



720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

MEMORANDUM

DATE: March 4, 2014

TO: Nick Popenuk, ECONorthwest

FROM: Chris Maciejewski, P.E., PTOE
Ray Delahanty, AICP
Benjamin Chaney, EIT

SUBJECT: Moving Forward Milwaukie
Task 3.6: Evaluation of Central Milwaukie Transportation Infrastructure

P#13120-000-002

The purpose of this memorandum is to evaluate and document the known gaps, deficiencies, and future projects related to transportation facilities serving Central Milwaukie. The memorandum will inform development of the proposed Central Milwaukie Commercial Zone that will include two opportunity sites as well as the existing commercial and high-density residential areas adjacent to Harrison and Oak streets. The two opportunity sites include:

- The Murphy site, in the northwest quadrant of the SE 32nd Avenue/SE Harrison Street intersection
- The McFarland site, in the southwest quadrant of the SE 37th Avenue/SE Monroe Street intersection

The evaluation includes findings of facility sufficiency based on transportation analysis performed for previous projects (including the Milwaukie Transportation System Plan (TSP), Portland-Milwaukie Light Rail (PMLR) studies), and qualitative site assessment. Specifically, the evaluation addresses:

- Circulation
- Connectivity within and around the Central Milwaukie area
- Transit issues
- Intersection Operations, particularly along Highway 224 through the study area
- Future Transportation Projects
- Potential compliance with the Transportation Planning Rule (TPR)

The evaluation includes findings of potential trip generation for the study area based on reasonable worst-case scenarios, and potential impacts on compliance with the TPR. While the trip generation evaluation does not include detailed analysis and estimations for land use quantities and the resulting trips, it identifies if potential Comprehensive Plan changes are likely to impact key intersections in and around the study area by allowing types of uses with higher trip rates, triggering TPR compliance issues. The two opportunity sites and the boundary of the Central Milwaukie study area are shown in Figure 1.

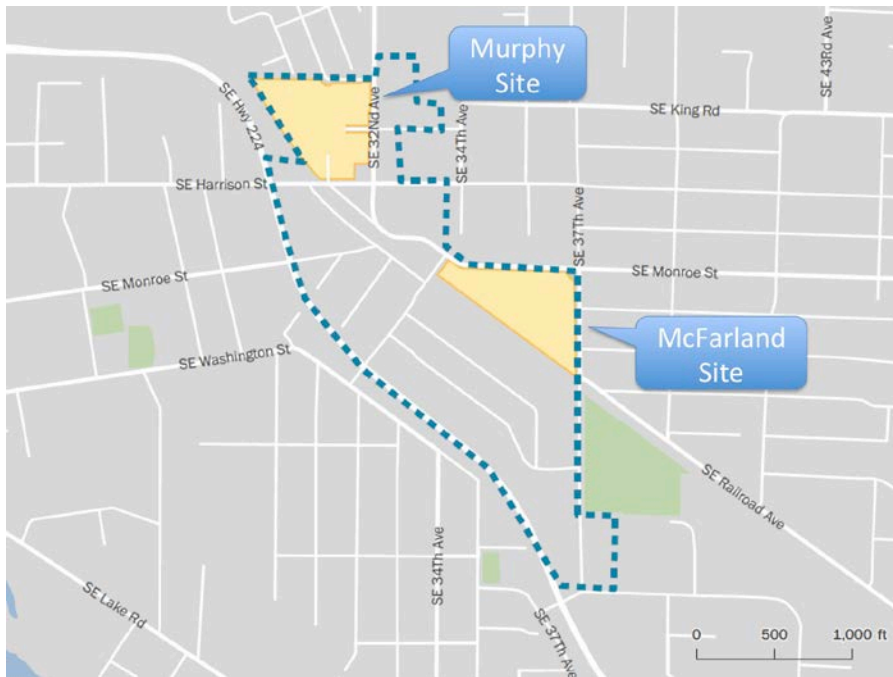


Figure 1: Study Area

GENERAL CENTRAL MILWAUKIE TRANSPORTATION ISSUES

Circulation

Highway 224 provides a regional connection to and through the study area. It is designated as a Statewide Expressway, part of the National Highway System, a Freight Route, and is a Regional Route in the City of Milwaukie's functional classifications.¹ However, the limited crossing opportunities on Highway 224 for all modes act as a barrier to local circulation. The railroad creates an additional barrier, limiting circulation within the study area to the established crossings at Harrison Street, Oak Street, and 37th Avenue. Harrison Street is the only arterial providing direct access to the study area, providing east-west connectivity between Downtown Milwaukie and the neighborhoods to the east. There is no north-south arterial serving the study area. North-south circulation is provided by a network of collector streets including 32nd Avenue, 37th Avenue, Oak Street, and Monroe Street. Using Metro RTP standards, the City's TSP acknowledges that a gap exists in the north-south arterial grid just south of the study area.² A new arterial from Lake Road to Railroad Avenue would provide

¹ Milwaukie TSP Figure 8-1, Table 8-7

² Milwaukie TSP, page 8-20. "Gap 4"

greater connectivity and circulation, but established industrial and residential neighborhoods make such an arterial impractical to implement.

Multi-Modal Connectivity

The bicycle and pedestrian environment within and near the study area presents both challenges and opportunities for multi-modal connectivity.

The study area is centrally located in the planned bike network, with roadway connections to Downtown Milwaukie as well as areas to the east, southeast, and south.³

- Monroe Street is recommended as a neighborhood greenway that will function as a bike corridor connecting downtown to the eastern part of the city. An eastbound bike lane and westbound shared lane are present on Monroe Street adjacent to the McFarland site, and continue into the residential neighborhoods to the east.
- Coming from the east, King Road currently has bike lanes until 42nd Avenue, where the lanes then follow 42nd Avenue and connect to Harrison Street.
- The TSP includes a project to add bike lanes to Harrison Street from 42nd Avenue through the study area, ultimately connecting with shared lanes to downtown currently in place west of Highway 224.
- An additional project identified in the TSP would add bike facilities to Railroad Avenue beginning at 37th Avenue and continuing south to the city limits.
- Bike lanes are planned on 37th Avenue to connect Harrison Street with Highway 224.
- An Intersection improvement project for bicyclists is planned at Washington St/Oak St/Hwy 224.

Of these projects, the Monroe Street neighborhood greenway and Railroad Avenue projects are included in the TSP Action Plan⁴, which represents the highest priority projects that are likely to be funded locally in the near future. The City has received a Transportation and Growth Management (TGM) grant from ODOT to create a Monroe Street Neighborhood Greenway Plan. The planned improvements listed here would provide good bicycle connectivity to and through the Central Milwaukie area.

While sidewalks are prevalent around the study area, and many of the intersections have been rebuilt with curb ramps, there remain many sidewalk gaps resulting in an incomplete pedestrian network.⁵ The TSP includes projects to fill sidewalk gaps along 37th Avenue and Highway 224, although they are medium priority⁶. The

³ Milwaukie TSP Figure 6-8a

⁴ Milwaukie TSP Table 6-3

⁵ Milwaukie TSP Figure 3-2

⁶ Milwaukie TSP Table 5-1

Railroad Avenue project previously mentioned would also provide continuous pedestrian facilities, and is included in the TSP action plan⁷. Filling sidewalk gaps that connect to and along Highway 224 should be a priority in order to support development of the Central Milwaukie area.

Highway 224 is the most significant barrier to multi-modal connectivity. Ensuring a safe and inviting crossing environment at the highway is key to making the study area accessible from downtown and the future light rail station. The TSP includes action plan projects to study and improve crossing locations along Highway 224, including 37th Avenue, Oak Street, Monroe Street, and Harrison Street.⁸ Though all these intersections have pedestrian signal phasing, the crossing distances remain long (6 lanes) and no refuge islands are available. The intersections all have corner curb ramps, however, the intersections at Oak Street and at 37th Avenue do not have sidewalks that continue along every leg of the intersection, such as along the north side of Highway 224.

Transit Issues

Five TriMet bus lines serve the study area, including one (Route 75) designated as a Frequent Service line running every 15 minutes during peak periods. Table 1 below details the service provided by these lines.⁹ Transit is provided primarily along Harrison Street and 32nd Avenue.¹⁰ The opportunity sites are both within a ¼ mile walk to transit during the peak and off-peak operating period, though the southern section of the study area is not covered during off-peak times.¹¹

Table 1: Central Milwaukie Transit Service

Bus Route (Study Area Roadway(s) served)	Weekday		Weekend		Destinations Served (Partial List)
	Schedule	Approx. Headway (min)	Schedule	Approx Headway (min)	
28 (Harrison, 32nd)	6:00 a.m.-7:00 p.m. Peak and Off-peak	60	No Service	N/A	Milwaukie Bus Transit Center, Clackamas Town Center
29 (Washington)	6:30 a.m. – 8:00 p.m. Peak and Off-peak	60	No Service	N/A	Milwaukie Bus Transit Center, Clackamas Town Center

⁷ Milwaukie TSP Table 5-3

⁸ Milwaukie TSP Table 5-3

⁹ Milwaukie TSP Table 3-1

¹⁰ Milwaukie TSP Figure 3-5

¹¹ Milwaukie TSP Figure 7-1

31 (Harrison)	6:00 a.m. – 10:00 p.m. Peak/Off-peak	30/60	Sat 6:30 a.m. – 10:00 p.m. Peak/Off-peak	30/60	Milwaukie Bus Transit Center, Clackamas Town Center, Downtown Portland
75 (Harrison, 32nd)	4:30 a.m. – 1:30 a.m. Peak/Off-peak	15/30	Sat & Sun 5:30 a.m. – 1:30 a.m. Peak/Off-peak	15/30	Milwaukie Bus Transit Center, Milwaukie Providence Hospital, St. Johns
152: Milwaukie Shuttle (Harrison, Milwaukie Marketplace, 37th)	6:30 a.m. – 6:30 p.m. Peak/Off-peak	30/60	No Service	N/A	Milwaukie Bus Transit Center, Clackamas Town Center, Milwaukie Center

The nearest light rail station will be downtown at Lake Road and Main Street. The light rail station will be over 2,500 feet (or about half a mile) from the nearest point in the study area. One-quarter to one-half mile is often used as a feasible walking distance for high-capacity transit, and Milwaukie offers 25% parking reduction for locations within 1,000 feet of light rail stations. Existing bus service will provide a frequent connection from the study area to the existing transit center, which is about 1,000 feet north of the planned LRT station, for transit users who are unable or unwilling to walk over 2,000 feet. The northern part of the district will be especially well-served, as several lines along Harrison Street will combine to provide frequent east-west service to the Milwaukie Bus Transit Center. An extension of existing routes south to the LRT station should be considered in order to make this transfer more seamless.

Proposed transit improvements recommended in the TSP include a new bus route along Harrison Street, 42nd Avenue, and Railroad Avenue. The Railroad Avenue bus route is included in the action plan as part of the Railroad Avenue Capacity Improvements.¹³

Intersection Operations

Intersections in and around the study area have been studied as part of the 2013 TSP Update process and the Portland to Milwaukie Light Rail (PMLR) process. The six intersections in Figure 2 are likely to be impacted by development in the study area. Table 2 summarizes the existing PM peak hour operations at these intersections and the projected operations in 2035.¹⁴

¹³ Milwaukie TSP Table 7-2

¹⁴ Milwaukie TSP Table 8-4, PMLR FEIS Table 6-4, PMLR FEIS Table 6-9

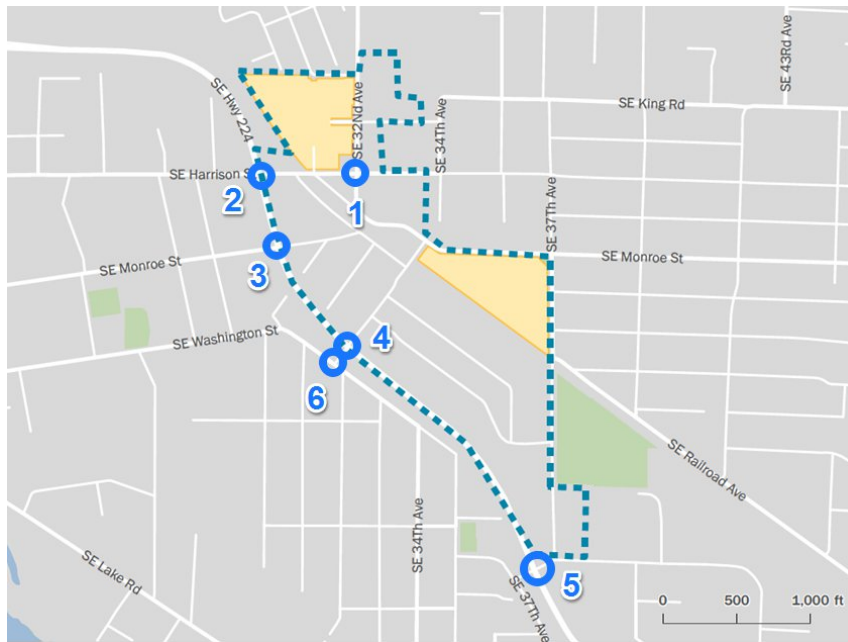


Figure 2: Study Intersections

Table 2: Intersection Operations - Existing and Future Base Case

Intersection	Existing 2012 (TSP) / 2009 (PMLR)			Future 2035 Base Case		
	Level of Service (LOS)	Average Delay (Seconds)	Volume/Capacity (V/C)	Level of Service (LOS)	Average Delay (Seconds)	Volume/Capacity (V/C)
Signalized Intersections – Milwaukie TSP						
1: Harrison St @ 32 nd Ave	B	10.5	0.45	B	18.6	0.70
2: Highway 224 @ Harrison St	D	40.0	0.89	E	74.7	1.13
3: Highway 224 @ Monroe St	B	19.0	0.75	C	27.1	0.87
4: Highway 224 @ Oak St	D	44.1	0.88	E	58.3	1.01
5: Highway 224 @ 37th Ave	C	25.5	0.82	F	>80.0	1.26
Unsignalized Intersections – PMLR FEIS						
6: Washington St @ Oak St	A/D	28.9	0.63	A/F		

Notes: A/A = major street LOS/minor street LOS

Signalized and all-way stop delay = average vehicle delay in seconds for entire intersection

Unsignalized delay = highest minor street approach delay

Intersections show in **bold type** exceed jurisdictional standards

Intersections 1 and 6 are under City jurisdiction with a mobility standard of LOS D¹⁵. Intersections 2-5 are under ODOT jurisdiction, and must meet Metro¹⁶ and ODOT¹⁷ mobility standards. The PM peak two-hour standards are LOS F/E and V/C 0.99/0.99 (first hour/second hour). Under current conditions, all of the intersections meet mobility standards. However, four of the six intersections are expected to fail to meet mobility standards in 2035. Future volumes at intersection 6 would meet signal warrants, however close proximity to intersection 4 limits improvement options due to signal timing and vehicle storage issues.¹⁸

Future operations indicate that the Highway 224 intersections at the edges of the study area (at Harrison Street and at 37th Avenue) are the two intersections that are most likely to trigger TPR issues as they are projected to be significantly over capacity in 2035. This means that more intense development at the Murphy site, which will likely rely on the Highway 224/Harrison Street intersection, may be more challenging than development at the McFarland site, which could rely more on the less congested highway intersections at Monroe Street and Oak Street.

Though not studied formally in either the TSP or PMLR FEIS, Monroe Street was identified by City staff as a known location that develops a persistent queue at the intersection with Oak Street. This intersection is two-way stop-controlled, with vehicles from Oak Street flowing freely. High volumes on Oak Street can make turns from Monroe Street difficult, resulting in long queues. Increased development in the study area would likely increase traffic volumes at all the intersections mentioned here, since there are limited alternative routes available.

¹⁵ Milwaukie Municipal Code (MMC), Section 19.1407.4.A

¹⁶ 2035 Regional Transportation Plan, Metro, 2010, Table 2.4

¹⁷ Oregon Highway Plan. Alternative Highway, Maximum Volume to Capacity Ratios Within Portland Metropolitan Region, Oregon Department of Transportation, January 2006, Table 7.

¹⁸ PMLR FEIS, Page 6-64

Future Transportation Projects

The TSP projects previously discussed will improve the bicycle, pedestrian, and transit connectivity in the area surrounding Central Milwaukie. Additionally, there are a number of TSP projects that could improve mobility to and within the study area.¹⁹ Short-term solutions are identified along Highway 224 at Harrison Street and Oak Street that would add protected left turn lanes on those streets, improving access to the study area. These solutions could be implemented quickly and at relatively low costs (estimated at \$20,000 each in the TSP), and the Oak Street project is included in the action plan.²⁰

Longer-term solutions identified in the TSP include roadway widening and improvements along Harrison Street and Railroad Avenue, both important access routes to the study area. While these projects include capacity improvements, they also include multi-modal travel and should make travel to and within the study area more appealing. The intersection of Highway 224, 37th Avenue, and International Way is also targeted for improvement in the TSP. The project would consolidate the approaches from 37th Avenue and International Way into a single approach, simplifying the intersection and potentially improving operations and safety. However, none of these projects are included in the action plan, meaning they have not been identified as reasonably likely to be locally funded by 2035.

Highway 224 is recommended for improvement with targeted Transportation System Management and Operations (TSMO) efforts, including improved signal technology (vehicle detection and signal timing coordination) and traveler information. Additionally, the Highway 224 and Highway 99E refinement plan would be a comprehensive effort to re-evaluate the highways through Central Milwaukie with the goal of establishing alternative mobility targets, improving auto and freight mobility, and reducing the barrier effect of the highways. The refinement plan is included in the action plan. While the outcome of the study is uncertain, it would likely include elements to improve access by all modes to the study area.

Table 3 presents the future operations of study area intersections if the action plan projects are implemented, compared with the future base case. Though other intersections examined in the TSP improve, the operations within the Central Milwaukie study area remain outside mobility targets. The Highway 224 and Highway 99E refinement plan may result in alternative mobility targets, such that the future operations are deemed acceptable.

¹⁹ Milwaukie TSP Table 8-5

²⁰ Milwaukie TSP Table 8-10 , Table 8-11.

Table 3: Intersection Operations - Future with Action Plan Projects

Intersection	Future 2035 Base Case			Future 2035 Action Plan ²¹		
	Level of Service (LOS)	Average Delay (Seconds)	Volume/Capacity (V/C)	Level of Service (LOS)	Average Delay (Seconds)	Volume/Capacity (V/C)
Signalized Intersections – Milwaukie TSP						
1: Harrison St @ 32 nd Ave	B	18.6	0.70	B	17.3	0.72
2: Highway 224 @ Harrison St	E	74.7	1.13	E	79.6	1.17
3: Highway 224 @ Monroe St	C	27.1	0.87	C	31.8	0.97
4: Highway 224 @ Oak St	E	58.3	1.01	E	66.9	1.06
5: Highway 224 @ 37th Ave	F	>80.0	1.26	F	>80.0	1.30
Unsignalized Intersections – PMLR FEIS						
6: Washington St @ Oak St	A/F					

Notes: A/A = major street LOS/minor street LOS
 Signalized delay = average vehicle delay in seconds for entire intersection
 Intersections show in **bold type** exceed jurisdictional standards

TPR Compliance and Considerations

Potential zoning changes within Central Milwaukie could impact nearby intersection operations. Figure 3 shows the current zoning in and around the study area.²² Table 4 describes the current zoning within the study area, and potential build-out use intensities. The Milwaukie Marketplace, zoned C-SC (Commercial Shopping Center) and located south of Oak Street, is excluded from this analysis as it is not under consideration for zoning changes.

Possible zoning changes under consideration include rezoning the residential area between Monroe Street and Oak Street, or adding a mixed-use overlay, creating a continuous commercial zone in Central Milwaukie. An additional possible change includes adding multi-family residential uses to the current commercial zone north of Oak Street.

These zoning changes would allow for retail use where there is currently none, and could add housing density to currently commercial-only locations. Depending on the mix and intensity of the uses, both of these changes may increase trips generated by the study area, and make for more continuous use throughout the day.

²¹ Milwaukie TSP Table 8-12

²² Milwaukie TSP Figure 3-15

Increased vehicle and pedestrian volumes could negatively impact intersection operations along Highway 224 at Harrison Street, Oak Street, and 37th Avenue. These are primary access points to the study area and are already performing near or above mobility targets. Increased activity at these locations could cause them to exceed mobility standards. The Monroe Street intersection offers access from Highway 224 that has adequate capacity now and in the future for increased use, and would be the best location to concentrate vehicle access to the rezoned areas. The Harrison Street / 32nd Avenue also has adequate capacity now and in the future. It offers the best pedestrian, bicycle, and transit access to the rezoned areas, and would be an ideal location to encourage multi-modal access.

Table 4: Existing Zoning in Study Area (sorted from highest intensity to lowest intensity)

Zoning	Typical Uses	Example Use (ITE Code)
ROC w/ Mixed Use Overlay (Mixed Use)	Retail Commercial Office Residential	Specialty Retail Center (814) Restaurant (931) General Office (710) Apartments (220)
CG (Commercial)	Office Retail Personal Services	General Office (710) Specialty Retail Center (814)
R1 (Residential)	Residential	Apartments (220)
R2 (Residential)	Residential	Apartments (220)
BI (Business Industrial)	Employee intensive industrial and office uses.	Manufacturing (140) General Office (710)

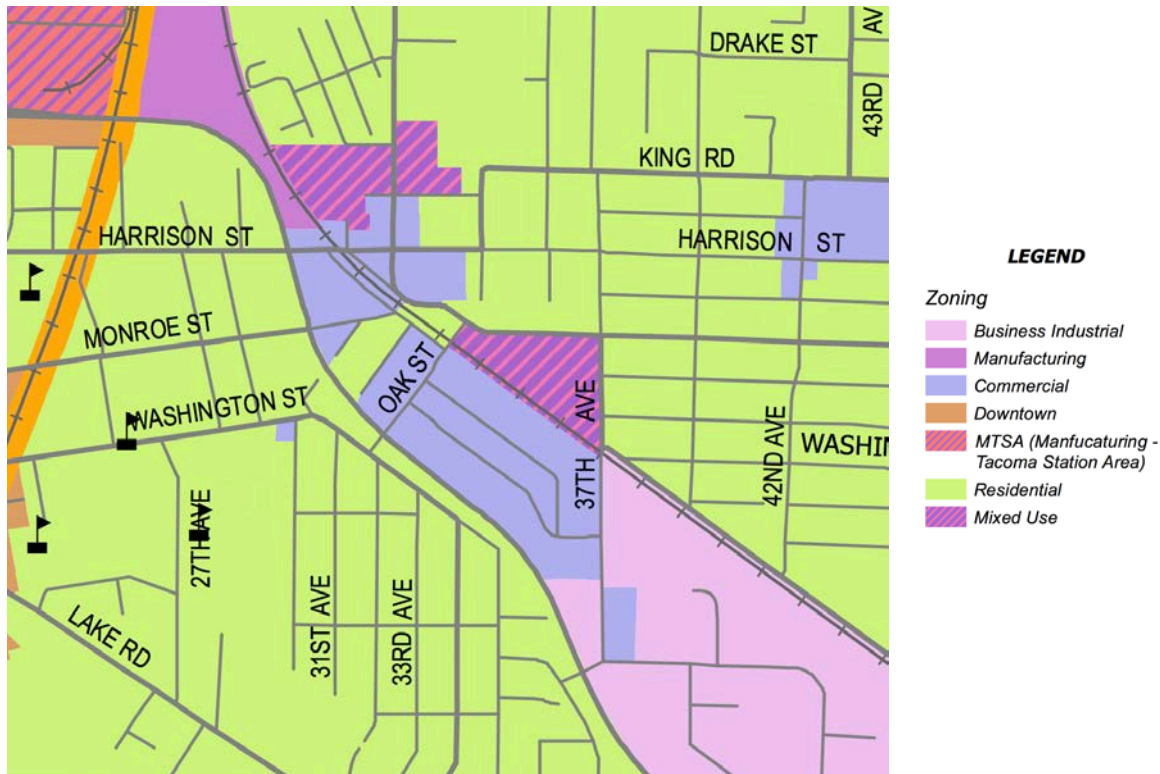


Figure 3: Existing Zoning Map

MURPHY SITE

Parking

On-street parking is prohibited on Harrison Street and 32nd Avenue near the Murphy site, so providing parking interior to the site would be important. Since the site is within 500 feet walking distance from frequent bus service, it qualifies for a 10% parking reduction for business and industrial uses, and a 20% parking reduction for multifamily housing uses.²³ The Providence Milwaukie Hospital, as well as the businesses on the east side of 32nd Avenue between Harrison Street and Llewellyn Street, all have large off-street surface parking lots that could have the potential for shared use.

Multimodal Access / Connectivity

The Murphy site is currently well connected to frequent transit service, available on Harrison Street and 32nd Avenue. The UPRR railroad crossing was recently upgraded to provide a safer pedestrian crossing environment, and the immediate sidewalk network is largely complete. If the Harrison Street TSP project is completed, it will

²³ MMC Section 19.605.3.B

also be a key nexus for the local bike network. Bicycle and pedestrian access through the south block face would be ideal to capture multi-modal trips.

Site Design

In the TSP there is a proposed road extension²⁴ that would connect Llewellyn Street with 29th Avenue, which should be incorporated into any site design plans. The railroad tracks and crossings limit design options on the south block face, but the east face offers a good opportunity for access. Table 5 describes intersection and access spacing standards. The east and north site faces, as well as the proposed Llewellyn Street road extension, offer the best opportunities for site access.

Table 5: Intersection and Access Spacing Standards for City Streets²⁵

Street Classification	Minimum Distance between Street Intersections	Maximum Distance Between Street Intersections	Maximum Block Perimeter	Private Drive Spacing
Arterial	530'	1000'	2600'	300'
Collector	300'	600'	1800'	150'
Neighborhood Route	150'	530'	1650'	N/A
Local	100'	530'	1650'	N/A

Based on the above standards, access spacing considerations for the Murphy site are as follows:

- North Side: 7 public roads are possible, no access restrictions.
- East Side (32nd Avenue): 1 public road possible (1 is existing), 2 new private driveways possible.
- South Side (Harrison Street): No new public roads possible (1 existing), no private driveways possible.
- West Side (railroad): No access possible without a new at-grade crossing.

A superblock of all undeveloped land in the Murphy site has a block perimeter of over 2,200', and is not in compliance with standards. With the Llewellyn Street extension, depending on design specifics, a single block in the northern area of the site is possible.

Considerations

The intersection of Harrison Street and 32nd Avenue has significant excess capacity, and would likely be able to accommodate increased trips generated from the Murphy Site. The intersection of Highway 224 and Harrison Street is near critical capacity, and may fail earlier than projected if the Murphy Site is developed with more intense zoning designations if not offset by reduced intensity elsewhere. However, the Murphy Site is primarily zoned ROC/MU which allows the highest density of development in the study area. Therefore, as long as any plan or zone changes for the area allows no more development intensity than what is allowed today, TPR compliance should not be a problem

²⁴ Milwaukie TSP Figure 8-4

²⁵ MMC 19.708.1.F, TSP Table 8-6, TSP Table 8-7

MCFARLAND SITE

Parking

On-street parking is allowed along 37th Avenue and Monroe Street near the McFarland site, but since the adjacent residential areas are fully built-out parking would still need to be provided internal to the site. The site is just over 500 feet from frequent bus service, and so would not qualify for transit-related parking reduction. Nearby uses are all residential, and there are no clear opportunities for shared parking arrangements.

Multimodal Access / Connectivity

The McFarland site is located next to an existing bike route, and is well placed within the planned bike network. The site is close to a frequent transit route, though separated by a residential area and not immediately adjacent. Pedestrian access across the UPRR tracks is recently improved, but the large back face of the Milwaukie Marketplace does not lend itself to pedestrian connectivity. Additionally, the eastern block face is entirely without sidewalks.

The TSP project to improve Railroad Avenue through multi-modal capacity improvements will position the McFarland site at a potential “gateway” location at the end of the corridor. The Monroe Street Neighborhood Greenway project will enhance bicycle and pedestrian connections along the length of Monroe Street, which is the northern site boundary.

Site Design

The railroad tracks and crossings limit design options on the southwest and west block faces, but the north and east faces offers good opportunities for access. Table 5 above describes intersection and access spacing standards.

Access spacing considerations for the McFarland site are as follows:

- Northwest side (Oak Street): No new public or private access possible.
- North Side (Monroe Street): 1 public road and 3 private driveways, or 4 private driveways possible.
- East Side (37th Avenue): 1 public road possible, though current layout has 2 intersections that would be options for roads. 3 private driveways possible.
- South side (Railroad): No access possible without a new at-grade crossing.

Considerations

The intersection of Monroe Street and Oak Street currently has excessive queuing along Monroe Street, and development of the McFarland site would benefit from improvement at this intersection. Close proximity to the UPRR crossing restricts design options at the intersection. The intersections along Highway 224 with Oak Street and 37th Avenue are currently near capacity, and projected to fail to meet mobility standards in the future. These intersections would be the primary access points to the McFarland site, and already handle high volumes of traffic from the Milwaukie Marketplace. It is possible that development of the McFarland site could cause the intersections to fail earlier than projected. However, the McFarland Site is zoned ROC/MU which allows the

highest density of development in the study area. Therefore, as long as any plan or zone changes for the area allows no more development intensity than what is allowed today, TPR compliance should not be a problem.

Because the Highway 224/Oak Street intersection is less severely over capacity in the future than the Highway 224/37th Avenue intersection, and because Highway 224/Monroe appears to have available capacity in the future, it may be best to develop site access and circulation to focus trips to and from this site on Oak Street and Monroe Street rather than 37th Avenue.

Truck access on 37th Street is restricted north of Railroad Avenue due to the presence of wetlands in the area.

SUMMARY

The study area in Central Milwaukie has the potential to be highly connected to the local multi-modal transportation system, especially after completion of projects identified in the TSP. The barrier effect of Highway 224 and the UPRR tracks is significant, but can be addressed with thoughtful multimodal design. Limited access points connecting the study area to downtown mean that traffic from increased development will largely fall on intersections that are near capacity and already projected to fail in the future. Changes to Comprehensive Plan designations in the study area should be designed to avoid increasing the reasonable worst-case trip generation of the study area as a whole.