



Banner University Medical Center, Tucson Campus Planned Area Development

Traffic Analysis

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Prepared for:

Banner Health

Banner Corporate Center – Phoenix

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1. INTRODUCTION

The Banner-University Medical Center (BUMC) Planned Area Development (PAD) applies to a portion of the Arizona Health Sciences Center (AHSC) and University Medical Center (UMC) campus that is being acquired by Banner Health, a private, non-profit entity (referenced as the “Property” or the “Site” throughout the BUMC PAD). A vicinity map is provided in **Figure 1**.

The original hospital dates back to the 1960’s and has become obsolete by today’s healthcare standards. The BUMC PAD District will be redeveloped into a state-of-the-art medical campus that will feature, among other things, the construction of a new hospital facility with phased dual bed towers to replace the majority of the current UMC Hospital.

Proposed Project

Banner Health will ultimately take fee title to approximately thirty-three acres of Property presently owned by Arizona Board of Regents and containing components of the AHSC and UMC, as well as the DCMC. The initial phase (Phase 1) of the BUMC development program will see the construction of a new hospital, including a new bed tower and patient support facilities, to replace those existing UMC hospital facilities originally developed in the 1960’s, together with a series of new surface parking areas and a new campus main entry and exit onto Campbell Avenue and Elm Street.

The second, longer-term development phase (Phase 2) will include additional hospital patient support facilities and a second bed tower added to the aforementioned new hospital, together with a new multi-level parking structure to support the expanded hospital.

Completion of Phase 2 will result in a campus with more than 1.8 million square feet of hospital space comprising approximately 800 beds, and will retain all of the DCMC square footage as it exists today and will repurpose as much of the other existing campus facilities as is reasonably practical and cost-effective. The full development program of the BUMC PAD District is described in detail in Section III (PAD District Proposal) of the PAD document.

Study Purpose

This traffic analysis is based on and updates the University of Arizona Health Science Center Campus (AHSC) Traffic and Circulation Study completed in December 2012, by Kimley-Horn. This traffic analysis:

- Reviews the BUMC PAD Site plan, its associated new and repurposed facilities as proposed by Banner Health.
- Considers future/proposed development lying outside of the actual PAD District boundary, anticipated development consistent with the University of Arizona 2020

Capital Plan, the University of Arizona Campus Comprehensive Plan, as well as the proposed private development of a 20-story mixed-used project near Speedway Boulevard at Campbell Avenue. Incorporating all of this nearby planned development into the analysis responsibly addresses the future traffic and transportation issues in the area in a comprehensive fashion.

- Develops trip generation rates for all of the above proposed development.
- Evaluates on-Site roadways and off-Site access points, based upon the trip generation rates, to analyze the full universe of impacts on surrounding transportation infrastructure.
- Documents transportation improvements and recommendations for each of the study area's intersections, roadway segments, etc.

The proposed Banner University Medical Center site plan is provided in **Figure 2**.

Figure 1. Vicinity Map

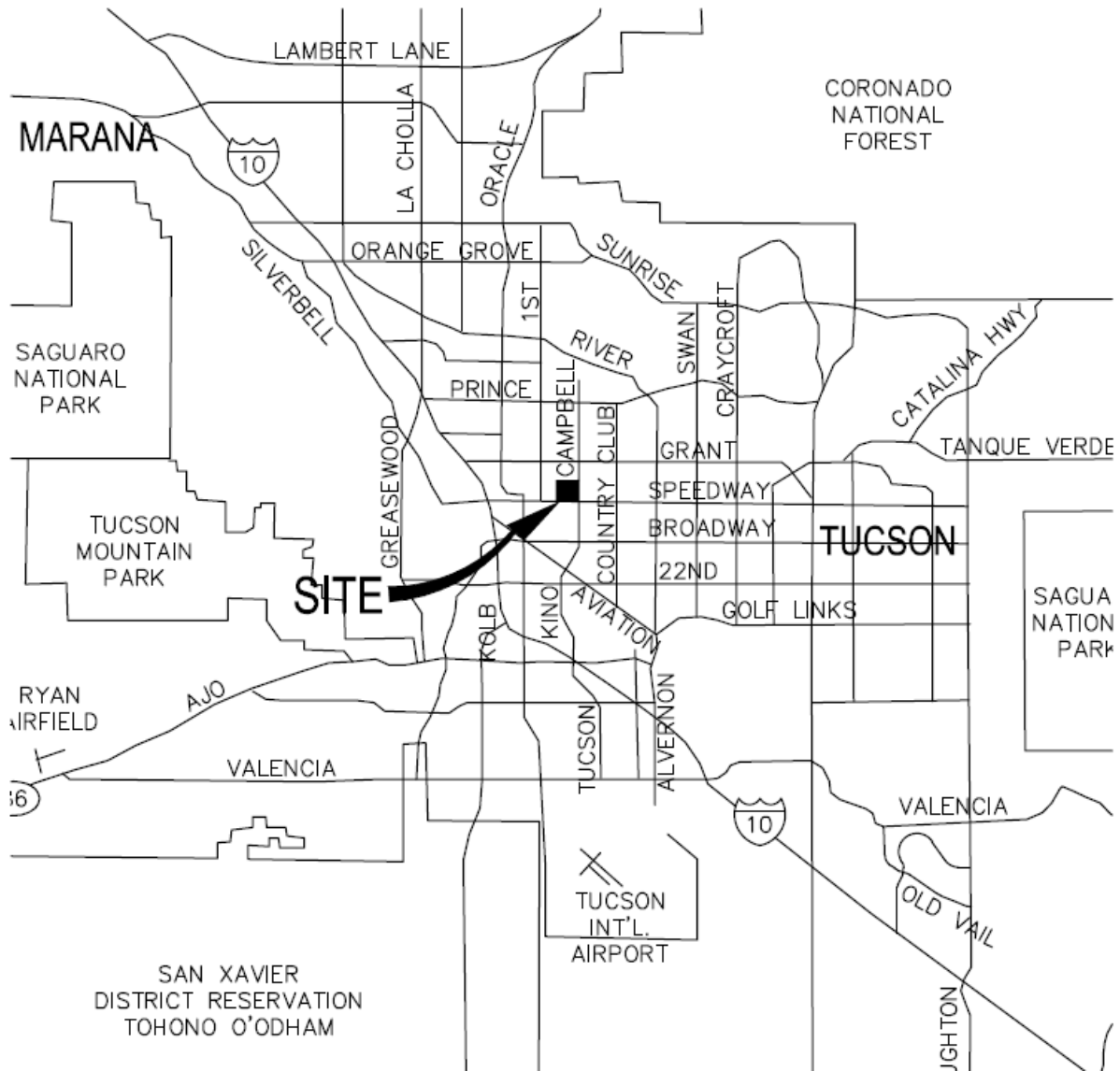
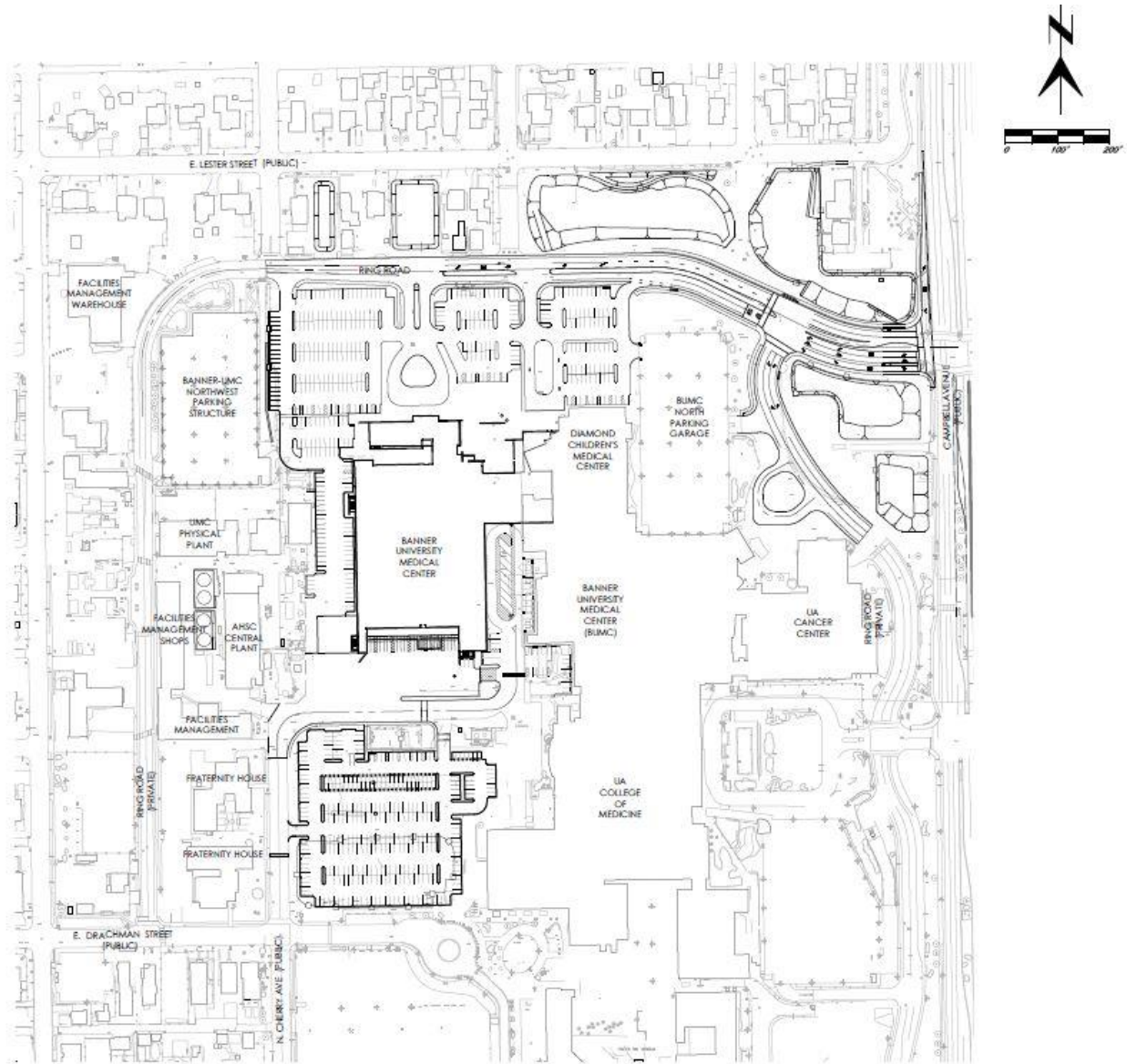


Figure 2. Banner University Medical Center, Tucson Campus Site Plan



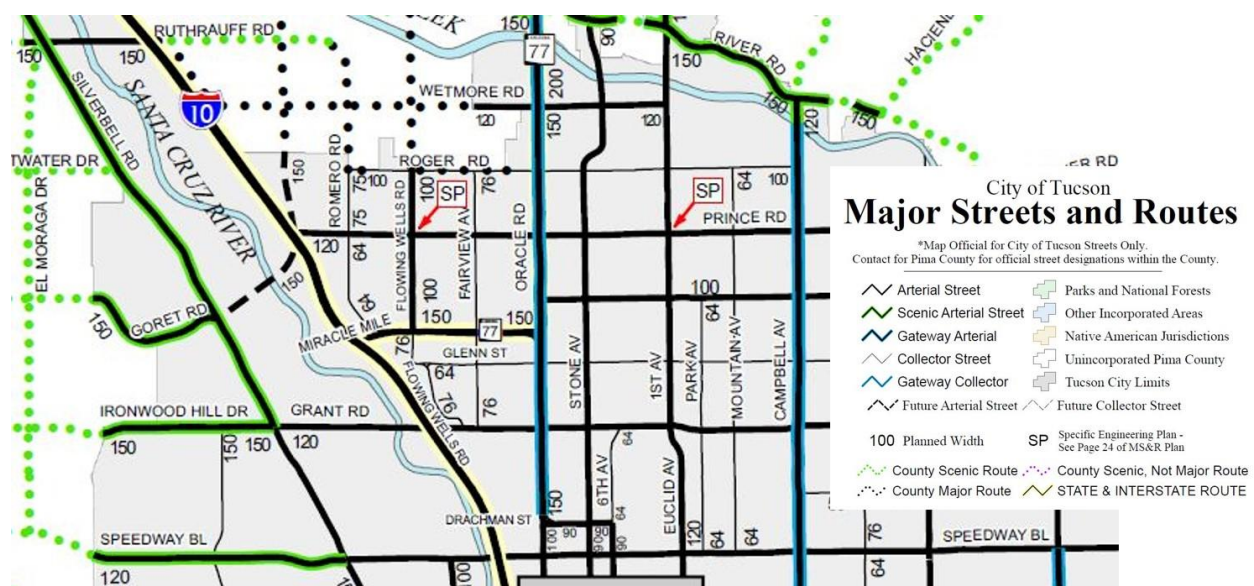
2. EXISTING CONDITIONS

City of Tucson Major Streets and Routes

The City of Tucson Major Streets and Routes Plan (MS&RP) identifies the general location and width of existing and proposed freeways, arterial and collector streets. The MS&RP also identifies future rights-of-way, setback requirements, typical intersections and cross sections, and gateway and scenic routes. The MS&RP (**Figure 3**) defines future right of way of Campbell Avenue and Speedway Boulevard to be 120 feet. Campbell Avenue is identified as a Gateway Arterial.

Gateway routes are routes to major employment centers, shopping areas, recreational areas, and transportation centers which are used regularly by large numbers of residents and visitors. The purpose of this designation is to improve the appearance of the built environment through the use of standards for the design and landscaping of the roadway and adjacent developments.

Figure 3. City of Tucson Major Streets and Routes Plan



Existing Conditions Traffic Control Configuration

Existing traffic control configuration at primary intersections within the AHSC campus area are illustrated in **Figure 4**. Signalized intersections are at Campbell Avenue/Elm Street, Campbell Avenue/Speedway Boulevard and Speedway Boulevard /Cherry Avenue.

Traffic volume data was collected in 2012 as part of the AHSC Traffic and Circulation Study. Existing traffic volumes are summarized in **Appendix B (Figure 11)**.

A capacity analysis of existing facilities was conducted. Capacity analysis demonstrates the relationship between traffic operations and roadway/intersection geometry, assesses deficiencies, and identifies alternatives.

Capacity analysis is performed based on methodologies outlined in the Highway Capacity Manual (Transportation Research Board, 2010). The Highway Capacity Manual (HCM) employs methodologies to calculate intersection Level of Service (LOS). LOS is a qualitative assessment of the quantitative effect of factors such as intersection geometry, lane configuration, and traffic volumes. Operating conditions are categorized as “A” through “F,” with “A” representing the most favorable conditions and “F” representing the least favorable. The City of Tucson requires the traffic impact of new development on roadways and intersections to be mitigated to a Level of Service D or better. LOS “D” for signalized intersections is equal to being delayed at the intersection for less than 35-55 seconds per vehicle. **Table 1** shows the delay (wait time thresholds) for each LOS grade.

Table 1. Level of Service Delay Thresholds

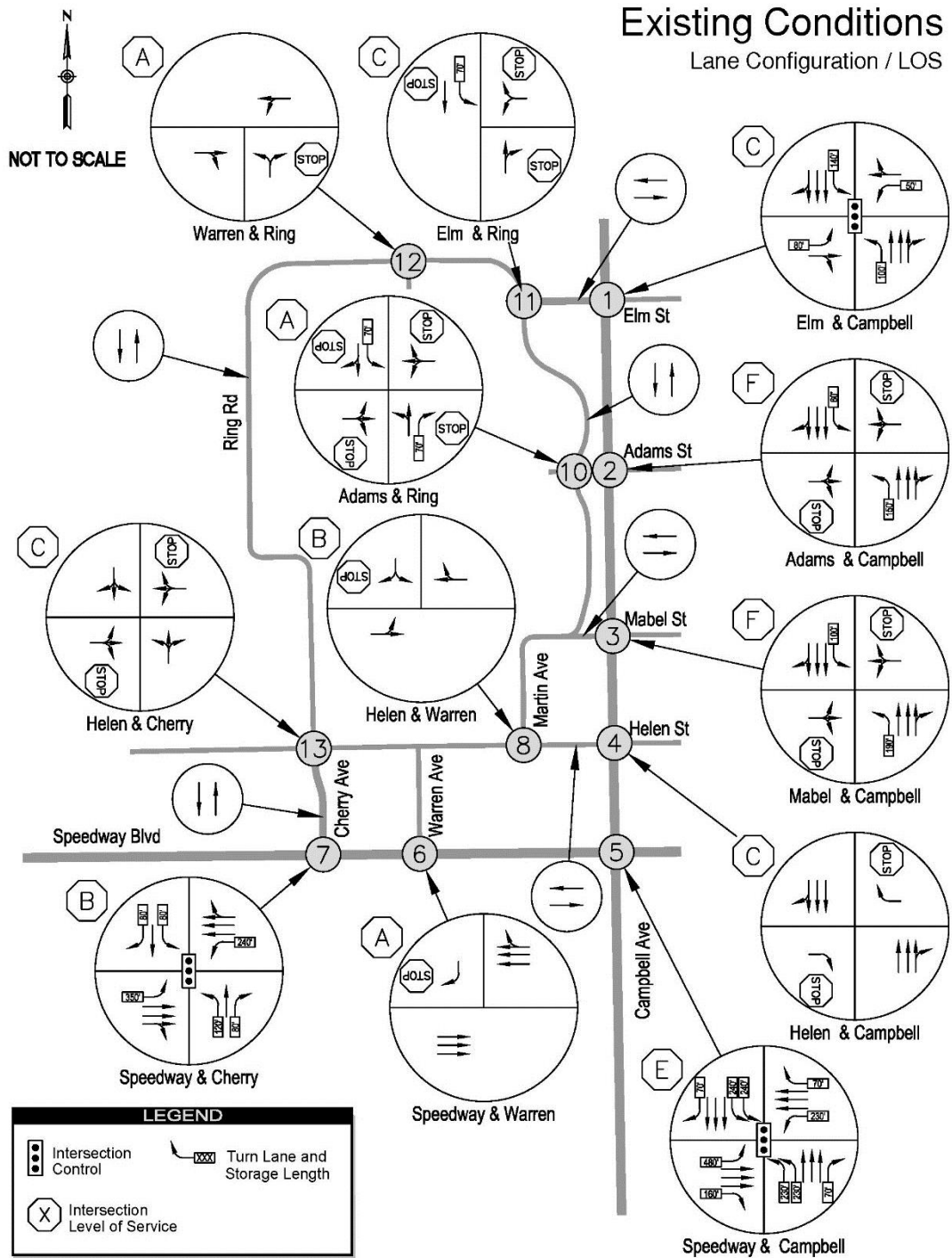
LOS	Signalized Intersection	Unsignalized Intersection
A	≤10 sec	≤10 sec
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	≥80 sec	≥50 sec

Intersection LOS is computed as a weighted average of vehicle delay. An intersection may have an acceptable overall LOS but may also have individual movements with unacceptable LOS. As a result, all movements are analyzed individually, and recommendations are made to reduce delay and increase capacity on critical movements.

Capacity analysis for existing conditions are found in **Figure 4**. Detailed capacity analysis results are included in the **Appendix C**.

Currently, the signalized intersection of Speedway Boulevard/Campbell Avenue operates at LOS “F”. The stop-controlled intersections of Adams Street/Campbell Avenue, and of Mabel Street/Campbell Avenue operate at LOS “F”. This is due to the delay incurred by vehicles attempting to make a left turn from eastbound Adams Street or Mabel Street to Northbound Campbell Avenue. LOS “F” on a minor street that is stop-controlled at its intersection with a major arterial is a common condition in busy urban environments.

Figure 4. Existing Traffic Configuration and Performance



Existing Roadway Network

Streets that provide direct access to the Banner UMC campus or provide circulation within the campus are described below.

Campbell Avenue

Campbell Avenue is the major north-south arterial roadway that runs directly east of Banner University Medical Center. Campbell Avenue is a six-lane arterial with raised medians and has a 35 MPH speed limit. The road is constructed to the maximum cross-section supported by the City of Tucson Major Streets and Routes Plan.

Speedway Boulevard

Speedway Boulevard is the major east-west arterial roadway that runs approximately ¼ mile south of Banner University Medical Center and directly through the northern portion of the University of Arizona campus. Speedway Boulevard is a six-lane arterial roadway with raised medians and has a 35 MPH speed limit. The road is constructed to the maximum cross-section supported by the City of Tucson Major Streets and Routes Plan.

Local Public Streets

Helen Street serves as a minor east-west collector street that provides access to several University of Arizona parking facilities and buildings on the north side of Speedway Boulevard. Cherry Avenue serves as a minor north-south collector street providing access to the main University of Arizona campus (to the south of Speedway), and to the AHSC campus (north of Speedway). The intersection of Cherry Avenue and Speedway Boulevard is signalized.

Ring Road

Internal circulation within the AHSC campus is provided by the 0.8 mile Ring Road. The Ring Road is a low speed two-lane corridor with a speed limit of approximately 20 MPH. It extends from Cherry Avenue, beginning at Drachman Street, north to Elm Street and then south to Mabel Street.

Multimodal Connectivity

The campus is served by bus, streetcar, and bicycle and pedestrian facilities.

Sun Tran Bus Routes & CatTran Shuttle Service

Sun Tran provides transit service to the AHSC campus with bus stops along Campbell Avenue and Speedway Boulevard. A variety of routes are accessible near the campus, including express service. Bus routes along Speedway Boulevard include 4, 5, 102X, 103X, 105X, and 109X. Bus routes on Campbell Avenue include 9, 15, 20, and 103X. Bus stop locations are noted in Error! Reference source not found.. In addition, the University of Arizona Cat Tran system circulates within the AHSC campus.

Sun Link Streetcar Facilities

The construction of the 3.9-mile modern streetcar system, known as Sun Link, was completed in the summer of 2014. The streetcar line begins at Warren Avenue and Helen Street, south of the Banner University Medical Center, and provides direct access to the University of Arizona campus and to downtown, terminating on the west side of I-10. Sun Link's service provides 10 to 15 minute headways, time between vehicles in a transit system, during the weekday and increases to 20 minutes to 30 minutes during the evenings and on Saturdays. The streetcar operates from 7:00 am to 10:00 pm on Monday to Wednesday, from 7:00 am to 2:00 am on Thursday and Friday, from 8:00 am to 2:00 am on Saturday, and from 8:00 am to 8:00 pm on Sunday.

Existing Bike Routes

The PAD District is served by a robust network of designated bicycle routes and bike lanes. Both Speedway Boulevard and Campbell Avenue provide a dedicated bike lane or striped shoulder.

An east-west low-volume bicycle route traverses through Lester Street, the Ring Road within the PAD District, and ultimately to Elm Street. In addition, an existing shared-use path along the Warren Avenue alignment serves as a north-south bicycle route for both cyclists and pedestrians. The Warren Avenue and Highland Avenue underpasses (further south and west of the PAD District) allows a grade-separated crossings beneath Speedway Boulevard to facilitate direct access to the UA main Campus. The Warren Avenue underpass is a pedestrian-only connection (bikes must be walked), while the Highland Avenue underpass accommodates both pedestrians and bicyclists, making it the best southward connective route to the main campus.

3. TRAFFIC ANALYSIS

This traffic impact analysis was prepared using a four-step process to forecast the travel demands of the proposed Banner-UMC development. Trip generation is the first step in this process and focuses on estimating the number of trips to be “produced” or “generated” by a particular land use type within a specific traffic analysis zone.

The initial trip-generation step is followed with the next three steps: 1) determining trip distribution, 2) mode choice, and 3) route assignment. Trip distribution is concerned with assigning the trips generated to the directions which people travel to and from the Site. Mode choice is then concerned with the mode of travel, i.e. by vehicle, walking/biking, or bus/transit. Finally, route assignment is concerned with the specific streets and routes by which they travel.

Once this four-step evaluative process is complete, a capacity analysis of the surrounding roadway network of streets and intersections is performed to evaluate their operational performance and make recommendations for any necessary improvements. Each of these steps is described in more detail below.

Trip Generation

Trip-generation is derived from qualitative measures associated with the development such as number of employees of a facility, development square footage, or number of dwelling units. Trip generation estimates reflect the number of trips entering or exiting a site or development during a specified time period (e.g., daily, or during the morning peak-period). The Institute of Transportation Engineers (ITE) Trip Generation Manual contains trip-generation rates developed from an aggregation of over 4,000 traffic studies, for dozens of land uses.

The ITE equations and averaged rates used for the proposed Banner Health redevelopments are found in **Table 2**.

Based on guidance provided by the *Trip Generation Handbook*, the weighted average rate was used to forecast the trips generated from the hospital during the AM/PM peak hours when forecasting the trips generated based on the number of beds. Thus, a linear relationship between the independent variable and trip ends are assumed. For the Total Daily Trips, regression based equations were used.

Table 2. Trip Generation Land Uses, ITE Codes and Rates

Hospital (SF)					
ITE 9th Edition:	610				
Daily	$T = 6.91 * (1000\text{'s of SF}) + 2923.63$	50%	In	50%	Out
AM Peak Hour	$T = 0.87 * (1000\text{'s of SF}) + 132.15$	59%	In	41%	Out
PM Peak Hour	$T = 0.78 * (1000\text{'s of SF}) + 186.59$	42%	In	58%	Out
Hospital (Beds)					
ITE 9th Edition:	610				
Daily	$T = 7.33 * (\text{Number of Beds}) + 2213.85$	50%	In	50%	Out
AM Peak Hour	1.24 Trips Generated per Bed	65%	In	35%	Out
PM Peak Hour	1.45 Trips Generated per Bed	40%	In	60%	Out
Medical-Dental Office Building					
ITE 9th Edition:	720				
Daily	$T = 40.89 * (1000\text{'s of SF}) - 214.97$	50%	In	50%	Out
AM Peak Hour	$T = 2.39 * (1000\text{'s of SF})$	79%	In	21%	Out
PM Peak Hour	$\ln(T) = 0.90 * \ln(1000\text{'s of SF}) + 1.53$	28%	In	72%	Out

Hospital Beds Trip Generation

Appendix A summarizes the buildings and their size (square footage, number of beds) that are proposed as part of Banner University Medical Center.

In Phase 1, floors 10 and 11 may be shelled and designed/bid as an add alternative. An 11-story alternative was included in this analysis as it will represent the highest-impact scenario.

It is important to note that exiting traffic counts (2012) reflect trip generation of the existing hospital. Upon completion of the new Phase 1 bed tower, beds in the existing hospital will be relocated to the new tower, and a portion of the existing hospital will be converted to support functions.

The number of trips that will be generated by Banner University Medical Center was therefore calculated based on the number of *net new beds* (as compared to beds in the existing hospital) for the proposed hospital towers and on square-footage for other uses. Two trip-generation scenarios were evaluated:

- 2019 Phase 1 – Construction of the first 11-story hospital tower.
- 2035 Phase 2 – Construction of the second 11-story hospital tower.

Each scenario also considers other development on the AHSC campus associated with the University of Arizona and private developers as referenced in the 2012 AHSC study.

Appendix A details the number of beds associated with each development phase. **Table 3** summarizes the proposed *net new beds* following completion of the new bed towers. Phase 1

will relocate 18 beds from the Diamond Children’s Medical Center and 165 beds from the University Medical Center’s 201 building. The 201 building is expected to relocate 100% of the beds to the proposed hospital. In Phase 2, 13 beds are planned to be relocated from the NEP building.

Table 3. Summary of Hospital Units

Scenario	Land Use	New Hospital Proposed Units (Beds)	Relocated Units (Beds)	Net New Units (Beds)
2019 Phase 1	Hospital	336	183	153
2035 Phase 2	Hospital	504	196	308

Medical Clinic/Office Trip Generation

Concurrent with the Banner University Medical Center project, Banner is preparing to construct additional clinic/out-patient space at the North Campus, located at Campbell Avenue and Allen Road. Upon completion of North Campus improvements, a significant portion of clinic/out-patient space will be relocated to the Banner UMC North Campus. As such, Clinic/out-patient occupancy at Banner University Medical Center is proposed to decrease upon completion of Phase 1.

According to information provided by Banner, 51,373 square feet of clinic/out-patient space currently exists. The Phase 1 development will include 46,477 square feet of clinic/out-patient space, a decrease of 4,896 square feet. As traffic generated from the existing 51,373 square feet of clinic/out-patient land use is represented in the collected traffic count data, net trips generated from the 4,896 square feet will be discounted from the Banner University Medical Center total trip generation.

Phase 2 development includes a total of 65,651 square feet of clinic/out-patient usage, an increase of 14,278 square feet over the existing 51,373 square feet. Thus, for Phase 2, an increase in the number of trips generated by 14,278 square feet of clinic/out-patient will be applied to the analysis. The Banner Health clinic/out-patient units are summarized in **Table 4**.

Table 4. Summary of Clinic/Out-Patient Units

Scenario	Land Use	Proposed Occupancy (SF)	Existing Occupancy (SF)	Net Occupancy (SF)
2019 Phase 1	Medical-Dental Office Building	46,477	51,373	-4,896
2035 Phase 2	Medical-Dental Office Building	65,651	51,373	14,278

Other Developments

A further consideration of this traffic analysis is the fact that, based upon the proposed development program by Banner Health, four development components that were originally planned by the UA (on its AHSC campus) are no longer a part of the larger medical campus and have, therefore, been excluded from the final trip-generation figures. **Appendix A, Figure 10,**

shows the removed land uses and total square-footage to be subtracted from the trip generation:

• South Elm Gateway Offices and Clinics (Map ID 23)	–	114,000 SF
• North Elm Gateway Offices (Map ID 24)	–	40,000 SF
• ED Expansion (Map ID 29)	–	100,000 SF
• Bio-Health (Map ID 5)	–	<u>187,000 SF</u>
		441,000 SF

A summary of the net trips added by the Banner University Medical Center are depicted in **Appendix B, Figure 13 (Phase 1), and Figure 16 (Phase 2)**.

Total Trip Generation

To facilitate the analysis, the study area was subdivided into five zones (**Figure 5**) based on their geographic locations and general anticipated trip characteristics. This approach is consistent with the 2012 AHSC study. The zones are:

- Zone 1: Private Mixed-Use Development that will include student housing, a shopping center, and a general office building
- Zone 2: Academic and Research Facilities for the University of Arizona (central)
- Zone 3: Academic and Research Facilities for the University of Arizona (west)
- Zone 4: Banner Health Medical Clinics and Offices (east)
- Zone 5: Proposed Banner Health 11-story Hospital Towers (west) for both phases of the development

Total daily trips generated by the AHSC Campus, including the Banner University Medical Center, are summarized in **Table 5** and **Table 6**.

The Phase 1 trips generated from the 4,896 square feet of Medical-Dental Office Building land use, representing the net decrease in clinic/out-patient occupancy, is discounted from the total trip generation. An increase in the number of trips from the 14,278 square feet increase of Medical-Dental Office land use is included for Phase 2.

Table 7 and **Table 8** present projected total daily trips for all proposed developments within the AHSC campus (Zones 1 through 5) after reductions for pass-by and multimodal/alternative mode reduction was applied.

Internal capture (adjusted based on proposed UMC redevelopment) and pass-by trip percentages are consistent with the 2012 AHSC study. Total trips include discounts due to multi-modal opportunities for Zones 1-3. No multimodal adjustment is applied to Zones 4 and 5. These estimates represent total additional daily trips that will be generated by the Banner Health's proposed development and projects to be constructed by others (including University of Arizona and private developers).

These trips will be added to the existing 2012 traffic counts, to analyze future capacity needs and infrastructure improvements in order to maintain acceptable operational performance.

Table 5. 2019 Phase 1: Total Trip Generation

Land Uses	Intensity	Units	Daily Total	AM Peak			PM Peak			Zone
				In	Out	Total	In	Out	Total	
Apartment (Private Developer)	400	DU	2,548	40	160	200	155	83	238	1
General Office Building (Private Developer)	200	1000 SF	2,275	288	39	327	52	251	303	
Shopping Center (Private Developer)	200	1000 SF	10,656	142	90	232	496	516	1,012	
Research and Development Center (University of Arizona)	309	1000 SF	2,506	291	60	351	49	278	327	2
Research and Development Center (University of Arizona)	300	1000 SF	2,433	284	58	342	48	272	320	3
Medical-Dental Office Building* (Banner Health)	5	1000 SF	(178)	(9)	(3)	(12)	(5)	(12)	(17)	4
Hospital** (Banner Health)	153	Beds	3,335	123	66	190	89	133	222	5
Subtotal	---	---	23,575	1,158	471	1,630	883	1,522	2,405	
Pass-By***			23,575	0	0	0	169	175	344	
Internal Capture			---	42	42	84	145	145	290	
Total	---	---	23,575	1,116	429	1,546	570	1,201	1,771	

*Net decrease in occupancy over existing. The number of trips in parentheses is deducted from the trip generation.

**Net increase in occupancy over existing

***Pass-By Percentages: Shopping Center 34% PM only

Table 6. 2035 Phase 2: Total Trip Generation

Land Uses	Intensity	Units	Daily Total	AM Peak			PM Peak			Zone
				In	Out	Total	In	Out	Total	
Apartment (Private Developer)	400	DU	2,548	40	160	200	155	83	238	1
General Office Building (Private Developer)	200	1000 SF	2,275	288	39	327	52	251	303	
Medical-Dental Office Building	50	1000 SF	1,830	91	24	115	41	112	153	
Shopping Center (Private Developer)	200	1000 SF	10,656	142	90	232	496	516	1,012	
Research and Development Center (University of Arizona)	660	1000 SF	5,353	559	115	674	92	519	610	2
Research and Development Center (University of Arizona)	814	1000 SF	6,602	670	137	807	109	616	725	3
Medical-Dental Office Building* (Banner Health)	14	1000 SF	516	27	7	34	14	37	66	4
Hospital* (Banner Health, Phase 1 and 2 Combined)	308	Beds	4,471	248	134	382	179	268	447	5
Subtotal	---	---	34,251	2,064	707	2,771	1,137	2,402	3,554	
Pass-By**			34,251	0	0	0	169	175	344	
Internal Capture			---	42	42	84	145	145	290	
Total	---	---	34,251	2,022	665	2,687	823	2,082	2,920	

* Net increase in occupancy over existing

**Pass-By Percentages: Shopping Center 34% PM only

Table 7. 2019 Phase 1: Net Total Trip Generation (with pass-by and multimodal reduction)

Land Uses	Intensity	Units	Daily Total	AM Peak			PM Peak			Zone
				In	Out	Total	In	Out	Total	
Apartment (Private Developer)	400	DU	2,548	40	160	200	155	83	238	1
General Office Building (Private Developer)	200	1000 SF	2,275	288	39	327	52	251	303	
Shopping Center (Private Developer)	200	1000 SF	10,656	142	90	232	496	516	1,012	
Pass-By***				0	0	0	169	175	344	
Internal Capture				33	33	66	120	120	240	
Total Less Internal Capture/Pass-By				436	257	693	413	555	969	
Research and Development Center (University of Arizona)	309	1000 SF	1,504	175	36	211	29	167	196	2
Internal Capture				3	2	6	5	9	17	
Total Less Internal Capture/Pass-By				171	33	204	24	158	180	
Research and Development Center (University of Arizona)	300	1000 SF	1,460	170	35	205	29	163	192	3
Internal Capture				3	2	6	5	9	16	
Total Less Internal Capture/Pass-By				167	33	199	24	154	176	
Medical-Dental Office Building* (Banner Health)	5	1000 SF	(178)	(9)	(3)	(12)	(5)	(12)	(17)	4
Hospital** (Banner Health)	153	Beds	3,335	123	66	190	89	133	222	5
Internal Capture				2	4	6	16	7	19	
Total Less Internal Capture/Pass-By				121	62	184	73	126	203	
Zone 2 - 5 Subtotal	---	---	21,599	459	134	594	142	451	593	2 to 5
Internal Capture (ITE Office to Retail)				9	9	18	25	25	50	
Total	---	---	21,599	895	384	1,280	535	993	1,528	

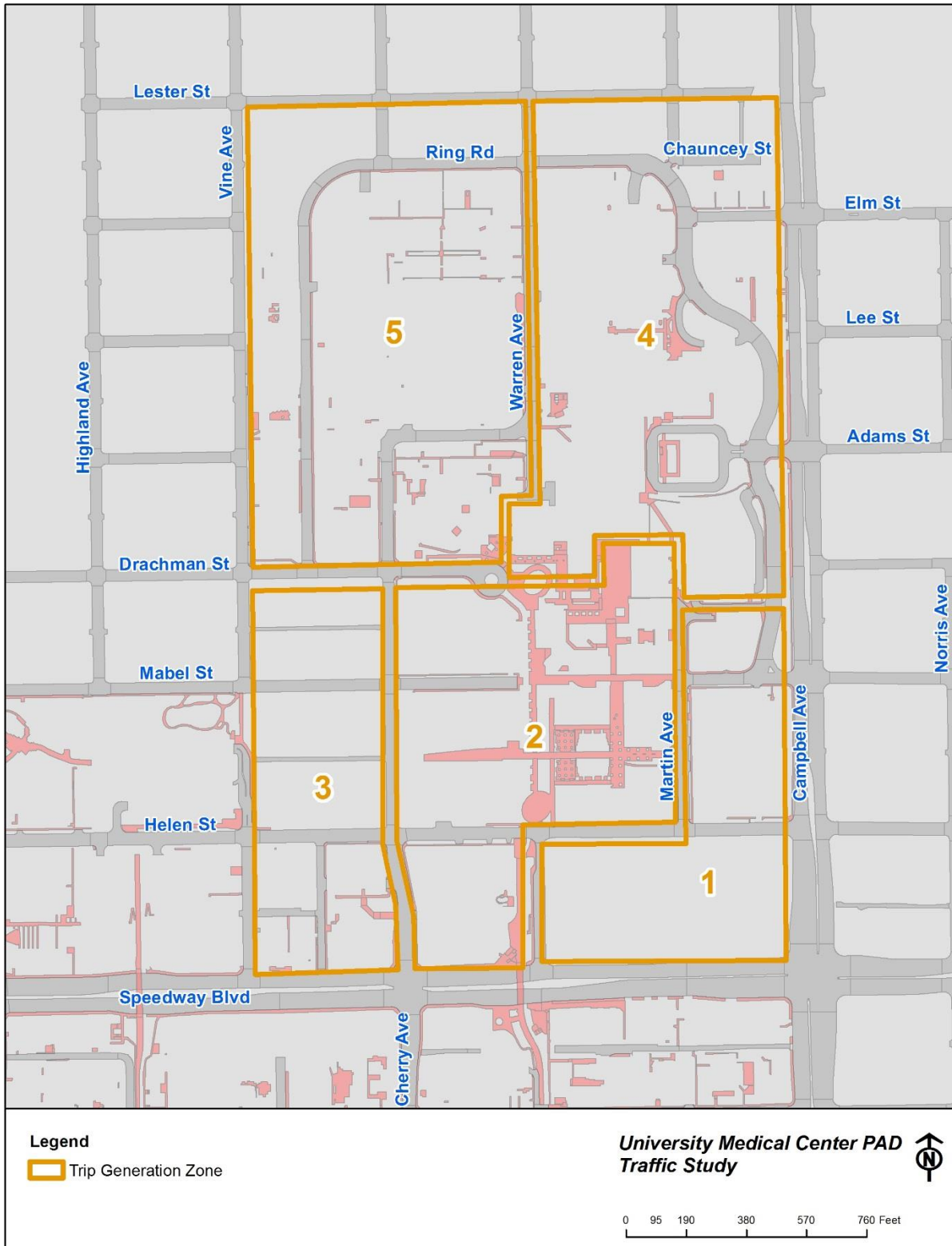
Note: A 40% alternative mode reduction was applied to Zones 2 and 3.
 *Net decrease in occupancy over existing. The number of trips in parentheses are deducted from the trip generation.
 **Net increase in occupancy over existing
 ***Pass-By Percentages: Shopping Center 34% PM only

Table 8. 2035 Phase 2: Net Total Trip Generation (with pass-by and multimodal reduction)

Land Uses	Intensity	Units	Daily Total	AM Peak			PM Peak			Zone
				In	Out	Total	In	Out	Total	
Apartment (Private Developer)	400	DU	2,548	40	160	200	155	83	238	1
General Office Building (Private Developer)	200	1000 SF	2,275	288	39	327	52	251	303	
Medical-Dental Office Building (Private Developer)	50	1000 SF	1,830	91	24	115	41	112	153	
Shopping Center (Private Developer)	200	1000 SF	10,656	142	90	232	496	516	1,012	
Pass-By**				0	0	0	169	175	344	
Internal Capture				33	33	66	120	120	240	
Total Less Internal Capture/Pass-By				527	281	808	455	667	1,122	
Research and Development Center (University of Arizona)	660	1000 SF	3,212	336	69	404	55	311	366	2
Internal Capture				3	2	6	4	8	14	
Total Less Internal Capture/Pass-By				333	67	399	51	303	352	
Research and Development Center (University of Arizona)	814	1000 SF	3,961	402	82	484	65	370	435	3
Internal Capture				4	3	7	5	9	17	
Total Less Internal Capture/Pass-By				398	80	478	60	360	418	
Medical-Dental Office Building* (Banner Health)	14	1000 SF	516	27	7	34	14	37	66	4
Internal Capture				0	0	0	1	1	2	
Total Less Internal Capture/Pass-By				27	7	34	13	36	64	
Hospital* (Banner Health, Phase 1 and 2 Combined)	308	Beds	4,471	248	134	382	179	268	447	5
Internal Capture				2	4	5	14	7	17	
Total Less Internal Capture/Pass-By				246	130	377	165	261	430	
Zone 2 - 5 Subtotal	---	---	29,469	1,013	292	1,305	313	986	1,314	2 to 5
Internal Capture (ITE Office to Retail)				9	9	18	25	25	50	
Total	---	---	29,469	1,531	564	2,095	743	1,628	2,386	

Note: A 40% alternative mode reduction was applied to Zones 2 and 3.
 * Net increase in occupancy over existing.
 **Pass-By Percentages: Shopping Center 34% PM only

Figure 5. Traffic Analysis Zones



Directional Trip Distribution

The next step in the analysis process is to estimate from which direction are trips originating and traveling to the development. The directional distribution is assumed to be consistent with the 2012 AHSC study, and derived from Pima Association of Governments 2040 travel demand model. The distribution assumes that 23 and 26 percent of trips that will access the study area will travel from the north and south on Campbell Avenue, respectively. From east and west, 24 percent of trips will access the study area from both directions on Speedway Boulevard. **Table 9** illustrates the trip distribution.

Table 9. Trip Distribution

Route	2040 Average Daily Traffic (ADT)	Percentage of ADT on Route
Campbell Avenue (from the north)	42,000	23%
Speedway (from the east)	45,000	24%
Campbell Ave (from the south)	48,000	26%
Speedway Blvd (from the west)	45,000	24%
Elm Street (from the east)	5,000	3%
Total	185,000	100%

Route Choice/Traffic Assignment

Traffic assignment is the next step of the traffic forecast procedure and it involves determining the amount of traffic that will use specific routes within the analysis network. The result of traffic assignment is total projected trips, by direction and turning movements, at each of the study intersections.

Traffic assignment is determined by considering logical routings, available roadway capacities, left turns at critical intersections, and perceived travel times. The locations of existing and proposed parking areas and the location of the main entrance of the new hospital were considered. To facilitate the large number of calculations required to complete this step, the Traffix software was utilized.

Appendix B (Figure 12, 13, 14, and 15) illustrates total intersection peak-hour volumes forecasted based on all applicable developments for each project phase.

Phase 1 and Phase 2 Capacity Analysis

The City of Tucson requires the traffic impact of new development on roadways and intersections to be mitigated to a Level of Service D or better (equivalent to being delayed at the intersection for less than 35-55 seconds per vehicle).

Capacity analysis was performed for each of the major study area intersections, both signalized and unsignalized, based on the existing intersection configurations with the forecasted Phase 1 and Phase 2 generated trips. Results are summarized in **Appendix C**.

Improvements needs were identified, and a second capacity analysis was performed that reflect the recommended improvements.

Figure 6 and **Figure 7** illustrate the capacity analysis results and the required lane configurations necessary to meet LOS “D” at each study area intersection.

Figure 6. Phase 1 Recommendations

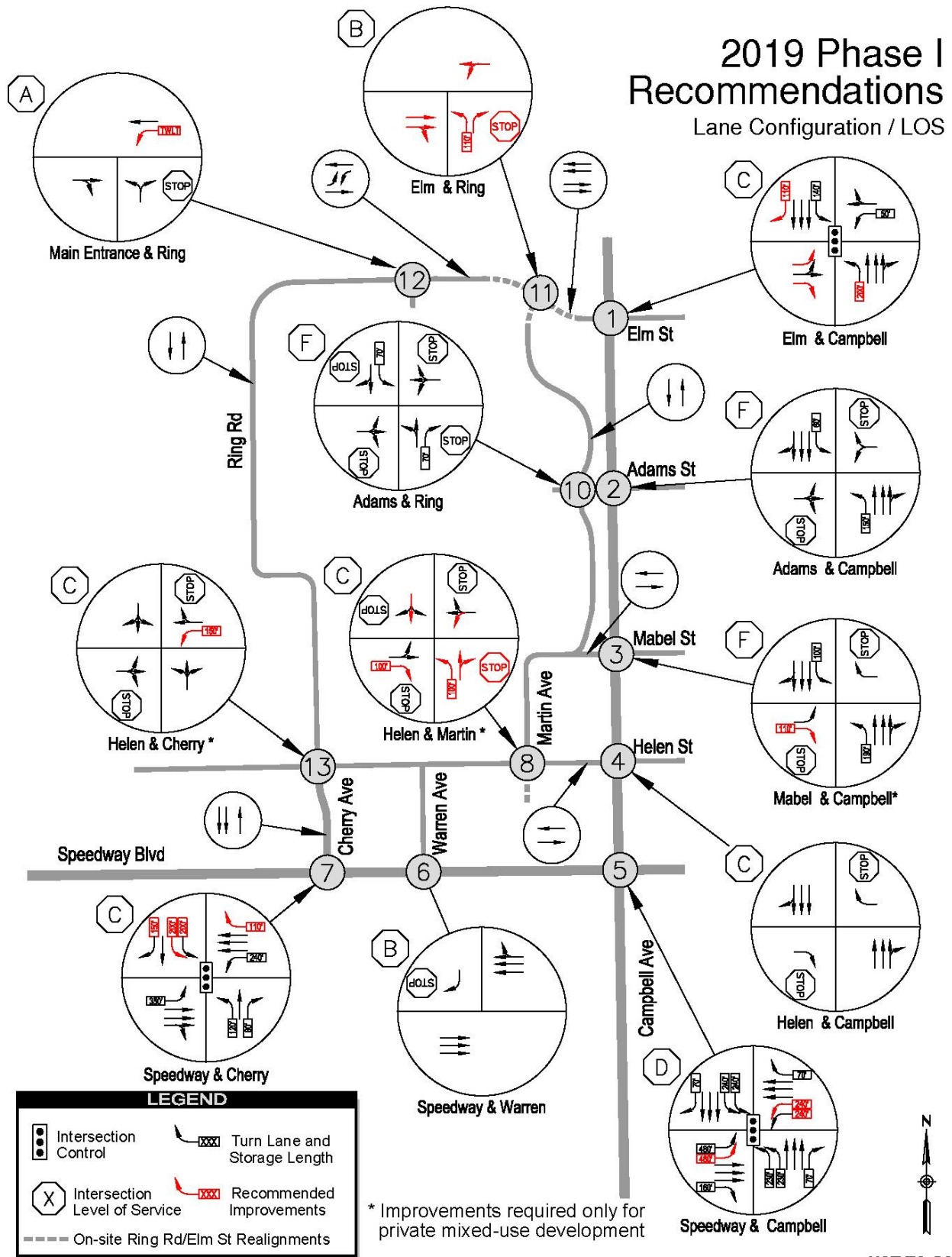
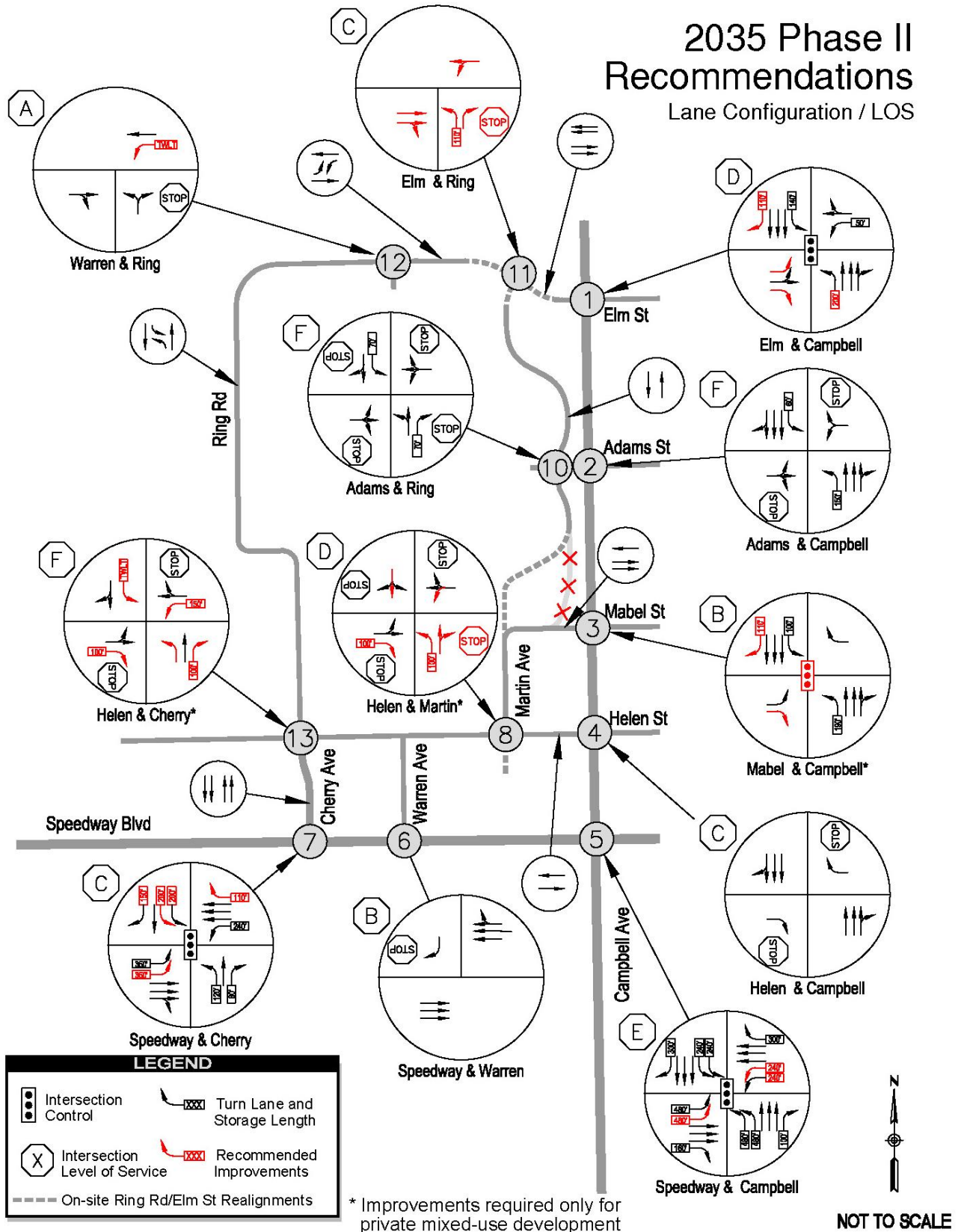


Figure 7. Phase 2 Recommendations



4. RECOMMENDATIONS

This chapter summarizes intersection and roadway improvements recommendations needed to maintain and achieve adequate traffic performance. Recommendations are made for each development phase:

- Phase 1 Recommendations (Projected 2019 Completion Timeframe) – Includes those transportation improvements required to meet the combined needs of: 1) the Phase 1 Banner-UMC redevelopment of the PAD District; 2) planned adjacent AHSC development consistent with the UA’s 2020 Capital Plan; and 3) the private mixed-use high-rise project near Speedway Boulevard and Campbell Avenue.
- Phase 2 Recommendations (Projected 2035 Completion Timeframe) – Includes those transportation improvements required to meet the combined needs of: 1) the Phase 2 Banner-UMC redevelopment of the PAD District (the second bed tower); and 2) the same off-Site AHSC and private development components referenced above.

Recommendations below build upon recommendations from the 2012 AHSC Traffic Study, with modifications as appropriate to reflect the Banner Health’s proposed site plan.

Roadway Segments

Figure 6 and **Figure 7** recommend roadway cross-section improvements to Ring Road, Elm Street, and Campbell Avenue. **Figure 6** and **Figure 7** also reflect other improvements associated with the AHSC Campus but are outside of Banner Health’s redevelopment area.

Recommendations regarding specific roadway segments associated with the Banner Health’s proposed redevelopment are described below.

- Elm Street from Ring Road to Campbell Avenue: Elm Street will serve as the primary inbound and outbound connection to proposed Banner Health facilities. This segment is recommended to consist of a 5-lane cross section (3-lanes in the eastbound direction and 2-lanes in the westbound direction).
- The Elm Street/Ring Road intersection is recommended to be reconstructed such that Ring Road forms a stop-controlled T-intersection with Elm Street, with east-west movements on Elm Street uninterrupted continuous traffic flow (refer to **Figure 8**). This configuration will provide direct access to the new hospital’s north facing main entrance from Campbell Avenue.
- Ring Road from Elm Street to western edge of development: The Ring Road on the north side of the proposed Banner University Medical Center, from Elm Street to the western edge of the development is proposed to consist of a 3-lane section (1-lane in each direction with a left turn lane) to provide optimal access for left turn movements to and

from the hospital main entrance and parking lots. The roadway should be designed to encourage lower speeds (25 mph) conducive to a campus environment.

Intersections

- Cherry Avenue at Speedway Boulevard: An additional left turn lane on southbound Cherry Avenue is recommended at the intersection of Speedway Boulevard and Cherry Avenue. Intersection improvements should also lengthen the existing Cherry Avenue southbound right turn lane to 150 feet, and the Speedway Blvd westbound right turn lane to 110 feet. Cherry Avenue will continue to serve as a primary access point for UMC employees, emergency vehicles, as well as the AHSC campus. In addition, visitors of the proposed medical facilities who are familiar with the area may utilize Cherry Avenue and the Ring Road to access Banner University Medical Center. These improvements are recommended to be implemented as part of a future City of Tucson project, as this intersection is outside of right-of-way controlled by Banner Health.
- Elm Street at Campbell Avenue: Recommended improvements at this intersection include extension of the Campbell Avenue northbound left turn lane, and construction of a Campbell Avenue southbound right turn lane. In addition, the eastbound Elm Street approach configuration should include a dedicated left turn lane, a combined left/through lane, and a dedicated right turn lane. This improvement is a Banner Health Responsibility under this PAD.
- Elm Street at Ring Road: This intersection is recommended to be reconstructed such that Ring Road forms a stop-controlled T-intersection with Elm Street, with continuous traffic flow on Elm Street (**Figure 8**). A westbound left turn lane is recommended to facilitate traffic turning south onto the Ring Road to access the Diamond Children's Medical Center. This improvement is a Banner Health Responsibility under this PAD.
- Speedway at Campbell Avenue: This intersection will require improvements to left turn lanes. A second left turn lane is required for eastbound Campbell Avenue. On westbound Campbell Avenue, the existing westbound left turn lane should be extended and a second westbound left turn lane should be constructed. These improvements are recommended to be implemented as part of a future City of Tucson project, as this intersection is outside of right-of-way controlled by Banner Health.

Bicycle and Pedestrian Facilities

Bike lanes and sidewalks will be provided on the Ring Road and Elm Street.

Lester Street, located north of the Banner University Medical Center is a designated bicycle route. The bicycle route extends to Martin Avenue, then south to Ring Road and Elm Street. The Banner University Medical Center development will close the Martin Avenue connection to Lester Street. This area will be converted to landscaped areas and retention basins. However, a shared use path will maintain bicycle and pedestrian connectivity through the drainage basins

between Lester Street and Ring Road bike lanes, through the open space and landscaped area. Striped bicycle routes (bike lanes) will also be provided on Elm Street and Ring Road from Campbell Avenue to the new main entrance of the hospital. Sidewalks will provide pedestrian mobility throughout the campus. A summary of these recommendations is provided in **Figure 9**.

Summary of Recommendations

Table 10 provides a comprehensive summary of the full universe of Phase 1 and Phase 2 transportation-improvement recommendations, including those that will constitute fair-share responsibility of Banner Health attendant to its redevelopment of the BUMC PAD District. No attempt will be made with this analysis or the PAD to define fair-share contributions or responsibilities for any other adjacent property owner/developer.

Figure 8. Elm Street/Ring Road Conceptual Reconfiguration

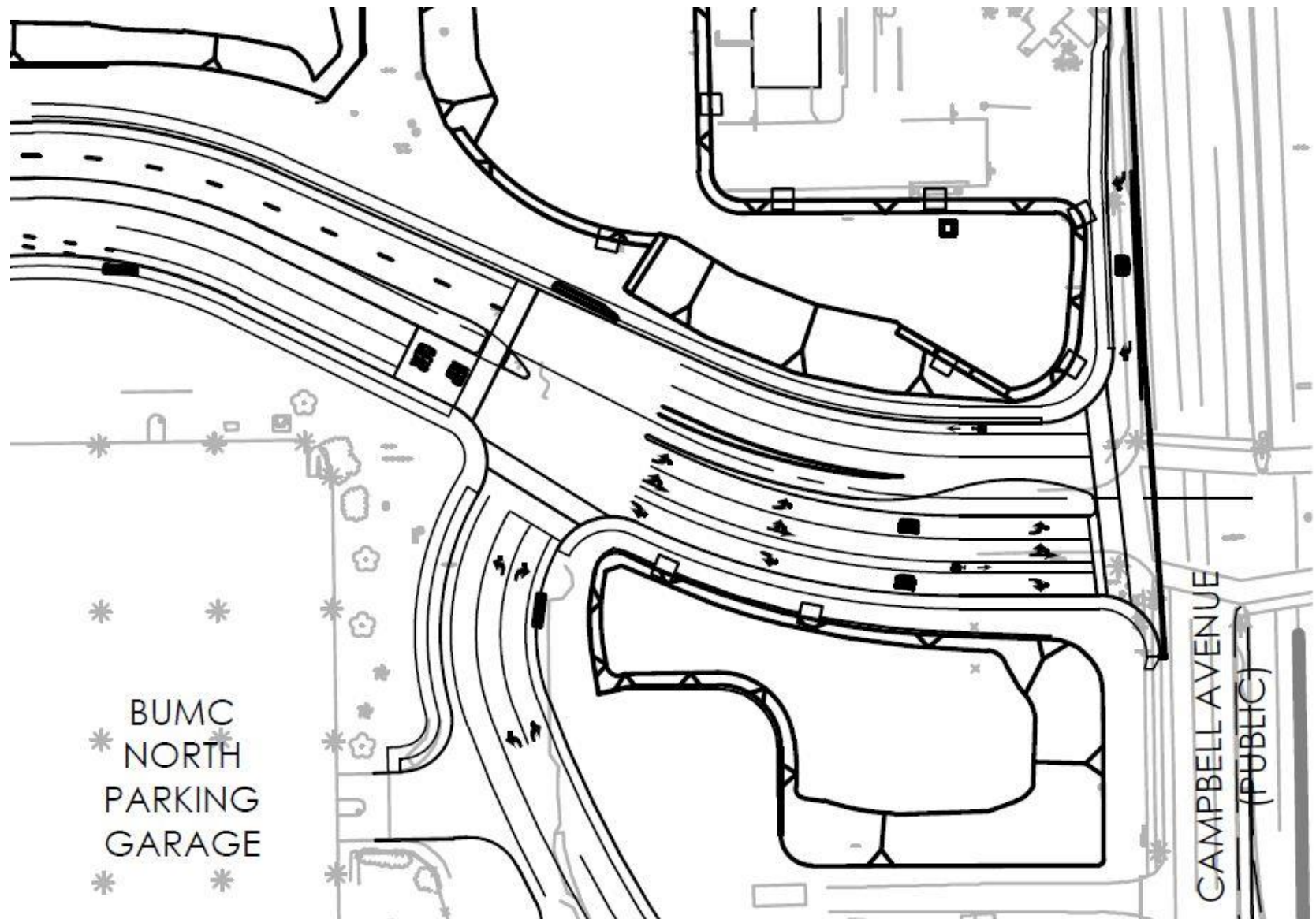


Figure 9. Bicycle and Pedestrian Facilities

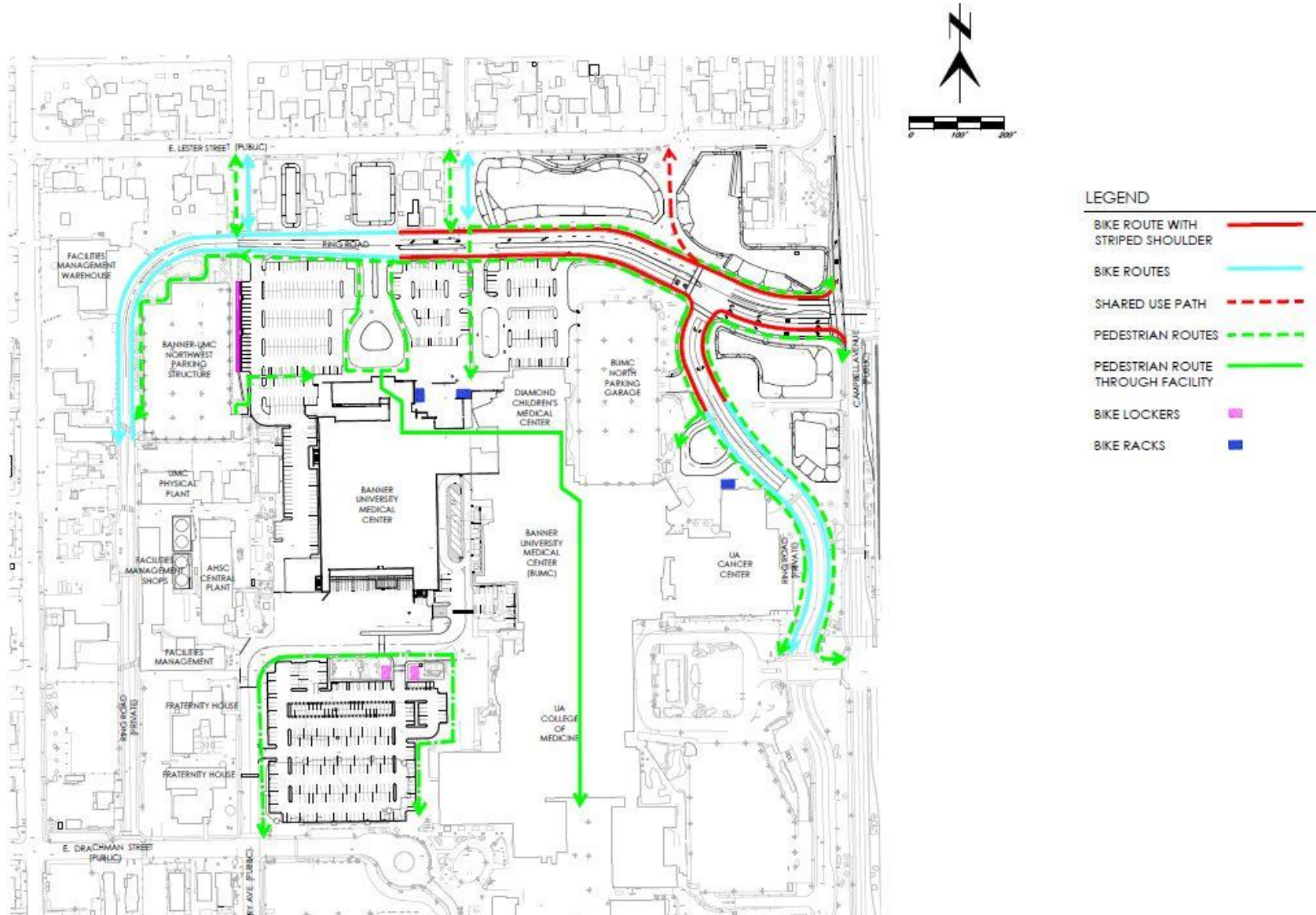


Table 10. Phase 1 and Phase 2 Recommendations


ID	Intersection	2019 Phase 1 Recommendations	2035 Phase 2 Recommendations	Comments
1	Campbell Ave / Elm St	<ul style="list-style-type: none"> • Improve Elm Street to a 5-lane roadway (2 inbound lane, and 3 outbound lanes) between Campbell Avenue and Ring Road. One EB lane transitions to a dedicated left-turn lane at Elm Street/Campbell Avenue. West of the NE Parking Garage entrance, Elm Street continues as a 2-lane roadway with a raised median island and left turn lanes. • Configure the EB through lane to be a shared through/left movement to provide sufficient capacity for left-turning traffic. • Extend existing northbound left turn lane on Campbell Avenue to 200'. • Add a dedicated right-turn lane on southbound Campbell Avenue. 	<ul style="list-style-type: none"> • No additional recommendations 	<p><i>Required improvements by Banner Health under this PAD.</i></p>
2	Campbell Ave / Adams St	<ul style="list-style-type: none"> • No improvements recommended. 	<ul style="list-style-type: none"> • No improvements recommended. 	-
3	Campbell Ave / Mabel St	<ul style="list-style-type: none"> • Add a 110' dedicated right-turn lane on eastbound Mabel St to accommodate vehicles turning onto southbound Campbell Ave. This intersection will be a "High-T Intersection" that will allow left-in and left-out on Campbell Avenue at Mabel; northbound mainline traffic on Campbell will not be required to stop at the intersection. 	<ul style="list-style-type: none"> • Install a new traffic signal at Mabel/Campbell to provide a third signalized access to and from the AHSC campus. • Realign the Ring Road north approach to Mabel St to the west to increase the spacing between the Ring Rd/Mabel Ave intersection and the Campbell Ave/Mabel St intersection. • Improve eastbound Mabel St between Martin Ave and Campbell Ave to two lanes 	<p>Recommended Improvements by others.</p>

ID	Intersection	2019 Phase 1 Recommendations	2035 Phase 2 Recommendations	Comments
			<ul style="list-style-type: none"> Add a 110' dedicated right-turn lane on southbound Campbell Ave. 	
4	Campbell Ave / Helen St	<ul style="list-style-type: none"> No improvements recommended. 	<ul style="list-style-type: none"> No improvements recommended. 	-
5	Campbell Ave / Speedway Blvd	<ul style="list-style-type: none"> Add an additional 480' left-turn lane on eastbound Speedway Blvd (for two total) to accommodate vehicles turning to northbound Campbell Ave. Add an additional 240' left-turn lane on westbound Speedway Blvd (for two total) to accommodate vehicles turning to southbound Campbell Ave. 	<ul style="list-style-type: none"> No additional recommendations. 	<i>Recommended as a City of Tucson project, as it is outside of the Banner UMC right-of-way. It is recommended that impact fees associated with the Banner UMC project be applied toward these improvements.</i>
6	Speedway Blvd / Warren Ave	<ul style="list-style-type: none"> No improvements recommended 	<ul style="list-style-type: none"> No improvements recommended. 	-
7	Speedway Blvd / Cherry Ave	<ul style="list-style-type: none"> Extend right-turn lane on southbound Cherry Avenue to 150' (existing is 80'). Extend left-turn lane on southbound Cherry Avenue to 200' (existing is 80'). Add an additional 200' left-turn lane (for two total) on southbound Cherry Ave to accommodate vehicles turning to eastbound Speedway Blvd. Add a 110' dedicated right-turn lane on westbound Speedway Blvd to accommodate vehicles turning on to Cherry Ave. 	<ul style="list-style-type: none"> Add an additional 350' left-turn lane on eastbound Speedway Blvd. Add new receiving lane on Cherry Ave. 	Responsibility for these improvements to be determined.

ID	Intersection	2019 Phase 1 Recommendations	2035 Phase 2 Recommendations	Comments
8	Helen St / Martin Ave	<ul style="list-style-type: none"> Improvements required for mixed-use development only. Reconfigure Helen/Martin to four-way intersection. 	<ul style="list-style-type: none"> Add a 100' dedicated right-turn lane on Helen St. 	Recommended Improvements by others.
9	Cherry Ave / Mabel St	<ul style="list-style-type: none"> Mabel Street is planned to be converted to a pedestrian mall. No vehicular improvements are recommended. 	-	-
10	Ring Rd / Adam St	<ul style="list-style-type: none"> No improvements recommended 	<ul style="list-style-type: none"> No improvements recommended. 	-
11	Elm St / Ring Rd	<ul style="list-style-type: none"> Reconfigure the intersection, removing the All-Way Stop Control. Narrow Ring Road to 2-lanes within the PAD site; transition to existing width. Add a 110' dedicated left-turn lane on northbound Ring Road. 	<ul style="list-style-type: none"> No improvements recommended. 	<i>Required improvements by Banner Health under this PAD.</i>
12	Ring Rd / Main Entrance	<ul style="list-style-type: none"> Proposed main entrance access to the future hospital 	-	<i>Required improvements by Banner Health under this PAD.</i>
13	Helen & Cherry	<ul style="list-style-type: none"> Add a 150' left-turn lane on westbound Helen St. 	<ul style="list-style-type: none"> Restripe Cherry Ave to include a left-turn lane on southbound Cherry Ave. Add a 100' dedicated right-turn lane on northbound Cherry Ave. 	Recommended Improvements by others.

Appendix A – Supporting Trip Generation Data

Table 11. Banner Health’s Proposed Site Development Options (GSF and Beds)



Summary Of BUMC Proposed Site Development Options

BUMC- Campus Development	OP Clinic/Adm GSF	Hospital GSF	Total GSF	Beds	Parking Surface	Parking Structured
2015 Existing Development:						
DCMC		209,713	209,713	233		
NEP – Hospital/Clinics		220,549	220,549	110		
201- Hospital		265,083	265,083	165		
201- Hospital/OP Clinics UA	51,373		51,373			
Other Existing Campus Medical Facilities	161,084		161,084			
Totals	212,457	695,345	907,802	508		
2019 Phase 1 Development:						
DCMC + Lobby Expansion & ED		214,213	214,213	215		
NEP – Hospital/Clinics	46,477	174,072	220,549	110		
201 - Use - Adm Office/Hospital Support		265,083	265,083	0		
New Hospital - Phase 1		740,000	740,000	336		
Totals	46,477	1,393,368	1,439,845	661		
2035 - Full Development:						
DMCM		214,213	214,213	215		
DMCM - Emergency Dept. Expansion		10,000	10,000			
NEP - Hospital/ OP Clinics	65,651	154,898	220,549	97		
201 - Use - Hospital Adm Office/Support		265,083	265,083	0		
New Hospital - Phase 1 (11-Stories)		740,000	740,000	336		
New Hospital - Phase 2 (11-Stories)		355,430	355,430	168		
Totals Full Development 11-Story Configuration	65,651	1,739,624	1,805,275	816		

Appendix B – Existing and Forecasted (Phase 1 and Phase 2) Intersection Traffic Volumes

Figure 11. Existing (2012) Peak-Hour Traffic Volumes

<p>1</p> <table border="1"> <tr> <td> <p>196 / 96 1262 / 1066 69 / 60</p> <p>Campbell Ave</p> </td> <td> <p>38 / 80 89 / 24 92 / 62</p> <p>Elm St</p> </td> </tr> <tr> <td> <p>107 / 330 24 / 121 53 / 139</p> </td> <td> <p>132 / 70 925 / 1434 21 / 60</p> </td> </tr> </table>	<p>196 / 96 1262 / 1066 69 / 60</p> <p>Campbell Ave</p>	<p>38 / 80 89 / 24 92 / 62</p> <p>Elm St</p>	<p>107 / 330 24 / 121 53 / 139</p>	<p>132 / 70 925 / 1434 21 / 60</p>	<p>2</p> <table border="1"> <tr> <td> <p>132 / 33 1391 / 1249 98 / 21</p> <p>Campbell Ave</p> </td> <td> <p>10 / 15 3 / 3</p> <p>Adams St</p> </td> </tr> <tr> <td> <p>14 / 39 3 / 1 80 / 125</p> </td> <td> <p>210 / 90 1116 / 1426 76 / 36</p> </td> </tr> </table>	<p>132 / 33 1391 / 1249 98 / 21</p> <p>Campbell Ave</p>	<p>10 / 15 3 / 3</p> <p>Adams St</p>	<p>14 / 39 3 / 1 80 / 125</p>	<p>210 / 90 1116 / 1426 76 / 36</p>	<p>3</p> <table border="1"> <tr> <td> <p>80 / 14 1445 / 1446 19 / 28</p> <p>Campbell Ave</p> </td> <td> <p>4 / 17 0 / 1</p> <p>Mabel St</p> </td> </tr> <tr> <td> <p>3 / 11 0 / 2 18 / 105</p> </td> <td> <p>126 / 60 1272 / 1588 40 / 10</p> </td> </tr> </table>	<p>80 / 14 1445 / 1446 19 / 28</p> <p>Campbell Ave</p>	<p>4 / 17 0 / 1</p> <p>Mabel St</p>	<p>3 / 11 0 / 2 18 / 105</p>	<p>126 / 60 1272 / 1588 40 / 10</p>	<p>4</p> <table border="1"> <tr> <td> <p>77 / 33 1286 / 1459</p> <p>Campbell Ave</p> </td> <td> <p>11 / 25</p> <p>Helen St</p> </td> </tr> <tr> <td> <p>31 / 122</p> </td> <td> <p>1385 / 1570 29 / 17</p> </td> </tr> </table>	<p>77 / 33 1286 / 1459</p> <p>Campbell Ave</p>	<p>11 / 25</p> <p>Helen St</p>	<p>31 / 122</p>	<p>1385 / 1570 29 / 17</p>
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Legend
X/Y = AM / PM PEAK HOUR
TURNING VOLUMES



Figure 12. 2019 Phase 1 Background Traffic Volumes

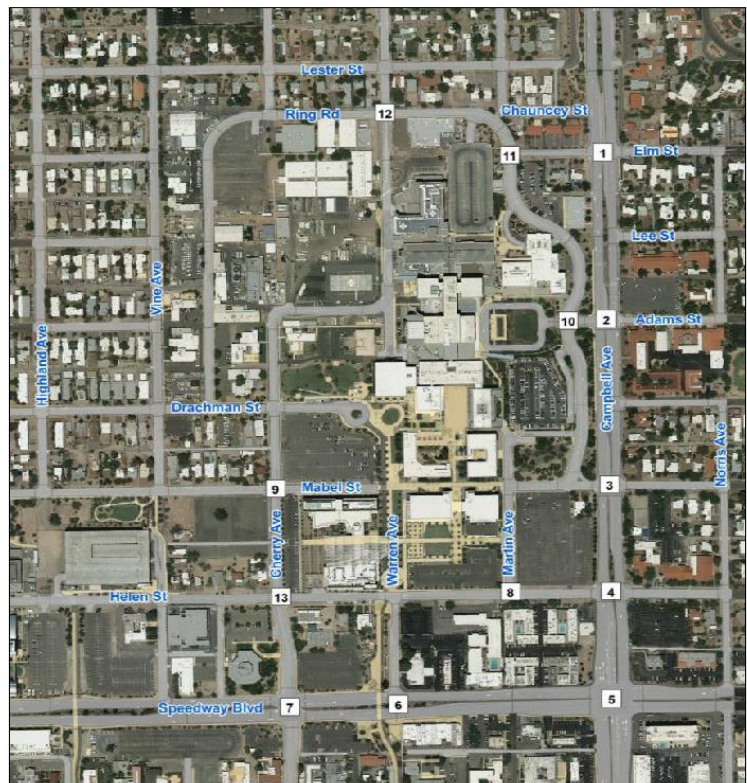
<p>1</p> <p>195 / 35 1430 / 1172 69 / 60</p> <p>Campbell Ave</p> <p>88 / 80 89 / 24 115 / 76</p> <p>Elm St</p> <p>109 / 337 24 / 122 53 / 139</p> <p>132 / 70 998 / 1626 30 / 85</p>	<p>2</p> <p>96 / 25 1630 / 1554 19 / 28</p> <p>Campbell Ave</p> <p>4 / 17</p> <p>Adams St</p> <p>77 / 188 32 / 139</p> <p>156 / 82 1281 / 1623 40 / 10</p>	<p>3</p> <p>256 / 197 1047 / 1163 272 / 484</p> <p>Campbell Ave</p> <p>183 / 168 1590 / 1327 364 / 310</p> <p>Mabel St</p> <p>194 / 347 850 / 1622 190 / 291</p> <p>558 / 449 997 / 1046 129 / 251</p>	<p>4</p> <p>71 / 187 72 / 64 145 / 473</p> <p>Campbell Ave</p> <p>350 / 74 1758 / 1643 72 / 70</p> <p>Helen St</p> <p>254 / 152 1177 / 1674 166 / 111</p> <p>52 / 172 70 / 76 41 / 159</p>
<p>5</p> <p>132 / 33 1592 / 1369 38 / 21</p> <p>Campbell Ave</p> <p>10 / 15 3 / 3</p> <p>Speedway Blvd</p> <p>14 / 39 3 / 1 80 / 125</p> <p>210 / 90 1198 / 1643 76 / 36</p>	<p>6</p> <p>214 / 135 1348 / 1500</p> <p>Warren Ave</p> <p>11 / 25</p> <p>Speedway Blvd</p> <p>104 / 295</p> <p>1404 / 1632 29 / 17</p>	<p>7</p> <p>59 / 126</p> <p>Cherry Ave</p> <p>288 / 262 2094 / 1699</p> <p>Speedway Blvd</p> <p>1372 / 2397</p>	<p>8</p> <p>47 / 56 33 / 31 10 / 12</p> <p>Martin Ave</p> <p>6 / 5 108 / 37 102 / 97</p> <p>Helen St</p> <p>62 / 93 40 / 162 133 / 126</p> <p>80 / 173 79 / 171 67 / 144</p>
<p>9</p> <p>146 / 208</p> <p>Cherry Ave</p> <p>232 / 150</p>	<p>10</p> <p>11 / 12 20 / 16 13 / 48</p> <p>Ring Rd</p> <p>50 / 26 76 / 39 157 / 44</p> <p>Adams St</p> <p>18 / 26 41 / 46 26 / 8</p> <p>3 / 19 43 / 133 45 / 93</p>	<p>11</p> <p>349 / 67 70 / 36</p> <p>Elm St</p> <p>174 / 400 28 / 35</p> <p>40 / 29 60 / 179</p>	<p>12</p> <p>252 / 95</p> <p>Ring Rd</p> <p>48 / 145</p>
<p>13</p> <p>146 / 208</p> <p>Cherry Ave</p> <p>33 / 20 44 / 13 131 / 309</p> <p>Helen St</p> <p>87 / 12 199 / 130 206 / 113</p> <p>3 / 12 23 / 109</p>			



Legend
X / Y = AM / PM PEAK HOUR
TURNING VOLUMES

Figure 13. 2019 Phase 1 Banner Health Traffic Volumes

<p>1</p> <p>↔ 26 / 16 ↕</p> <p>Campbell Ave</p> <p>↕ 3 / 2</p> <p>Elm St</p> <hr/> <p>↕ 14 / 26 ↕ 2 / 3 ↕ 21 / 39</p> <p>↕ 38 / 23</p>	<p>2</p> <p>↕ 20 / 38</p> <p>Campbell Ave</p> <p>↕ 38 / 23</p>	<p>3</p> <p>↕ 12 / 24 ↕ 10 / 19</p> <p>Campbell Ave</p> <p>↕ 18 / 11 ↕ 8 / 5</p> <p>Mabel St</p> <hr/> <p>↕ 4 / 9 ↕ 3 / 6</p> <p>↕ 9 / 6 ↕ 20 / 12</p>	<p>4</p> <p>↕ 14 / 28 ↕ 7 / 15</p> <p>Campbell Ave</p> <p>↕ 18 / 11</p> <p>Helen St</p> <hr/> <p>↕ 28 / 17</p>
<p>5</p> <p>↕ 21 / 39</p> <p>Campbell Ave</p> <p>Speedway Blvd</p> <hr/> <p>↕ 38 / 23</p>	<p>6</p> <p>↕ 20 / 38</p> <p>Warren Ave</p> <p>Speedway Blvd</p> <hr/> <p>↕ 2 / 4</p> <p>↕ 38 / 23</p>	<p>7</p> <p>↕ 17 / 10</p> <p>Speedway Blvd</p> <hr/> <p>↕ 7 / 14</p>	<p>8</p> <p>↕ 2 / 4</p> <p>Helen St</p>
<p>9</p> <p>↕ 23 / 46</p> <p>Cherry Ave</p> <p>↕ 45 / 27</p>	<p>10</p>	<p>11</p> <p>↕ 69 / 42</p> <p>Ring Rd</p> <p>Elm St</p> <hr/> <p>↕ 36 / 71</p>	<p>12</p> <p>↕ 9 / 6 ↕ 62 / 37</p> <p>Ring Rd</p> <hr/> <p>↕ 5 / 8 ↕ 19 / 12</p> <p>↕ 10 / 19 ↕ 32 / 63</p>
<p>13</p> <p>↕ 22 / 43 ↕ 2 / 4</p> <p>Cherry Ave</p> <p>Helen St</p> <hr/> <p>↕ 45 / 27</p>			



NOT TO SCALE

Legend

X / Y = AM / PM PEAK HOUR
TURNING VOLUMES

Figure 14. 2019 Phase 1 Total Traffic Volumes

<p>1</p> <p>↖ 221 / 51 ↗ 1490 / 1171 ↘ 69 / 60</p> <p>Campbell Ave</p> <p>↖ ↗ ↘ ↙ 38 / 80 ↘ 115 / 76</p> <p>Elm St</p> <p>122 / 363 26 / 125 74 / 178</p> <p>↖ ↗ ↘ ↙ 170 / 93 ↘ 998 / 1626 30 / 85</p>	<p>2</p> <p>↖ 96 / 25 ↗ 1651 / 1592 ↘ 19 / 28</p> <p>Campbell Ave</p> <p>↖ ↗ ↘ ↙ 4 / 17</p> <p>Adams St</p> <p>77 / 188 32 / 139</p> <p>156 / 82 1318 / 1646 40 / 10</p>	<p>3</p> <p>↖ 256 / 195 ↗ 1059 / 1186 ↘ 282 / 503</p> <p>Campbell Ave</p> <p>↖ ↗ ↘ ↙ 201 / 180 ↘ 1599 / 1332 364 / 310</p> <p>Mabel St</p> <p>193 / 347 854 / 1630 193 / 297</p> <p>568 / 454 1017 / 1059 129 / 251</p>	<p>4</p> <p>↖ 86 / 215 ↗ 72 / 64 ↘ 153 / 486</p> <p>Campbell Ave</p> <p>↖ ↗ ↘ ↙ 368 / 84 ↘ 1758 / 1641 72 / 70</p> <p>Helen St</p> <p>281 / 168 1176 / 1674 166 / 111</p> <p>52 / 172 70 / 76 41 / 159</p>
<p>5</p> <p>↖ 132 / 33 ↗ 1613 / 1407 ↘ 38 / 21</p> <p>Campbell Ave</p> <p>↖ ↗ ↘ ↙ 10 / 15 ↘ 3 / 3</p> <p>Speedway Blvd</p> <p>14 / 39 3 / 1 80 / 124</p> <p>209 / 90 1237 / 1666 76 / 36</p>	<p>6</p> <p>↖ 214 / 134 ↗ 1368 / 1537</p> <p>Warren Ave</p> <p>↖ ↗ ↘ ↙ 11 / 25</p> <p>Speedway Blvd</p> <p>106 / 298</p> <p>1462 / 1655 29 / 17</p>	<p>7</p> <p>↖ 59 / 126</p> <p>Cherry Ave</p> <p>↖ ↗ ↘ ↙ 288 / 262 ↘ 2112 / 1707</p> <p>Speedway Blvd</p> <p>1379 / 2410</p>	<p>8</p> <p>↖ 47 / 56 ↗ 33 / 31 ↘ 10 / 12</p> <p>Martin Ave</p> <p>↖ ↗ ↘ ↙ 6 / 5 ↘ 108 / 37 102 / 97</p> <p>Helen St</p> <p>62 / 93 42 / 165 133 / 126</p> <p>80 / 173 79 / 171 67 / 144</p>
<p>9</p> <p>↖ 169 / 254</p> <p>Cherry Ave</p> <p>↖ ↗ ↘ ↙ 277 / 177</p>	<p>10</p> <p>↖ 11 / 12 ↗ 20 / 16 ↘ 13 / 47</p> <p>Ring Rd</p> <p>↖ ↗ ↘ ↙ 49 / 26 ↘ 76 / 39 157 / 44</p> <p>Adams St</p> <p>18 / 26 41 / 46 26 / 8</p> <p>3 / 19 43 / 133 45 / 93</p>	<p>11</p> <p>↖ 418 / 109 ↘ 68 / 35</p> <p>Ring Rd</p> <p>↖ ↗ ↘ ↙ 261 / 101 ↘ 62 / 37</p> <p>Ring Rd</p> <p>210 / 471 28 / 35</p> <p>40 / 29 59 / 177</p>	<p>12</p> <p>↖ 53 / 153 ↘ 19 / 12</p> <p>↖ ↗ ↘ ↙ 10 / 19 ↘ 32 / 63</p>
<p>13</p> <p>↖ 146 / 208 ↗ 22 / 43 ↘ 2 / 4</p> <p>Cherry Ave</p> <p>↖ ↗ ↘ ↙ 33 / 20 ↘ 44 / 13 131 / 308</p> <p>Helen St</p> <p>3 / 12 23 / 108</p> <p>87 / 11 244 / 157 206 / 113</p>			



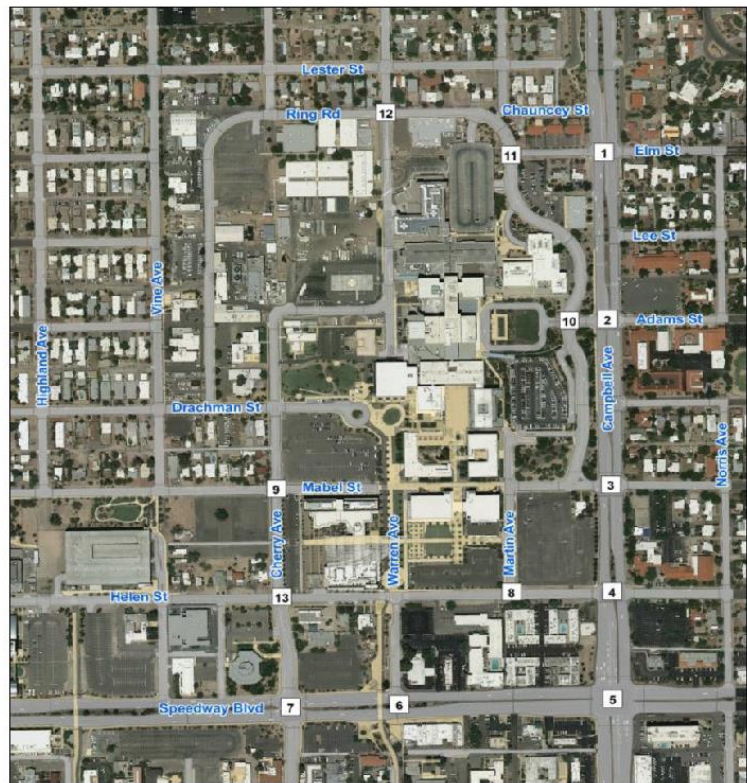
NOT TO SCALE

Legend

X / Y = AM / PM PEAK HOUR
TURNING VOLUMES

Figure 15. 2035 Phase 2 Background Traffic Volumes

<p>1</p> <p>195 / 35 ↔ ↗ ↘ 1252 / 1382 ↔ ↗ ↘ 69 / 69</p> <p>Campbell Ave</p> <p>↔ ↗ ↘ 38 / 80 88 / 24 92 / 79</p> <p>Elm St</p>	<p>2</p> <p>80 / 30 ↔ ↗ ↘ 1445 / 1577 ↔ ↗ ↘ 19 / 28</p> <p>Campbell Ave</p> <p>↔ ↗ ↘ 4 / 17</p> <p>Adams St</p>	<p>3</p> <p>208 / 207 ↔ ↗ ↘ 974 / 1220 ↔ ↗ ↘ 238 / 497</p> <p>Campbell Ave</p> <p>↔ ↗ ↘ 168 / 170 1419 / 1350 364 / 310</p> <p>Mabel St</p>	<p>4</p> <p>34 / 230 ↔ ↗ ↘ 72 / 64 ↔ ↗ ↘ 62 / 685</p> <p>Campbell Ave</p> <p>↔ ↗ ↘ 244 / 93 1649 / 1683 72 / 70</p> <p>Helen St</p>
<p>107 / 347 24 / 123 53 / 139</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>3 / 248 ↔ ↗ ↘ 18 / 152</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>185 / 398 786 / 1721 179 / 355</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>68 / 177 1177 / 1674 166 / 111</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>
<p>132 / 70 925 / 1724 21 / 98</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>126 / 85 1272 / 1674 40 / 10</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>373 / 475 981 / 1048 129 / 251</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>52 / 172 70 / 76 41 / 159</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>
<p>5</p> <p>132 / 33 ↔ ↗ ↘ 1391 / 1396 ↔ ↗ ↘ 38 / 21</p> <p>Campbell Ave</p> <p>↔ ↗ ↘ 10 / 15 3 / 3</p> <p>Speedway Blvd</p>	<p>6</p> <p>77 / 147 ↔ ↗ ↘ 1286 / 1522 ↔ ↗ ↘</p> <p>Warren Ave</p> <p>↔ ↗ ↘ 11 / 25</p> <p>Speedway Blvd</p>	<p>7</p> <p>26 / 150 ↔ ↗ ↘</p> <p>Cherry Ave</p> <p>↔ ↗ ↘ 66 / 285 1912 / 1735</p> <p>Speedway Blvd</p>	<p>8</p> <p>34 / 61 ↔ ↗ ↘ 0 / 35 ↔ ↗ ↘ 10 / 12</p> <p>Martin Ave</p> <p>↔ ↗ ↘ 6 / 5 73 / 40 0 / 106</p> <p>Helen St</p>
<p>14 / 39 3 / 1 80 / 125</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>31 / 362</p> <p>↔ ↗ ↘</p>	<p>1289 / 2609</p> <p>↔ ↗ ↘</p>	<p>52 / 142 34 / 190 0 / 139</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>
<p>210 / 90 1116 / 1763 76 / 36</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>1385 / 1686 29 / 17</p> <p>↔ ↗ ↘ ↔ ↗ ↘</p>		<p>0 / 208 0 / 205 0 / 173</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>
<p>9</p> <p>146 / 208 ↔ ↗ ↘</p> <p>Cherry Ave</p> <p>↔ ↗ ↘ 282 / 150</p> <p>Helen St</p>	<p>10</p> <p>11 / 12 ↔ ↗ ↘ 20 / 16 ↔ ↗ ↘ 13 / 48</p> <p>Ring Rd</p> <p>↔ ↗ ↘ 50 / 26 76 / 39 157 / 44</p> <p>Adams St</p>	<p>11</p> <p>18 / 26 41 / 46 26 / 8</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>12</p> <p>349 / 67 70 / 36</p> <p>↔ ↗ ↘ ↔ ↗ ↘</p>
<p>3 / 19 41 / 144 45 / 30</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>	<p>174 / 400 28 / 35</p> <p>↔ ↗ ↘ ↔ ↗ ↘</p>	<p>40 / 29 58 / 190</p> <p>↔ ↗ ↘ ↔ ↗ ↘</p>	<p>48 / 145</p> <p>↔ ↗ ↘</p>
<p>146 / 208 ↔ ↗ ↘</p> <p>Cherry Ave</p> <p>↔ ↗ ↘ 33 / 20 40 / 14 34 / 419</p> <p>Helen St</p>	<p>0 / 28 0 / 254</p> <p>↔ ↗ ↘ ↔ ↗ ↘</p>		
<p>0 / 31 199 / 130 0 / 139</p> <p>↔ ↗ ↘ ↔ ↗ ↘ ↔ ↗ ↘</p>			



Legend
X / Y = AM / PM PEAK HOUR
TURNING VOLUMES

Figure 16. 2035 Phase 2 Banner Health Traffic Volumes

<p>1</p> <p>63 / 41 ↔</p> <p>Campbell Ave</p> <p>↕</p> <p>8 / 5</p> <p>Elm St</p> <hr/> <p>32 / 68 4 / 9 ↕</p> <p>50 / 111 ↕</p> <p>101 / 65</p>	<p>2</p> <p>50 / 113 ↔</p> <p>Campbell Ave</p> <p>↕</p> <p>103 / 66</p>	<p>3</p> <p>1 / 3 ↔</p> <p>30 / 65 ↔</p> <p>24 / 53 ↔</p> <p>Campbell Ave</p> <p>↕</p> <p>48 / 31 17 / 11</p> <p>Mabel St</p> <hr/> <p>2 / 1 9 / 18 ↕</p> <p>6 / 12 ↕</p> <p>19 / 12 52 / 34</p>	<p>4</p> <p>32 / 69 ↔</p> <p>15 / 30 ↔</p> <p>Campbell Ave</p> <p>↕</p> <p>36 / 24 1 / 3</p> <p>Helen St</p> <hr/> <p>64 / 42 2 / 1 ↕</p>
<p>5</p> <p>50 / 111 ↔</p> <p>Campbell Ave</p> <p>↕</p> <p>1 / 3 ↕</p>	<p>6</p> <p>50 / 113 ↔</p> <p>Warren Ave</p> <p>↕</p> <p>4 / 7 ↕</p> <p>101 / 66</p>	<p>7</p> <p>↕</p> <p>36 / 27</p> <p>Speedway Blvd</p> <hr/> <p>17 / 31 ↕</p>	<p>8</p> <p>↕</p> <p>4 / 7 ↕</p> <p>Helen St</p>
<p>9</p> <p>51 / 107 ↔</p> <p>Cherry Ave</p> <p>↕</p> <p>99 / 66</p>	<p>10</p> <p>1 / 3 ↔</p> <p>Ring Rd</p> <p>↕</p> <p>2 / 1</p> <p>Adams St</p>	<p>11</p> <p>↕</p> <p>167 / 109 5 / 2</p> <p>Elm St</p> <hr/> <p>84 / 181 ↕</p> <p>1 / 7</p>	<p>12</p> <p>↕</p> <p>19 / 13 143 / 94</p> <p>Ring Rd</p> <hr/> <p>10 / 20 46 / 31 ↕</p> <p>34 / 51 73 / 154</p>
<p>13</p> <p>46 / 99 ↔</p> <p>4 / 7 ↔</p> <p>Cherry Ave</p> <p>↕</p> <p>Helen St</p> <hr/> <p>99 / 66</p>			



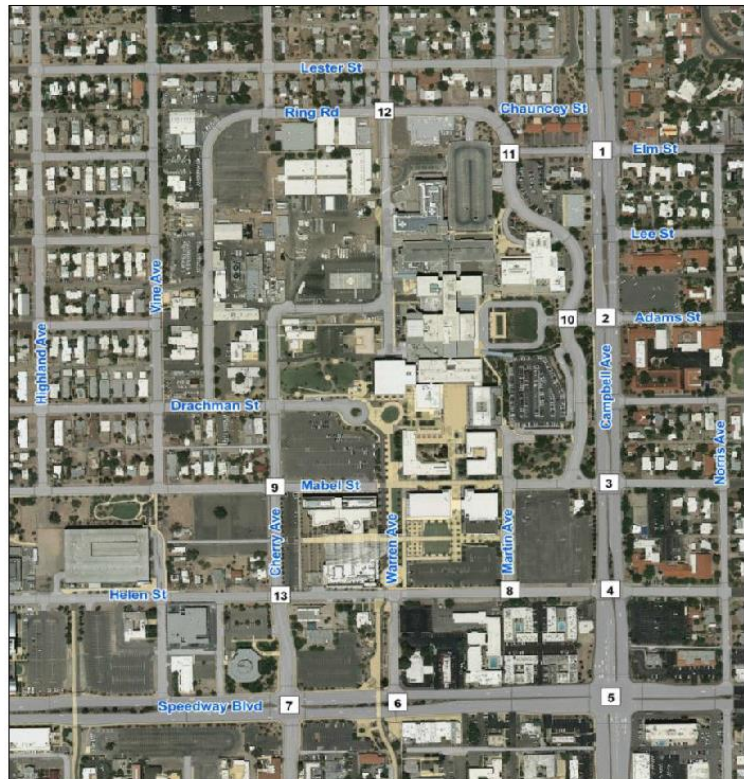
NOT TO SCALE

Legend

X / Y = AM / PM PEAK HOUR
TURNING VOLUMES

Figure 17. 2035 Phase 2 Total Traffic Volumes

<p>1</p> <p>258 / 76 1542 / 1382 69 / 69</p> <p>Campbell Ave</p> <p>88 / 80 97 / 29 130 / 79</p> <p>Elm St</p> <p>142 / 415 29 / 132 103 / 250</p> <p>233 / 135 1020 / 1724 88 / 98</p>	<p>2</p> <p>122 / 30 1781 / 1690 19 / 28</p> <p>Campbell Ave</p> <p>4 / 17</p> <p>Adams St</p> <p>90 / 248 35 / 152</p> <p>169 / 85 1395 / 1740 40 / 10</p>	<p>3</p> <p>319 / 209 1089 / 1285 298 / 550</p> <p>Campbell Ave</p> <p>237 / 201 1718 / 1362 364 / 310</p> <p>Mabel St</p> <p>207 / 399 881 / 1739 211 / 367</p> <p>697 / 487 1056 / 1062 129 / 251</p>	<p>4</p> <p>113 / 298 72 / 64 209 / 716</p> <p>Campbell Ave</p> <p>507 / 117 1870 / 1686 72 / 70</p> <p>Helen St</p> <p>434 / 218 1179 / 1675 166 / 111</p> <p>52 / 172 70 / 76 41 / 159</p>
<p>5</p> <p>132 / 33 1768 / 1506 38 / 21</p> <p>Campbell Ave</p> <p>10 / 15 3 / 3</p> <p>Speedway Blvd</p> <p>14 / 39 3 / 1 81 / 128</p> <p>212 / 91 1824 / 1819 76 / 96</p>	<p>6</p> <p>252 / 147 1463 / 1635</p> <p>Warren Ave</p> <p>11 / 25</p> <p>Speedway Blvd</p> <p>120 / 360</p> <p>1551 / 1752 29 / 17</p>	<p>7</p> <p>64 / 150</p> <p>Cherry Ave</p> <p>354 / 285 2358 / 1761</p> <p>Speedway Blvd</p> <p>1438 / 2641</p>	<p>8</p> <p>78 / 61 40 / 35 10 / 12</p> <p>Martin Ave</p> <p>6 / 5 125 / 40 123 / 106</p> <p>Helen St</p> <p>73 / 142 50 / 197 161 / 139</p> <p>88 / 208 87 / 205 73 / 173</p>
<p>9</p> <p>197 / 315</p> <p>Cherry Ave</p> <p>381 / 216</p>	<p>10</p> <p>11 / 12 20 / 16 14 / 51</p> <p>Ring Rd</p> <p>52 / 27 76 / 39 157 / 44</p> <p>Adams St</p> <p>18 / 26 41 / 46 26 / 8</p> <p>3 / 19 45 / 144 45 / 98</p>	<p>11</p> <p>516 / 176 70 / 2</p> <p>Elm St</p> <p>268 / 581 28 / 35</p> <p>40 / 29 63 / 197</p>	<p>12</p> <p>271 / 108 143 / 94</p> <p>Ring Rd</p> <p>58 / 165 46 / 31</p> <p>34 / 51 73 / 154</p>
<p>13</p> <p>146 / 208 48 / 99 4 / 7</p> <p>Cherry Ave</p> <p>33 / 20 50 / 14 156 / 419</p> <p>Helen St</p> <p>6 / 28 56 / 255</p> <p>207 / 31 298 / 196 323 / 139</p>			



Legend
X / Y = AM / PM PEAK HOUR
TURNING VOLUMES

Appendix C – Intersection Level of Service

Table 12. Existing (2012) Level of Service

Local Intersection	EB				WB				NB				SB				Intersection LOS	Intersection Delay (s)	Traffic Control
	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)			
Elm Street / Campbell Avenue																			
AM Peak Hour	D		B	33.8	D		D	39.7	C		B	16.4	B		C	24.0	C	23.0	Signalized
PM Peak Hour	D		C	30.6	C		A	13.9	C		D	35.6	D		C	32.2	C	32.6	
Adams Street / Campbell Avenue*																			
AM Peak Hour			F	447.9			F	116.8	B		A	2.2	B		A	0.3	F	447.9	Unsignalized
PM Peak Hour			F	194.1			E	46.5	B		A	0.6	B		A	0.2	F	194.1	
Mabel Street / Campbell Avenue*																			
AM Peak Hour			E	42.9			A	9.0	C		A	1.7	B		A	0.1	E	42.9	Unsignalized
PM Peak Hour			F	50.5			A	9.2	C		A	0.6	B		A	0.2	F	50.5	
Helen Street / Campbell Avenue*																			
AM Peak Hour	-	-	B	12.6	-	-	A	9.2	A		A	0.0	A		A	0.0	B	12.6	Unsignalized
PM Peak Hour	-	-	C	15.3	-	-	A	9.3	A		A	0.0	A		A	0.0	C	15.3	
Speedway Boulevard / Campbell Avenue																			
AM Peak Hour	C	C	A	24.3	E	D	B	47.3	E	D	B	51.8	D	D	B	43.4	D	43.1	Signalized
PM Peak Hour	E	D	A	48.6	E	D	A	36.7	D	E	C	54.0	F	D	B	67.8	D	51.5	
Warren Avenue / Speedway Boulevard*																			
AM Peak Hour	-	A	-	0.0	-		A	0.0	-	-	-	-	-	-	A	9.8	A	9.8	Unsignalized
PM Peak Hour	-	A	-	0.0	-		A	0.0	-	-	-	-	-	-	A	9.6	A	9.6	
Cherry Avenue / Speedway Boulevard																			
AM Peak Hour	C		B	13.3	B		B	17.1	D	D	A	34.5	D	D	A	36.5	B	17.3	Signalized
PM Peak Hour	C		C	27.8	C		C	23.4	D	C	B	27.3	D	C	A	30.5	C	26.3	
Cherry Avenue / Helen Street*																			
AM Peak Hour			C	16.7			C	21.9			A	2.6			A	0.4	C	21.9	Unsignalized
PM Peak Hour			A	0.0			B	10.8			A	0.0			A	0.0	B	10.8	
Martin Avenue / Helen Street*																			
AM Peak Hour			A	4.6			A	0.0			-	-			A	9.2	A	9.2	Unsignalized
PM Peak Hour			A	2.1			A	0.0			-	-			A	9.1	A	9.1	
Ring Road / Elm Street*																			
AM Peak Hour	-	-	-	-			B	12.8	A		A	9.1	B	A	-	10.7	B	12.8	Unsignalized
PM Peak Hour	-	-	-	-			A	9.3	A		A	9.0	C	A	-	16.9	C	16.9	

* Intersection LOS and Delay for unsignalized intersections is reported as "Worst-Movement LOS"

Table 13. 2019 Phase 1 Level of Service with Existing Intersection Configurations

Local Intersection	EB				WB				NB				SB				Intersection LOS	Intersection Delay (s)	Traffic Control
	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)			
Elm Street / Campbell Avenue																			
AM Peak Hour	D		B	34.8	D		D	42.5	D		B	17.4	B		C	26.7	C	25.1	Signalized
PM Peak Hour	D		C	37.5	C		A	16.9	D		D	36.9	D		C	33.8	D	35.1	
Adams Street / Campbell Avenue*																			
AM Peak Hour			F	N/A			F	N/A	C		A	2.3	B		A	0.3	F	N/A	Unsignalized
PM Peak Hour			F	N/A			F	N/A	B		A	0.6	C		A	0.2	C	24.8	
Mabel Street / Campbell Avenue*																			
AM Peak Hour			F	N/A			A	9.0	D		A	3.1	B		A	0.1	F	N/A	Unsignalized
PM Peak Hour			F	N/A			A	9.2	C		A	0.9	B		A	0.2	F	N/A	
Helen Street / Campbell Avenue*																			
AM Peak Hour	-	-	C	16.2	-	-	A	9.2	-	-	A	0.0	-	-	A	0.0	C	16.2	Unsignalized
PM Peak Hour	-	-	E	36.0	-	-	A	9.3	-	-	A	0.0	-	-	A	0.0	D	36.0	
Speedway Boulevard / Campbell Avenue																			
AM Peak Hour	C	C	A	24.9	E	F	B	75.9	F	E	A	115.2	D	E	C	55.4	E	71.6	Signalized
PM Peak Hour	F	F	B	81	E	D	A	40.2	F	E	C	75.9	F	F	B	116.2	E	78.8	
Warren Avenue / Speedway Boulevard*																			
AM Peak Hour	-	A	-	0.0	-		A	0.0	-	-	-	-	-	-	B	10.4	B	10.4	Unsignalized
PM Peak Hour	-	A	-	0.0	-		A	0.0	-	-	-	-	-	-	B	10.4	B	10.4	
Cherry Avenue / Speedway Boulevard																			
AM Peak Hour	F		B	49.9	B		B	19.2	D	D	A	34.5	E	D	A	43.2	C	33.1	Signalized
PM Peak Hour	F		C	41.0	C		C	24.5	D	C	B	27.3	D	C	B	129.6	D	47.6	
Cherry Avenue / Helen Street*																			
AM Peak Hour			A	9.6			D	31.7			A	1.9			A	0.1	D	31.7	Unsignalized
PM Peak Hour			B	10.2			F	64.4			A	0.4			A	0.2	C	64.4	
Martin Avenue / Helen Street*																			
AM Peak Hour			A	4.7			A	0.0			-	-			A	9.5	A	9.5	Unsignalized
PM Peak Hour			A	3.0			A	0.0			-	-			A	9.4	A	9.4	
Ring Road / Elm Street*																			
AM Peak Hour	-	-	-	-			C	16.1	-		A	9.6	B	A	-	12.3	C	16.1	Unsignalized
PM Peak Hour	-	-	-	-			B	10.1	-		A	9.7	D	A	-	25.9	C	19.4	

* Intersection LOS and Delay for unsignalized intersections is reported as "Worst-Movement LOS"

Table 14. 2019 Phase 1 Level of Service with Improvements

Local Intersection	EB				WB				NB				SB				Intersection LOS	Intersection Delay (s)	Traffic Control
	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)			
Elm Street / Campbell Avenue																			
AM Peak Hour	D	D	A	31.1	D	D		43.6	D	B		23.4	B	C	A	25.3	C	26.3	Signalized
PM Peak Hour	D	D	A	39.4	D	B		27.1	B	C		33.1	C	C	A	22.3	C	30.3	
Adams Street / Campbell Avenue*																			
AM Peak Hour		F		N/A		F		N/A	C	A		2.3	B	A		0.3	F	N/A	Unsignalized
PM Peak Hour		F		N/A		F		108.2	B	A		0.6	C	A		0.2	D	27.3	
Mabel Street / Campbell Avenue*																			
AM Peak Hour	F	-	B	N/A		A		8.9	D	A		3.1	B	A		0.1	F	N/A	Unsignalized
PM Peak Hour	F	-	C	N/A		A		9.2	C	A		0.9	B	A		0.2	F	N/A	
Helen Street / Campbell Avenue*																			
AM Peak Hour	-	-	C	16.2	-	-	A	9.1	-	A		0.0	-	A		0.0	C	16.2	Unsignalized
PM Peak Hour	-	-	E	36.0	-	-	A	9.4	-	A		0.0	-	A		0.0	E	36.0	
Speedway Boulevard / Campbell Avenue																			
AM Peak Hour	D	C	A	27.3	C	D	A	37.6	F	C	A	47.8	D	D	B	36.6	D	38.0	Signalized
PM Peak Hour	E	D	A	42.9	E	C	A	37.6	F	D	B	49.4	F	D	B	54.3	D	45.9	
Warren Avenue / Speedway Boulevard*																			
AM Peak Hour	-	A	-	0.0	-	A		0.0	-	-	-	-	-	-	B	10.5	B	10.5	Unsignalized
PM Peak Hour	-	A	-	0.0	-	A		0.0	-	-	-	-	-	-	B	10.4	B	10.4	
Cherry Avenue / Speedway Boulevard																			
AM Peak Hour	D		B	19.6	B	C	A	19.9	C	D	A	26.6	E	D	A	39.0	C	21.4	Signalized
AM Peak Hour	D		C	31	C	D	A	34.5	C	D	B	23.8	D	D	B	35.2	C	32.3	
Cherry Avenue / Helen Street*																			
AM Peak Hour		A		9.3	C	B		15.4		A		1.9		A		0.1	C	15.4	Unsignalized
PM Peak Hour		B		10.0	C	B		20.6		A		0.4		A		0.2	C	20.6	
Martin Avenue / Helen Street*																			
AM Peak Hour		A	A	8.8		B		12.8	A	A		9.5		B		10.2	B	10.3	Unsignalized
PM Peak Hour		C	A	14.1		B		13.3	B	C		15.1		B		11.7	C	15.1	
Ring Road / Elm Street*																			
AM Peak Hour	-	A	A	0	B	-		1.6	B	-	A	11.1	-	-	-	-	B	11.1	Unsignalized
PM Peak Hour	-	A	A	0	A	-		2.7	B	-	B	11.5	-	-	-	-	B	11.5	

* Intersection LOS and Delay for unsignalized intersections is reported as "Worst-Movement LOS"

Table 15. 2035 Phase 2 Level of Service with Existing Intersection Configurations

Local Intersection	EB				WB				NB				SB				Intersection LOS	Intersection Delay (s)	Traffic Control
	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)			
Elm Street / Campbell Avenue																			
AM Peak Hour	E		B	35.4	D		D	45.8	D		C	27	A		C	28.6	C	29.8	Signalized
PM Peak Hour	E		C	46.5	C		A	18.7	D		D	42.4	D		D	38	D	40.6	
Adams Street / Campbell Avenue*																			
AM Peak Hour			F	N/A			F	N/A	C		A	2.5	B		A	0.3	F	N/A	Unsignalized
PM Peak Hour			F	N/A			F	N/A	B		A	0.5	C		A	0.3	F	N/A	
Mabel Street / Campbell Avenue*																			
AM Peak Hour			F	N/A			A	9.0	E		A	4.6	B		A	0.1	F	N/A	Unsignalized
PM Peak Hour			F	N/A			A	9.3	C		A	1	B		A	0.2	F	N/A	
Helen Street / Campbell Avenue*																			
AM Peak Hour	-	-	C	18.2	-	-	A	9.3	A		A	0.0	A		A	0.0	C	18.2	Unsignalized
PM Peak Hour	-	-	F	73.6	-	-	A	9.4	A		A	0.0	A		A	0.0	F	73.6	
Speedway Boulevard / Campbell Avenue																			
AM Peak Hour	C	C	A	25.4	E	F	B	100.5	F	E	A	180.1	D	E	C	61.2	F	98.4	Signalized
PM Peak Hour	E	E	B	65.7	F	E	B	79.4	F	E	C	79.4	F	F	C	91.0	E	77.5	
Warren Avenue / Speedway Boulevard*																			
AM Peak Hour	-	A	-	0.0	-		A	0.0	-	-	-	-	-	-	B	11.0	B	11.0	Unsignalized
PM Peak Hour	-	A	-	0.0	-		A	0.0	-	-	-	-	-	-	B	11.2	B	11.2	
Cherry Avenue / Speedway Boulevard																			
AM Peak Hour	F		C	261.2	C		D	45.3	C	C	A	24.2	D	C	A	29.9	F	123.6	Signalized
PM Peak Hour	F		C	59.7	B		B	16.8	D	C	B	27.3	F	C	C	310.7	F	92.7	
Cherry Avenue / Helen Street*																			
AM Peak Hour			B	12.2			F	N/A			A	3.7			A	0.2	F	N/A	Unsignalized
PM Peak Hour			B	13.5			F	N/A			A	0.9			A	0.2	F	N/A	
Martin Avenue / Helen Street*																			
AM Peak Hour			A	4.7			A	0.0			-	-			A	9.7	A	4.7	Unsignalized
PM Peak Hour			A	3.7			A	0			-	-			A	9.7	A	4.3	
Ring Road / Elm Street*																			
AM Peak Hour	-	-	-	-			C	19.0	-		A	10.0	C	A	-	14.7	C	16.6	Unsignalized
PM Peak Hour	-	-	-	-			B	11.0	-		B	10.5	F	A	-	56.2	F	56.2	

* Intersection LOS and Delay for unsignalized intersections is reported as "Worst-Movement LOS"

Table 16. 2035 Phase 2 Level of Service with Improvements

Local Intersection	EB				WB				NB				SB				Intersection LOS	Intersection Delay (s)	Traffic Control
	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)	L	T	R	Approach Delay (s)			
Elm Street / Campbell Avenue																			
AM Peak Hour	D	D	A	29.6	D	D		45.3	D	C		25.1	C	D	A	38.1	C	33.5	Signalized
PM Peak Hour	D	D	B	43.6	D	C		33.8	D	C		29	D	D	A	35.4	C	34.0	
Adams Street / Campbell Avenue*																			
AM Peak Hour		F		N/A		F		N/A	C	A		2.5	B	A		0.2	F	N/A	Unsignalized
PM Peak Hour		F		N/A		F		N/A	B	A		0.5	C	A		0.3	F	N/A	
Mabel Street / Campbell Avenue																			
AM Peak Hour	D	-	A	32.5		A		0.0	C	A		10.8	A	B	A	17.7	B	15.2	Signalized
PM Peak Hour	D	-	B	33.0		A		0.1	C	C		23.3	C	D	A	43.0	C	32.8	
Helen Street / Campbell Avenue*																			
AM Peak Hour	-	-	B	10.5	-	-	A	9.2	A	A		0.0	A	A		0.0	B	10.5	Unsignalized
PM Peak Hour	-	-	B	14.3	-	-	A	9.6	A	A		0.0	A	A		0.0	B	14.3	
Speedway Boulevard / Campbell Avenue																			
AM Peak Hour	E	D	A	36.2	D	D	A	47.2	F	D	A	52.0	D	E	C	57.7	D	49.0	Signalized
PM Peak Hour	D	D	B	40.1	F	D	A	52.3	F	D	B	56.2	F	E	C	75.1	E	55.1	
Warren Avenue / Speedway Boulevard*																			
AM Peak Hour	-	A	-	0.0	-	A		0.0	-	-	-	-	-	-	B	12.1	B	12.1	Unsignalized
PM Peak Hour	-	A	-	0.0	-	A		0.0	-	-	-	-	-	-	B	11.2	B	11.2	
Cherry Avenue / Speedway Boulevard																			
AM Peak Hour	D		B	19.1	B	C	A	17.3	D	D	A	34.8	D	D	A	33.6	B	19.9	Signalized
PM Peak Hour	D		C	24.6	C	C	A	28.0	C	D	A	25.9	D	C	C	44.1	C	29.8	
Cherry Avenue / Helen Street*																			
AM Peak Hour		B	B	10.4	D	C		25.6	A	A	A	2.0	A	A		0.2	D	25.6	Unsignalized
PM Peak Hour		B	B	11.7	F	B		109.3	A	A	A	0.7	A	A		0.2	F	109.3	
Martin Avenue / Helen Street*																			
AM Peak Hour		B	A	9.9		C		15.2	B	B		10.5		B		11.5	C	15.2	Unsignalized
PM Peak Hour		D	B	23.7		C		15.3	C	D		23.3		B		13.2	D	23.7	
Ring Road / Elm Street*																			
AM Peak Hour	-	A	A	0	A	-		1	B	-	A	10.7	-	-	-	-	B	10.7	Unsignalized
PM Peak Hour	-	A	A	0	A	-		0.1	B	-	B	13.1	-	-	-	-	B	13.1	

* Intersection LOS and Delay for unsignalized intersections is reported as "Worst-Movement LOS"

Appendix D – Synchro Files

Available upon request.