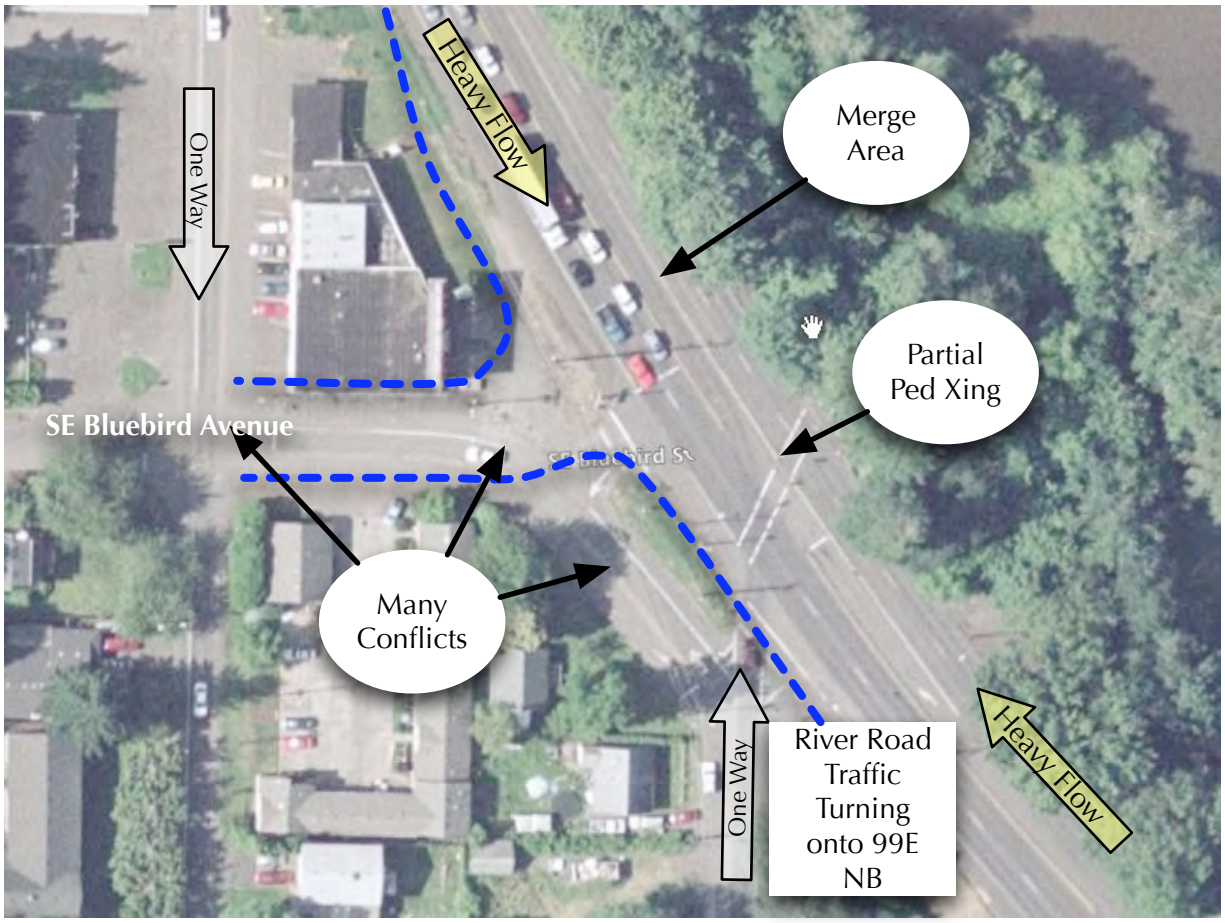
Measure of Effectiveness	Alt. 1: Do Nothing	Alt. 2: Add Right-turn lanes
Traffic Operations Portland Standard = LOS D	2030 conditions drop to LOS E. Vehicle queues and delays during peak hours could be excessive.	Widen JCB approaches to provide for standard right-turn pockets. May need to acquire ROW. Relocate traffic signal poles, as needed.
Safety	No change.	Widening will extend crosswalk lengths and time to cross. Need to integrate for trail crossing on south leg into design.
Cost	None.	$$
		PREFERRED

5. SE King Road / SE Linwood Avenue



Measure of Effectiveness	Alt. 1: Modify Traffic Signal Phasing on King Road	Alt. 2: Reduce City LOS Mobility Standard
Traffic Operations City Standard = LOS D	Modify traffic controls to provide protect left-turn (green arrow) and protected left-turn (flashing yellow arrow) on King Road approaches Does not attain LOS D.	Modify city standard to allow for LOS E conditions during peak hours at traffic signals.
Safety	No change	No change
Cost	$$	$
	PREFERRED	

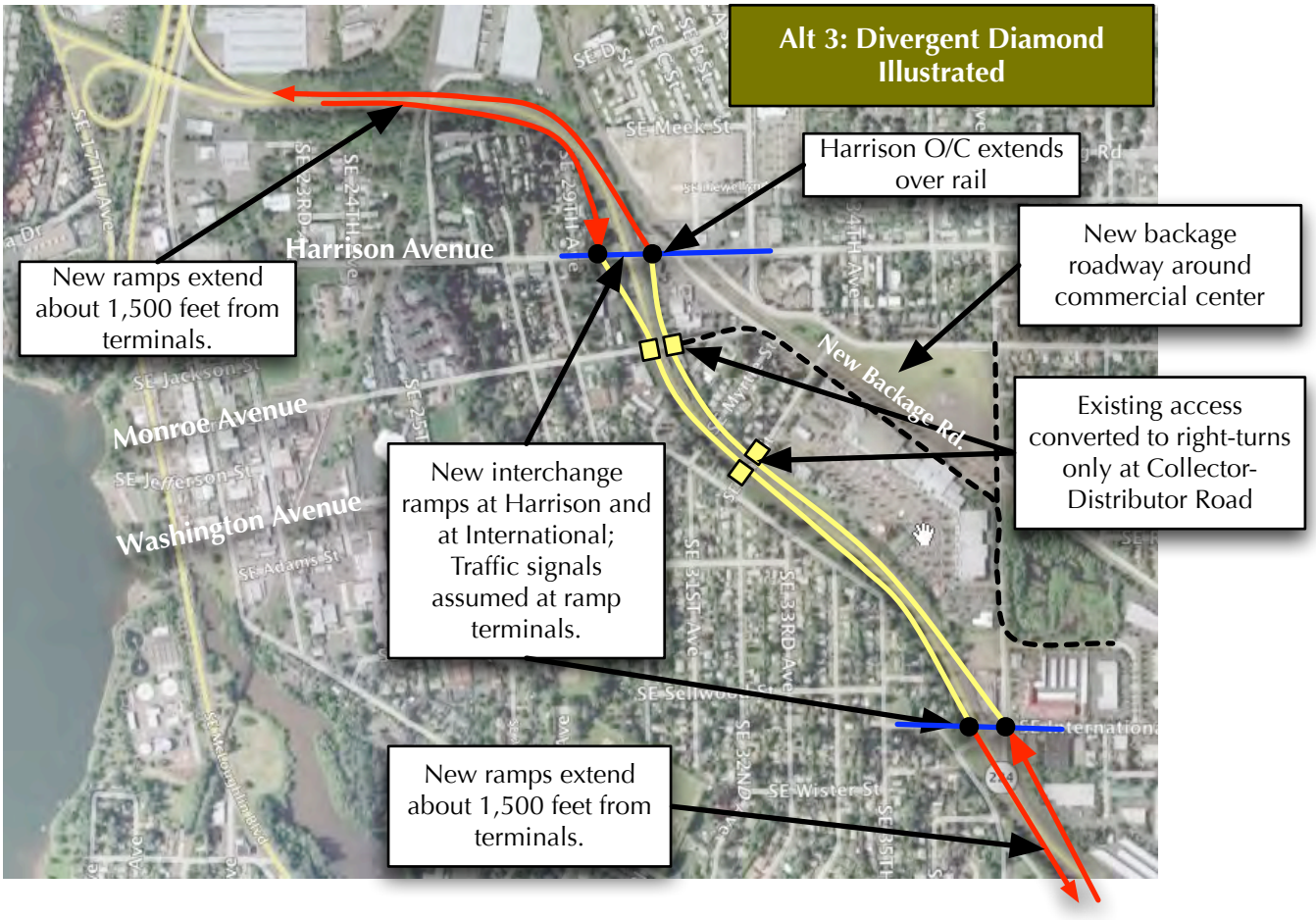
6. ORE 99E / River Road



Measure of Effectiveness	Alt. 1: Reconfigure Existing Intersection	Alt. 2: Reconstruct Intersection	Alt. 3: Defer Decision
Traffic Operations Standard: v/c = 0.99	Widen River /Road approach to add 2nd NB left turn lane	Consolidate 22nd Avenue, River Road & Bluebird legs, possibly acquire building north of Bluebird; shown.	Make no specific recommendations; defer improvement plan to other ODOT studies underway.
Safety	Re-design NB River Road approach to move Ped Xing to full signal control; Make NB 99E traffic stop at signal	Make conventional intersection near existing Bluebird Lane connection.	No change
Cost	$$	$$$	

All projects on state facilities require review and approval by ODOT.

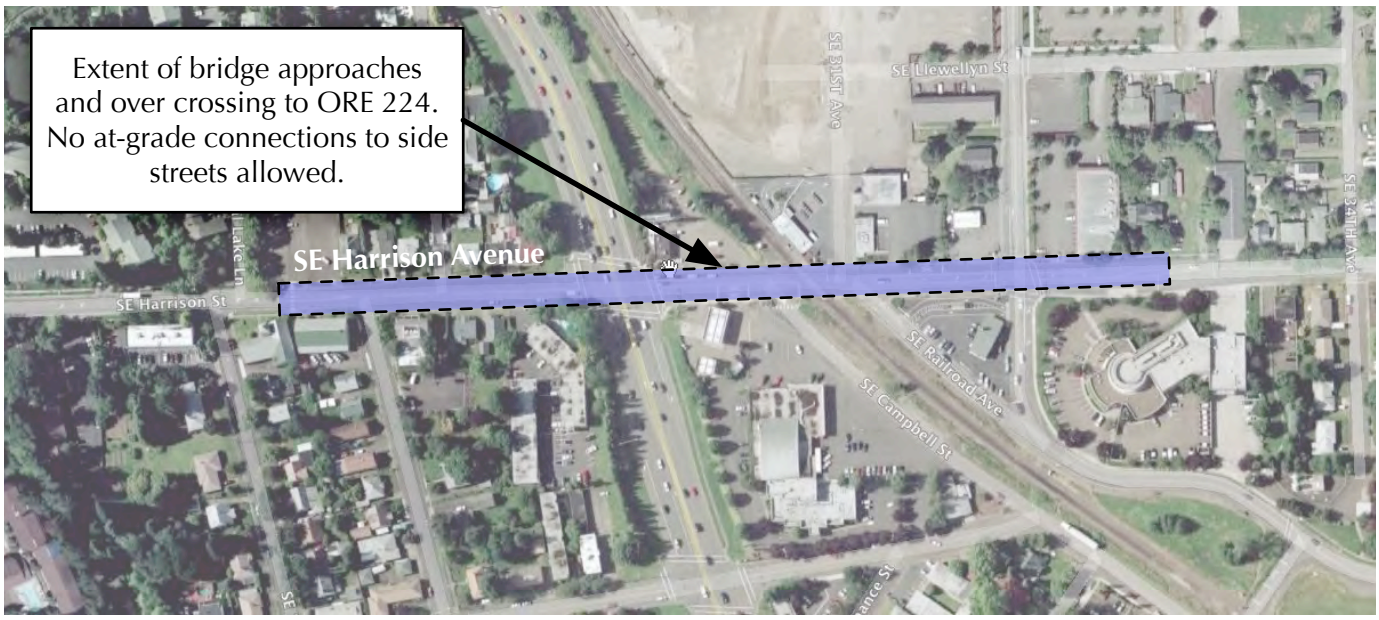
7. ORE 224 / Harrison to Oak



Measure of Effectiveness	Alt. 1: 7-Lane ORE 224	Alt. 2: 7-Lanes Plus Harrison O/C	Alt. 3: Divergent Diamond
Traffic Operations ODOT Standard = v/c 0.99	Complies with Mobility standards for highway traffic; status quo for cross-city travel	Less interruptions of ORE 224; superior circulation for cross-city trips on Harrison	Construct freeway ramps and collector distributor roads (yellow); Construct over (under) crossings to highway at Harrison and at International. Construct backage road from 37th to Monroe for commercial area.. Limit access at Monroe and Oak to new C-D road.
Safety	Extends pedestrian and bike crossing length; same barrier issues as today.	Provide grade separated crossing option for non-auto travel. Better safety and less delays.	Provides two grade separated crossings. Would need access management plan on city street approaches to I/C
Cost	$$$	$$$	$$$$

All projects on state facilities require review and approval by ODOT.

8. Harrison Avenue / ORE 224



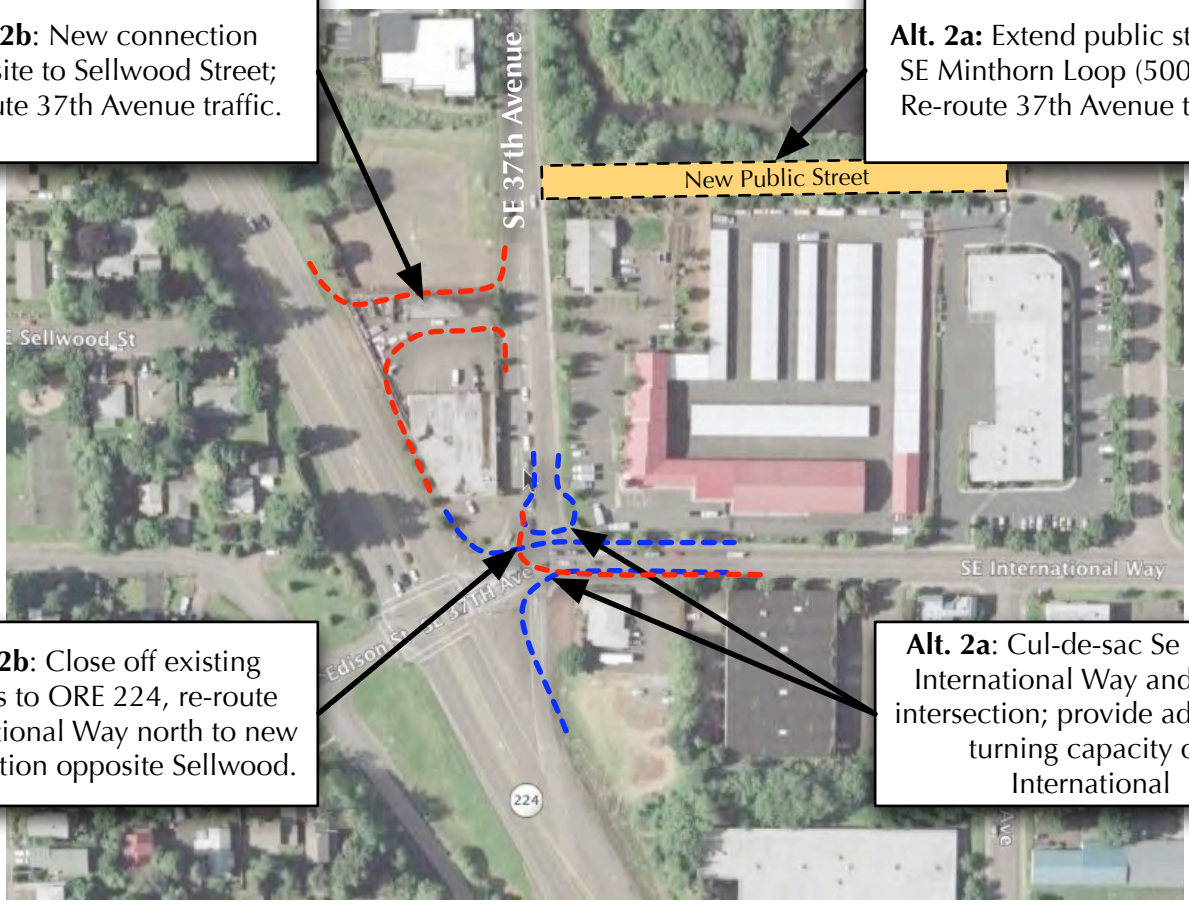
Measure of Effectiveness	Alt. 1: At-Grade	Alt. 2: Cross Over ORE 224 with No Ramps
Traffic Operations ODOT Standard = v/c 0.99	Assumes seven-lane section on ORE 224. Complies with minimum mobility standard.	Removal of at-grade intersection and access to King Road. Highway operates same as mainline section.
Safety	Wider approaches on ORE 224 extend crossing times for pedestrians and bikes.	Uninterrupted flow of pedestrians and bikes to either side of city. Bridge structure would also cross RR tracks.
Cost	$$$	$$$

All projects on state facilities require review and approval by ODOT.

9. International Way - 37th Ave. / ORE 224

Alt. 2b: New connection opposite to Sellwood Street; Re-route 37th Avenue traffic.

Alt. 2a: Extend public street to SE Minthorn Loop (500 feet); Re-route 37th Avenue traffic.



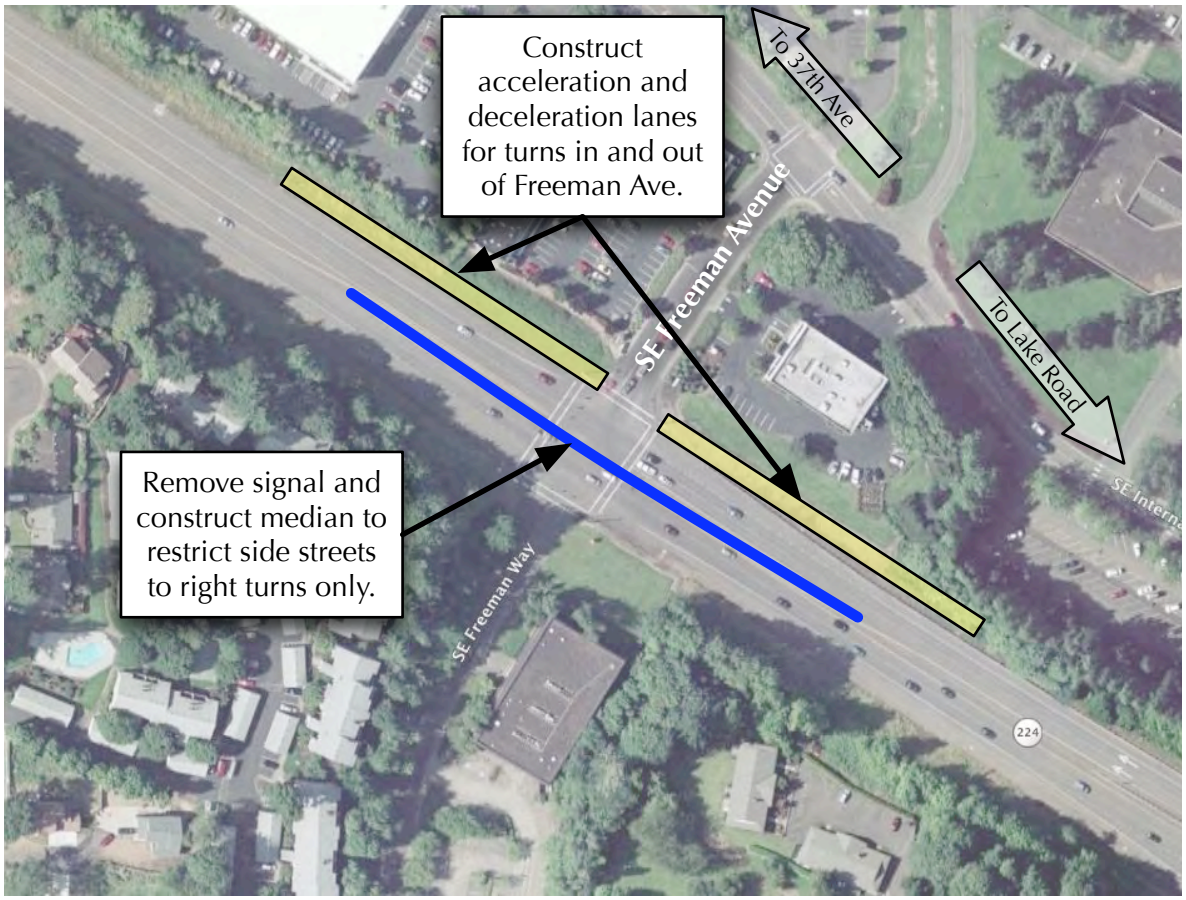
Alt. 2b: Close off existing access to ORE 224, re-route International Way north to new connection opposite Sellwood.

Alt. 2a: Cul-de-sac Se 37th at International Way and focus intersection; provide additional turning capacity on International

Measure of Effectiveness	Alt. 1: Do Nothing	Alt. 2a: Re-Route 37th Connection	Alt. 2b: Re-Route International Way Connection
Traffic Operations ODOT Standard = v/c 0.99	Highway marginally exceeds peak hour standard (1.05)	The reconfigured intersection more efficient. Extension of Winthorp impacts wetlands area. Could add turn lanes on International Way.	The reconfigured intersection more efficient. Primary connection to 37th Ave. Re-route of International Way traffic north.
Safety	High level of conflicts with two closely spaced full access intersections. Vehicle queues and truck operations compound safety issues.	Significant safety improvements for autos, trucks and pedestrians.	Significant safety improvements for autos, trucks and pedestrians.
Cost	None	$$$	$$

All projects on state facilities require review and approval by ODOT.

10. ORE 224 / SE Freeman Avenue



Measure of Effectiveness	Alt. 1: Do Nothing	Alt. 2: Restrict Access on Freeman to Right-turns only
Traffic Operations ODOT Standard = v/c 0.99	Exceeds highway maximum congestion level (1.12 during peak hours..	Eliminating traffic signal would reduce interruptions for regional and freight traffic; some local traffic re-routed to Lake Rd. or Edison or 37th
Safety	No change	Vehicle conflicts and safety should be improved. Removal of pedestrian facilities could reduce safety.
Cost	None	$$

All projects on state facilities require review and approval by ODOT.

DKS Associates
TRANSPORTATION SOLUTIONS

MEMORANDUM

DATE: August 3, 2007

TO: Freight Working Group, City of Milwaukie

FROM: Alan Snook, AICP
Michael Tomasini, E.I.T.

SUBJECT: **Milwaukie TSP Update Task 8 Freight Access Alternatives** P06097x008x008

The purpose of this Memorandum is to outline different freight access alternatives for the northern industrial area in the City of Milwaukie. An alternatives analysis was done to look at the potential impacts to freight operations resulting from different combinations of access management, bridge construction and roadway realignment projects, as well as the impact of two potential light rail transit (LRT) alignments. This memorandum contains a short description of the methodology used to compare the quantitative and qualitative impacts of each alternative, a brief account of the common themes between each alternative, and an overview of the special aspects of each alternative and an evaluation matrix which compares the alternatives based on criteria developed earlier in the evaluation phase of this project.

Study Area and Methodology

A total of nine alternatives were looked at for this analysis and a study area included the city's northern industrial lands. The northern industrial area of Milwaukie is bounded by the city's northern city limit, Highway 224 to the south, the Tillamook Line railroad tracks to the east and 17th Avenue to the west. Figure 1 shows the study area in relation to surrounding regional facilities, such as SE McLoughlin Boulevard (Highway 99E) and Highway 224.

Although nine alternatives were analyzed, there were, in essence four main alternatives, A, B, C, and D, which contained different roadway alignment options and/or a slight modification to the alternative alignment. The remaining five alternatives came about as a result of having two light rail alignment options. Therefore, each main alternative was analyzed twice, once with the Locally Preferred Alternative (LPA) light rail alignment and a second time with the Tillamook Branch alignment. The exception to this is with Alternate B, in which the LPA option was analyzed with two different roadway alignment options.

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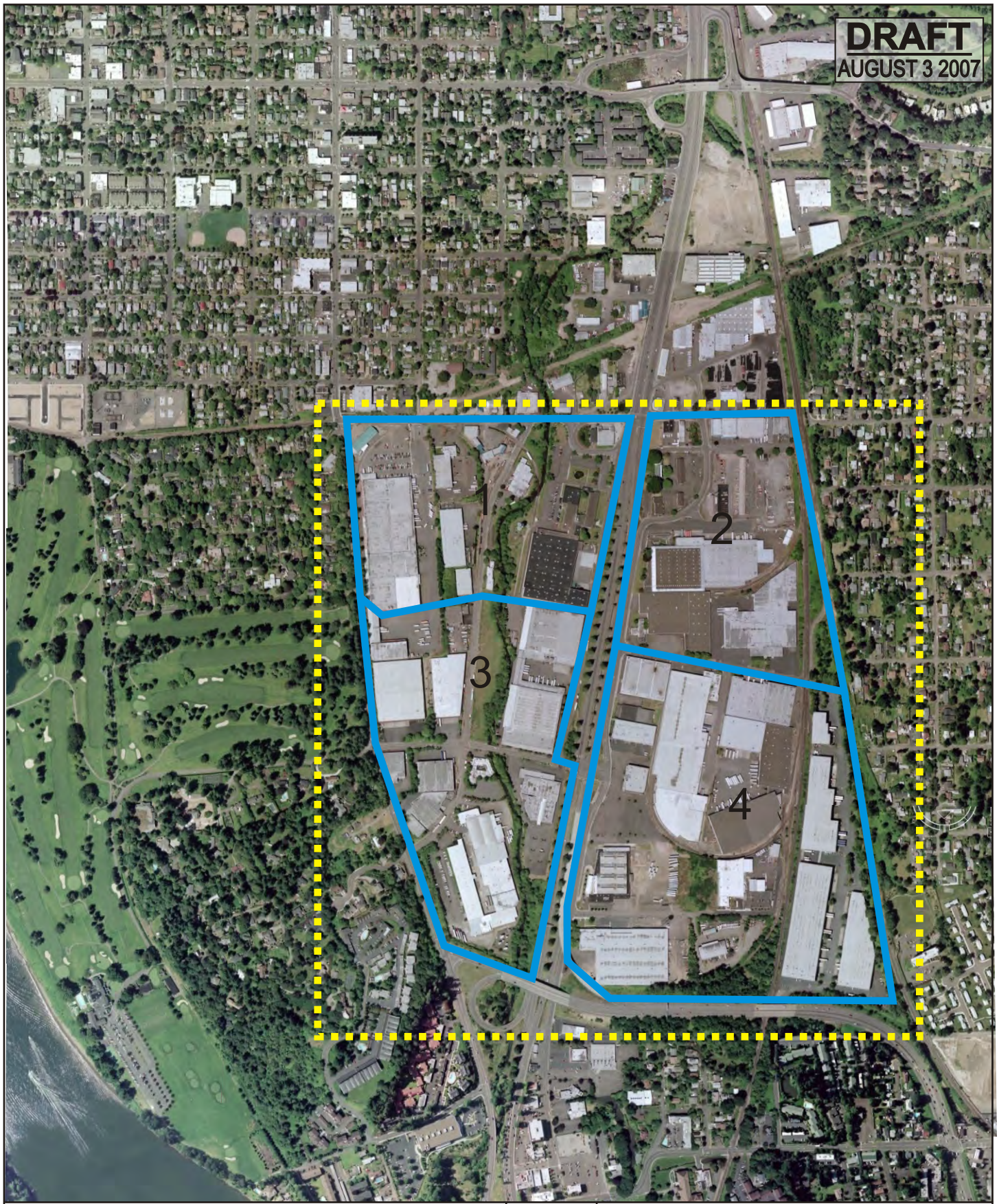


STUDY AREA

FIGURE 1

For each alternative, key criteria were analyzed, including:

- Freight operations;
- Traffic throughput on SE McLoughlin Boulevard (Highway 99E);
- Local side street traffic operations, access, crossing improvements, and safety;
- Resource limitations;
- Out of direction travel;
- Pedestrian connectivity;
- Bicycle connectivity;
- Transit access/egress and conflicts; and
- Robustness of the alternative.

Synchro traffic analysis software was used to measure the effects of the different roadway alignments and the impact of the light rail operations for many of the qualitative criteria, such as traffic and freight operations. ArcGIS (Geographic Information Systems) software was used in part to measure the amount of out of direction travel that would be experienced for each subgroup within the study area. While engineering judgment was used for the remaining qualitative criteria (side street crossing, safety, bicycle and pedestrian connectivity, and transit access/egress and conflicts), a quantitative assessment was conducted for the other criteria. All of the data from the technical analysis for each alternative is located in the Freight Technical Appendix.

Alternatives Described

The following gives a brief description of each alternative that was developed and analyzed for this assessment.

Alternates A1 and A2

The only difference between alternates A1 (LPA LRT) and A2 (Tillamook LRT), as can be seen in Figures A1 and A2 are the LRT alignments. The main themes for Alternates A1 and A2 are the construction of an overpass at SE Ochoco Street with auxiliary lanes connecting SE Ochoco Street to SE McLoughlin Boulevard and the complete closure of the SE McLoughlin Boulevard/SE Milport Road intersection for all movements except through traffic on SE McLoughlin Boulevard. As a result of this closure, the intersection of SE Milport Road/SE Main Street would also be closed, leaving SE Main Street as a through street. SE Frontage Road would be converted to a cul-de-sac at the north and the intersection of SE Milport Road/SE Frontage Road would be turned into a through street. The intersection of SE Ochoco Street/SE Main Street would be closed and SE Main Street would be converted to cul-de-sacs on either side of SE Ochoco Street. Finally, a new roadway extension of SE 25th Avenue would connect SE Main Street to SE Ochoco Street.

Alternates B1, B2, and B1a

Alternates B1 and B2 are similar to the “A” Alternates in that they involve the construction of an overpass for SE Ochoco Street with auxiliary lanes accessing SE McLoughlin Boulevard. The difference is that the auxiliary lanes are located further north of the overpass, and the auxiliary lane for southbound traffic on SE McLoughlin Boulevard connects with SE Frontage Road and does not require this roadway to become a cul-de-sac. Furthermore, the intersection of SE Ochoco Street/SE Main Street

remains open and the intersection of SE McLoughlin Boulevard/SE Milport Road is only subject to a partial closure. Through movements on SE McLoughlin Boulevard and right turning traffic would be allowed to access SE McLoughlin Boulevard from SE Milport Road.

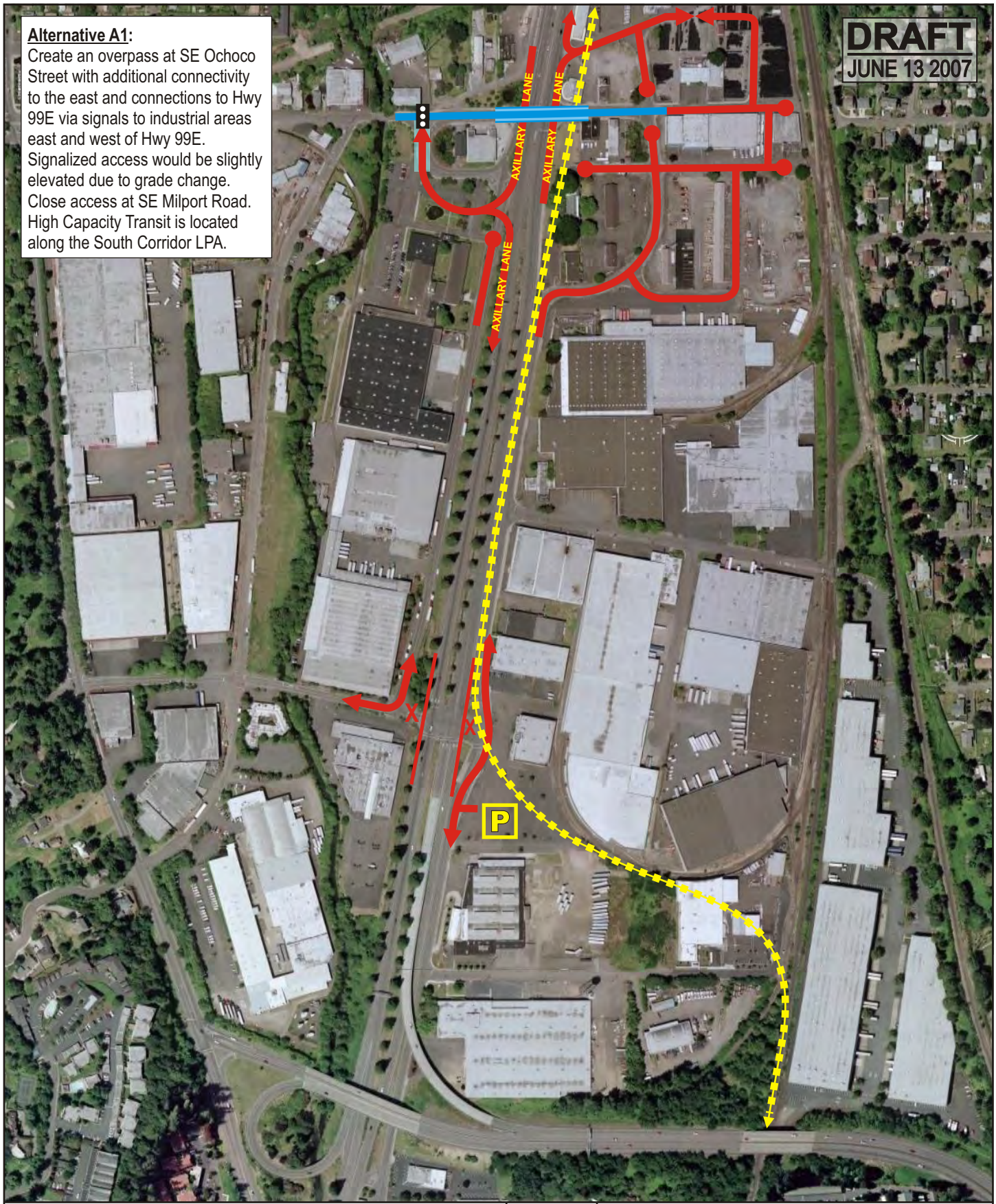
Alternates B1 and B2 differ only by the LRT alignment. Alternate B1a and B1 both have the LPA LRT alignment, their only difference is in the road network. The auxiliary lane in Alternate B1a connects with SE McBrod Avenue instead of SE Frontage Road. A cul-de-sac is also created at SE Frontage Road in this alternative. Figures B1, B1a, and B2 show the alignments for the different alternatives.

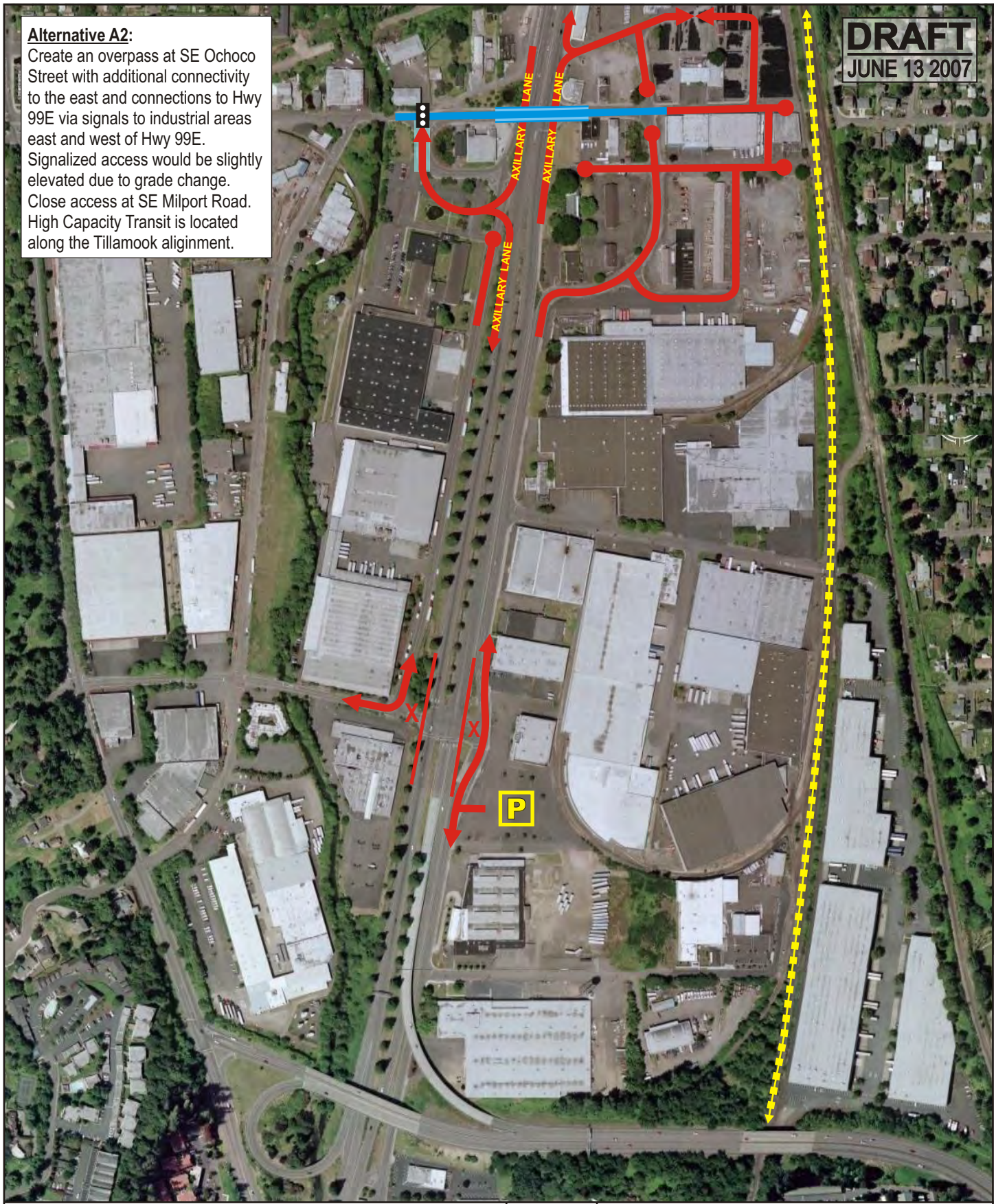
Alternates C1 and C2

Alternates C1 and C2 would include the construction of a Highway 224 overpass with Highway 224 being grade separated from the full access intersection of SE McLoughlin Boulevard/SE Milport Road. The intersection of SE Milport Road/SE Main Street would be moved and SE Main Street would be realigned to allow for more storage space and increased intersection spacing. Auxiliary lanes would be constructed to allow right-in/right-out access from north of SE Ochoco Street (SE Moores Street). The partial closure of the intersection of SE McLoughlin Boulevard/SE Ochoco Street would only allow north/south through movements on SE McLoughlin Boulevard. These alternatives can be seen in Figures C1 and C2.

Alternates D1 and D2

The “D” Alternatives would include the construction of an overpass of SE McLoughlin Boulevard at SE Ochoco Street with no direct access to SE McLoughlin Boulevard. The intersection of SE McLoughlin Boulevard/SE Milport Road would be converted into a full access intersection with. A cul-de-sac would be constructed at the southern end of SE Frontage Road, and the intersection of SE Milport Road/SE Frontage Road would be closed to access onto SE Frontage Road. As with Alternate C1 and C2, the intersection of SE Milport Road/SE Main Street would be moved to the southeast and SE Main Street would be realigned to allow for increased intersection spacing and increased storage length for both of the “D” Alternatives. Figures D1 and D2 show the proposed roadway alignments for both alternatives.


Alternative A1:
Create an overpass at SE Ochoco Street with additional connectivity to the east and connections to Hwy 99E via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated due to grade change. Close access at SE Milport Road. High Capacity Transit is located along the South Corridor LPA.
DRAFT
JUNE 13 2007
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
P
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Potential High Capacity Transit
- Full Access Signal
X - Closed Roadway
P - Park-and-Ride
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE A1
FIGURE A1


Alternative A2:
Create an overpass at SE Ochoco Street with additional connectivity to the east and connections to Hwy 99E via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated due to grade change. Close access at SE Milport Road. High Capacity Transit is located along the Tillamook aliginment.
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LANE
LANE
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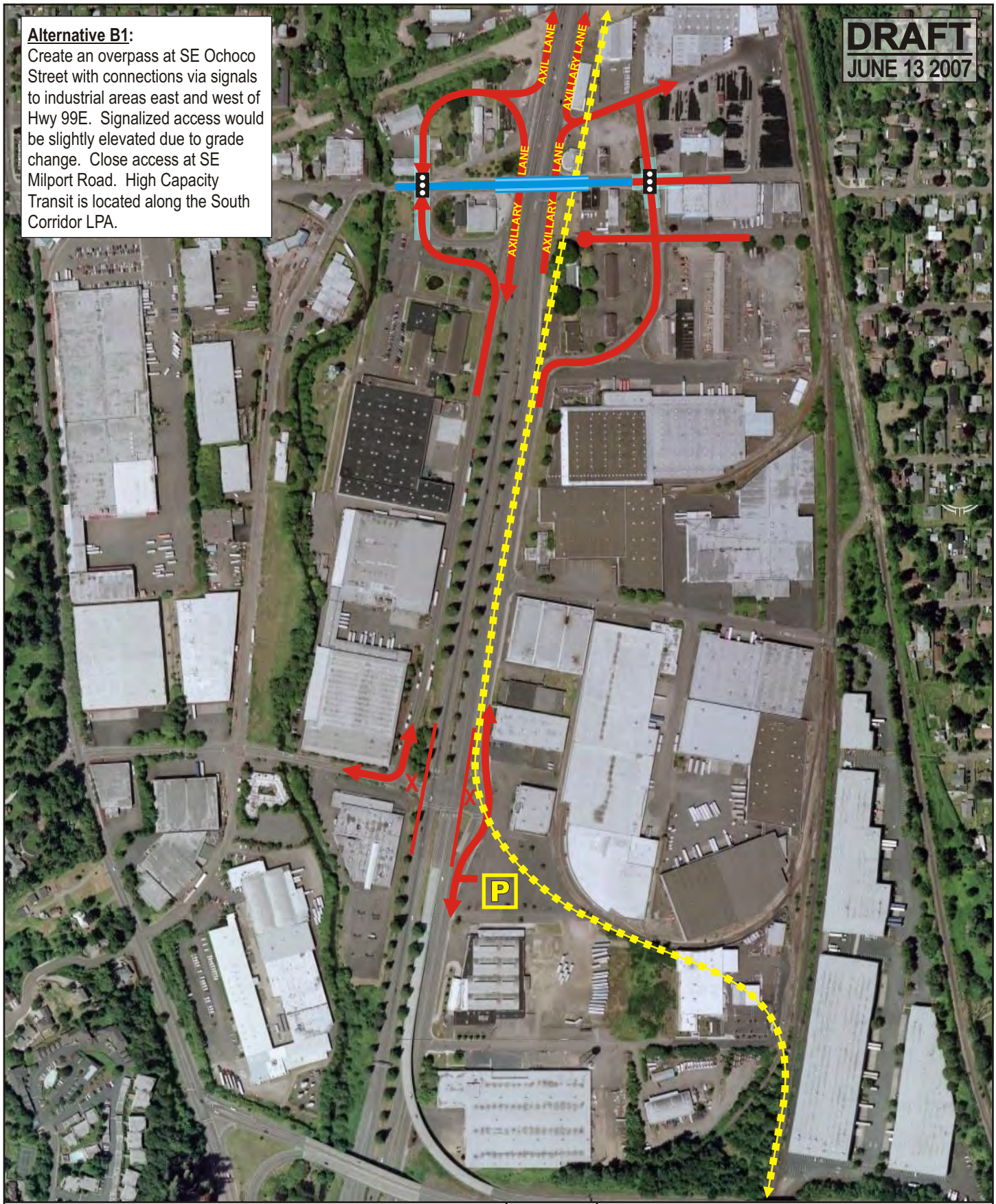
AXILLARY LANE
X
X
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Potential High Capacity Transit
- Full Access Signal
X - Closed Roadway
P - Park-and-Ride
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE A2
FIGURE A2


Alternative B1:
Create an overpass at SE Ochoco Street with connections via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated due to grade change. Close access at SE Milport Road. High Capacity Transit is located along the South Corridor LPA.
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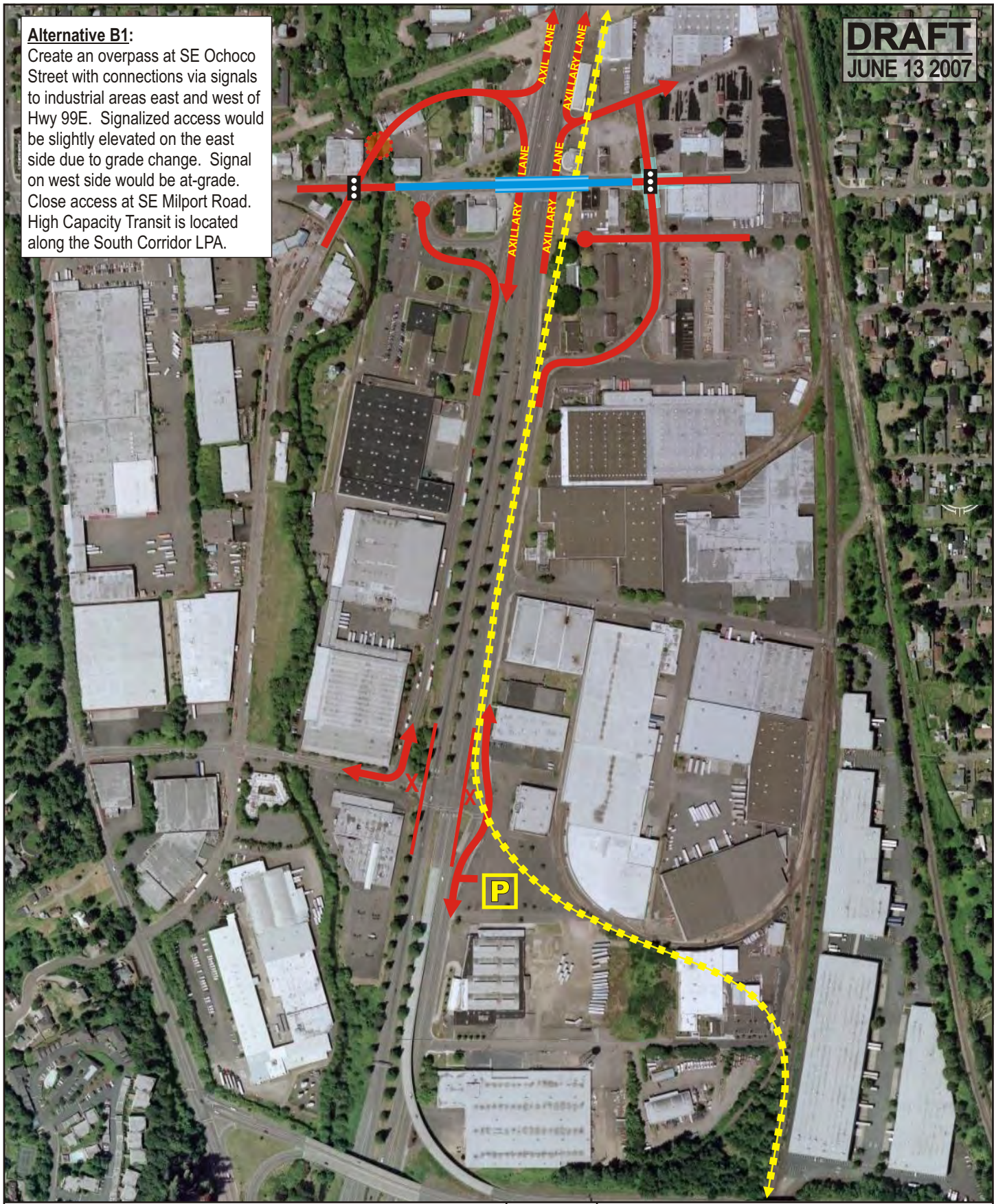
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
X
X
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Potential High Capacity Transit
- Full Access Signal
X - Closed Roadway
P - Park-and-Ride
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE B1
FIGURE B1


Alternative B1:
Create an overpass at SE Ochoco Street with connections via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated on the east side due to grade change. Signal on west side would be at-grade. Close access at SE Milport Road. High Capacity Transit is located along the South Corridor LPA.
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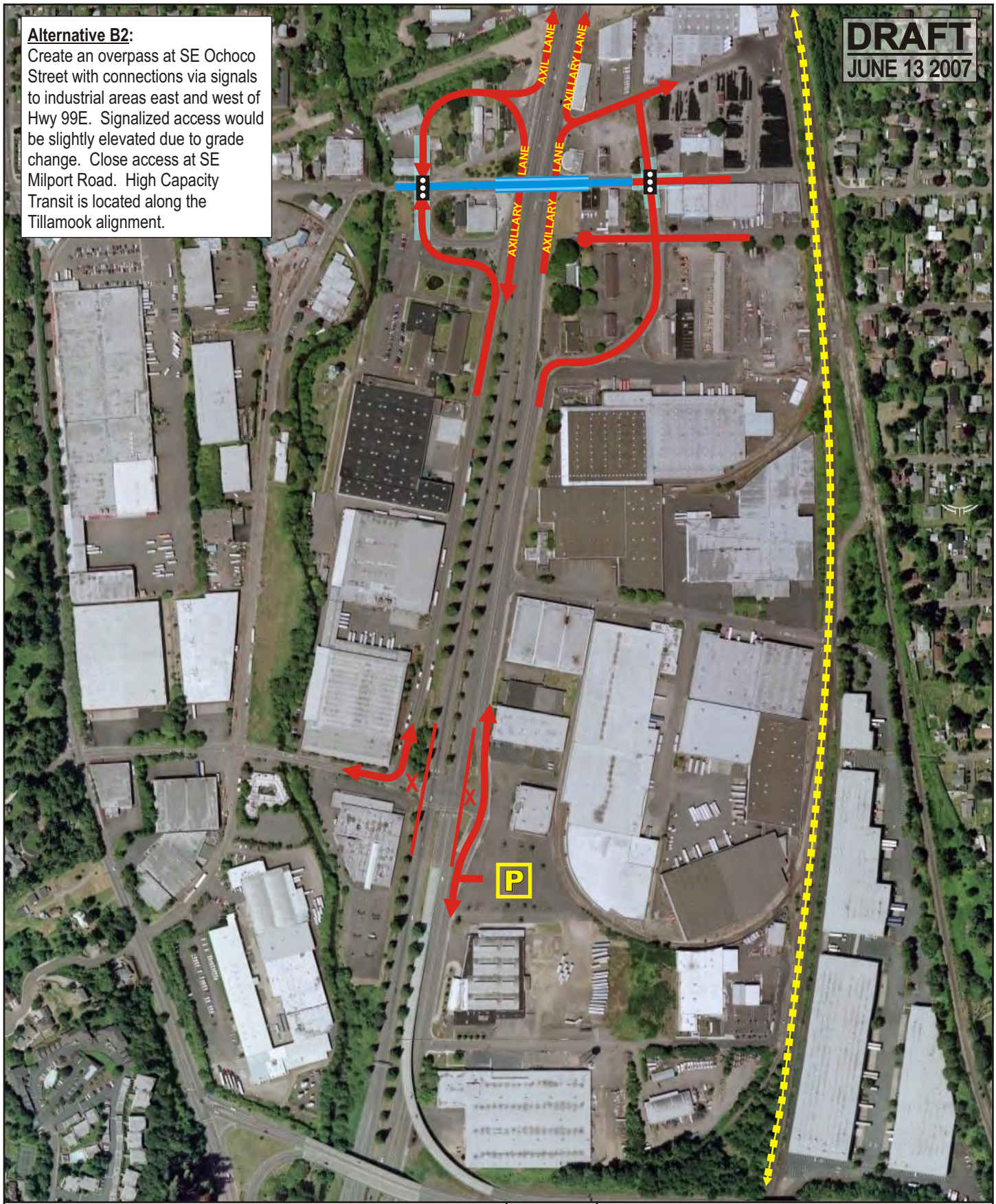
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
AXILLARY
AXILLARY
X
X
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- New Crossing Over Creek
- Full Access Signal
- Closed Roadway
- Park-and-Ride
- Potential High Capacity Transit
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE B1a
FIGURE B1a


Alternative B2:
Create an overpass at SE Ochoco Street with connections via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated due to grade change. Close access at SE Milport Road. High Capacity Transit is located along the Tillamook alignment.
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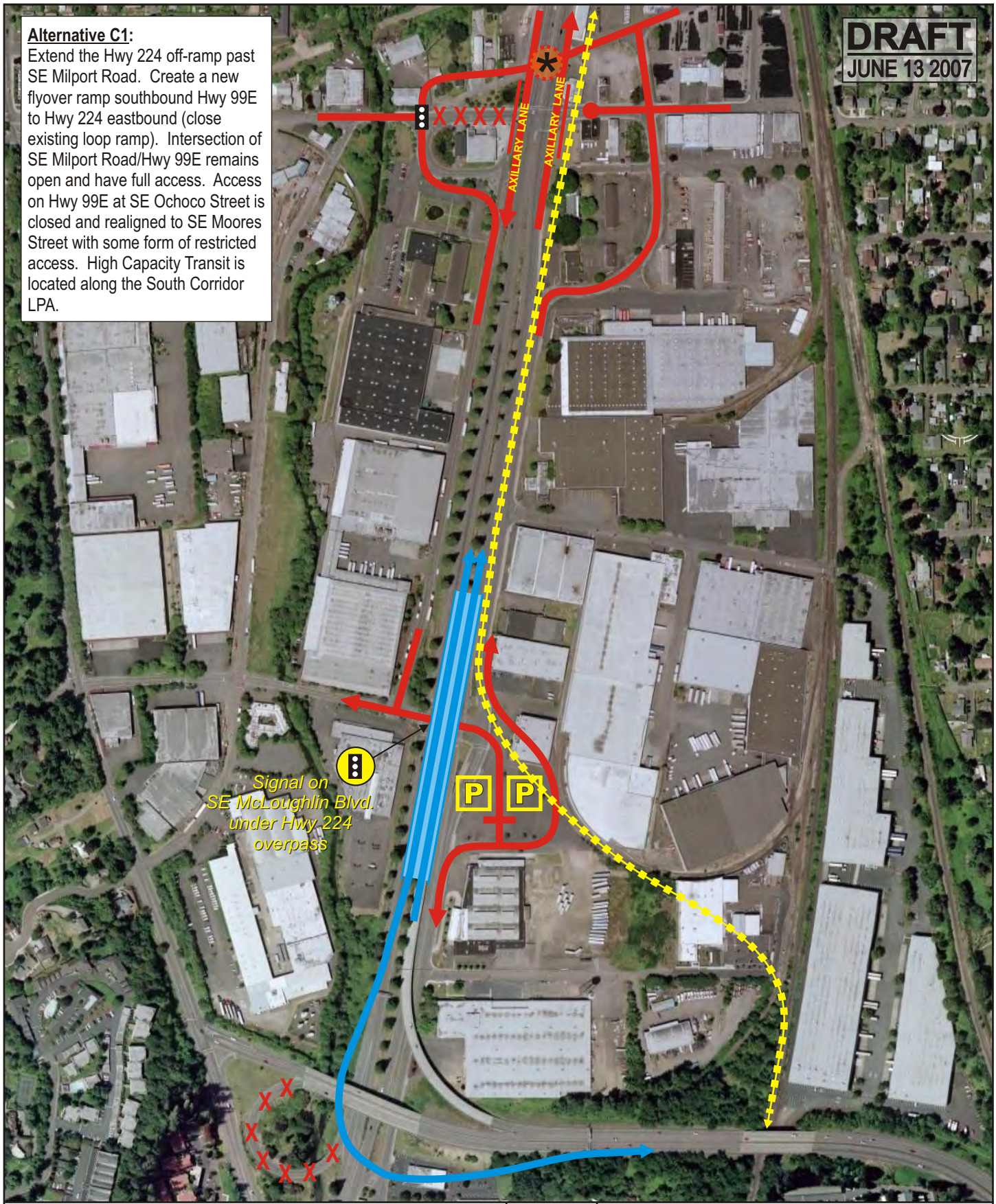
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
AXILLARY LANE
X
X
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Potential High Capacity Transit
- Full Access Signal
X - Closed Roadway
P - Park-and-Ride
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE B2
FIGURE B2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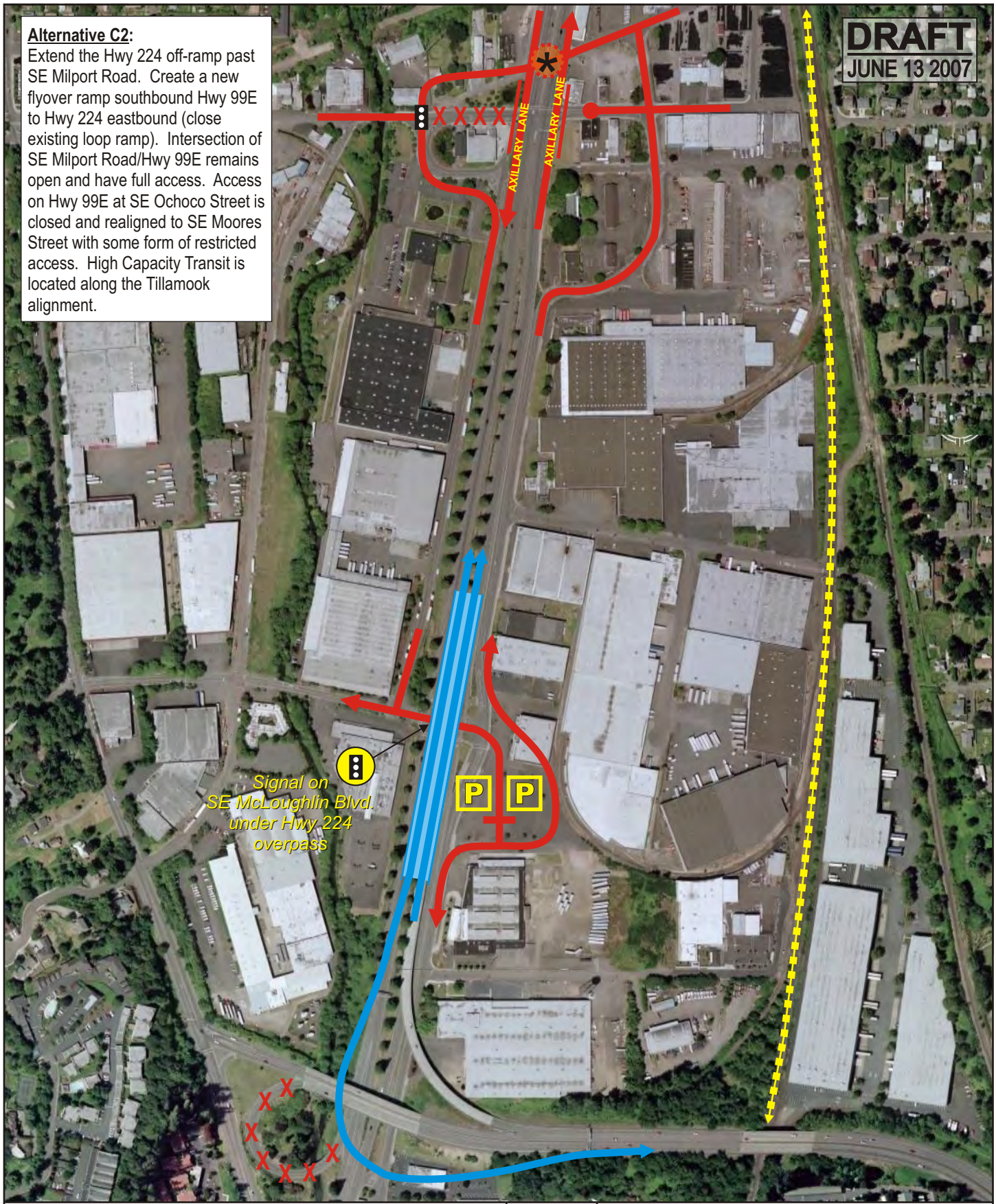
Alternative C1:
Extend the Hwy 224 off-ramp past SE Milport Road. Create a new flyover ramp southbound Hwy 99E to Hwy 224 eastbound (close existing loop ramp). Intersection of SE Milport Road/Hwy 99E remains open and have full access. Access on Hwy 99E at SE Ochoco Street is closed and realigned to SE Moores Street with some form of restricted access. High Capacity Transit is located along the South Corridor LPA.
AXILLARY LANE
AXILLARY LANE
Signal on SE McLoughlin Blvd. under Hwy 224 overpass
P
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Restricted Access Intersection (Right-in/Right-out, No Access, Right-in, Closed, Overpass)
- Full Access Signal
- Closed Roadway
- Park-and-Ride
- Potential High Capacity Transit
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE C1
FIGURE C1


Alternative C2:
Extend the Hwy 224 off-ramp past SE Milport Road. Create a new flyover ramp southbound Hwy 99E to Hwy 224 eastbound (close existing loop ramp). Intersection of SE Milport Road/Hwy 99E remains open and have full access. Access on Hwy 99E at SE Ochoco Street is closed and realigned to SE Moores Street with some form of restricted access. High Capacity Transit is located along the Tillamook alignment.
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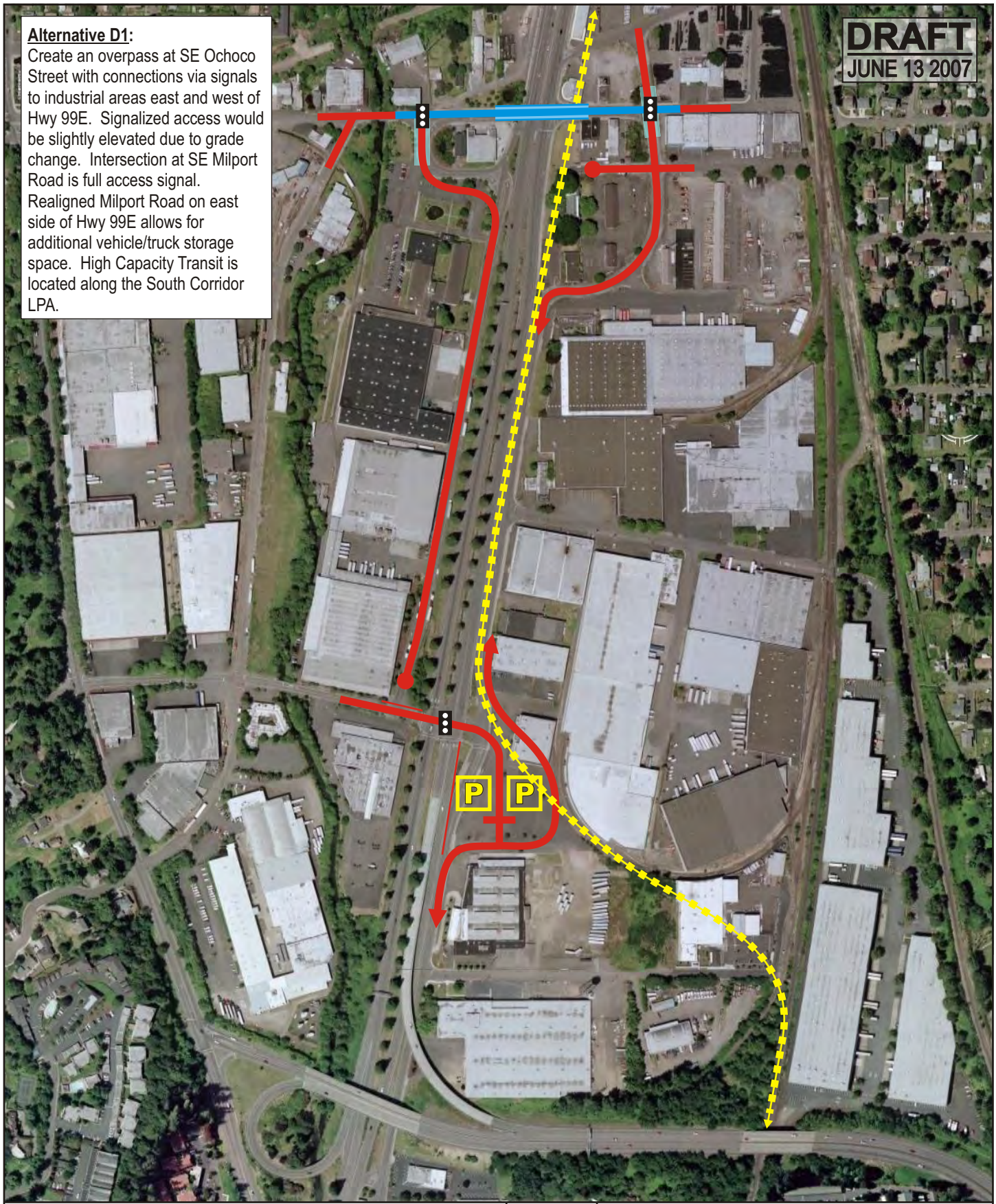
AXILLARY LANE
AXILLARY LANE
Signal on SE McLoughlin Blvd. under Hwy 224 overpass
P
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Restricted Access Intersection (Right-in/Right-out, No Access, Right-in, Closed, Overpass)
- Full Access Signal
- Closed Roadway
- Park-and-Ride
- Potential High Capacity Transit
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE C2
FIGURE C2


Alternative D1:
Create an overpass at SE Ochoco Street with connections via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated due to grade change. Intersection at SE Milport Road is full access signal. Realigned Milport Road on east side of Hwy 99E allows for additional vehicle/truck storage space. High Capacity Transit is located along the South Corridor LPA.
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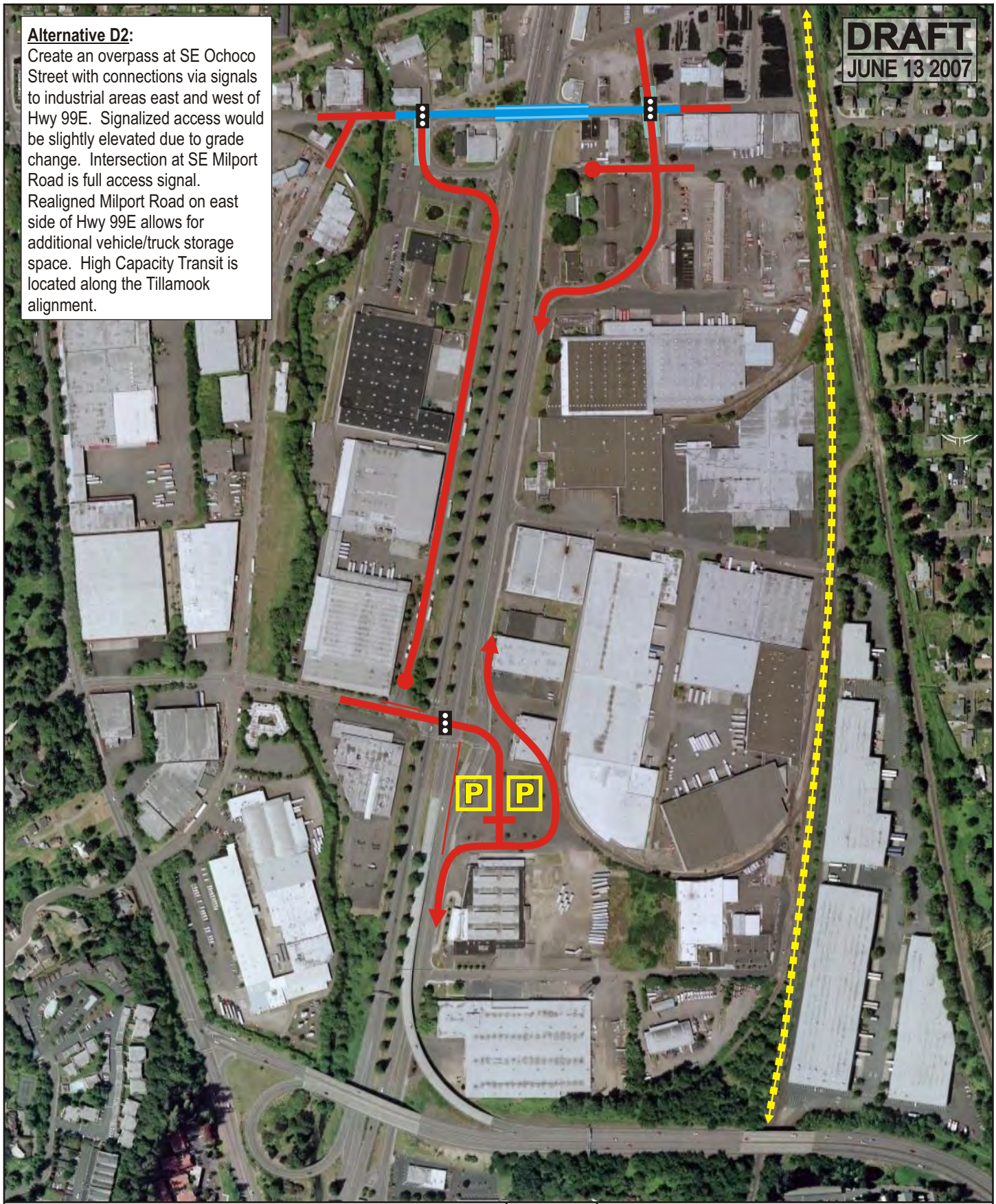
P
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Potential High Capacity Transit
- Full Access Signal
X - Closed Roadway
P - Park-and-Ride
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE D1
FIGURE D1


Alternative D2:
Create an overpass at SE Ochoco Street with connections via signals to industrial areas east and west of Hwy 99E. Signalized access would be slightly elevated due to grade change. Intersection at SE Milport Road is full access signal. Realigned Milport Road on east side of Hwy 99E allows for additional vehicle/truck storage space. High Capacity Transit is located along the Tillamook alignment.
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P
P
LEGEND
- At-grade Roadway
- Elevated Roadway
- Elevated Area
- Potential High Capacity Transit
- Full Access Signal
X - Closed Roadway
P - Park-and-Ride
N
Approximate Scale
0 100 200 feet
Information Sources: DKS Associates
FREIGHT ACCESS ALTERNATIVE D2
FIGURE D2

Table 1-1: Freight Evaluation Comparison Matrix

	Evaluation Criteria \ Alternative	A1 Ochoco overpass with closure at Milport. LRT on LPA alignment	A2 Ochoco overpass with closure at Milport. LRT on Tillamook alignment	B1 Ochoco overpass with full connection to frontage road. Right-out at Milport. LRT on LPA alignment.	B1a Ochoco overpass with access at McBroad. Right-out at Milport. LRT on LPA alignment.	B2 Ochoco overpass with full connection to frontage road. LRT on Tillamook alignment.	C1 Hwy 224 overpass, full access intersection at Milport. Ochoco closed with right-in/right-out access at Moores. LRT on LPA alignment.	C2 Hwy 224 overpass, full access intersection at Milport. Ochoco closed with right-in/right-out access at Moores. LRT on Tillamook alignment.	D1 Ochoco overpass, with no access at 99E. Full access intersection at Milport. LRT on LPA alignment.	D2 Ochoco overpass, with no access at 99E. Full access intersection at Milport. LRT on Tillamook alignment.
Primary Criteria	Freight operations	☐	☐	◘	▣	◘	▣	▣	⊡	⊡
	Traffic operations 99E throughput	■	■	◘	◘	◘	▣	▣	☐	☐
	Traffic operations local access and crossing improvements	☐	☐	◘	◘	◘	▣	▣	☐	☐
	Safety	◘	◘	▣	⊡	▣	⊡	⊡	⊡	⊡
	Resource limitations	▣	▣	◘	◘	◘	☐	☐	⊡	⊡
	Out of direction travel for access to/from sub-areas	☐	☐	⊡	⊡	⊡	⊡	⊡	☐	☐
Secondary Criteria	Pedestrian connectivity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	▣	▣
	Bicycle connectivity	⊡	⊡	⊡	⊡	⊡	⊡	⊡	▣	▣
	Transit access/egress and conflicts	⊡	▣	⊡	⊡	▣	⊡	▣	⊡	⊡
	Robust solution	☐	☐	▣	▣	▣	⊡	⊡	☐	☐
	Overall Rating	▣	▣	◘	▣	◘	⊡	⊡	⊡	⊡

Evaluation Scale

☐ ⊡ ▣ ◘ ■

Poor Medium Good