

Appendix:

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PART 3 OF 3

MILWAUKEE ARENA

Traffic Report

FINAL

October 23, 2015

CHAPTER 1 - INTRODUCTION & EXECUTIVE SUMMARY

HNTB Corporation was contracted by the Milwaukee Bucks to conduct a traffic study in conjunction with the planned construction of a new Arena and the planned development of various residential, office and retail uses. The Arena and other proposed uses are located in an eight block area of downtown Milwaukee generally within the boundaries of Old World 3rd Street, 6th Street, McKinley Avenue and State Street. The traffic report assesses the future traffic needs given the trip generation created by the proposed development. Recommended intersection geometry and signal control improvements are presented based on the results of the traffic study.

PART A - PURPOSE OF REPORT AND STUDY OBJECTIVES

The purpose of this report is to assess the peak hour traffic operations at the study area intersections in the vicinity of the proposed development and to recommend intersection improvements necessary that would be expected to achieve Level of Service (LOS) D or better operations or to at least maintain the existing level of service into the future. LOS D is the traffic industry standard and represents the traffic conditions generally acceptable during peak hour operations. The study reviews PM, Pregame and Postgame traffic operations at intersections around the proposed Arena development.

PART B - EXECUTIVE SUMMARY

The planned Milwaukee Bucks Arena is expected to be located one block north of the existing BMO Harris Bradley Center, and provide a similar seating capacity to the existing facility. Additional developments in the vicinity of the planned Arena, relocation of parking facilities and modifications to the existing transportation network are also proposed. This report documents the development of traffic and pedestrian demands and the subsequent operational analysis on over 20 intersections in the vicinity of the planned Arena.

Traffic demands are projected to increase within the study area due to both the proposed developments and the application of an assumed 0.5% annual growth of background traffic traveling through the study area. 4th Street is proposed to be vacated between Highland Avenue and Juneau Avenue as part of the Arena project, which would redistribute traffic to other streets in the area.

Existing LOS Issues

This analysis identifies traffic signal or geometric improvements to maintain acceptable LOS, or maintain the pre-existing Level of Service (LOS) conditions. Operational analysis of the study area intersections identified two intersections that have existing intersection-level LOS issues.

- The intersection of McKinley Avenue and 6th Street has LOS F conditions in the Postgame condition and is projected to still have LOS F with either alternative circulation pattern for the Block 7 parking structure between McKinley Avenue and Juneau Avenue.

- Interstate Highway (IH) 43 SB ramp terminal intersection with Fond du Lac Avenue also experiences LOS F in the existing condition and is projected to continue to operate at LOS F under the proposed condition.

Projected LOS Issues

Below is a list of intersections that are projected to observe LOS E or worse conditions and require intersection geometry improvements, signal phasing improvements, signal timings improvements or additional services.

Intersection Geometry Improvements Necessary – Phases I, II & III

Intersections that have both heavier traffic volumes and nearby parking structures, which contribute to projected level of service issues include the following intersections. Intersection geometry improvements that are expected to be needed in all three phases (Phase I, II and III) are discussed below.

- McKinley Avenue and 6th Street intersection is projected to be directly affected by the operation of the proposed parking structure in its southeast quadrant, along with how vehicles are expected to access and egress that parking facility. Two operational plans have been identified for 5th Street between McKinley Avenue and Juneau Avenue. Each would impact McKinley Avenue and 6th Street in different ways, depending on the final design and operation of the adjacent parking structure in Block 7.
- Juneau Avenue and 6th Street intersection is projected to be directly affected by operations of the proposed parking structure in its northeast quadrant. The proposed Juneau Avenue cross-section reduces this intersection's lane geometry to have one eastbound through lane and one westbound through lane, along with one westbound right turn lane. The addition of a westbound left turn bay is recommended. Eastbound protected left turn phasing and westbound protected left turn phasing are recommended for Phases II and III. The proposed eastbound valet lane is recommended to begin where feasible to the east of the westbound left turn bay end taper.
- Highland Avenue and 6th Street intersection is projected to be directly affected by the operation of the proposed parking structure in its southeast quadrant. The design of the Block 2 parking structure has not been finalized yet. Currently, the main entrance is assumed to be along 5th Street, which would be expected to force many vehicles to perform the northbound right turn movement along 6th Street onto Highland Avenue during the Pregame time period. Therefore, investigation into a second right turn lane should be conducted. Options include either striping one of the two northbound through lanes as a shared through/right turn lane or utilizing temporary traffic control devices such as traffic cones along with police officer traffic control during the Pregame peak hour to route one of the two northbound through lanes as a second right turn lane. The exact needs for this intersection will become clearer when a more detailed design of the Block 2 parking facility exists.

Signal Phasing, Signal Timing & Lane Re-striping Improvements Necessary– Phases I, II & III

The following intersections require changes to signal phasing and signal timing in all three phases (Phases I, II and III) to achieve acceptable traffic operating conditions in the future with the proposed development in place or to maintain pre-existing LOS traffic operating conditions:

- McKinley Avenue and 4th Street intersection includes recommendations to remove the current northbound left turn protected signal phase and install an eastbound left turn protected signal phase. With the closure of 4th Street between Juneau Avenue and Highland Avenue reduced traffic demands occur along 4th Street, which removes the need for a northbound left turn protected phase and presents an opportunity to reduce the northbound approach to one left turn bay and one shared through/right turn lane. However, future development in the area is anticipated to increase eastbound left turn volumes, which would utilize the recommended protected phase.
- McKinley Avenue and Old World 3rd Street intersection includes a recommendation to install a westbound left turn protected signal phase. An eastbound left turn protected signal phase is already in place at this intersection. Future development in the area, along with the removal of 4th Street between Juneau Avenue and Highland Avenue increase the traffic that is expected to utilize the westbound left turn movement at this Old World 3rd Street intersection.
- Juneau Avenue and Old World 3rd Street includes a recommendation to re-stripe the westbound approach's two through lanes to be one through lane and one right turn only lane. Current plans include the westbound Juneau Avenue cross-section, west of Old World 3rd Street, to include one through lane and one continuous right turn lane. Therefore, re-striping the westbound Juneau Avenue approach at the intersection with Old World 3rd Street from two through lanes to one through lane creates better lane continuity with the downstream cross-section. In addition to the lane re-striping, eastbound protected left turn phasing is recommended in Phase III.
- State Street and 6th Street intersection includes a recommendation to remove the northbound left turn protected signal phase during the Postgame time period, depending on the final design of the Block 2 parking structure. The higher volumes traveling southbound and westbound at this intersection during the Postgame time period are expected to require more green time. It should also be noted that State Street is currently one-way westbound in the project study area. Two-way State Street operation would be expected to provide improved traffic access to better develop Block 2 and Block 3 for mixed-use development as proposed to be retail, office, residential and hotel uses. In addition, the two-way traffic operation would support the spirit of the urban design principles identified in the General Planned Development (GPD) document. Pending the final design of the parking structure ingress and egress on Block 2, a two-way State Street would likely improve the traffic flow at intersections near Block 2, and ultimately improve access to the new arena. A two-way State Street would also likely improve the connectivity of the new arena, ancillary development and other Wisconsin Center facilities to the cultural and entertainment facilities east of the Milwaukee River. Converting State Street to two-way operation should be examined further when the final design of the Block 2 parking structure is completed.

Signal Timings Improvements Only Necessary

The following intersections require changes to signal timing to achieve acceptable traffic operating conditions in the future with the proposed development in place or to maintain pre-existing LOS traffic operating conditions. The specific phases and peak hours where signal timings adjustments are expected to be needed are also identified.

- Juneau Avenue and 4th Street intersection includes an opportunity to reduce the southbound approach to one left turn bay and one right turn lane, because of reduced southbound traffic volumes caused by the proposed closure of 4th Street between Juneau Avenue and Highland Avenue. This intersection includes signal timings adjustments in all phases and peak hours.
- Fond du Lac Avenue & IH 43 SB ramp – minor signal timings adjustment in Postgame Phase I Postgame hour.
- Highland Avenue & Southbound IH 43 ramp – minor signal timings adjustment in Phases I, II and III of Pregame peak hour.
- Knapp Street & Water Street – minor signal timings adjustment in Phases I, II and III in all peak hours.
- Juneau Avenue & Water Street – minor signal timings adjustment in PM Phase III only.
- State Street & Water Street – minor signal timings adjustment in Phases I, II and III of PM peak hour.
- Kilbourn Avenue & 6th Street – minor signal timings adjustment in Phases I, II and III of PM and Pregame peak hours.
- Wells Street & 6th Street – minor signal timings adjustment in Phases II and III of PM peak hour.

Additional Services Needed– Phases I, II & III

The following intersections are planned to be unsignalized, but are anticipated to require police officer traffic control before and after events at the proposed Arena during all three phases.

- McKinley Avenue and 5th Street
- Juneau Avenue and 5th Street
- State Street and 5th Street (assuming the parking structure on Block 2 exits onto 5th Street)

No Projected LOS Issues, No Improvements Necessary

The following intersections do not need improvements to achieve overall intersection LOS D or better conditions during the PM, Pregame and Postgame peak hour or to maintain pre-existing LOS traffic operating conditions:

- Fond du Lac Avenue & Northbound IH 43 ramps
- Highland Avenue & Old World 3rd Street
- Highland Avenue & 4th Street
- State Street & 4th Street
- Kilbourn Avenue & 4th Street

Block 7 Parking Structure Traffic Routing Alternatives

Two routing alternatives were analyzed for the proposed parking facility on Block 7 between McKinley Avenue and Juneau Avenue. The main access to the parking facility is currently planned to be located along 5th Street. The two parking facility access alternatives are the following:

1. Two-way 5th Street – 5th Street between McKinley Avenue and Juneau Avenue would operate with a two-way 5th Street. Parking facility traffic could enter and exit from northbound and southbound directions along 5th Street.
2. One-way 5th Street – 5th Street between McKinley Avenue and Juneau Avenue would operate as one-way southbound only during Pregame and one-way northbound only during Postgame. This one-way requirement would route Arena traffic away from Juneau Avenue (and the Arena) during both Pregame and Postgame time periods onto McKinley Avenue. The one-way 5th Street operation would only take effect during Pregame and Postgame periods.

Both parking structure access alternatives present traffic operation results that benefit different nearby intersection approaches and turning movements. Generally, the two-way alternative allows traffic more routing options to and from the parking facility. However, the one-way alternative beneficially restricts parking facility traffic from accessing Juneau Avenue in front of the proposed Arena, which would likely include a high number of pedestrians. Furthermore, the one-way alternative may also require police officer traffic control at only one of the two 5th Street intersections at Juneau Avenue and McKinley Avenue, while additionally providing comparatively lower vehicle delays at two intersection approaches of particular interest to the City of Milwaukee – the northbound 6th Street approach at McKinley Avenue and the westbound Juneau Avenue approach at 6th Street. Therefore, the one-way access alternative is the preferred Block 7 parking facility access option during the Pregame and Postgame peak hours, pending final design of the parking facility. However, the two-way access alternative is preferred for the PM peak hour. The one-way access alternative is not preferred in the PM peak hour because it would force all of the commuters from the proposed large office component in Block 6 to exit onto Juneau Avenue, which is proposed to have a reduced cross-section with only one through lane in each direction. The two-way access alternative along 5th Street allows office commuters a second option during the PM peak hour to exit onto McKinley Avenue for better traffic operations and distribution in the study area.

CHAPTER 2 - PROPOSED DEVELOPMENT

This chapter describes the proposed on-site development and the project study area.

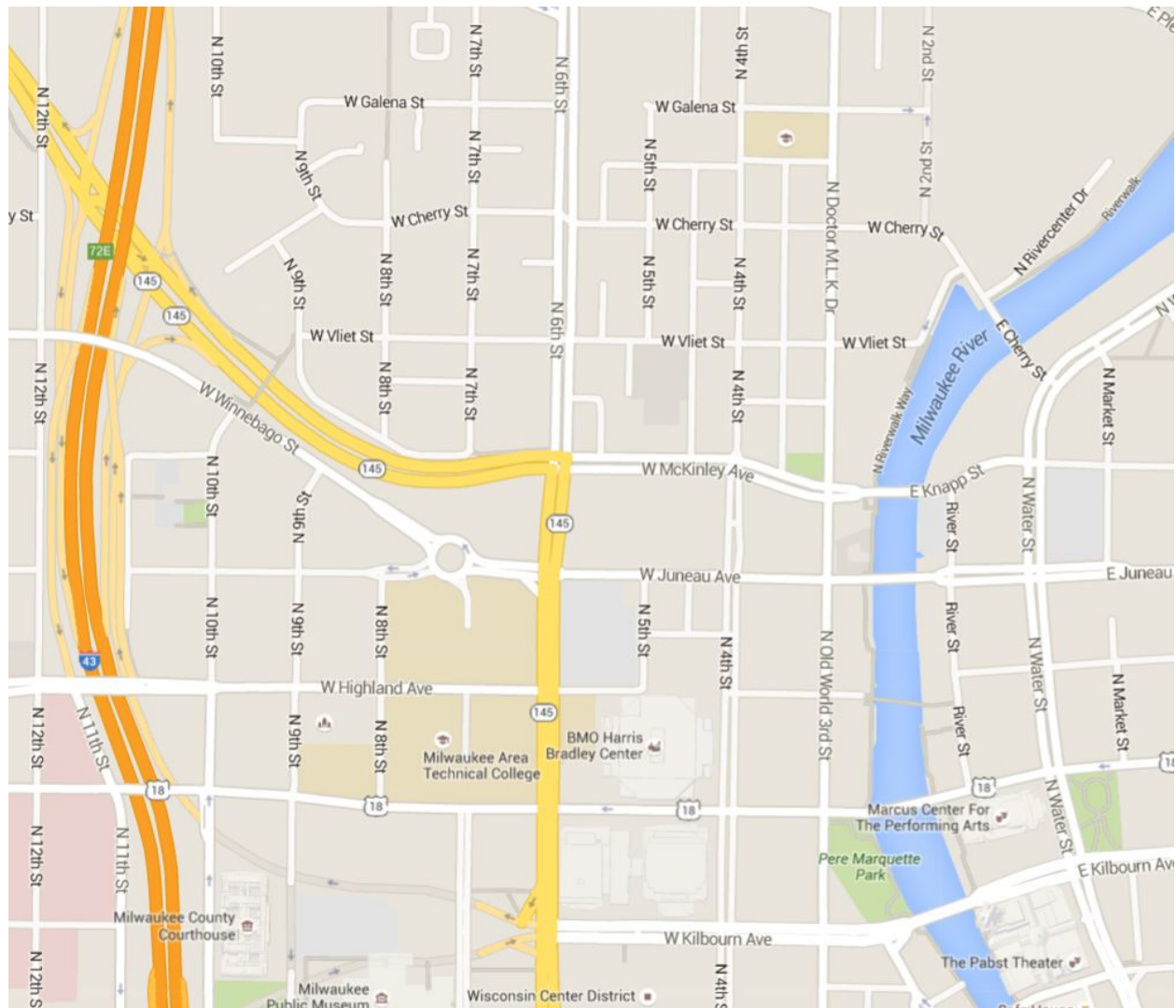
PART A - ON-SITE DEVELOPMENT

The purpose of this section is to describe the proposed development site location, proposed site plan and the development phasing.

1. Development Description and Site Location

Exhibit 2-1 shows the Site Location Map of the proposed development. It is located in the northwestern area of downtown Milwaukee generally between McKinley Avenue to the north, State Street to the south, 6th Street to the west and Old World 3rd/4th Street to the east. More specifically, the development site includes the current location of the Bradley Center and the vacant Park East Corridor land located just north of the Bradley Center.

Exhibit 2-1: Site Location Map

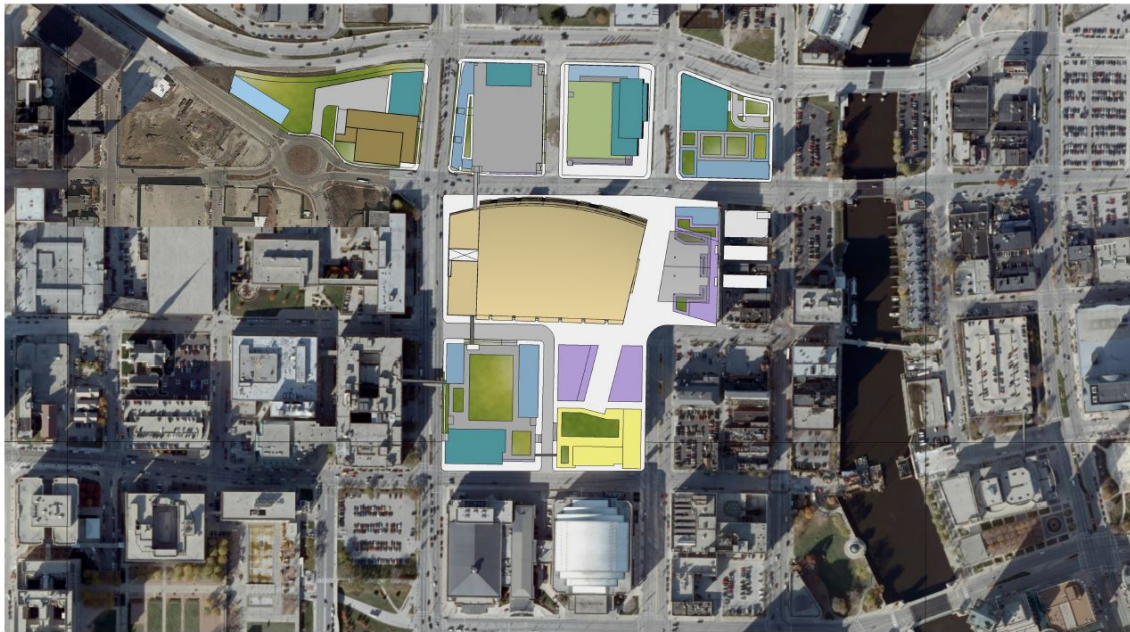


2. Land Use and Intensity

The proposed on-site development includes a new arena to host Milwaukee Bucks basketball games and other entertainment events. Other land uses planned for the development include apartments, a hotel, retail and office space, parking facilities and a practice facility for the Milwaukee Bucks.

3. Proposed Site Plan

Exhibit 2-2 shows the Site Plan, dated October 23, 2015. The proposed development includes eight proposed blocks

Exhibit 2-2: Site Plan**BUCKS ARENA DEVELOPMENT**

MASTERPLAN

espestein urban : architects
10/23/2015 115423
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4. Development Phasing and Timing

The development includes three phases expected to develop in Years 2018, 2022 and 2027, respectively. Exhibit 2-3A shows Phase I, which is comprised of Blocks 1, 4, 7 & 8. Exhibit 2-3B shows Phase II, which is comprised of Blocks 2 & 3. Exhibit 2-3C shows Phase III, which is comprised of Blocks 5 & 6. The specific land uses types and sizes are presented in Table 4-1 in a later chapter.

It should be noted that traffic circulation is expected to be modified as part of the proposed development. The segment of 4th Street between Juneau Avenue and Highland Avenue is proposed to be closed to vehicle traffic beginning in Phase I. This area is planned as a public plaza for use on Milwaukee Bucks gamedays and for other non-gameday events. Furthermore, it should be noted that 5th Street is expected to be open to all traffic in two new segments where 5th Street does not currently exist, between McKinley Avenue and Juneau Avenue and between Highland Avenue and State Street. The segment of 5th Street between Juneau Avenue and Highland Avenue is where the proposed arena is planned to be located.

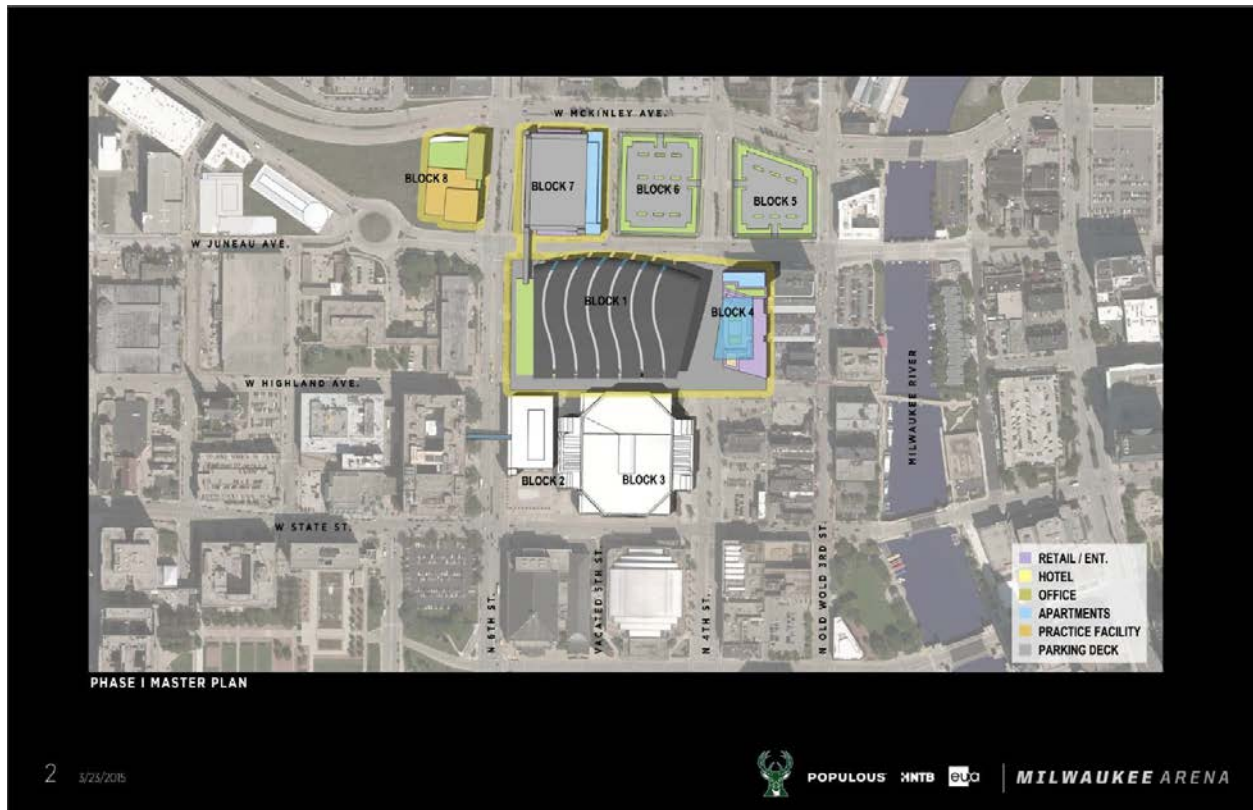
Exhibit 2-3A: Phase I Proposed Development

Exhibit 2-3B: Phase II Proposed Development

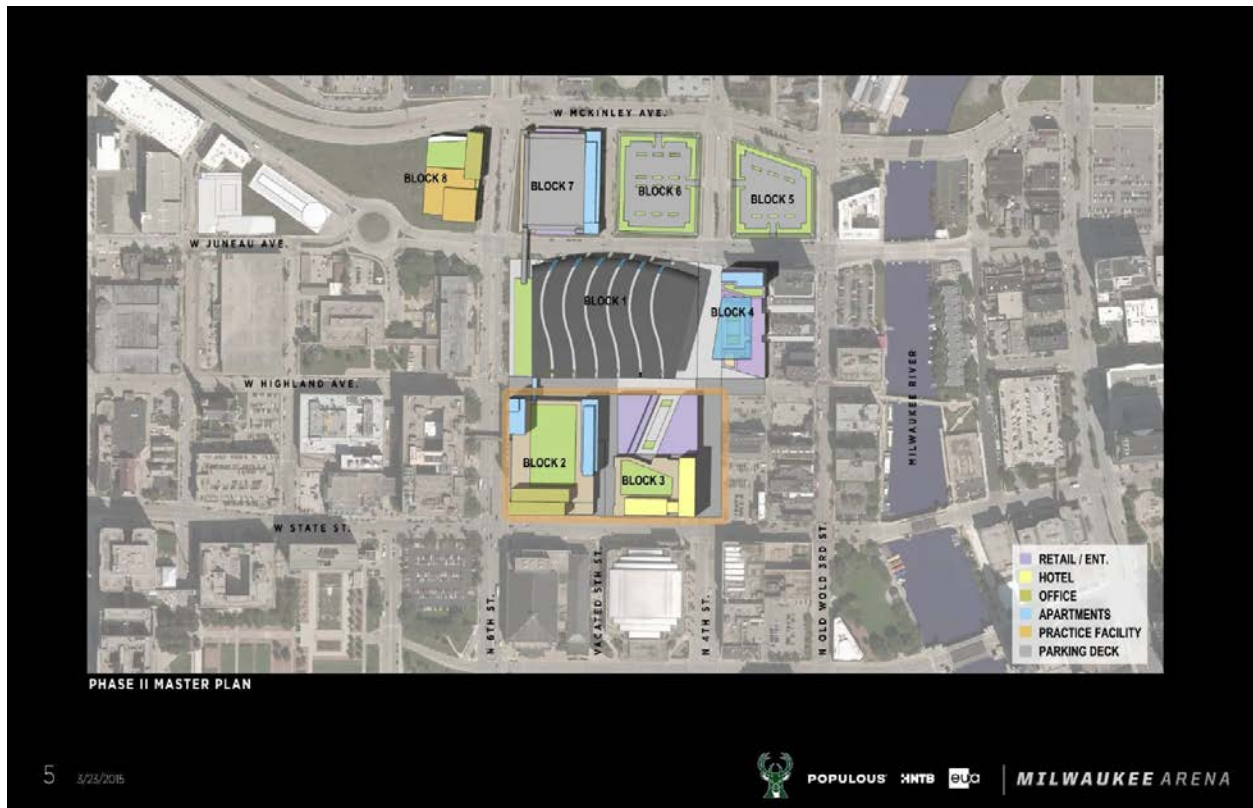
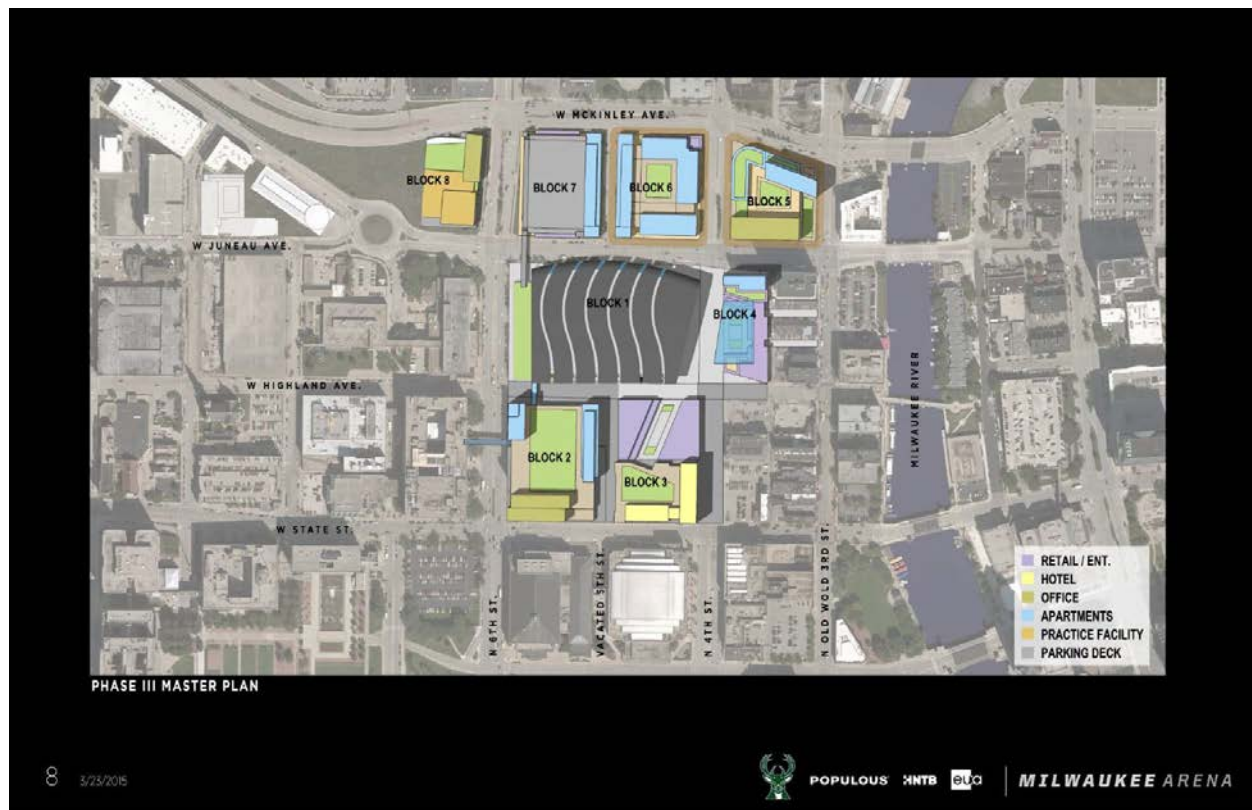


Exhibit 2-3C: Phase III Proposed Development



PART B - STUDY AREA

The purpose of this section is to describe the intersections that may be impacted by the proposed development, which make up the project study area.

1. Study Area Intersections

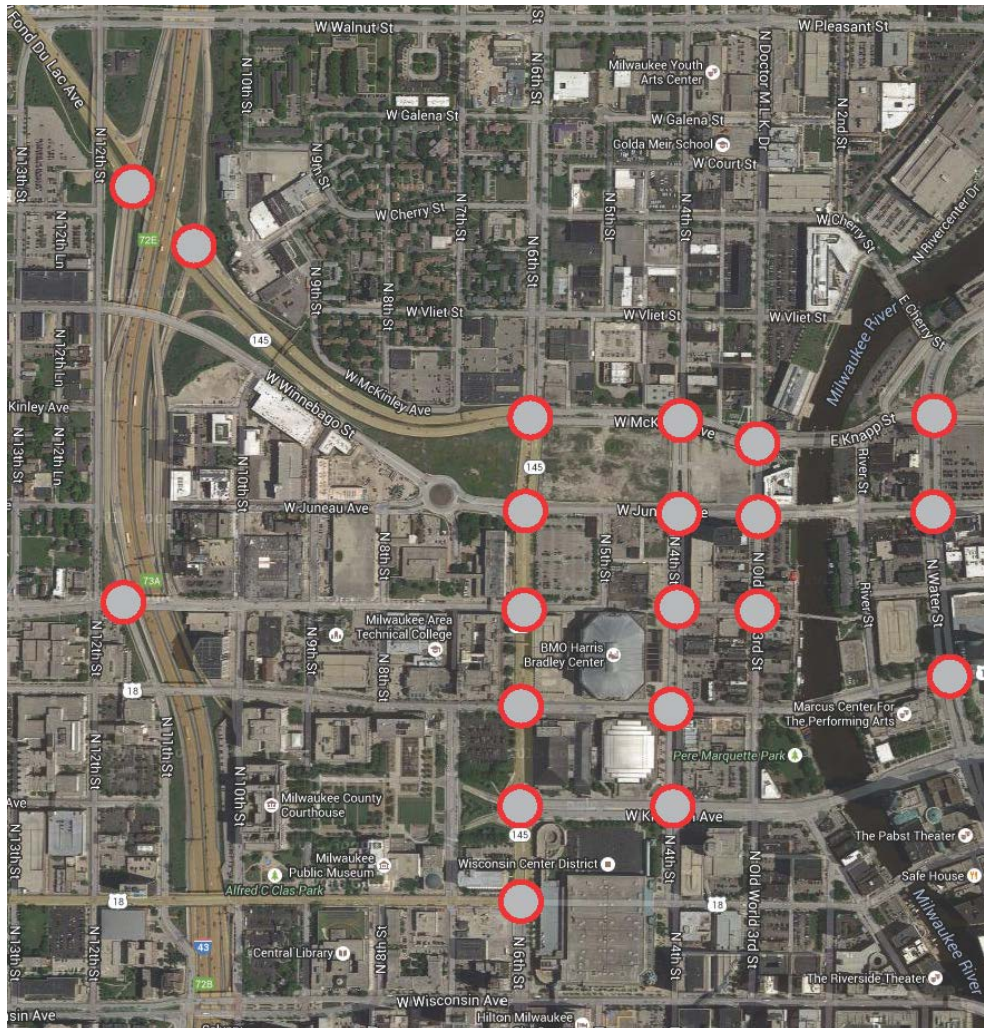
Twenty (20) existing intersections were determined to be within the influence area of the proposed development. All twenty (20) intersections were included in the traffic operations analysis. However, only twelve (12) of the twenty (20) are currently included in the micro-simulation traffic analysis. The list of intersections below identifies which eight (8) intersections were analyzed as part of the traffic operations analysis and not in the micro-simulation traffic analysis.

- Knapp Street & Water Street – Operations analysis only
- McKinley Avenue/Knapp Street & Old World 3rd Street
- McKinley Avenue & 4th Street
- McKinley Avenue/Fond du Lac Avenue & 6th Street
- Fond du Lac Avenue & Northbound IH 43 ramps
- Fond du Lac Avenue & Southbound IH 43 ramps

- Juneau Avenue & Water Street – Operations analysis only
- Juneau Avenue & Old World 3rd Street – Operations analysis only
- Juneau Avenue & 4th Street
- Juneau Avenue & 6th Street
- Highland Avenue & Old World 3rd Street – Operations analysis only
- Highland Avenue & 4th Street
- Highland Avenue & 6th Street
- Highland Avenue & Southbound IH 43 ramp – Operations analysis only
- State Street & Water Street – Operations analysis only
- State Street & 4th Street
- State Street & 6th Street
- Kilbourn Avenue & 4th Street – Operations analysis only
- Kilbourn Avenue & 6th Street
- Wells Street & 6th Street – Operations analysis only

Exhibit 2-4 below graphically shows the twenty (20) intersections that are considered study area intersections.

Exhibit 2-4: Study Area Intersections



PART C - OFF-SITE LAND USE AND DEVELOPMENT

The surrounding area outside of the proposed development area is downtown Milwaukee. Any new future land uses that will develop due to the construction of the proposed Site Plan area development are incorporated in the proposed development. Development in the vacant area of the former Park East corridor and in the future vacant area of the planned demolition of the Bradley Center are included as part of this proposed eight-block development. Therefore, no significant off-site development is incorporated as part of this traffic study. However, traffic growth due to any future development in the surrounding area outside of the proposed development area is incorporated by applying a 0.5% annual growth to Background traffic. Background traffic is identified as traffic in the study area not related to Arena events or to the proposed developments in the eight-block study area included in the Site Plan.

PART D - SITE ACCESSIBILITY

The current site is largely served by IH 43, which is located about a one quarter-mile west of 6th Street. IH 43 interchanges are located at McKinley Avenue, at Highland Avenue and at Kilbourn Avenue. The McKinley Avenue/IH 43 interchange is a full access interchange serving both northbound and southbound IH 43 traffic. The Highland Avenue/IH 43 interchange serves only IH 43 traffic to and from the north. The Kilbourn Avenue/IH 43 interchange only serves northbound IH 43 traffic. Further to the south, an IH 43 southbound entrance ramp access is located at Wisconsin Avenue & 11th Street. In addition, IH 794 is located approximately one-half mile south of State Street. Several interchanges accessing IH 794 exist at Clybourn Street, James Lovell Street, St. Paul Avenue, 2nd Street and Plankinton Avenue. All interchanges are within one mile of the proposed development site and are expected to remain important for accessibility of vehicle traffic to and from the proposed development.

In addition, there are several city bus stops in the area around the proposed development site. Shuttles to and from local hotels and businesses are also used to transport large groups to events at the Bradley Center and are expected to continue to be used in conjunction with events at the proposed new arena.

Discussion of potential new and modified traffic signals and intersection sign controls are discussed in a subsequent chapter of this report where future traffic operations are analyzed.

CHAPTER 3 - ANALYSIS OF EXISTING CONDITIONS

This chapter discusses the analysis of Existing traffic operations in the project study area.

PART A - PHYSICAL CHARACTERISTICS

Twenty intersections surrounding the BMO Harris Bradley (Milwaukee Bucks) Arena were analyzed, from I-43 to Water St. and from Fond du Lac to Wells St. Of these, the 10 considered most challenging to the future Bucks Arena development underwent a closer evaluation through traffic microsimulation analysis to mitigate potential vehicle and pedestrian traffic concerns. Exhibit 2-4 previously identified the intersections to be analyzed. Exhibits 2-3A, 2-3B, and 2-3C show the planned transportation system, in Phases I, II, and III, respectively. These intersections were identified in a discussion between HNTB and the City of Milwaukee.

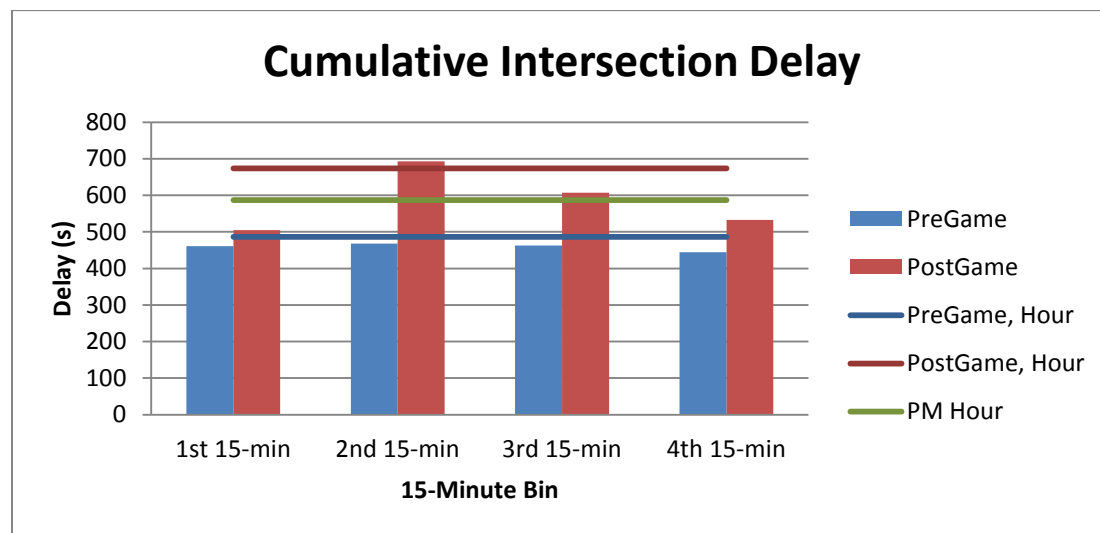
PART B - TRAFFIC VOLUMES & LEVEL OF SERVICE

Based on traffic counts on April 23, 2015 during the PM Peak (4:45-5:45pm), the Pregame hour (6-7pm), and the Postgame hour (9:45-10:45pm), pedestrian and vehicle traffic was evaluated to determine the area of influence caused during a playoff game at the BMO Harris Bradley Center. This date was selected for the counts specifically due to the playoff status of the sold-out game against the Chicago Bulls, a worst-case traffic scenario due to the importance of the game and the proximity of the opposing team/fan base.

Exhibits 3-1 to 3-3 in the Appendix show the existing PM, Pregame, and Postgame intersection turning volumes in the study area.

Balanced vehicle counts and pedestrian crosswalk volumes were applied to Synchro models, with HCM 2010 (Highway Capacity Manual) reports then generated for both of these modes of travel. Additionally, Pregame and Postgame 15-minute hourly flow rates were analyzed within Synchro to further understand the atypical traffic peaks that happen before and after a special event such as a Milwaukee Bucks playoff basketball game (See Exhibit 3-4). Breaking these into 4, 15-minute hourly flow rate models vs. a cumulative 1-hour model with a traditionally calculated peak-hour factor (PHF; used to describe traffic distribution over time within analysis hour) applied has multiple advantages in the Pregame/Postgame situations. This assessment gives better detail in analyzing across intersections with imbalances due to parking facilities, as well as recognizes that not all movements may experience their worst traffic simultaneously. For reference, the full hour with PHF was included for PM/Pregame/Postgame. Full-hour delay is calculated based on the worst 15-minutes for each movement. Because the worst 15-minute period for each movement doesn't occur simultaneously, the full hour lines tend to represent higher than 15-minute component bins. Note, Pregame delay remains relatively flat, as PM commuter traffic declines, Arena traffic increases. Postgame delay experiences substantial peaking, as attendants tend to depart en masse as opposed to arrival patterns.

Exhibit 3-4: 15-Minute Intersection Delay Bins, HCM2000



Vehicle Traffic Analysis

HCM 2010 data was exported for each of the 20 intersections for each period, PM/Pregame/Postgame. For vehicle operations, both movement-specific LOS and intersection LOS were taken into account for Exhibit 3-5 below. Select intersections had police manually directing traffic during the heaviest traffic periods for the Pre and Postgame, although ultimately the intersection analysis relies on a worst-case scenario of only the standard signal timing plans. The ring surrounding the intersection dot indicates the cumulative number of movements LOS E or F between PM/Pregame/Postgame. The fill indicates the worst intersection LOS during either the PM, Pregame, or Postgame conditions. Note, volumes for select movements, especially in the Postgame, were metered due to downstream congestion on Fond du Lac at IH 43. These lower metered volumes represent only those vehicles that got through, not the demand, and as such, operations are potentially positive. Intersections most affected are those along the McKinley Ave/Fond Du Lac Ave. Peak hour intersection LOS operations for each time period is shown in Table 3-1 below.

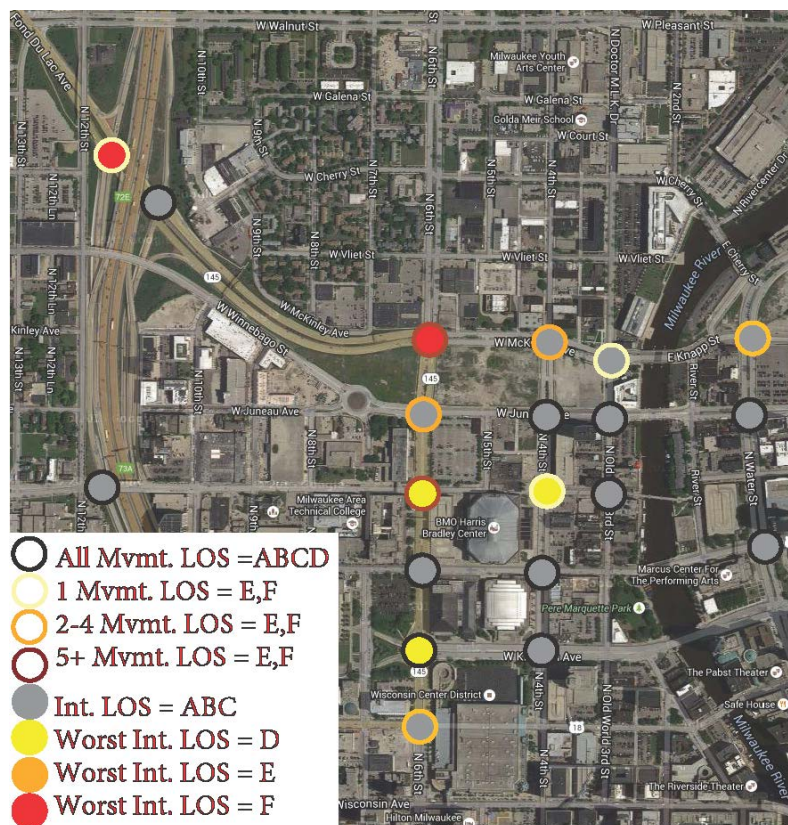
Table 3-1: Existing Intersection Peak Hour Traffic Operations

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Fond du Lac Ave & IH 43 SB ramps	Traffic Signal	Existing	PM	B	-	D	A	B	A	-	-	-	-	C	C	A
			Pregame	C	-	C	A	C	A	-	-	-	-	C	C	A
			Postgame	F	-	C	A	F	A	-	-	-	-	C	C	A
Fond du Lac Ave & IH 43 NB ramps	Traffic Signal	Existing	PM	B	A	A	-	-	B	A	D	D	-	-	-	-
			Pregame	A	A	A	-	-	B	A	C	C	-	-	-	-
			Postgame	B	A	A	-	-	B	A	C	C	-	-	-	-
Highland Ave & IH 43 SB ramp/ SB frontage road	Traffic Signal	Existing	PM	B	-	B	B	B	B	-	-	-	-	B	C	C
			Pregame	B	-	B	B	B	B	-	-	-	-	B	C	C
			Postgame	B	-	B	B	B	B	-	-	-	-	B	B	C
McKinley Ave & 6 th Street	Traffic Signal	Existing	PM	D	D	C	D	E	A	A	F	E	E	F	C	C
			Pregame	D	D	C	F	F	C	C	E	D	D	D	C	C
			Postgame	F	C	B	B	C	C	C	F	C	C	D	C	C
McKinley Ave & 4 th Street	Traffic Signal	Existing	PM	C	F	B	C	E	D	D	B	A	A	C	C	C
			Pregame	B	C	B	C	E	A	A	B	A	A	C	C	C
			Postgame	B	B	B	B	A	A	A	C	A	A	C	C	C
McKinley Ave & Old World 3 rd Street	Traffic Signal	Existing	PM	C	E	A	A	C	C	B	C	A	A	C	D	D
			Pregame	B	B	A	A	C	B	B	B	A	A	C	D	D
			Postgame	B	A	A	A	B	B	B	B	A	A	C	C	C
Juneau Ave & 6 th Street	Traffic Signal	Existing	PM	C	D	C	A	C	C	C	D	C	C	F	B	B
			Pregame	B	C	C	A	C	C	C	C	B	B	C	B	B
			Postgame	C	E	C	A	C	C	D	B	B	B	C	B	A
Juneau Ave & 4 th Street	Traffic Signal	Existing	PM	B	C	B	B	C	B	B	A	A	A	B	B	B
			Pregame	B	B	C	C	B	A	A	A	A	A	B	B	B
			Postgame	B	C	B	B	A	A	A	A	A	A	B	B	B
Juneau Ave & Old World 3 rd Street	Traffic Signal	Existing	PM	C	D	C	C	D	C	C	A	A	A	B	B	B
			Pregame	C	D	C	D	D	C	C	C	C	C	C	B	B
			Postgame	C	D	C	C	D	C	C	D	D	C	C	B	B
Highland Ave & 6 th Street	Traffic Signal	Existing	PM	D	F	F	C	E	E	A	C	B	B	E	D	C
			Pregame	D	F	F	C	F	F	A	B	A	A	D	C	C
			Postgame	C	C	C	B	E	E	A	B	A	A	C	C	C

Table 3-1 (continued): Existing Intersection Peak Hour Traffic Operations

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Highland Ave & 4 th Street	Traffic Signal	Existing	PM	B	-	-	-	C	-	C	-	A	A	B	B	-
			Pregame	B	-	-	-	C	-	C	-	A	B	C	B	-
			Postgame	D	-	-	-	C	-	F	-	A	B	B	B	-
Highland Ave & Old World 3 rd Street	Traffic Signal	Existing	PM	A	C	C	C	C	B	A	A	A	A	A	A	A
			Pregame	A	C	C	C	C	B	A	A	A	A	A	A	A
			Postgame	B	C	C	C	C	B	A	A	A	A	A	A	A
State Street & 6 th Street	Traffic Signal	Existing	PM	C	D	-	C	B	B	B	C	B	-	-	C	C
			Pregame	C	D	-	C	C	B	C	B	B	-	-	C	C
			Postgame	B	C	-	C	C	B	B	B	B	-	-	C	C
State Street & 4 th Street	Traffic Signal	Existing	PM	B	-	-	-	B	B	B	B	B	-	-	A	B
			Pregame	B	-	-	-	B	B	B	C	C	-	-	B	C
			Postgame	B	-	-	-	B	B	B	B	B	-	-	B	D
Kilbourn Ave & 6 th Street	Traffic Signal	Existing	PM	D	C	C	A	D	C	D	D	D	C	D	D	A
			Pregame	C	D	C	A	C	C	D	B	C	C	C	C	A
			Postgame	C	C	C	A	C	D	D	C	C	C	B	D	A
Kilbourn Ave & 4 th Street	Traffic Signal	Existing	PM	C	D	C	C	C	B	B	B	B	B	A	A	A
			Pregame	C	D	C	C	C	B	B	C	B	C	C	B	C
			Postgame	C	C	C	C	B	B	B	C	B	B	C	C	C
Wells Street & 6 th Street	Traffic Signal	Existing	PM	C	E	B	B	C	C	D	C	C	B	E	C	C
			Pregame	C	C	B	B	C	C	C	C	C	C	D	B	B
			Postgame	C	C	B	B	C	C	C	B	B	B	B	B	B
Water Street & Knapp Street	Traffic Signal	Existing	PM	C	F	C	C	C	C	C	C	A	A	C	C	D
			Pregame	C	D	C	C	C	C	C	C	A	A	C	C	F
			Postgame	B	C	B	B	C	C	C	B	A	A	C	C	C
Water Street & Juneau Avenue	Traffic Signal	Existing	PM	B	D	D	D	D	C	C	C	A	A	B	C	B
			Pregame	B	C	B	B	C	C	C	B	A	A	B	C	B
			Postgame	B	C	B	C	D	C	C	B	A	A	B	B	B
Water Street & State Street	Traffic Signal	Existing	PM	C	-	-	-	C	C	C	C	C	-	-	D	D
			Pregame	B	-	-	-	B	B	B	B	B	-	-	B	B
			Postgame	B	-	-	-	B	B	B	B	B	-	-	B	B

Table 3-1 shows that the Fond du Lac Avenue intersection with IH 43 SB ramps and the McKinley Avenue intersection with 6th Street operate at an overall intersection LOS F in the existing Postgame peak hour. All other existing intersections observe overall intersection LOS operations of LOS D or better during the three peak hours. Various intersection traffic turning movements operate at LOS E or F conditions in the existing scenario.

Exhibit 3-5: Intersection LOS, Vehicles, Σ (PM, Pregame, Postgame)

Pedestrian Traffic Analysis

Similar to vehicle LOS, pedestrian LOS was calculated from HCM 2010 via Synchro, exported, and summarized in Exhibit 3-6 below. The ring surrounding the intersection dot indicates sidewalk corner LOS of E or F, with yellow showing one corner and red indicating two or more. Corner crosswalk LOS is dependent purely on geometry; length, width, and curb radius. A large curb radius cuts further into the corner sidewalk queuing space; this reduces queuing space for pedestrians, increases crosswalk distance, and increases vehicle cornering speeds and therefore the perceived and real risk for pedestrians. Corner crosswalk LOS can be improved by reducing curb radius; a fix that doesn't compromise vehicle capacity. The fill within each intersection dot indicates circulation LOS, with yellow representing 1 crosswalk with LOS E or F, and red indicating 2 or more crosswalks with LOS E or F. Circulation LOS is dependent on both crosswalk width/length, as well as signal timing. While it may be challenging to add walk time for certain pedestrian crosswalks, widening it is another method to improve the circulation LOS. The takeaway for pedestrian LOS calculations is that it is much more dependent upon crosswalk width and sidewalk queue space, compared to vehicle operations that are more reliant on signal timing. Although components of pedestrian LOS still rely on signal timing, many pedestrian LOS issues can be resolved through basic sidewalk and crosswalk design.

Table 3-2: Intersections Recommended for Further Analysis

#1	Fond Du Lac & I-43 SB Ramp
#2	Fond Du Lac & I-43 NB Ramp
#3	Fond Du Lac/McKinley & 6 th
#4	McKinley & 4 th
#5	McKinley & Old World 3 rd
#6	Juneau & 6 th
#7	Juneau & 4 th
#8	Highland & 6 th
#9	Highland & 4 th
#10	State & 6 th
#11	State & 4 th
#12	Kilbourn & 6 th

Existing Traffic Microsimulation Analysis

A traffic microsimulation analysis was conducted to assess the flow of traffic through the existing network and gauge the impact of event-going pedestrians cause on traffic operations within the study area. The VISSIM microsimulation software program was utilized with twelve of the twenty intersections. The following twelve intersections are included in the VISSIM microsimulation analysis:

- McKinley Avenue/Knapp Street & Old World 3rd Street
- McKinley Avenue & 4th Street
- McKinley Avenue/Fond du Lac Avenue & 6th Street
- Fond du Lac Avenue & Northbound IH 43 ramps
- Fond du Lac Avenue & Southbound IH 43 ramps
- Juneau Avenue & 4th Street
- Juneau Avenue & 6th Street
- Highland Avenue & 4th Street
- Highland Avenue & 6th Street
- State Street & 4th Street
- State Street & 6th Street
- Kilbourn Avenue & 6th Street

Two traffic microsimulation models were created to represent the existing conditions; one representing the PM peak & Pregame and the other representing the Postgame. Existing signal phasing and timings plans were input into the models to represent the control delay in the study area. Both models were calibrated using the GEH statistic. This statistic gauges the difference between the observed volumes compared to the modeled volumes. Calibration results of the existing conditions are provided in the Appendix. Within the PM peak & Pregame microsimulation models, PM peak volumes utilized consistent loading while the Pregame utilized profile loading to reflect traffic volume peaking characteristics observed in the traffic counts. The Postgame microsimulation model also utilized profile loading. For instance, during the Postgame the first 15-minute period would likely include the highest amount of vehicles exiting followed by subsequent 15-minute periods with waning traffic flows.

The existing traffic microsimulation model LOS results are shown in the Appendix. The results show that the microsimulation LOS results are similar to the traffic operations results shown in Table 3-1. The existing microsimulation results show some turning movements at the intersections of McKinley Avenue with 6th Street and with 4th Street operating at LOS E/F, and the westbound approach of Fond du Lac Avenue intersection with IH 43 Northbound Ramp operating at LOS F during the Postgame. Operations of LOS F are experienced due to significant lane changing in preparation of the southbound IH 43 entrance ramp. A significant amount of traffic is destined for southbound IH 43 which results in poor lane balance at the northbound ramp terminal. Most of the other turning movements in the existing microsimulation models are LOS D or better. The similarity between the existing traffic operations intersection LOS conditions (Table 3-1) and the existing microsimulation intersection LOS results suggest

that the existing microsimulation models are well calibrated and the multimodal auto-pedestrian interaction is represented in both software packages.

Conclusions

Table 3-3 below highlights the different time periods of analysis, and when each network, pedestrian and vehicle, had the most issues with LOS. Important to note, LOS is calculated based on successful pedestrian and vehicle movements. As discussed previously the Postgame rapidly becomes over-saturated, metering vehicles and thus counts do not accurately capture demands. Based on a study by the Brooklyn Nets (*“Barclays Center TDM Effectiveness in Meeting Mode Split Objectives,”* June 7, 2013, which is provided in the Appendix), vehicle occupancy was estimated at 2.75 people/vehicle¹, although not measured directly for the Bucks traffic analysis. This value of 2.75 was used to ensure sufficient attendees’ were accounted for via parking lot capacity.

Table 3-3: Total Movements System-wide of LOS E, F

TOTAL	Pedestrian Network	Vehicle Network
PM	1	16
Pregame	19	9
Postgame	11	5

PART C - SOURCES OF DATA

Traffic counts were gathered via Miovision video traffic counting on April 23, 2015, and signal timings were provided by the City of Milwaukee.

¹ *Barclays Center TDM Effectiveness in Meeting Mode Split Objectives*, June 7 2013. Table 3: Weekday Evening Nets Game Peak Hour Auto Trip Comparison, page 5.

CHAPTER 4 - PROJECTED TRAFFIC

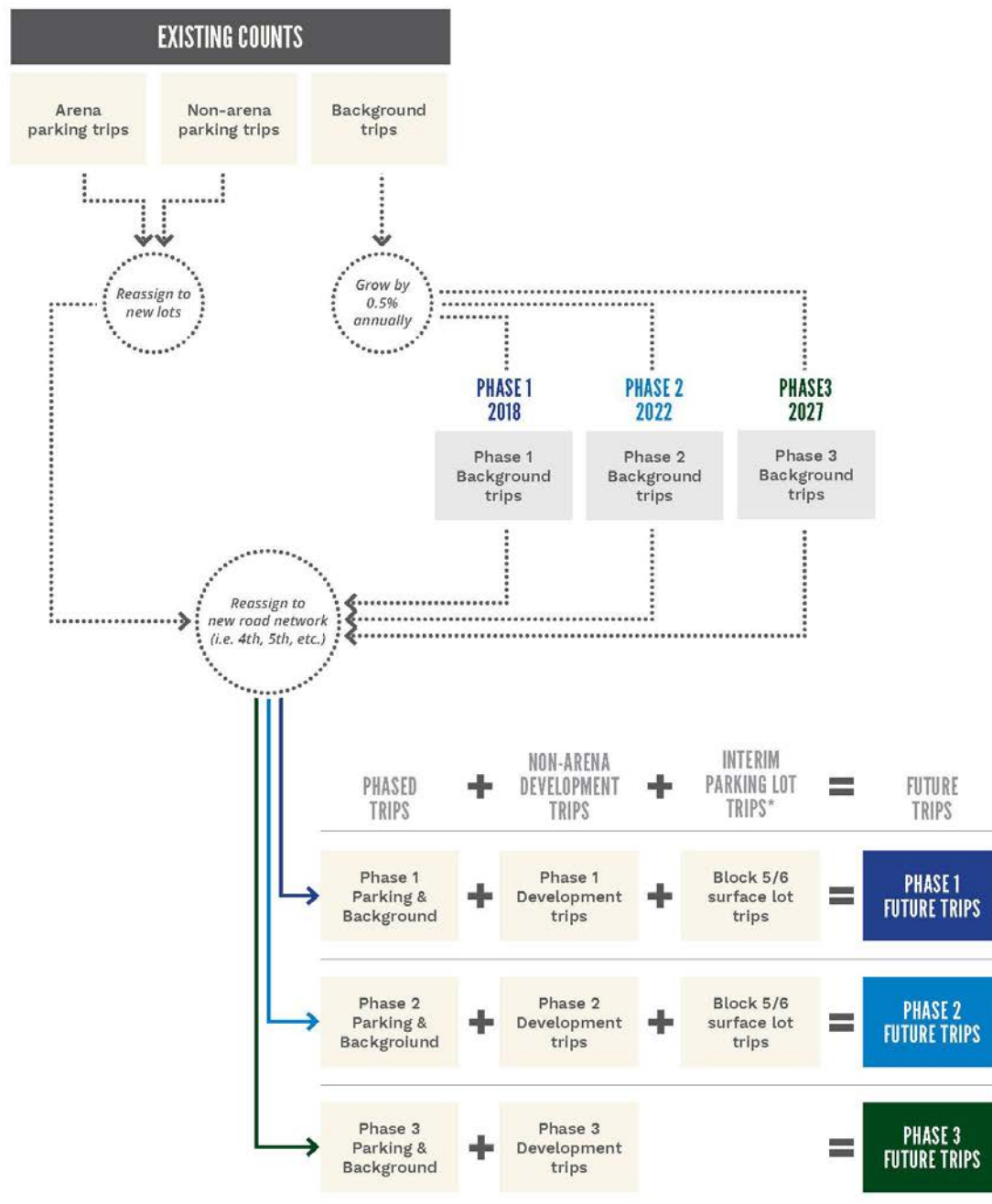
This chapter describes the expected trip generation of the proposed development and the calculation of future year traffic volumes.

The future year traffic volumes for this traffic study are calculated using a multi-step process. In summary, they include the following steps. The process is described in more detail in this chapter and subsequent chapters.

1. Collect intersection turning movement counts at twenty intersections within the core study area. Analyze the intersection volumes to estimate vehicles entering and exiting parking lot structures. These are considered “arena parking trips.” Subtract these “arena parking trips” from the Existing peak hour traffic volumes throughout the study area intersections to determine the Existing Year 2015 Background traffic volumes.
Also, identify the Existing trips going to and from parking lots during the peak hours in the study area that are not related to a Bradley Center event. These are considered “non-arena parking trips,” which represent vehicles in the parking lot structures associated with non- event activities that are leaving the parking structure during the analysis period.
2. Apply an assumed annual 0.5% growth rate to the Existing Background traffic volumes to determine the Phase I, Phase II and Phase III future year Background traffic volumes. Phase I is in Year 2018 and includes three years of 0.5% annual Background traffic growth. Phase II is in Year 2022 and includes 7 years of 0.5% annual Background traffic growth. Phase III is in Year 2027 and includes 12 years of 0.5% annual Background traffic growth.
3. Re-assign the “arena parking trips” and the “non-arena parking trips” that utilize existing parking lots that are expected to be removed under the proposed development plans to new parking lots that are proposed to be constructed under development plans.
4. Adjust the routing and circulation of the Phase I, Phase II & Phase III Background traffic, and the arena and non-arena parking traffic, through the study area intersections of the proposed future network. This includes the proposed closure of 4th Street between Juneau Avenue and Highland Avenue, the proposed opening of Highland Avenue between 5th Street and 6th Street, and the proposed opening of 5th Street between McKinley Avenue & Juneau Avenue and between Highland Avenue & State Street to re-route traffic flow.
5. Determine Phase I, Phase II & Phase III non-arena development traffic volumes, respectively, and assign the non-arena development traffic to the proposed future network in the study area.
6. Add Phase I non-arena development trips to the Phase I Background traffic to determine Phase I future traffic volumes.
Add Phase II non-arena development traffic to the Phase II Background traffic to determine Phase II future traffic volumes.
Add Phase III non-arena development trips to the Phase III Background traffic to determine Phase III future traffic volumes.

Below is Figure 4-1, which is a simple flow chart that graphically shows the process used for calculating future year traffic volumes, which is summarized in the previous text.

Figure 4-1: Flow Chart of Process for Calculating Future Year Traffic Volumes



* Interim parking lots that are redeveloped in Phase III. These lots provide parking in the study area to trips that are otherwise pedestrians in the study area.

PART A - BACKGROUND TRAFFIC FORECASTING

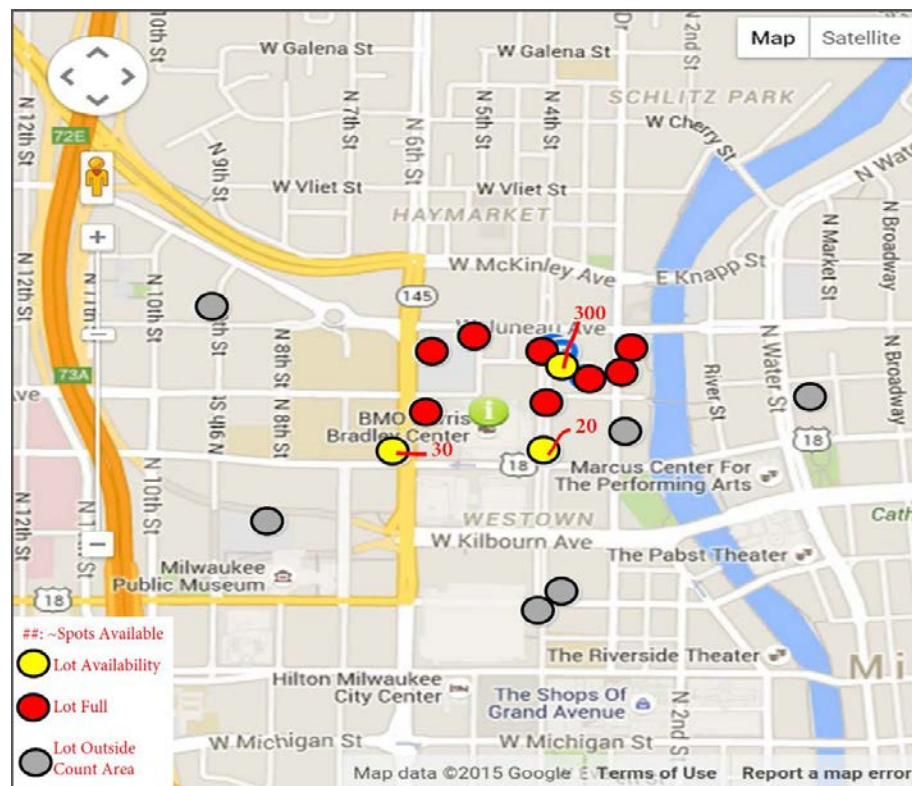
This section describes the process of determining the Background traffic.

- **Identify Arena Parking Trips and Non-arena Parking Trips**

The proposed development includes replacing the Bradley Center with a proposed arena of a similar seating capacity, therefore the trips related to the existing arena are not included in the Background traffic volumes. With the proposed arena seating capacity being similar to the existing arena, the number of vehicle trips coming to and from the proposed arena is not expected to increase in the future, therefore only the non-arena trips are expected to increase at the annual Background traffic growth rate. Therefore, the Existing trips related to the Bradley Center, i.e. the “arena parking trips”, were identified and then removed from the Existing traffic volumes at the study area intersections to determine the Existing Year 2015 Background traffic volumes, which were then balanced between intersections.

The Existing “arena parking trips” were identified by noting the imbalance of the Existing traffic volume counts between intersections in the study area. The imbalance was assumed to exist because of traffic entering and exiting parking lots located mid-block. During the PM and Pregame peak hours, the mid-block traffic imbalance was assumed to be due to inbound traffic and during the Postgame peak hour the mid-block traffic imbalance was assumed to be due to outbound traffic. The traffic imbalances were compared to the capacity of the parking lot at each location. The comparison showed that the sum of PM and Pregame traffic imbalances between intersections generally equated to the parking lot capacity at each location within about 5% except for the parking facility located along 4th Street between Juneau Avenue and Highland Avenue. Figure 4-2 shows a graphic of this comparison.

Figure 4-2: Comparison of Existing Traffic Count Mid-block Imbalances to Parking Lot Capacities



Because the parking facility located along 4th Street between Juneau Avenue and Highland Avenue is 300 vehicles short of its capacity based on the traffic imbalance between intersections, it is assumed to be caused by about 300 “non-arena” vehicles exiting the parking facility, probably during the PM peak hour after work. These 300 exiting vehicles reduce the mid-block imbalance by 300, thus canceling out the missing 300 inbound vehicles which would fill up the parking facility’s capacity. Therefore, it was assumed that 300 vehicles exited this parking facility during the PM peak hour and 300 entering vehicles were added to the number of vehicles entering the parking facility. These 300 exiting and 300 entering vehicles were already counted as part of the intersection traffic counts, but they are identified so that they can be later re-assigned to proposed parking facilities, because this particular parking facility is expected to be removed under the proposed development plans. The 300 entering vehicles are considered to be among the “arena parking trips” that are removed from the Existing traffic volumes to determine Existing Background traffic volumes. Similarly, the 300 exiting vehicles at this parking facility are considered to be the “non-arena parking trips.”

- **Apply the Annual Background Traffic Growth Rate**

After the Existing “arena parking trips” are removed from the Existing traffic volumes, the assumed Background traffic growth of 0.5% per year is applied to determine the Future Background traffic volumes. The Background annual growth rate value of 0.5% was used as a conservative value to represent potential redevelopment in the greater downtown Milwaukee area. Existing Background traffic is grown

0.5% annually from Existing Year 2015 to Year 2018 to calculate Phase I Background traffic, to Year 2022 to calculate Phase II Background traffic and to Year 2027 to calculate Phase III Background traffic. Exhibits 4-1 to 4-7 in the Appendix show the Phase I, Phase II and Phase III Background peak hour intersection traffic volumes.

- **Re-assign the Arena Parking Trips and Non-Arena Parking Trips**

Because the proposed development plans call for some existing parking lots to be removed and new parking structures to be built and located elsewhere in the study area, the “arena parking trips” and the “non-arena parking trips” that utilize parking facilities slated for removal were re-assigned to new proposed parking facilities.

The proposed parking facilities are located in Block 2 and Block 7 (see Exhibits 2-2 and 2-3A, 2-3B, 2-3C). It should be noted that the number of existing parking spaces planned for removal under the development proposal is similar to the total of 2,704 parking spaces planned for the two new parking structures located in Block 2 (1,488 parking spaces) and Block 7 (1,216 parking spaces). Figure 4-3 below shows the existing parking lots in the project study area and their vehicle capacity. Note that the parking facilities labeled 1, 4, 5, 6 and 8 are slated for removal under the proposed development plans. These five existing parking facilities include a sum total of 2,293 parking spaces.

Figure 4-3 – Existing Parking Lots and Parking Capacities



Number	Lot/Structure	Address	Spaces
1	Bradley Center	1030 N. 6th Street	776
2	Turner Hall Lot	1034 N. 4th St.	54
3	Fourth and State Parking	1020 N. 4th St.	90
4	Amber Lot	1128 N. 6th St.	421
5	Bradley Center Lot	1150 N. 5th Street	72
6	1149 N. 4th St.	1149 N. 4th St.	31
7	6th and State St.	601 W. State St.	150
8	324 W Highland	324 W. Highland Blvd.	993
9	Lloyds Parking LLC	316 W. Highland Ave.	40
10	Vern's Parking 3rd & State	1030 N. Old World 3 rd St.	47
11	1110 N. Old World Third St (South Lot)	1110 N. Old World 3 rd Street	75
12	1124 N Old World Third St (West Lot)	1124 N Old World 3 rd St	34

Block 5 and Block 6 Surface Parking Lots during Phase I & Phase II

It should be noted that Phase I and Phase II include utilizing Blocks 5 and 6 as surface parking lots (see Exhibits 2-3A and 2-3B). For purposes of this traffic study, it is assumed that these Block 5 and Block 6 surface parking lots would be expected to fill to capacity on gamedays during Phase I and Phase II. Based on the existing 421 vehicle capacity of the surface parking lot at 1128 N. 6th Street, which is the southeast quadrant of the intersection of 6th Street and Juneau Avenue (see Figure 4-3), it is conservatively estimated that during Phases I and II, Blocks 5 & 6 would each carry a surface parking lot capacity of approximately 300 vehicles for a total of 600 vehicle parking capacity. The 600-vehicle capacity estimate is provided as a

worst case scenario, which may be slightly higher than what the final design plan shows when it is completed. In order to accommodate these surface parking facilities, 600 vehicles were assigned to and from these two surface parking lots during the Pregame and Postgame hours through the project area intersections. Access locations were assumed to be along Old World 3rd Street, 4th Street and 5th Street, because the assumed parking access locations for the parking facilities on Blocks 2 and 7 were also along the north-south streets. Traffic distribution was assumed to be similar to Pregame and Postgame traffic patterns coming into and out of the study area based on a screenline on the border of the project study area. This auto traffic distribution was calculated to be the following.

- 50% to/from the West
- 20% to/from the East
- 15% to/from the North
- 15% to/from the South

- **Re-route/Re-circulate the Background Trips and Parking Trips**

The proposed roadway network in the project study area includes some roadway segment closures that currently carry traffic as well as some new roadway segments that currently do not exist.

The roadway segment of 4th Street between Juneau Avenue and Highland Avenue is proposed to be closed under the development plans. In its place is a proposed public plaza for use on gamedays and also for special events on non-gamedays. It should be noted that 4th Street between Juneau Avenue and Highland Avenue has a 2012 WisDOT annual daily volume count of 3,900 vehicles per day. The adjacent corridor to the west, 6th Street, has a 2012 daily count of 15,300 vehicles per day between Juneau Avenue and Highland Avenue. The adjacent corridor to the east, Old World 3rd Street, has a 2012 daily count of 5,200 vehicles per day between Juneau Avenue and Highland Avenue. 6th Street had functioned with over 22,000 vehicles per day in the past. Therefore, adequate daily capacity appears to be available on adjacent routes if 4th Street is closed between Juneau Avenue and Highland Avenue. According to the existing peak hour counts collected on the day of the sold-out Bucks playoff game that are used in this traffic study, the segment of 4th Street between Juneau Avenue and Highland Avenue carries 1,006 vehicles in the PM peak hour, 1,194 vehicles in the Pregame peak hour and 791 vehicles in the Postgame peak hour. These vehicles would be expected to divert to adjacent corridors such as Old World 3rd Street and 6th Street. According to the counts collected on the Bucks playoff gameday, Old World 3rd Street carries 1,096, 1,054 & 734 vehicles during the PM, Pregame and Postgame peak hours between Juneau Avenue and Highland Avenue. 6th Street carries 2,415, 1,748 & 1,138 vehicles in the PM, Pregame and Postgame peak hours between Juneau Avenue and Highland Avenue. Hourly volume traffic capacity is typically dependent on intersection operations. Later in the report, future intersection peak hour operations are analyzed in detail with 4th Street closed between Juneau Avenue and Highland Avenue. Future intersection operational analysis showed no lane geometric improvements were necessary at Old World 3rd Street and 6th Street intersection approaches due to the 4th Street closure.

The roadway segments of 5th Street between McKinley Avenue & Juneau Avenue and between Highland Avenue & State Street are expected to be open to traffic under the development plans. These segments of 5th Street do not currently exist because the segment between McKinley Avenue and Juneau Avenue is part of the vacant land in the former Park East Freeway corridor and the segment between Highland Avenue and State Street is part of the current Bradley Center footprint. The missing segment of 5th Street between Juneau Avenue and Highland Avenue is expected to be part of the proposed arena's footprint.

The Phase I, Phase II and Phase III Background traffic volumes, as well as the "arena parking trips" and the "non-arena parking trips", were re-assigned to the proposed future network given the proposed roadway changes. These re-assigned "arena parking trips" and "non-arena parking trips" were added to each of the Phase I, Phase II and Phase III Background traffic volumes, including the surface parking lot trips in Block 5 and Block 6 for the Phase I and Phase II Background traffic (described previously).

PART B - ON SITE AND OFF SITE DEVELOPMENT TRAFFIC FORECASTING

This section describes the on-site development trip generation.

Any future land uses that are expected to develop due to the new Arena are included in the adjacent blocks incorporated in the proposed development. Development in the vacant area of the former Park East corridor and in the future vacant area of the razed Bradley Center are included as part of this proposed eight-block development. Any off-site trip generation included in this traffic study is incorporated by applying a 0.5% annual growth to Background traffic. Background traffic is identified as traffic not related to Arena events or to the proposed developments in the eight-block study area included in the Site Plan.

This section continues the summary points listed at the beginning of Chapter 4, therefore this section details point #5.

- **Development Trip Generation**

The proposed development is comprised of a multi-use sports and entertainment facility (NBA Arena), apartments, retail and office space, parking facilities and a professional basketball practice facility. The proposed development covers eight blocks in the northern part of Westtown in downtown Milwaukee and is comprised of three separate phases. The previously shown Exhibits 2-2, 2-3A, 2-3B, and 2-3C display the site plan and the development land uses and phasing. The three development phases are the following:

- Phase I – Blocks 1, 4, 7 & 8 in Year 2018.
- Phase II – Blocks 2 & 3 in Year 2022.
- Phase III – Blocks 5 & 6 in Year 2027.

The development trip generation is based on trip rates in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition*. Table 4-1 on the following pages shows the PM, Pregame and Postgame peak hour trip generation for the proposed development. The peak hour trip generation rates in the ITE *Trip Generation Manual, 9th Edition* are only provided for AM and PM peak hours. Therefore, the Pregame and Postgame peak hours' trips generation were estimated. The process of determining the Pregame and Postgame trip generation is discussed in more detail below. It should also be mentioned that the "Shopping Center" designation in the ITE's *Trip Generation Manual, 9th Edition* was used for Retail land uses, the "General Office Building" designation was used for Office land uses and the "Apartment" designation was used for the Student Housing land use.

Table 4-1: Proposed Development Trip Generation

Block	ITE Code	Development Type	Size	Daily Trips	PM Peak Hour			Pregame Peak Hour*			Postgame Peak Hour*		
					In	Out	Total	In	Out	Total	In	Out	Total
1	--	NBA Arena	--	Not calculated. Assumed to replace trips generated by current Arena.									
2	220	Apartments	102 units	678	40	25	65	25	15	40	5	5	10
	220	Student Housing	62 units	412	25	15	40	15	10	25	5	5	10
	820	Retail	34,079 sq. ft.	1,455	60	65	125	45	50	95	10	10	20
	710	Office	102,438 sq. ft.	1,130	25	130	155	15	80	95	5	25	30
3	310	Hotel	300 rooms	2,451	90	90	180	55	55	110	15	15	30
	820	Retail	89,805 sq. ft.	3,835	160	175	335	120	135	255	30	30	60
4	820	Retail	58,962 sq. ft.	2,518	105	115	220	80	90	170	20	20	40
	220	Apartments	48 units	319	20	10	30	10	5	15	5	0	5
5	220	Apartments	215 units	1,430	90	45	135	55	25	80	15	10	25
	820	Retail	16,519 sq. ft.	705	30	30	60	20	25	45	5	5	10
	710	Office	101,795 sq. ft.	1,123	25	125	150	15	75	90	5	20	25
6	220	Apartments	55 units	366	25	10	35	15	5	20	5	0	5
	710	Office	350,000 sq. ft.	3,861	90	430	520	55	255	310	15	75	90
	820	Retail	12,000 sq. ft.	512	20	25	45	15	20	35	5	5	10
7	220	Apartments	70 units	466	30	15	45	20	10	30	5	5	10
	820	Retail	11,402 sq. ft.	487	20	20	40	15	15	30	5	5	10
	710	Office	36,621 sq. ft.	404	10	45	55	5	25	30	0	10	10
8	710	Office	30,000 sq. ft.	331	10	35	45	5	20	25	0	5	5
	--	Practice Facility	45,000 sq. ft.	Not calculated. Assumed no trip generation during PM, Pregame, & Postgame peak hours on gamedays.									
TOTAL				22,483	875	1,405	2,280	585	915	1,500	155	250	405

*The Pregame and Postgame peak hour trip generation is calculated as a function of the PM peak hour trip generation. The process is explained in the next section.

Arena and Practice Facility Development Trips

Because the BMO Harris Bradley Center is proposed to be replaced with a new arena, and the new arena is expected to have a similar seating capacity, the trip generation of the proposed arena in Block 1 was not included in the table. Instead the current arena trips were identified and removed from the Existing traffic volume counts and later added back in after the Background traffic growth rate was applied. This task was covered and explained in more detail previously in Chapter 4, Part A.

The Practice Facility development trips in Block 8 were not included because it is assumed that little to no activity, and therefore little to no traffic, would be generated by the Practice Facility when a Milwaukee Bucks home game is played at the proposed arena.

Pregame and Postgame Development Trip Generation Discussion

ITE's *Trip Generation Manual, 9th Edition* only includes land use trip rates for the AM and PM peak hours. Because the Pregame and Postgame peak hours occur after the PM peak hour, a proportion of the PM peak hour trips was calculated to develop the proposed development's Pregame and Postgame peak hour trip generation. Information about the hourly distribution of retail Shopping Center trips from the ITE's *Trip Generation Manual, 9th Edition* was used to develop the Pregame and Postgame retail trip generation and hourly data information from WisDOT's "WisTransPortal" website was used to develop the Pregame and Postgame non-retail trip generation. The WisTransPortal system serves the data management needs of Wisconsin Traffic Operations and Safety (TOPS) laboratory and provides traffic volume data as well as crash data.

The ITE *Trip Generation Manual, 9th Edition* section detailing the Shopping Center (820) retail land use includes a discussion of the hourly distribution of volumes to and from Shopping Center retail land uses based on survey data collection. The volume distribution is given in hourly intervals between 10am to 10pm. The data shows that the amount of incoming Shopping Center trips occurring during the Pregame peak hour (6-7pm) was equal to about 74% of the PM peak hour Shopping Center incoming trips. The data also shows that the amount of outgoing Shopping Center trips occurring during the Pregame peak hour was equal to about 78% of the outgoing PM peak hour Shopping Center trips. During the Postgame peak period (9-10pm was the closest time interval available), the amount of Shopping Center trips was equal to about 19% of the PM peak hour Shopping Center trips and about 17% of the outgoing PM Shopping Center trips. Therefore, these proportions were applied to the PM Retail incoming and outgoing development trips to calculate the Pregame and Postgame incoming and outgoing Retail development peak hour trips. The ITE Shopping Center hourly distribution table is shown in the Appendix.

Because no such hourly distribution data was available for Apartment, Hotel and Office land uses in the ITE's *Trip Generation Manual, 9th Edition*, hourly data was instead gathered from WisDOT's "WisTransPortal" website. The hourly data includes 24 hour traffic volumes collected at various sites in the State of Wisconsin. Hourly data was selected from four roadway segments that were available that most closely surround the Bradley Center. They include the following locations (the hourly datasets for these four locations are shown in the Appendix):

- 4th Street, north of State Street
- 6th Street, between State Street and Juneau Avenue
- Juneau Avenue, between 4th Street and 6th Street
- State Street, west of 6th Street.

The hourly data is divided into hourly intervals. The hourly intervals that are closest in time to the Pregame and Postgame peak hour time periods were 6-7pm and 10-11pm. The proportion of daily traffic that occurred during 6-7pm and 10-11pm at each of the four roadway locations was calculated and compared against the PM peak hour. The average of the four datasets shows that traffic volumes during the Pregame peak hour (6-7pm hourly interval) was about 60% of the PM peak hour traffic volume. The Postgame peak hour (10-11pm) was about 18% of the PM peak hour traffic volume. These proportions were applied to the PM peak hour Apartment, Hotel and Office land use trips to calculate the Pregame and Postgame peak hour development trips for these land uses.

Passby, Internally-Linked, Multi-Linked, Externally-Linked Trips

Although some passby and linked trips could be expected from the proposed development, no passby and linked trips are included in the analysis. Without any passby and linked trips the traffic analysis is considered a more conservative assessment of intersection operations.

PART C - BUILD AND TOTAL TRAFFIC

This section details the Future Build traffic volumes and continues the summary points listed at the beginning of Chapter 4, therefore this section describes point #6.

- **Future Build Traffic - Phase I, Phase II & Phase III**

Trip Distribution

The proposed development trips were distributed to the future proposed network based on existing intersection turning volume proportional splits. Some blocks have limited or no parking, while other land uses, such as Block 2 and Block 7, have large parking facilities. Therefore, development traffic was assigned to the future network with parking locations in mind. If traffic is generated by a block with limited or no parking, it was assumed that the traffic would likely travel to and from a parking facility at the closest adjacent block (usually Block 2 or Block 7). The non-arena development trips from the separate block were added together by their Phase I, Phase II and Phase III phasing periods. Exhibits 4-8 to 4-14 in the Appendix show the peak hour Phase I, Phase II and Phase III non-arena development trips assigned to the study area network.

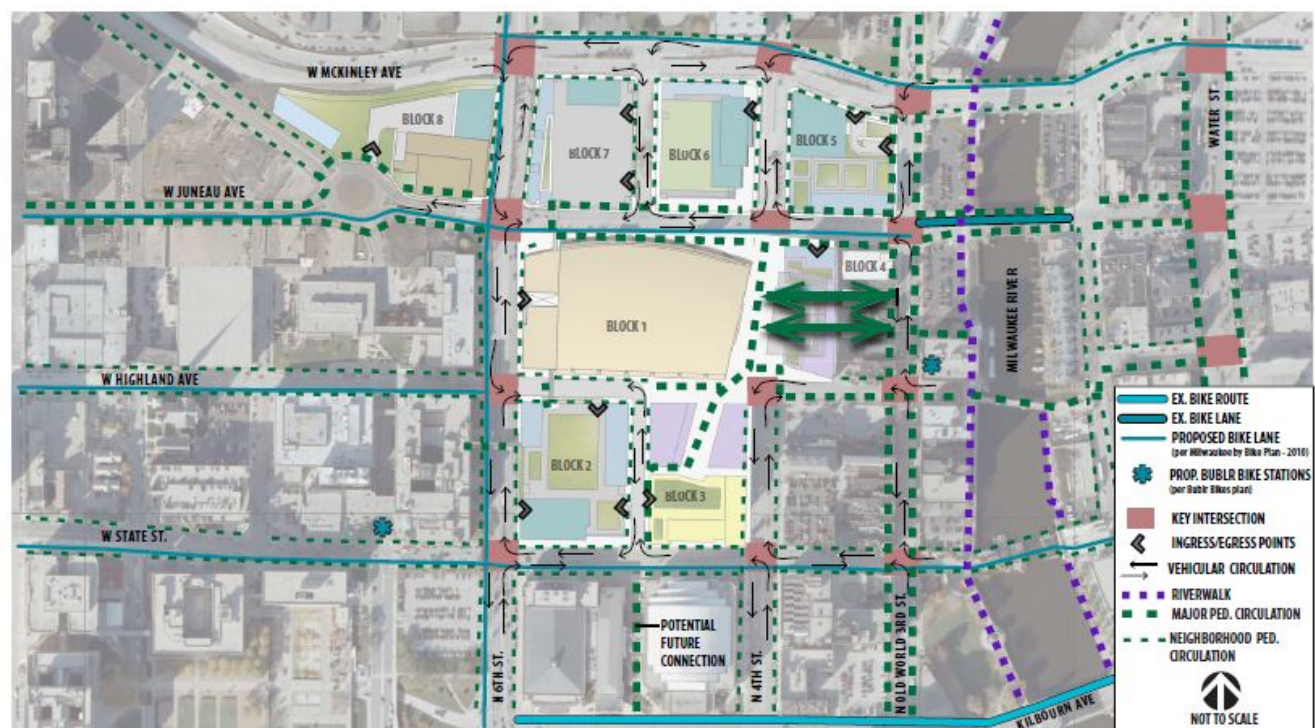
Trip Assignment

The Phase I, Phase II and Phase III non-arena development trips are added to the Phase I, Phase II and Phase III Background traffic volumes (including the “arena parking trips” and “non-arena parking trips” as well as the surface parking lot trips in Block 5 and Block 6 during Phases I and II) to develop the Future Build Phase I, Future Build Phase II and Future Build Phase III traffic volumes. Exhibits 4-15 to 4-21 in the Appendix show the peak hour Phase I, Phase II, and Phase III Future Build Total traffic volumes.

PART D - PEDESTRIAN DEMAND PROJECTIONS

Pedestrian data was collected for PM, Pregame and Postgame conditions during a Bucks basketball game. Existing analysis is identified in Chapter 3. Future pedestrian demands were forecasted by first accounting for the relocation of Arena and the associated parking structures. The proposed Arena has a seating capacity similar to the existing BMO Harris Bradley Center, therefore, the number of pedestrians destined to the new Arena is assumed to stay constant from the existing pedestrian demands. A conservative approach to vehicle trip generation was taken to assume limited or no pedestrian trips to new developments within the study area, making auto operations of the surrounding intersections a worst case analysis. Figure 4-4 shows expected auto, bike and pedestrian patterns in the project study area.

Figure 4-4 – Auto, Bike & Pedestrian Patterns



BUCKS ARENA DEVELOPMENT AUTO, BIKE & PEDESTRIAN PATTERNS



CHAPTER 5 - TRAFFIC AND IMPROVEMENT ANALYSIS

This section presents the Future peak hour traffic operations analysis during Phases 1, 2, and 3. Geometric and signal phasing/timing improvements are recommended based on intersection traffic operation needs. Intersection traffic operations improvements are identified through generally seeking to achieve LOS D or better conditions or by at least matching existing intersection traffic operations.

For purposes of this project, the PM and Pregame peak hours are analyzed under Phases 1, 2 and 3 scenarios, while the Postgame peak hour is only analyzed under Phase 1 scenarios.

PART A - CAPACITY/LEVEL OF SERVICE OPERATIONAL ANALYSIS

This section presents the Future peak hour intersection traffic operations and the recommended improvements for Phases I, II and III. Synchro traffic engineering software was used with 2010 HCM (Highway Capacity Manual) methods to assess the future peak hour intersections traffic operations.

RECOMMENDED IMPROVEMENTS

The following are the recommended intersection geometry and signal phasing improvements for the study area intersections.

McKinley Avenue & 6th Street – Phases I, II & III

- The City of Milwaukee plans to install monotubes at McKinley Avenue and 6th Street. As part of this project, the City plans to install a lagging green phase for northbound left turn movements. In addition, the southbound left turn movement includes a leading protected-permitted phase. The eastbound and westbound left turn movements include permitted phasing under a flashing yellow signal. The Appendix includes the City of Milwaukee's proposed signal design graphic for this intersection. Future improved scenarios of this intersection include the proposed signal design phasing.
- Adjust traffic signal timings.

McKinley Avenue & 5th Street – Phases I, II & III

- Stop sign at northbound approach.
- Anticipate police officer traffic control needed during Pregame and Postgame peak hours.

McKinley Avenue & 4th Street – Phases I, II & III

- Remove northbound left protected phasing due to reduced traffic demands resulting from closure of 4th Street south of Juneau Avenue.
- Install eastbound left protected phasing.
- Northbound approach intersection lane geometry reduced to include a left turn bay with a shared through/right turn lane.
- Adjust traffic signal timings.

McKinley Avenue & Old World 3rd Street – Phases I, II & III

- Install westbound protected left turn phasing.
- Adjust traffic signal timings.

Juneau Avenue – between 6th Street & Old World 3rd Street – Phases I, II & III

- Juneau Avenue is proposed to be reduced to a three-lane cross section between 6th Street and west of Old World 3rd Street. The westbound direction includes one through lane and one continuous right turn lane. The eastbound direction includes one through lane (shared with left turning vehicles) along with a valet lane for pick up/drop off vehicles for events at the Arena that ends at 4th Street. East of 4th Street, the eastbound direction has two through lanes. The Appendix includes the proposed cross-section design for Juneau Avenue between 6th Street and Old World 3rd Street.

Juneau Avenue & 6th Street– Phases I, II & III

- Eastbound approach modified to one left turn bay, one through lane and one right turn bay to match the proposed one-lane eastbound Juneau Avenue cross-section described above.
- Westbound approach modified to one left turn bay, one through lane and one right turn lane.
- The eastbound segment, east of the intersection includes a valet lane that begins where feasible to the east of the proposed westbound left turn bay.
- Install protected left turn signal phasing for eastbound and westbound left turn movements in Phases II and III.
- Adjust traffic signal timings.

Juneau Avenue & 5th Street– Phases I, II & III

- Stop sign at southbound approach.
- Anticipate police officer traffic control needed during Pregame and Postgame peak hours.

Juneau Avenue & 4th Street– Phases I, II & III

- Southbound approach intersection lane geometry can be reduced to include a left turn bay with a right turn lane.
- Northbound leg is closed.
- Adjust traffic signal timings.

Juneau Avenue & Old World 3rd Street– Phases I, II & III

- Re-stripe the westbound approach to include one left turn bay, one through lane, and one right turn only lane. This intersection geometry will match better into the proposed westbound traffic cross-section along Juneau Avenue, west of Old World 3rd Street, which is proposed to include one westbound through lane and one continuous westbound right turn lane.
- Install protected left turn signal phasing for eastbound left turn in Phase III.
- Adjust traffic signal timings.

Highland Avenue & 6th Street– Phases I, II & III

- Westbound approach is assumed to include a left turn bay and shared through/right turn lane.
- Depending on the design of the parking structure on Block 2, investigate the Northbound approach geometry of one left turn bay, one through lane, one shared through/right turn lane and one right turn bay. The second right turn lane is needed to facilitate Pregame operations. Additionally, investigate the feasibility of a mid-block entrance to parking facility along 6th Street. Alternatively, maintain one left turn bay, two through lanes and one right-turn bay with police officer traffic control to facilitate ability for one through lane to include right-turning vehicles along with the dedicated right turn lane.
- Adjust traffic signal timings.

Highland Avenue & 4th Street– Phases I, II & III

- The northern leg is removed.
- The western leg will not allow traffic.
- The current traffic signal could be replaced with more pedestrian-friendly traffic controls, which could include stop sign control, yield control, pedestrian beacons, or other similar traffic controls.
- Only two traffic movements are allowed at this intersection: westbound left and northbound right.

State Street & 6th Street– Phases I, II & III

- Depending on the parking structure design on Block 2, remove northbound left turn protected phasing to facilitate Postgame operations, which require more green time for outgoing traffic.
- State Street is currently one-way westbound in the project study area. Two-way State Street operation would be expected to provide improved traffic access to better develop Block 2 and Block 3 for mixed-use development as proposed to be retail, office, residential and hotel uses. In addition, the two-way traffic operation would support the spirit of the urban design principles identified in the General Planned Development (GPD) document. Pending the final design of the parking structure ingress and egress on Block 2, a two-way State Street would likely improve the traffic flow at intersections near Block 2, and ultimately improve access to the new arena. A two-way State Street would also likely improve the connectivity of the new arena, ancillary development and other Wisconsin Center facilities to the cultural and entertainment facilities east of the Milwaukee River. Converting State Street to two-way operation should be examined further when the final design of the Block 2 parking structure is completed.
- Adjust signal timings.

FUTURE NO BUILD ANALYSIS

An intersection operations analysis was also conducted on study area intersections assuming no modifications associated with the Arena were made, including the relocation of parking structures, the associated land developments or the modifications to the roadway network. Traffic demands assumed existing Arena parking and grew the background trips by the 0.5% annual growth rate. This analysis

indicated that the following intersections would have LOS issues without the modifications identified as part of the planned Arena project.

- 1) 6th & McKinley: LOS E in Pre-Game
- 2) 6th & Highland: LOS E in PM

FUTURE OPERATIONAL ANALYSIS

The twenty study area intersections, plus three additional intersections along the 5th Street corridor at McKinley Avenue, Juneau Avenue and State Street, were analyzed under future Phase 1, Phase 2 and Phase 3 conditions with improved intersection geometry, signal phasing and timings. Improvements were recommended in order to achieve LOS D or better conditions or to at least maintain existing LOS conditions. Tables 5-1 to 5-8 below present the future traffic operations analysis at the study area intersections, along with the existing traffic operations for comparative reference.

Four intersection approaches (Northbound 6th Street at McKinley Avenue, Northbound Old World 3rd Street at McKinley Avenue, Eastbound McKinley Avenue at Old World 3rd Street and Westbound Juneau Avenue at 6th Street) are denoted by a thick black border to identify the approaches that are of particular interest to the City of Milwaukee. These four approaches are discussed more in detail below.

It should also be noted that later in the report is a discussion comparing two potential access alternatives for the proposed parking facility on Block 7 along 5th Street between McKinley Avenue and Juneau Avenue. One alternative includes two-way operation along 5th Street, the other alternative includes one-way operation along 5th Street on gamedays before and after games only. A later section (Tables 5-9 to 5-11) compares the traffic operations of both alternatives, however the following LOS tables (Tables 5-1 to 5-8) include only the two-way 5th Street parking facility access alternative.

Table 5-1: Future Intersection Peak Hour Traffic Operations – IH 43 intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Fond du Lac Ave & IH 43 SB ramps • Adjust timings	Traffic Signal	Existing	PM	B	-	D	A	B	A	-	-	-	-	C	C	A
			Pregame	C	-	C	A	C	A	-	-	-	-	C	C	A
			Postgame	F	-	C	A	F	A	-	-	-	-	C	C	A
		Phase 1	PM	B	-	D	A	B	A	-	-	-	-	C	C	A
			Pregame	C	-	C	A	D	A	-	-	-	-	C	C	A
			Postgame	F	-	C	A	F	A	-	-	-	-	C	C	A
		Phase 2	PM	B	-	D	A	B	A	-	-	-	-	C	C	A
			Pregame	C	-	C	A	D	A	-	-	-	-	C	C	A
		Phase 3	PM	C	-	D	A	B	A	-	-	-	-	C	C	A
			Pregame	C	-	C	A	D	A	-	-	-	-	C	C	A
Fond du Lac Ave & IH 43 NB ramps	Traffic Signal	Existing	PM	B	A	A	-	-	B	A	D	D	-	-	-	-
			Pregame	A	A	A	-	-	B	A	C	C	-	-	-	-
			Postgame	B	A	A	-	-	B	A	C	C	-	-	-	-
		Phase 1	PM	B	A	A	-	-	B	A	D	D	-	-	-	-
			Pregame	A	A	A	-	-	B	A	C	C	-	-	-	-
			Postgame	B	A	A	-	-	B	A	C	C	-	-	-	-
		Phase 2	PM	B	A	A	-	-	B	A	D	D	-	-	-	-
			Pregame	A	A	A	-	-	B	A	C	C	-	-	-	-
		Phase 3	PM	B	A	A	-	-	B	A	D	D	-	-	-	-
			Pregame	A	A	A	-	-	B	A	D	D	-	-	-	-
Highland Ave & IH 43 SB ramp/ SB frontage road • Adjust timings	Traffic Signal	Existing	PM	B	-	B	B	B	B	-	-	-	-	B	C	C
			Pregame	B	-	B	B	B	B	-	-	-	-	B	C	C
			Postgame	B	-	B	B	B	B	-	-	-	-	B	B	C
		Phase 1	PM	B	-	B	B	B	B	-	-	-	-	C	C	C
			Pregame	C	-	B	B	C	B	-	-	-	-	B	D	D
			Postgame	C	-	B	B	B	B	-	-	-	-	B	C	C
		Phase 2	PM	B	-	B	B	B	B	-	-	-	-	C	C	C
			Pregame	D	-	B	B	C	B	-	-	-	-	B	D	D
		Phase 3	PM	C	-	B	B	B	B	-	-	-	-	C	C	C
			Pregame	D	-	B	B	C	B	-	-	-	-	B	D	D

Table 5-2: Future Intersection Peak Hour Traffic Operations – McKinley Avenue intersections

Intersection & Improvements	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
McKinley Ave & 6 th Street - City of Milwaukee: NBLT lag phase - Adjust timings - LOS issues identified without Arena development	Traffic Signal	Existing	PM	D	D	C	D	E	A	A	F	E	E	F	C	C
			Pregame	D	D	C	F	F	C	C	E	D	D	D	C	C
			Postgame	F	C	B	B	C	C	C	F	C	C	D	C	C
		Phase 1	PM	D	F	C	E	F	C	D	F	D	D	E	C	C
			Pregame	D	D	D	F	F	B	B	E	D	D	D	C	C
			Postgame	F	D	B	B	C	C	C	F	C	D	C	C	C
		Phase 2	PM	D	F	C	F	F	C	C	E	E	E	D	D	D
			Pregame	D	C	C	F	F	A	A	E	D	D	D	C	C
		Phase 3	PM	E	F	D	F	F	C	C	E	E	E	E	D	D
			Pregame	D	C	C	F	F	A	A	F	D	D	D	C	C
McKinley Ave & 4 th Street - Remove NBLT protected phasing - Add EBLT protected phasing - Reduce NB approach to LT bay and shared TH/RT lane - Adjust timings	Traffic Signal	Existing	PM	C	F	B	C	E	D	D	B	A	A	C	C	C
			Pregame	B	C	B	C	E	A	A	B	A	A	C	C	C
			Postgame	B	B	B	B	A	A	A	C	A	A	C	C	C
		Phase 1	PM	C	D	A	A	C	D	D	B	B	B	C	C	C
			Pregame	B	C	A	A	C	D	D	B	B	B	C	C	C
			Postgame	C	C	C	C	B	C	C	C	B	B	B	B	B
		Phase 2	PM	B	C	A	A	A	B	B	B	B	B	C	C	C
			Pregame	A	B	A	A	A	A	A	D	C	C	C	C	C
		Phase 3	PM	C	D	A	A	C	D	D	D	C	C	C	C	D
			Pregame	C	D	A	A	C	D	D	D	D	C	C	C	C
McKinley Ave & Old World 3 rd Street - Add WBLT protected phasing - Adjust timings	Traffic Signal	Existing	PM	C	E	A	A	C	C	B	C	A	A	C	D	D
			Pregame	B	B	A	A	C	B	B	B	A	A	C	D	D
			Postgame	B	A	A	A	B	B	B	B	A	A	C	C	C
		Phase 1	PM	D	C	D	C	C	D	C	C	A	A	C	D	D
			Pregame	C	C	D	C	D	C	B	C	A	A	C	D	D
			Postgame	B	B	B	B	B	C	C	C	A	A	C	C	C
		Phase 2	PM	D	C	D	C	C	D	C	D	C	C	C	D	E
			Pregame	D	C	D	C	D	C	B	C	C	C	C	D	D
		Phase 3	PM	D	D	D	B	C	C	B	D	B	B	C	F	F
			Pregame	D	C	D	C	D	C	C	C	A	A	C	D	D

Northbound 6th Street approach at McKinley Avenue

- City of Milwaukee approach of interest

The northbound 6th Street approach operates at LOS E/F under existing conditions. Under future conditions, the northbound LOS conditions remain similar to existing conditions. The northbound left turn movement currently includes dual left-turn lanes with about 150 feet of storage per lane. Under

Postgame conditions the northbound left-turn movement can be expected to backup significantly. Aside from simply increasing the northbound left turn storage bay length, another option to improve northbound left turn operations and queuing would be to route Arena traffic from the proposed parking facility on Block 7 (southeast quadrant of McKinley Avenue/6th Street intersection) to travel northbound only along 5th Street. (Comparison of this parking facility's two different traffic routing options is discussed subsequently in this chapter.) Routing the exiting Postgame traffic northbound only from the parking facility's 5th Street exit would reduce the number of vehicles that require use of the northbound left turn movement on 6th Street at McKinley Avenue in order to access the IH 43 interchange at McKinley Avenue. Instead, exiting Postgame traffic would be diverted to use the westbound through movement on McKinley Avenue at 6th Street.

Eastbound McKinley Avenue approach at Old World 3rd Street &
Northbound Old World 3rd Street approach at McKinley Avenue

- City of Milwaukee approaches of interest

The eastbound McKinley Avenue left turn movement operates at LOS E conditions during the existing PM peak hour. During Pregame and Postgame peak hours, the eastbound left turn operates at LOS A/B conditions. The eastbound left turn bay currently has about 100 feet of storage. The northbound left turn operates at LOS C conditions during the existing PM peak hour and at LOS B conditions during the Pregame and Postgame peak hours. The northbound left turn bay currently has about 100 feet of storage. In order to meet the future traffic needs of the westbound left-turn movement at this intersection, it is recommended that protected left-turn phasing be installed for the westbound approach. With the recommended protected westbound left-turn phasing, the signal timing can be adjusted while utilizing the existing eastbound and northbound left-turn protected phasing to achieve expected LOS D or better conditions in the future.

Table 5-3: Future Intersection Peak Hour Traffic Operations – Juneau Avenue intersections

Intersection & Improvements	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Juneau Ave & 6 th Street - EB and WB approaches include 1 LT bay, 1 TH lane, 1 RT lane - Add EBLT & WBLT protected phasing - Adjust timings	Traffic Signal	Existing	PM	C	D	C	A	C	C	C	D	C	C	F	B	B
			Pregame	B	C	C	A	C	C	C	C	B	B	C	B	B
			Postgame	C	E	C	A	C	C	D	B	B	B	C	B	A
		Phase 1	PM	D	D	C	A	D	C	C	D	C	C	F	B	B
			Pregame	C	C	C	A	D	C	C	C	B	C	D	B	B
			Postgame	F	C	B	A	D	C	F	C	C	C	C	B	B
		Phase 2	PM	D	D	C	A	D	D	C	D	D	C	F	B	B
			Pregame	C	C	D	A	D	D	D	C	C	C	E	B	B
		Phase 3	PM	D	D	C	A	D	D	C	D	B	B	F	B	B
			Pregame	C	C	D	A	D	D	D	C	C	C	D	B	B
Juneau Ave & 4 th Street - Reduce SB approach to LT bay and RT lane - Adjust timings	Traffic Signal	Existing	PM	B	C	B	B	C	B	B	A	A	A	B	B	B
			Pregame	B	B	C	C	B	A	A	A	A	A	B	B	B
			Postgame	B	C	B	B	A	A	A	A	A	A	B	B	B
		Phase 1	PM	C	D	D	-	-	C	B	-	-	-	C	-	C
			Pregame	C	D	D	-	-	C	B	-	-	-	C	-	D
			Postgame	C	D	D	-	-	B	B	-	-	-	B	-	B
		Phase 2	PM	C	D	D	-	-	C	B	-	-	-	C	-	C
			Pregame	C	C	C	-	-	B	B	-	-	-	C	-	C
		Phase 3	PM	C	D	D	-	-	B	A	-	-	-	E	-	E
			Pregame	D	F	D	-	-	B	B	-	-	-	C	-	D
Juneau Ave & Old World 3 rd Street - Change WB approach to 1 LT, 1 TH, 1 RT lane. - Adjust timings	Traffic Signal	Existing	PM	C	D	C	C	D	C	C	A	A	A	B	B	B
			Pregame	C	D	C	D	D	C	C	C	C	C	C	B	B
			Postgame	C	D	C	C	D	C	C	D	D	C	C	B	B
		Phase 1	PM	C	E	C	C	D	C	C	D	C	B	C	C	C
			Pregame	C	D	C	C	D	C	C	D	D	D	D	C	C
			Postgame	C	D	C	C	C	C	C	D	C	C	C	B	B
		Phase 2	PM	C	E	C	C	D	D	C	D	D	C	C	C	C
			Pregame	C	D	C	C	D	C	C	D	D	C	D	C	C
		Phase 3	PM	D	D	C	C	D	D	C	F	A	C	D	D	D
			Pregame	C	D	C	C	D	C	C	E	A	D	D	C	C

Westbound Juneau Avenue approach at 6th Street

- City of Milwaukee approaches of interest

The westbound Juneau Avenue left turn movement operates at LOS C conditions during the existing PM, Pregame and Postgame peak hours. The westbound left turn bay currently has less than 100 feet of storage. In order to meet, future traffic needs it is recommended that the westbound approach include a

left turn bay, through lane and right turn only lane. This would match into the proposed cross-section of Juneau Avenue that includes one westbound through lane and one continuous right turn lane between Old World 3rd Street and 6th Street. Keeping the westbound left turn lane would require a slight adjustment to the eastbound portion of the proposed Juneau Avenue cross-section between 6th Street and 4th Street, which includes one through lane and one valet lane. The valet lane would end at 4th Street. With the westbound left turn bay, the eastbound valet lane can begin where feasible to the east of the westbound left turn bay end taper. Additionally, similar to the northbound 6th Street left-turn movement at McKinley Avenue discussion previously, the traffic operations of Postgame Arena vehicles utilizing the Juneau Avenue westbound approach would be improved with the use of the one-way northbound only access alternative along 5th Street for the parking facility on Block 7. Requiring exiting vehicles from the Block 7 parking facility to travel northbound along 5th Street routes Postgame traffic away from Juneau Avenue, thus reducing the number of vehicles that would perform the westbound Juneau Avenue left turn and right turn movements. Instead, the number of vehicles traveling southbound through along 6th Street at Juneau Avenue would be expected to increase. Table 5-3 shows conditions under the two-way 5th street access alternative only. A subsequent table (Table 5-10) shows improved Postgame operations under the one-way 5th Street operation compared to the two-way 5th Street condition, which includes the westbound right turn operating at LOS F under the Postgame scenario.

Table 5-4: Future Intersection Peak Hour Traffic Operations – Highland Avenue intersections

Intersection & Improvements	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Highland Ave & 6 th Street* - NB approach includes LT bay, TH lane, TH/RT lane & RT bay - Adjust timings - LOS issues identified without Arena development	Traffic Signal	Existing	PM	D	F	F	C	E	E	A	C	B	B	E	D	C
			Pregame	D	F	F	C	F	F	A	B	A	A	D	C	C
			Postgame	C	C	C	B	E	E	A	B	A	A	C	C	C
		Phase 1	PM	C	C	C	C	C	C	B	D	C	C	A	D	D
			Pregame	C	D	C	C	D	C	B	C	A	C	C	D	D
			Postgame	B	C	C	C	A	C	C	B	A	A	C	C	D
		Phase 2	PM	C	C	C	C	D	C	B	D	B	B	D	D	D
			Pregame	C	D	C	C	F	B	B	C	A	D	D	D	D
		Phase 3	PM	C	D	C	C	D	C	B	D	B	C	D	D	C
			Pregame	C	C	C	C	F	B	B	C	A	B	D	D	D
Highland Ave & 4 th Street	Traffic Signal	Existing	PM	B	-	-	-	C	-	C	-	A	A	B	B	-
			Pregame	B	-	-	-	C	-	C	-	A	B	C	B	-
			Postgame	D	-	-	-	C	-	F	-	A	B	B	B	-
	Stop Sign	Phase 1	PM	--	-	-	-	A	-	-	-	-	A	-	-	-
			Pregame	--	-	-	-	B	-	-	-	-	B	-	-	-
			Postgame	--	-	-	-	A	-	-	-	-	A	-	-	-
		Phase 2	PM	--	-	-	-	B	-	-	-	-	B	-	-	-
			Pregame	--	-	-	-	B	-	-	-	-	B	-	-	-
		Phase 3	PM	--	-	-	-	B	-	-	-	-	B	-	-	-
			Pregame	--	-	-	-	B	-	-	-	-	B	-	-	-
Highland Ave & Old World 3 rd Street	Traffic Signal	Existing	PM	A	C	C	C	C	B	A	A	A	A	A	A	A
			Pregame	A	C	C	C	C	B	A	A	A	A	A	A	A
			Postgame	B	C	C	C	C	B	A	A	A	A	A	A	A
		Phase 1	PM	B	C	C	C	C	B	A	B	B	B	A	A	A
			Pregame	B	C	C	D	C	B	A	B	B	B	A	A	A
			Postgame	B	C	C	C	C	B	A	B	B	B	A	A	A
		Phase 2	PM	B	C	C	D	C	B	A	B	B	B	A	A	A
			Pregame	B	C	C	D	C	B	A	C	B	B	B	B	B
		Phase 3	PM	B	C	C	D	C	B	A	B	B	B	A	A	A
			Pregame	B	C	C	D	C	B	A	B	B	B	A	A	A

* The Block 2 parking structure still needs to be designed. This Highland Avenue & 6th Street analysis assumes one-way westbound State Street and access off of Highland Avenue and 5th Street.

It should be noted that without the second northbound right turn lane at the Highland Avenue intersection with 6th Street, a single northbound right turn during the Pregame time period would be expected to observe LOS F traffic operations during all three phases.

Table 5-5: Future Intersection Peak Hour Traffic Operations – State Street intersections

Intersection & Improvements	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
State Street & 6 th Street • Remove NBLT protected phasing during Postgame • Adjust timings	Traffic Signal	Existing	PM	C	D	-	C	B	B	B	C	B	-	-	C	C
			Pregame	C	D	-	C	C	B	C	B	B	-	-	C	C
			Postgame	B	C	-	C	C	B	B	B	B	-	-	C	C
		Phase 1	PM	C	D	-	C	B	B	B	C	C	-	-	D	C
			Pregame	C	D	-	C	B	A	B	C	B	-	-	C	C
			Postgame	C	A	-	A	C	A	A	D	C	-	-	C	C
		Phase 2	PM	C	E	-	C	B	A	A	D	C	-	-	D	C
			Pregame	C	D	-	C	B	A	B	C	B	-	-	C	D
		Phase 3	PM	C	E	-	C	C	B	B	D	C	-	-	D	C
			Pregame	C	D	-	C	B	A	B	C	B	-	-	C	D
State Street & 4 th Street	Traffic Signal	Existing	PM	B	-	-	-	B	B	B	B	B	-	-	A	B
			Pregame	B	-	-	-	B	B	B	C	C	-	-	B	C
			Postgame	B	-	-	-	B	B	B	B	B	-	-	B	D
		Phase 1	PM	B	-	-	-	B	B	B	C	B	-	-	C	B
			Pregame	B	-	-	-	B	B	B	D	B	-	-	C	C
			Postgame	B	-	-	-	B	B	B	B	B	-	-	C	C
		Phase 2	PM	B	-	-	-	B	B	B	D	B	-	-	C	B
			Pregame	B	-	-	-	B	B	B	D	B	-	-	C	C
		Phase 3	PM	B	-	-	-	B	B	B	D	B	-	-	C	B
			Pregame	B	-	-	-	B	B	B	D	B	-	-	C	C

* The Block 2 parking structure still needs to be designed. This State Street & 6th Street analysis assumes one-way westbound State Street and access off of Highland Avenue and 5th Street.

Table 5-6: Future Intersection Peak Hour Traffic Operations – 5th Street intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
McKinley Avenue & 5 th Street • Anticipate police officer traffic control	Stop Sign	Existing	PM	--	-	-	-	-	-	-	-	-	-	-	-	-
			Pregame	--	-	-	-	-	-	-	-	-	-	-	-	-
			Postgame	--	-	-	-	-	-	-	-	-	-	-	-	-
		Phase 1	PM	--	-	A	A	F	A	-	F	-	F	-	-	-
			Pregame	--	-	A	A	F	A	-	A	-	A	-	-	-
			Postgame	--	-	A	A	A	A	-	F	-	F	-	-	-
		Phase 2	PM	--	-	A	A	F	A	-	F	-	F	-	-	-
			Pregame	--	-	A	A	F	A	-	A	-	A	-	-	-
		Phase 3	PM	--	-	A	A	F	A	-	F	-	F	-	-	-
			Pregame	--	-	A	A	F	A	-	A	-	A	-	-	-
Juneau Avenue & 5 th Street • Anticipate police officer traffic control	Stop Sign	Existing	PM	--	-	-	-	-	-	-	-	-	-	-	-	-
			Pregame	--	-	-	-	-	-	-	-	-	-	-	-	-
			Postgame	--	-	-	-	-	-	-	-	-	-	-	-	-
		Phase 1	PM	--	A	A	-	-	A	A	-	-	-	F	-	F
			Pregame	--	B	A	-	-	A	A	-	-	-	A	-	A
			Postgame	--	A	A	-	-	A	A	-	-	-	F	-	F
		Phase 2	PM	--	A	A	-	-	A	A	-	-	-	F	-	F
			Pregame	--	B	A	-	-	A	A	-	-	-	A	-	A
		Phase 3	PM	--	A	A	-	-	A	A	-	-	-	F	-	F
			Pregame	--	A	A	-	-	A	A	-	-	-	A	-	A
State Street & 5 th Street* • Anticipate police officer traffic control	Stop Sign	Existing	PM	--	-	-	-	-	-	-	-	-	-	-	-	-
			Pregame	--	-	-	-	-	-	-	-	-	-	-	-	-
			Postgame	--	-	-	-	-	-	-	-	-	-	-	-	-
		Phase 1	PM	--	A	A	-	-	A	A	-	-	-	A	-	A
			Pregame	--	A	A	-	-	A	A	-	-	-	A	-	A
			Postgame	--	A	A	-	-	A	A	-	-	-	C	-	C
		Phase 2	PM	--	A	A	-	-	A	A	-	-	-	A	-	A
			Pregame	--	A	A	-	-	A	A	-	-	-	A	-	A
		Phase 3	PM	--	A	A	-	-	A	A	-	-	-	A	-	A
			Pregame	--	A	A	-	-	A	A	-	-	-	A	-	A

*Note: Highway Capacity Manual (HCM) 2010 does not support more than three through lanes on a major street approach at an unsignalized intersection. Therefore, HCM 2000 LOS is used at this intersection.

The traffic operations analysis at the 5th Street intersections in Table 5-6 does not factor in the gaps that occur from adjacent signals at 4th Street and 6th Street. The gaps generated by the signals would be expected to improve LOS conditions. Additionally, police officer traffic control before and after events at the Arena would be expected to improve LOS conditions.

Table 5-7: Future Intersection Peak Hour Traffic Operations – Kilbourn Ave & Wells Street intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Kilbourn Ave & 6 th Street • Adjust timings	Traffic Signal	Existing	PM	D	C	C	A	D	C	D	D	D	C	D	D	A
			Pregame	C	D	C	A	C	C	D	B	C	C	C	C	A
			Postgame	C	C	C	A	C	D	D	C	C	C	B	D	A
		Phase 1	PM	D	C	C	A	D	C	D	D	D	C	D	D	A
			Pregame	D	D	C	A	D	D	D	C	C	C	D	C	A
			Postgame	C	C	C	A	C	C	D	C	C	C	C	B	A
		Phase 2	PM	D	D	D	A	D	D	E	D	D	C	D	D	A
			Pregame	D	E	C	A	D	D	D	C	D	C	D	C	A
		Phase 3	PM	D	D	D	A	E	D	F	D	D	C	D	D	A
			Pregame	D	D	C	A	C	D	D	C	D	C	D	C	A
Kilbourn Ave & 4 th Street	Traffic Signal	Existing	PM	C	D	C	C	C	B	B	B	B	B	A	A	A
			Pregame	C	D	C	C	C	B	B	C	B	C	C	B	C
			Postgame	C	C	C	C	B	B	B	C	B	B	C	C	C
		Phase 1	PM	C	C	C	C	C	B	B	B	B	B	A	A	A
			Pregame	C	D	C	C	C	B	B	C	B	C	C	B	B
			Postgame	B	C	C	C	B	B	B	C	B	B	C	B	C
		Phase 2	PM	C	D	C	C	C	B	B	B	B	B	A	A	A
			Pregame	C	D	C	C	C	B	B	C	B	C	C	B	B
		Phase 3	PM	C	D	C	C	C	B	B	B	B	B	A	A	A
			Pregame	C	D	C	C	C	B	B	C	B	C	C	B	B
Wells Street & 6 th Street • Adjust timings	Traffic Signal	Existing	PM	C	E	B	B	C	C	D	C	C	B	E	C	C
			Pregame	C	C	B	B	C	C	C	C	C	C	D	B	B
			Postgame	C	C	B	B	C	C	C	B	B	B	B	B	B
		Phase 1	PM	C	E	B	B	C	C	D	C	C	B	E	C	C
			Pregame	C	C	B	B	C	C	C	C	D	C	D	B	B
			Postgame	C	C	B	B	C	C	D	B	B	B	B	B	C
		Phase 2	PM	C	E	B	B	C	D	D	C	C	B	F	C	C
			Pregame	C	C	B	B	C	C	C	B	C	B	D	B	B
		Phase 3	PM	C	E	B	B	D	D	E	C	C	B	F	C	C
			Pregame	C	C	B	B	C	C	C	C	D	C	D	B	B

Table 5-8: Future Intersection Peak Hour Traffic Operations – Water Street intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	T H	RT	LT	TH	RT
Water Street & Knapp Street • Adjust timings	Traffic Signal	Existing	PM	C	F	C	C	C	C	C	C	A	A	C	C	D
			Pregame	C	D	C	C	C	C	C	C	A	A	C	C	F
			Postgame	B	C	B	B	C	C	C	B	A	A	C	C	C
		Phase 1	PM	C	F	C	C	C	C	C	D	A	A	C	C	D
			Pregame	D	D	C	C	C	C	C	C	A	A	C	C	F
			Postgame	C	D	B	B	D	D	D	B	A	A	C	C	C
		Phase 2	PM	D	F	C	C	C	C	C	D	A	A	C	C	D
			Pregame	D	D	C	C	C	C	C	C	A	A	C	C	F
		Phase 3	PM	D	F	C	C	D	C	C	D	A	A	C	C	E
			Pregame	D	D	C	C	C	D	D	C	A	A	C	C	F
Water Street & Juneau Avenue • Adjust timings	Traffic Signal	Existing	PM	B	D	D	D	D	C	C	C	A	A	B	C	B
			Pregame	B	C	B	B	C	C	C	B	A	A	B	C	B
			Postgame	B	C	B	C	D	C	C	B	A	A	B	B	B
		Phase 1	PM	C	D	D	D	D	C	C	C	A	A	B	C	B
			Pregame	B	C	B	B	C	C	C	B	A	A	B	C	B
			Postgame	B	B	B	C	C	C	C	B	A	A	B	B	B
		Phase 2	PM	B	D	C	C	D	C	C	C	A	A	B	C	B
			Pregame	B	C	B	C	C	C	C	B	A	A	B	C	B
		Phase 3	PM	C	D	C	C	D	C	C	D	A	A	C	C	C
			Pregame	B	C	B	C	C	C	C	B	A	A	B	C	B
Water Street & State Street • Adjust timings	Traffic Signal	Existing	PM	C	-	-	-	C	C	C	C	C	-	-	D	D
			Pregame	B	-	-	-	B	B	B	B	B	-	-	B	B
			Postgame	B	-	-	-	B	B	B	B	B	-	-	B	B
		Phase 1	PM	C	-	-	-	C	C	C	C	C	-	-	D	D
			Pregame	B	-	-	-	B	B	B	B	B	-	-	B	B
			Postgame	B	-	-	-	B	B	B	B	B	-	-	B	B
		Phase 2	PM	C	-	-	-	C	C	C	C	C	-	-	D	D
			Pregame	B	-	-	-	B	B	B	B	B	-	-	B	B
		Phase 3	PM	C	-	-	-	C	C	C	C	C	-	-	D	D
			Pregame	B	-	-	-	B	B	B	B	B	-	-	B	B

Block 7 Parking Facility Access Alternative discussion

Two separate parking access alternatives were analyzed for the Block 7 parking facility. This parking facility is located between 5th and 6th Streets and between McKinley and Juneau Avenues. The main access to the parking facility is currently planned to be located along 5th Street. The two parking facility access alternatives are the following:

1. Two-way 5th Street – 5th Street between McKinley Avenue and Juneau Avenue would operate with a two-way 5th Street. Parking facility traffic could enter and exit from northbound and southbound directions along 5th Street.
2. One-way 5th Street – 5th Street between McKinley Avenue and Juneau Avenue would operate as one-way southbound only before an event at the Arena and one-way northbound only after an event at the Arena. This one-way requirement would route Arena traffic away from Juneau Avenue (and the Arena) onto McKinley Avenue. The one-way 5th Street operation would only take effect on gamedays during Pregame and Postgame periods.

Tables 5-9 to 5-11 below show the future traffic operations analysis with the two-way 5th Street and one-way 5th Street parking access alternatives at the six nearest surrounding intersections that are most impacted by the two potential alternatives: McKinley Avenue intersections with 4th, 5th & 6th Streets and Juneau Avenue intersections with 4th, 5th & 6th Streets.

Table 5-9: Future Intersection Peak Hour Traffic Operations – Block 7 Parking Ramp Access Comparison at Signalized McKinley Avenue Intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
McKinley Avenue & 6 th Street	Traffic Signal	Phase 1	PM – 2 way	D	F	C	E	F	C	D	F	D	D	E	C	C
			PRE – 2 way	D	D	D	F	F	B	B	E	D	D	D	C	C
			POST – 2 way	F	D	B	B	C	C	C	F	C	D	C	C	C
			PM – 1 way	D	E	C	E	F	C	C	F	E	E	E	D	D
			PRE – 1 way	D	D	D	F	F	B	B	E	D	D	E	C	C
			POST – 1 way	F	D	B	B	E	D	D	F	C	D	C	D	D
		Phase 2	PM – 2 way	D	F	C	F	F	C	C	E	E	E	D	D	D
			PRE – 2 way	D	C	C	F	F	A	A	E	D	D	D	C	C
			PM – 1 way	E	F	D	F	F	C	C	D	D	D	F	E	D
			PRE – 1 way	D	C	C	F	F	A	A	E	E	E	E	C	C
		Phase 3	PM – 2 way	E	F	D	F	F	C	C	E	E	E	E	D	D
			PRE – 2 way	D	C	C	F	F	A	A	F	D	D	D	C	C
			PM – 1 way	E	E	D	F	F	B	B	F	F	F	F	E	D
			PRE – 1 way	E	D	C	F	F	B	B	F	E	E	D	C	C
McKinley Avenue & 4 th Street	Traffic Signal	Phase 1	PM – 2 way	C	D	A	A	C	D	D	B	B	B	C	C	C
			PRE – 2 way	B	C	A	A	C	D	D	B	B	B	C	C	C
			POST – 2 way	C	C	C	C	B	C	C	C	B	B	B	B	B
			PM – 1 way	C	C	A	A	C	D	D	C	C	C	C	C	C
			PRE – 1 way	B	C	A	A	A	B	B	D	C	B	C	C	C
			POST – 1 way	C	C	C	C	B	C	C	C	C	B	B	B	B
		Phase 2	PM – 2 way	B	C	A	A	A	B	B	B	B	B	C	C	C
			PRE – 2 way	A	B	A	A	A	A	A	D	C	C	C	C	C
			PM – 1 way	C	C	A	A	C	D	D	D	C	C	C	C	C
			PRE – 1 way	C	C	A	A	C	D	D	D	D	C	C	C	C
		Phase 3	PM – 2 way	C	D	A	A	C	D	D	D	C	C	C	C	D
			PRE – 2 way	C	D	A	A	C	D	D	D	D	C	C	C	C
			PM – 1 way	C	D	A	A	C	E	E	D	D	C	D	D	E
			PRE – 1 way	C	D	A	A	C	D	D	E	D	C	C	C	C

Table 5-10: Future Intersection Peak Hour Traffic Operations – Block 7 Parking Ramp Access
Comparison at Signalized Juneau Avenue Intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Juneau Avenue & 6 th Street	Traffic Signal	Phase 1	PM – 2 way	D	D	C	A	D	C	C	D	C	C	F	B	B
			PRE – 2 way	C	C	C	A	D	C	C	C	B	C	D	B	B
			POST – 2 way	F	C	B	A	D	C	F	C	C	C	C	B	B
			PM – 1 way	D	D	B	A	C	C	C	D	C	B	F	C	B
			PRE – 1 way	C	D	C	A	D	C	D	C	B	C	D	B	B
			POST – 1 way	C	C	B	A	C	B	C	C	C	C	C	B	B
		Phase 2	PM – 2 way	D	D	C	A	D	D	C	D	D	C	F	B	B
			PRE – 2 way	C	C	D	A	D	D	D	C	C	C	E	B	B
			PM – 1 way	E	D	C	A	C	D	E	D	D	C	F	B	B
			PRE – 1 way	C	D	C	A	D	C	D	C	C	C	E	B	B
		Phase 3	PM – 2 way	D	D	C	A	D	D	C	D	B	B	F	C	B
			PRE – 2 way	C	C	D	A	D	D	D	C	C	C	D	B	B
			PM – 1 way	E	E	C	A	C	D	F	E	D	C	F	C	B
			PRE – 1 way	C	D	C	A	D	D	E	D	C	C	E	B	B
Juneau Avenue & 4 th Street	Traffic Signal	Phase 1	PM – 2 way	C	D	D	-	-	C	B	-	-	-	C	-	C
			PRE – 2 way	C	D	D	-	-	C	B	-	-	-	C	-	D
			POST – 2 way	C	D	D	-	-	B	B	-	-	-	B	-	B
			PM – 1 way	C	D	D	-	-	C	B	-	-	-	D	-	D
			PRE – 1 way	F	F	F	-	-	C	C	-	-	-	C	-	D
			POST – 1 way	C	D	C	-	-	B	B	-	-	-	B	-	B
		Phase 2	PM – 2 way	C	D	D	-	-	C	B	-	-	-	C	-	C
			PRE – 2 way	C	C	C	-	-	B	B	-	-	-	C	-	C
			PM – 1 way	C	D	D	-	-	C	B	-	-	-	D	-	E
			PRE – 1 way	F	F	F	-	-	B	B	-	-	-	C	-	C
		Phase 3	PM – 2 way	C	D	D	-	-	B	A	-	-	-	E	-	E
			PRE – 2 way	D	F	D	-	-	B	B	-	-	-	C	-	D
			PM – 1 way	E	F	F	-	-	B	B	-	-	-	D	-	D
			PRE – 1 way	C	C	C	-	-	A	A	-	-	-	C	-	E

Table 5-11: Future Intersection Peak Hour Traffic Operations – Block 7 Parking Ramp Access
Comparison at Unsignalized 5th Street Intersections

Intersection	Traffic Control	Scenario	Peak Hour	Level of Service per Movement by Approach												
				Int. LOS	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
McKinley Avenue & 5 th Street	Stop Sign	Phase 1	PM – 2 way	--	-	A	A	F	A	-	F	-	F	-	-	-
			PRE – 2 way	--	-	A	A	F	A	-	A	-	A	-	-	-
			POST – 2 way	--	-	A	A	A	A	-	F	-	F	-	-	-
			PM – 1 way	--	-	A	A	F	A	-	-	-	-	-	-	-
			PRE – 1 way	--	-	A	A	F	A	-	-	-	-	-	-	-
			POST – 1 way	--	-	A	A	A	A	-	F	-	F	-	-	-
		Phase 2	PM – 2 way	--	-	A	A	F	A	-	F	-	F	-	-	-
			PRE – 2 way	--	-	A	A	F	A	-	A	-	A	-	-	-
			PM – 1 way	--	-	A	A	F	A	-	-	-	-	-	-	-
			PRE – 1 way	--	-	A	A	F	A	-	-	-	-	-	-	-
		Phase 3	PM – 2 way	--	-	A	A	F	A	-	F	-	F	-	-	-
			PRE – 2 way	--	-	A	A	F	A	-	A	-	A	-	-	-
			PM – 1 way	--	-	A	A	F	A	-	-	-	-	-	-	-
			PRE – 1 way	--	-	A	A	F	A	-	-	-	-	-	-	-
Juneau Avenue & 5 th Street	Stop Sign	Phase 1	PM – 2 way	--	A	A	-	-	A	A	-	-	-	F	-	F
			PRE – 2 way	--	B	A	-	-	A	A	-	-	-	A	-	A
			POST – 2 way	--	A	A	-	-	A	A	-	-	-	F	-	F
			PM – 1 way	--	-	A	-	-	A	A	-	-	-	F	-	F
			PRE – 1 way	--	-	A	-	-	A	A	-	-	-	A	-	A
			POST – 1 way	--	A	A	-	-	A	A	-	-	-	-	-	-
		Phase 2	PM – 2 way	--	A	A	-	-	A	A	-	-	-	F	-	F
			PRE – 2 way	--	B	A	-	-	A	A	-	-	-	A	-	A
			PM – 1 way	--	-	A	-	-	A	A	-	-	-	F	-	F
			PRE – 1 way	--	-	A	-	-	A	A	-	-	-	A	-	A
		Phase 3	PM – 2 way	--	B	A	-	-	A	A	-	-	-	F	-	F
			PRE – 2 way	--	A	A	-	-	A	A	-	-	-	A	-	A
			PM – 1 way	--	-	A	-	-	A	A	-	-	-	F	-	F
			PRE – 1 way	--	-	A	-	-	A	A	-	-	-	F	-	F

The following general observations can be taken from a comparison of the LOS traffic operations in Tables 5-9 to 5-11:

1. Two-way 5th Street alternative benefits:

- Better northbound traffic operation along 6th Street at McKinley Avenue before the event. One-way 5th Street traffic operations require northbound traffic to avoid routing to 5th

Street to access parking facilities and must instead choose an adjacent corridor, such as 6th Street.

- Better southbound left turn traffic operations along 6th Street at McKinley Avenue before the event. One-way 5th Street traffic operations require southbound 6th Street traffic to turn left to access Block 7 parking facility. Two-way 5th Street operations allow the additional option to access the parking facility by turning left at Juneau Avenue.
- Better westbound traffic operations along McKinley Avenue at 6th Street during Postgame peak hour. One-way 5th Street traffic operations route all Postgame exiting traffic to McKinley Avenue.
- The intersection of McKinley Avenue and 4th Street operates slightly better before the event. The one-way 5th Street alternative forces some traffic to re-route to adjacent corridors, such as 4th Street.
- The intersection of Juneau Avenue and 4th Street operates better before the event. The one-way 5th Street alternative forces some traffic to re-route to adjacent corridors, such as 4th Street.
- The ability to enter and exit to/from the north or south along 5th Street gives drivers more routing options and better disperses out vehicles rather than requiring all vehicles to enter and exit the same direction.

2. One-way 5th Street alternative benefits:

- The intersection of McKinley Avenue & 6th Street includes several movements at LOS E/F in both alternatives, however the northbound left turn LOS F has a lower delay under the one-way alternative (10 minutes) than the two-way alternative (18 minutes) during the Postgame peak hour.
- The intersection of Juneau Avenue & 6th Street operates better, especially the westbound approach during Postgame.
- The intersection of Juneau Avenue & 5th Street operates better Pregame and Postgame.
- No traffic entering or exiting the parking facility from Juneau Avenue before or after the event.
- May not require police officers directing traffic at the unsignalized intersection of Juneau Avenue & 5th Street before and after the event, because the one-way 5th Street operation would route all traffic to and from the intersection McKinley Avenue and 5th Street during the Pregame and Postgame peak hours.

PART B - FUTURE TRAFFIC MICROSIMULATION ANALYSIS

A traffic microsimulation analysis was conducted to assess the flow of future forecasted traffic through the network within the study area. Future traffic microsimulation models were created for the PM, Pregame and Postgame Phase I scenarios. The PM and Pregame peak hour models were combined into one PM-

Pregame model due to the proximity of their time periods. Model results were extracted for the PM and Pregame peak hours separately. The PM-Pregame and the Postgame models include future forecasted peak hour traffic volumes with improved intersection geometry, signal phasings and timings. The same twelve intersections from the existing microsimulation models were included in the future traffic simulation along with three additional 5th Street intersections at McKinley Avenue, Juneau Avenue and State Street. Similar to the existing microsimulation models, the future PM, Pregame and Postgame volumes utilized 15-minute profile loading to vary traffic volumes within the peak hour to better reflect traffic volume peaking characteristics. Both models were calibrated using the GEH statistic. This statistic gauges the difference between the observed volumes compared to the modeled volumes. Calibration results of the future Phase I conditions are provided in the Appendix.

The Phase 1 PM, Pregame and Postgame traffic microsimulation model LOS results are also shown in the Appendix. The results show that the microsimulation LOS results are similar to the traffic operations shown in Tables 5-1 through 5-8. The Phase 1 PM peak hour microsimulation results show some turning movements at the intersections of McKinley Avenue with 6th Street operating at LOS E/F, Juneau Avenue with 6th Street at LOS E, State Street with 6th Street at LOS E/F, and Kilbourn Avenue with 6th Street at LOS E. During the Pregame, the results show some turning movements at the intersections of McKinley Avenue with 6th Street operating at LOS F, McKinley Avenue with 4th Street at LOS E, Juneau Avenue with 4th Street at LOS F, and State Street with 6th Street at LOS F. Most of the other turning movements in the Phase 1 PM, Pregame and Postgame models are at LOS D or better. During the Postgame, the results show some turning movements at the intersections of McKinley Avenue with 6th Street operating at LOS E. The westbound approach of Fond du Lac Avenue intersection with the IH 43 Northbound Ramp operates at LOS F during the Postgame. Similar to the existing condition, traffic congestion is due to significant lane changing in preparation of the southbound IH 43 entrance ramp. A significant amount of traffic is destined for southbound IH 43 which results in poor lane balance at the northbound ramp terminal. The similarity between the Phase 1 traffic operations intersection LOS conditions (Tables 5-1 through 5-8) and the Phase 1 PM, Pregame and Postgame microsimulation intersection LOS results suggest that the Phase I microsimulation models are well calibrated and the multimodal auto-pedestrian interaction is represented in both software packages.

PART C - PEDESTRIAN, BICYCLE, AND MULTI-USE TRAIL ACCOMODATIONS

Pedestrian Level of Service (LOS) was analyzed for selected alternatives. Few LOS issues were identified in the existing conditions analysis and those issues identified were typically not auto volume dependent.

PART D - TRAFFIC CONTROL NEEDS

Police officer provided traffic control is currently in use with events at the BMO Harris Bradley Center. It is recommended that officer control be provided at the McKinley and 5th Street intersection to aid in the orderly flow of traffic, depending on the final design of the Block 7 parking structure. Police officer control may not be required in directing traffic at the unsignalized intersection of Juneau Avenue & 5th Street before and after the event if the one-way 5th Street operation is in effect, because the one-way 5th

Street operation would route all traffic to and from the intersection McKinley and 5th Street during the Pregame and Postgame peak hours, away from the intersection of Juneau Avenue and 5th Street.

The intersection of 6th and Highland may also require officer control depending on the design of the parking structure and surrounding streets. These traffic operational details will require further information regarding the design and operation of the parking ramps proposed near both of these locations.

CHAPTER 6 - CONCLUSIONS AND RECOMMENDATIONS

The planned Milwaukee Bucks Arena is expected to be located one block north of the existing BMO Harris Bradley Center, and provide a similar seating capacity to the existing facility. Additional developments in the vicinity of the planned Arena, relocation of parking facilities and modifications to the existing transportation network are also proposed. This report documents the development of traffic and pedestrian demands and the subsequent operational analysis on over 20 intersections in the vicinity of the planned Arena.

Traffic demands are projected to increase within the study area due to both the proposed developments and the application of an assumed 0.5% annual growth of background traffic traveling through the study area. 4th Street is proposed to be vacated between Highland Avenue and Juneau Avenue as part of the Arena project, which would redistribute traffic to other streets in the area.

Existing LOS Issues

This analysis identifies traffic signal or geometric improvements to maintain acceptable LOS, or maintain the pre-existing Level of Service (LOS) conditions. Operational analysis of the study area intersections identified two intersections that have existing intersection-level LOS issues.

- The intersection of McKinley Avenue and 6th Street has LOS F conditions in the Postgame condition and is projected to still have LOS F with either alternative circulation pattern for the Block 7 parking structure between McKinley Avenue and Juneau Avenue.
- Interstate Highway (IH) 43 SB ramp terminal intersection with Fond du Lac Avenue also experiences LOS F in the existing condition and is projected to continue to operate at LOS F under the proposed condition.

Projected LOS Issues

Below is a list of intersections that are projected to observe LOS E or worse conditions and require intersection geometry improvements, signal phasing improvements, signal timings improvements or additional services.

Intersection Geometry Improvements Necessary – Phases I, II & III

Intersections that have both heavier traffic volumes and nearby parking structures, which contribute to projected level of service issues include the following intersections. Intersection geometry improvements that are expected to be needed in all three phases (Phase I, II and III) are discussed below.

- McKinley Avenue and 6th Street intersection is projected to be directly affected by the operation of the proposed parking structure in its southeast quadrant, along with how vehicles are expected to access and egress that parking facility. Two operational plans have been identified for 5th Street between McKinley Avenue and Juneau Avenue. Each would impact McKinley Avenue and 6th Street in different ways, depending on the final design and operation of the adjacent parking structure in Block 7.

- Juneau Avenue and 6th Street intersection is projected to be directly affected by operations of the proposed parking structure in its northeast quadrant. The proposed Juneau Avenue cross-section reduces this intersection's lane geometry to have one eastbound through lane and one westbound through lane, along with one westbound right turn lane. The addition of a westbound left turn bay is recommended. Eastbound protected left turn phasing and westbound protected left turn phasing are recommended for Phases II and III. The proposed eastbound valet lane is recommended to begin where feasible to the east of the westbound left turn bay end taper.
- Highland Avenue and 6th Street intersection is projected to be directly affected by the operation of the proposed parking structure in its southeast quadrant. The design of the Block 2 parking structure has not been finalized yet. Currently, the main entrance is assumed to be along 5th Street, which would be expected to force many vehicles to perform the northbound right turn movement along 6th Street onto Highland Avenue during the Pregame time period. Therefore, investigation into a second right turn lane should be conducted. Options include either striping one of the two northbound through lanes as a shared through/right turn lane or utilizing temporary traffic control devices such as traffic cones along with police officer traffic control during the Pregame peak hour to route one of the two northbound through lanes as a second right turn lane. The exact needs for this intersection will become clearer when a more detailed design of the Block 2 parking facility exists.

Signal Phasing, Signal Timing & Lane Re-striping Improvements Necessary– Phases I, II & III

The following intersections require changes to signal phasing and signal timing in all three phases (Phases I, II and III) to achieve acceptable traffic operating conditions in the future with the proposed development in place or to maintain pre-existing LOS traffic operating conditions:

- McKinley Avenue and 4th Street intersection includes recommendations to remove the current northbound left turn protected signal phase and install an eastbound left turn protected signal phase. With the closure of 4th Street between Juneau Avenue and Highland Avenue reduced traffic demands occur along 4th Street, which removes the need for a northbound left turn protected phase and presents an opportunity to reduce the northbound approach to one left turn bay and one shared through/right turn lane. However, future development in the area is anticipated to increase eastbound left turn volumes, which would utilize the recommended protected phase.
- McKinley Avenue and Old World 3rd Street intersection includes a recommendation to install a westbound left turn protected signal phase. An eastbound left turn protected signal phase is already in place at this intersection. Future development in the area, along with the removal of 4th Street between Juneau Avenue and Highland Avenue increase the traffic that is expected to utilize the westbound left turn movement at this Old World 3rd Street intersection.
- Juneau Avenue and Old World 3rd Street includes a recommendation to re-stripe the westbound approach's two through lanes to be one through lane and one right turn only lane. Current plans include the westbound Juneau Avenue cross-section, west of Old World 3rd Street, to include one through lane and one continuous right turn lane. Therefore, re-striping the westbound Juneau

Avenue approach at the intersection with Old World 3rd Street from two through lanes to one through lane creates better lane continuity with the downstream cross-section. In addition to the lane re-stripping, eastbound protected left turn phasing is recommended in Phase III.

- State Street and 6th Street intersection includes a recommendation to remove the northbound left turn protected signal phase during the Postgame time period, depending on the final design of the Block 2 parking structure. The higher volumes traveling southbound and westbound at this intersection during the Postgame time period are expected to require more green time. It should also be noted that State Street is currently one-way westbound in the project study area. Two-way State Street operation would be expected to provide improved traffic access to better develop Block 2 and Block 3 for mixed-use development as proposed to be retail, office, residential and hotel uses. In addition, the two-way traffic operation would support the spirit of the urban design principles identified in the General Planned Development (GPD) document. Pending the final design of the parking structure ingress and egress on Block 2, a two-way State Street would likely improve the traffic flow at intersections near Block 2, and ultimately improve access to the new arena. A two-way State Street would also likely improve the connectivity of the new arena, ancillary development and other Wisconsin Center facilities to the cultural and entertainment facilities east of the Milwaukee River. Converting State Street to two-way operation should be examined further when the final design of the Block 2 parking structure is completed.

Signal Timings Improvements Only Necessary

The following intersections require changes to signal timing to achieve acceptable traffic operating conditions in the future with the proposed development in place or to maintain pre-existing LOS traffic operating conditions. The specific phases and peak hours where signal timings adjustments are expected to be needed are also identified.

- Juneau Avenue and 4th Street intersection includes an opportunity to reduce the southbound approach to one left turn bay and one right turn lane, because of reduced southbound traffic volumes caused by the proposed closure of 4th Street between Juneau Avenue and Highland Avenue. This intersection includes signal timings adjustments in all phases and peak hours.
- Fond du Lac Avenue & IH 43 SB ramp – minor signal timings adjustment in Postgame Phase I Postgame hour.
- Highland Avenue & Southbound IH 43 ramp – minor signal timings adjustment in Phases I, II and III of Pregame peak hour.
- Knapp Street & Water Street – minor signal timings adjustment in Phases I, II and III in all peak hours.
- Juneau Avenue & Water Street – minor signal timings adjustment in PM Phase III only.
- State Street & Water Street – minor signal timings adjustment in Phases I, II and III of PM peak hour.
- Kilbourn Avenue & 6th Street – minor signal timings adjustment in Phases I, II and III of PM and Pregame peak hours.

- Wells Street & 6th Street – minor signal timings adjustment in Phases II and III of PM peak hour.

Additional Services Needed– Phases I, II & III

The following intersections are planned to be unsignalized, but are anticipated to require police officer traffic control before and after events at the proposed Arena during all three phases.

- McKinley Avenue and 5th Street
- Juneau Avenue and 5th Street
- State Street and 5th Street (assuming the parking structure on Block 2 exits onto 5th Street)

No Projected LOS Issues, No Improvements Necessary

The following intersections do not need improvements to achieve overall intersection LOS D or better conditions during the PM, Pregame and Postgame peak hour or to maintain pre-existing LOS traffic operating conditions:

- Fond du Lac Avenue & Northbound IH 43 ramps
- Highland Avenue & Old World 3rd Street
- Highland Avenue & 4th Street
- State Street & 4th Street
- Kilbourn Avenue & 4th Street

Block 7 Parking Structure Traffic Routing Alternatives

Two routing alternatives were analyzed for the proposed parking facility on Block 7 between McKinley Avenue and Juneau Avenue. The main access to the parking facility is currently planned to be located along 5th Street. The two parking facility access alternatives are the following:

3. Two-way 5th Street – 5th Street between McKinley Avenue and Juneau Avenue would operate with a two-way 5th Street. Parking facility traffic could enter and exit from northbound and southbound directions along 5th Street.
4. One-way 5th Street – 5th Street between McKinley Avenue and Juneau Avenue would operate as one-way southbound only during Pregame and one-way northbound only during Postgame. This one-way requirement would route Arena traffic away from Juneau Avenue (and the Arena) during both Pregame and Postgame time periods onto McKinley Avenue. The one-way 5th Street operation would only take effect during Pregame and Postgame periods.

Both parking structure access alternatives present traffic operation results that benefit different nearby intersection approaches and turning movements. Generally, the two-way alternative allows traffic more routing options to and from the parking facility. However, the one-way alternative beneficially restricts parking facility traffic from accessing Juneau Avenue in front of the proposed Arena, which would likely include a high number of pedestrians. Furthermore, the one-way alternative may also require police officer traffic control at only one of the two 5th Street intersections at Juneau Avenue and McKinley Avenue, while additionally providing comparatively lower vehicle delays at two intersection approaches of

particular interest to the City of Milwaukee – the northbound 6th Street approach at McKinley Avenue and the westbound Juneau Avenue approach at 6th Street. Therefore, the one-way access alternative is the preferred Block 7 parking facility access option during the Pregame and Postgame peak hours, pending final design of the parking facility. However, the two-way access alternative is preferred for the PM peak hour. The one-way access alternative is not preferred in the PM peak hour because it would force all of the commuters from the proposed large office component in Block 6 to exit onto Juneau Avenue, which is proposed to have a reduced cross-section with only one through lane in each direction. The two-way access alternative along 5th Street allows office commuters a second option during the PM peak hour to exit onto McKinley Avenue for better traffic operations and distribution in the study area.