LITTLE AMERICA FLAGSTAFF
MASTER PLAN

TRANSPORTATION ELEMENT

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EXECUTIVE SUMMARY

This report summarizes the transportation impacts associated with the proposed Little America property redevelopment in Flagstaff. The report includes an analysis of build-out conditions as well as two interim year analyses that identify the implementation timing for the various identified roadway improvements, so that the road system would continue to provide adequate operations as the development progresses toward completion.

The development is located in the southeast quadrant of the I-40 / Butler Avenue interchange. Existing land uses on the site include the Little America Hotel and the Sinclair gas station/truck stop along East Butler Avenue, but the remainder of the approximately 537-acre parcel is undeveloped. For the purpose of this traffic analysis, full development of the site was assumed to include approximately 1,235 multi-family homes, 211 single family homes, 206,500 square feet of commercial development, a 200-room hotel/conference center, and an 18-hole golf course. The primary access will be via the East Butler Avenue/Harold Ranch Road intersection, which would be improved as part of the project. In the long term, it is expected that John Wesley Powell Boulevard (JW Powell Boulevard) will be extended up from the south to connect to 4th Street, east of the site, and that Harold Ranch Road will connect to JW Powell Boulevard east of the project site.

Existing traffic counts were taken in March 2013 and May 2013 to determine existing conditions and project future traffic conditions. Future background traffic projections throughout the study area were calculated using traffic projections from the City of Flagstaff Metropolitan Planning Organization's (FMPO) travel demand forecasting model.

Trip forecasts for the project were developed based on trip rates published in *Trip Generation, 9th Edition* (Institute of Transportation Engineers, 2012). These trips were assigned to the surrounding road system based on trip distribution percentages derived from the FMPO's travel demand forecasting model.

Trip Generation

The following highlights the results of the resort trip generation analysis for the proposed development:

- In the interim year 2020 the development is estimated to generate approximately 10,800 external vehicle trips per day (vpd), with 950 of those trips occurring in the PM peak hour.

- In the interim year 2025 the development is estimated to generate approximately 18,900 external vpd, with 1,650 of those trips occurring in the PM peak hour.

- Full buildout of the property is estimated to generate approximately 26,000 external vpd, with 2,300 of those trips occurring in the PM peak hour.

Traffic Impacts

The following highlights the results of the level of service analyses conducted for the project, including the recommended improvement measures identified to mitigate the impacts of the site traffic:

Existing Intersections

4th Street / US 66

This intersection would operate at LOS D in the long range future (2030), both without and with the project. This level of service meets the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

4th Street / Industrial Drive / Huntington Drive

This intersection would operate at LOS C in the long range future without the project and LOS D in the long range future with the project. Both levels of service meet the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

US 66 / Ponderosa Parkway

This intersection would operate at LOS C in the long range future both without and with the project. This level of service meets the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

Butler Aveue / Babbitt Drive

This intersection would operate at LOS B in the long range future both without and with the project This level of service meet the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

Butler Avenue / Ponderosa Parkway

By converting the southbound approach at this intersection from right + through + left to shared through-right + through + left, and changing the eastbound right turn phasing to protected + overlap to eliminate any safety conflicts that might occur between the dual right turn lanes and the two southbound through lanes, this intersection would operate at LOS D with the project.

Butler Avenue / I-40 Ramps

ADOT is currently conducting a Design Concept Study to determine potential improvements to this interchange. Four designs are currently under consideration; this report analyzed the improved diamond option that includes dual left-turn lanes at the ramps and a total of seven lanes on Butler Avenue between the ramps. With these improvements, in the long range future the westbound ramp intersection would operate at LOS B without the project and LOS C with the project, while the eastbound ramps would operate at LOS D both with and without the project. These level of service represent adequate traffic operations and thus no additional changes in the proposed improved diamond lane geometry would be required.

East Butler Avenue / Harold Ranch Road

This intersection would serve as the main access to the Little America property, and would have roundabout traffic control. To accommodate buildout of the project, the roundabout would have two circulating lanes, an eastbound right turn bypass lane and a northbound right turn bypass lane. Under this configuration the intersection would operate at LOS C with the project.

4th Street / East Butler Avenue / JW Powell Extension

In the long range future it was assumed that the JW Powell Drive extension would be completed and form the south leg of this intersection. To accommodate the JW Powell Extension and the projected future traffic volumes on East Butler Avenue and 4th Street both with and without the project, it is recommended that the eastbound leg have a left turn lane, two through lanes and a right turn lane, the northbound leg have separate left, through and right turn lanes, the westbound leg have a left turn lane, two through lanes and a right turn lane, and the southbound leg have separate left, through and right turn lanes. With these improvements the intersection would operate at LOS C without the project and LOS D with the project.

4th Street / Sparrow Avenue

This study identified a need to widen 4th Street to four lanes between East Butler Avenue and Huntington Drive/Industrial Drive to accommodate long range traffic forecasts both without and with project traffic (see roadways discussion below). With 4th Street as a four lane roadway, this intersection would operate at LOS B both without and with the project during the PM peak hour.

4th Street / Soliere Avenue

This study identified a need to widen 4th Street to four lanes between East Butler Avenue and Huntington Drive/Industrial Drive to accommodate long range traffic forecasts both without and with project traffic (see roadways discussion below). With 4th Street as a four lane roadway, this intersection is expected to operate at LOS D both without and with the project.

New Intersections

Harold Ranch Road / Retail Driveway (Internal Intersection #10)

This internal intersection south of East Butler Avenue intersection is expected to meet signal warrants at full buildout of the project. It is recommended that the intersection geometry include left turn and right turn lanes on the eastbound approach, a right turn and through lane on the southbound approach, and a left turn and through lane on the northbound approach. With this geometry, the signalized intersection would operate at LOS B during the PM peak hour.

Harold Ranch Road / Hotel and Golf Course Loop Road (Internal Intersection #15)

This internal intersection south of the above intersection is expected to meet signal warrants at full buildout of the project due to projected through traffic volumes on Harold Ranch Road and projected side street volumes associated with the hotel, conference center and golf course. It is recommended that the intersection geometry include a left turn lane and a through/right turn lane on the eastbound approach, a left turn lane and a through/right turn lane on the northbound approach, a single left/through/right turn lane on the westbound approach, and separate left through and right turn lanes on the southbound approach. With this geometry, the signalized intersection would operate at LOS A during the PM peak hour.

Harold Ranch Road / JW Powell Boulevard Extension (Internal Intersection #22)

This intersection of two public road south and east of the project was assumed to left turn pockets on all four legs, a southbound right turn lane, and stop control on the Harold Ranch Road approaches. With this geometry both side street left turn movements from Harold Ranch onto JW Powell would operate at LOS F, with the eastbound to northbound left turn experiencing v/c ratios greater than 1.0 and queues of 12 vehicles. Traffic volumes are not anticipated to meet signal warrants in 2030, so to mitigate the poor traffic operations, all way stop control is recommended. Under all way stop control the intersection would operate at LOS C, with queues of four vehicles or less on all four approaches.

Roadways

East Butler Avenue

Both without and with the project, it is recommended that East Butler Avenue be widened to four lanes between I-40 and the existing five lane section east of 4th Street to accommodate the long range future traffic forecasts on that road. The segment between I-40 and the east end of the Little America property should be widened in 2020, the segment between Little America and 4th Street should be widened in 2025, and the segment between 4th Street and the existing five lane section east of 4th Street should be widened in 2030.

4th Street

Both without and with the project, it is recommended that 4th Street be widened to four lanes between East Butler Avenue and Huntington Drive/Industrial Drive to accommodate the long range future traffic forecasts on that road. The segment between Huntington/Industrial and Sparrow Avenue should be widened in 2025 and the segment between Waterslide Drive and East Butler Avenue should be widened in 2030.

Harold Ranch Road

Based on the long range traffic forecasts, Harold Ranch would function adequately as a two lane roadway. Left turn lanes should be constructed at all key intersections. A southbound right turn lane should also be constructed at the retail driveway intersection and the hotel access road intersection. All other internal roadway intersections should have two way stop control, with Harold Ranch Road functioning as the major (uncontrolled) street.

I. STUDY AREA CONDITIONS

A. Land Use

The Little America property is located in the southeast quadrant of the I-40 / Butler Avenue interchange. Existing land uses on the site include the Little America Hotel and the Sinclair gas station and truck stop along East Butler Avenue, but the remainder of the approximately 537-acre parcel is undeveloped. The parcels surrounding the site are also undeveloped, and the parcels further east and south primarily consist of single family developments. It is anticipated that the undeveloped parcels surrounding the Little America property will ultimately become residential developments.

For the purposes of this study, full development of the Little America site was assumed to include 1,235 multi-family homes, 211 single family homes, 206,500 square feet of commercial development along East Butler Avenue, a 200-room hotel/conference center, and an 18-hole golf course. The primary access will be via the East Butler Avenue/Harold Ranch Road intersection.

B. Roadway System

Major roadways in the vicinity of the proposed Flagstaff Little America development are illustrated on **Figure 1**. As shown, the site is located south of East Butler Avenue and southeast of Interstate 40. The primary access to the site will be via East Butler Avenue, which is currently a two-lane roadway along the property frontage, with a diamond interchange at Interstate 40.

In the long-term, it is expected that John Wesley Powell Boulevard (JW Powell Boulevard) will be extended up from the south to connect to 4th Street, east of the site, and that Harold Ranch Road will connect to JW Powell Boulevard east of the project site.

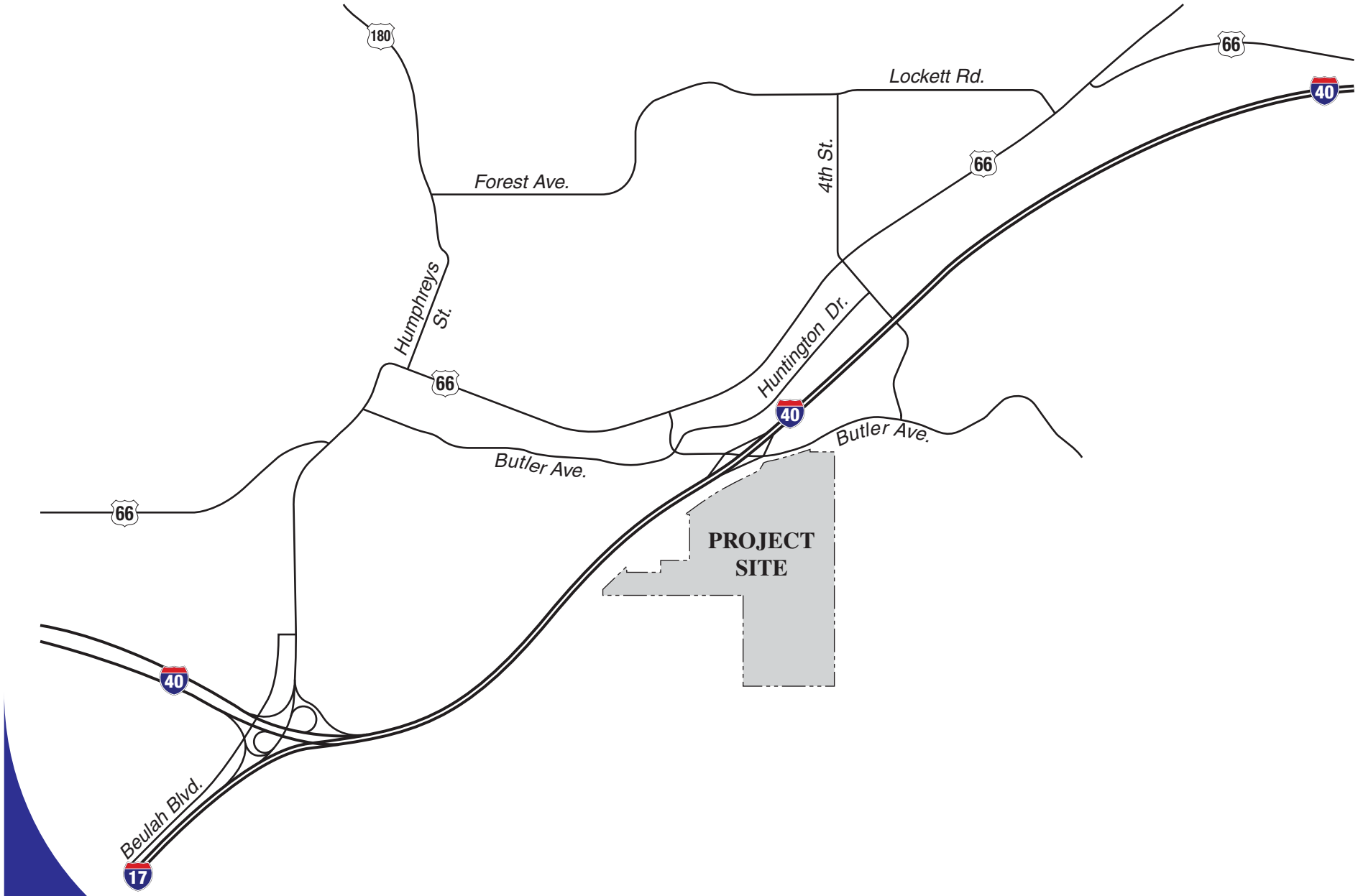

Figure 1
Vicinity Map

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Flagstaff Little America, 13-075, 4/18/13

II. EXISTING OPERATIONS

A. Roadway Conditions and Traffic Control

Table 1 summarizes the current roadway conditions and traffic control at each of the roadways and intersections within the study area. It should also be noted that the Arizona Department of Transportation (ADOT) is currently conducting a Design Concept Report for I-40 through the City of Flagstaff and as a part of the project will identify a preferred alternative for the I-40 Butler Avenue interchange. Recent conversations with ADOT staff have indicated that a decision on the preferred alternative is anticipated sometime during the summer of 2013. There are four alternatives being analyzed:

- Diamond with Roundabouts
- Signalized Diamond - Existing condition with additional lanes on Butler Avenue and the ramps
- Double Crossover (Diverging Diamond)
- Three Point Urban Interchange

Table 1. Roadway Conditions and Traffic Control

Roadway	Number of Through Lanes
US 66	4
Ponderosa Parkway	2 @ US 66, 1 SB, 2 NB @ Butler
Huntington Drive	4 @ Butler Avenue, 2 @ 4th Street
Babbitt Drive	2
Butler Avenue	4
I-40	4
Harold Ranch Road	2 (unpaved)
4th Street	2 @ East Butler Avenue, Sparrow Avenue and Soliere Avenue, 4 @ Huntington/Industrial and US 66
Industrial Avenue	2
Intersection	**Existing Traffic Control**
US 66/Ponderosa	Signalized
Ponderosa/Butler/Huntington	Signalized
Butler/Babbitt	Signalized
Butler/I-40 EB Ramps	Signalized
Butler/I-40 WB Ramps	Signalized
East Butler/Harold Ranch	Unsignalized
East Butler/4th Street	Signalized
4th Street/Sparrow	Signalized
4th Street/Soliere	Signalized
4th Street/Huntington/Industrial	Signalized
US 66/4th Street	Signalized

B. Other Travel Modes

In general, there is very little pedestrian and bicycle traffic along East Butler Road. A total of 8 pedestrians (seven crossing East Butler and one walking along East Butler) and 10 bicycles (four crossing East Butler and six cycling along East Butler) were observed at the East Butler Avenue/Harold Ranch Road intersection between 4 PM and 6 PM on March 12, 2013, when the intersection turning movement counts were collected. In the nearby vicinity of the Little America site, East Butler Avenue has curb, gutter and sidewalk on both sides of the road from I-40 to the end of the truck stops on the north and south sides of that road. East of that point East Butler has 3-5 foot paved shoulders for pedestrians and bicycles.

C. Traffic Volumes

Daily traffic volumes along Butler Avenue, 4th Street and US 66 were collected in March 2013 and May 2013. Turning movement counts were also collected during the PM peak hour at 11 intersections in the vicinity of the site. The existing daily and PM peak hour counts are shown in **Figure 2**. As shown, daily traffic volumes within the study area range from 14,700 vehicles per day (vpd) on Butler Avenue east of the I-40 interchange to 30,200 vpd on US 66 west of Ponderosa Parkway. **Appendix A** contains the raw traffic count data.

D. Levels of Service

Traffic operations within the study area were evaluated according to techniques documented in the Highway Capacity Manual, (Transportation Research Board, 2010) (HCM-2010). Level of service (LOS) is a qualitative measure of traffic operational conditions based on roadway capacity and vehicle delay. Levels of service are described by a letter designation ranging from LOS A to LOS F, with LOS A representing the best possible conditions and LOS F representing congested conditions. For signalized intersections, level of service is calculated for the entire intersection; for unsignalized intersections, levels of service are calculated for movements which must yield right-of-way to other traffic movements.

Existing levels of service are shown on **Figure 3**. The 4th Street/Huntington/Industrial Road intersection currently operates at LOS F during the afternoon peak hour, while all other signalized intersections currently operate at LOS D or better. Revising the green times at the 4th Street/Huntington/Industrial Road intersection would improve operations to LOS D and resolve the poor levels of service there.

At the unsignalized intersection of Harold Ranch Road and East Butler Avenue the westbound left turning movement operates at LOS A, while the northbound movement operates at LOS D. **Appendix B** contains the existing level of service worksheets.

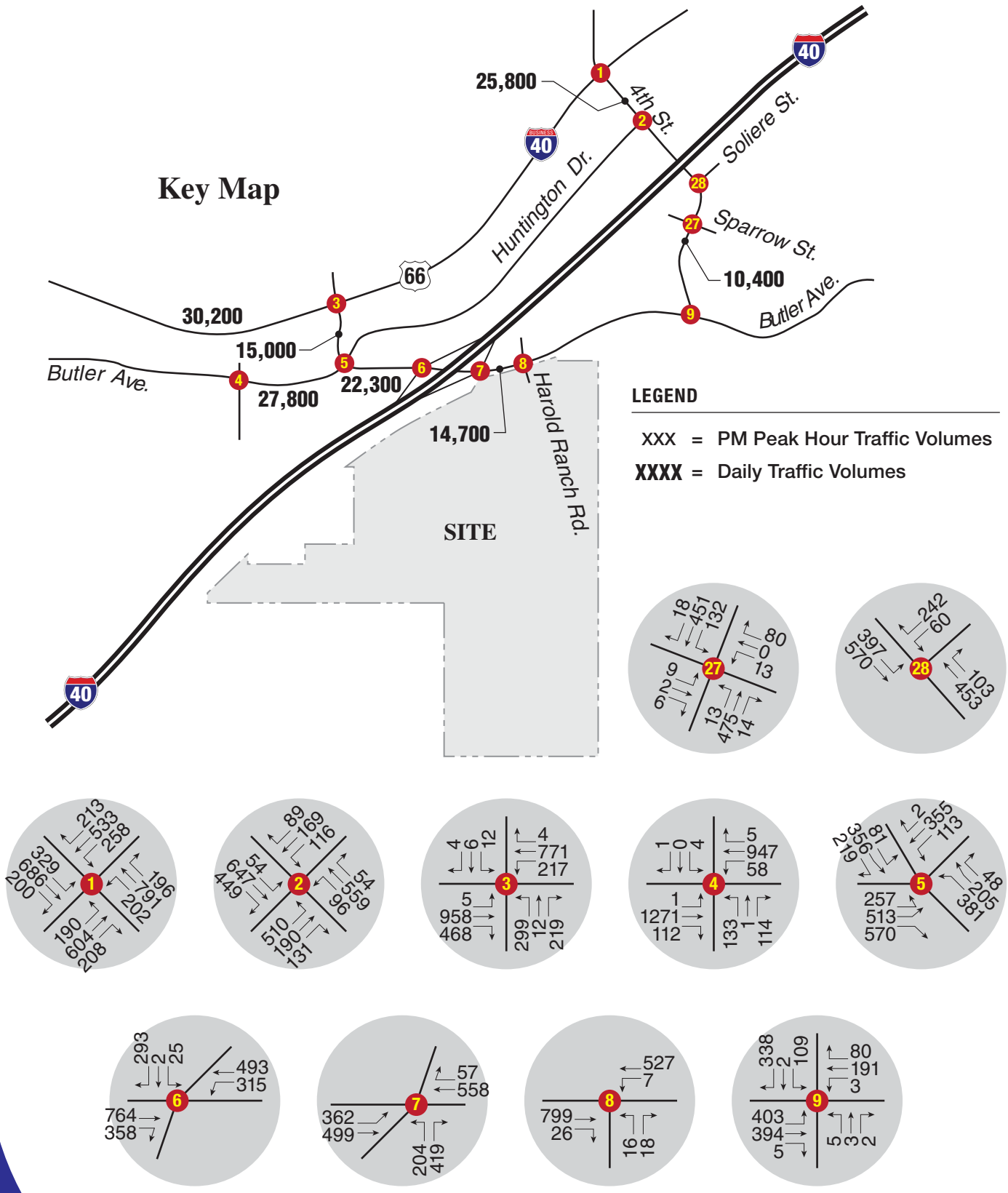

Figure 2
Existing Traffic Volumes

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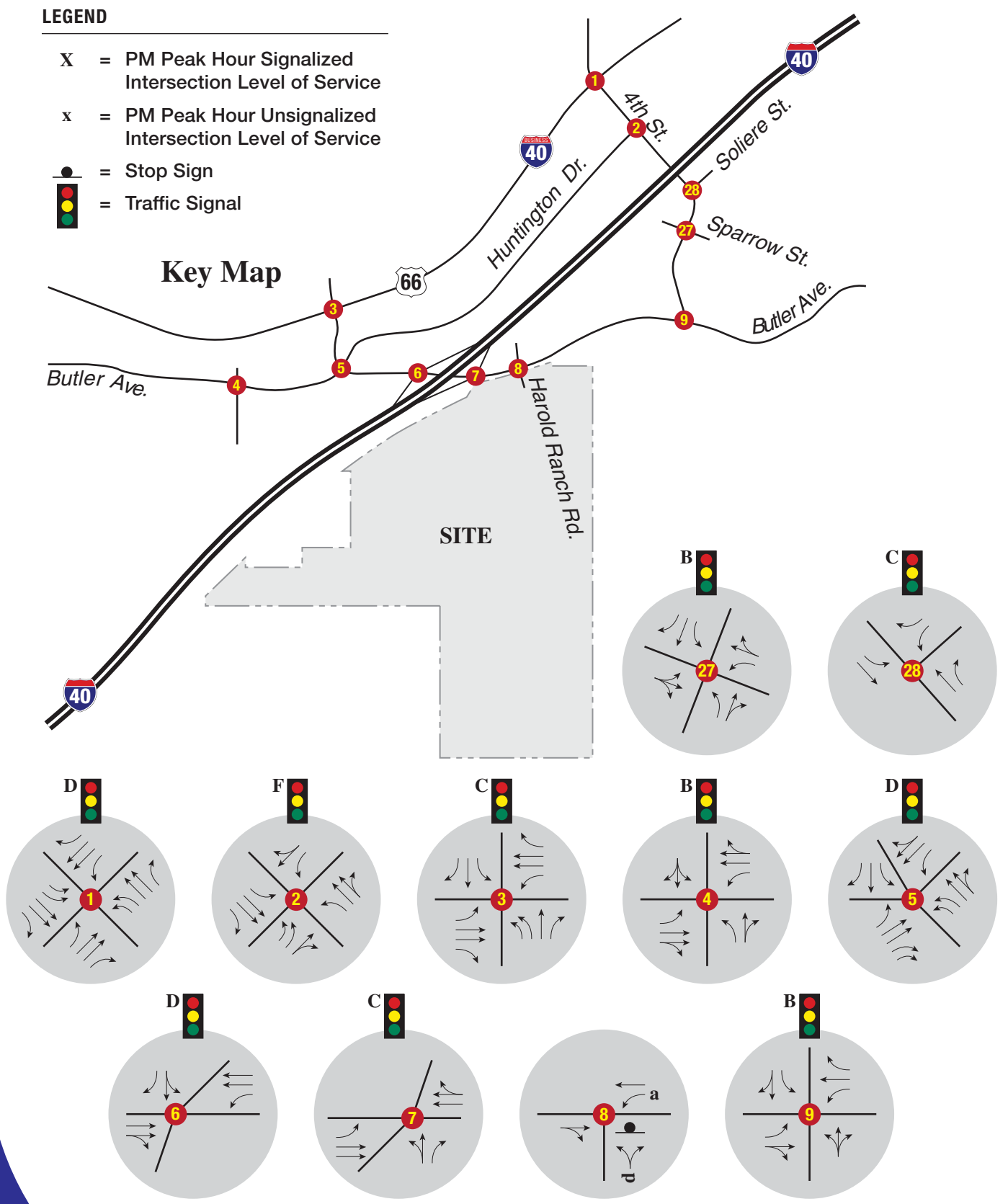

Figure 3
Existing Levels of Service

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Flagstaff Little America, 13-075, 6/26/13

III. PROJECTED TRAFFIC

This section documents the processes used to develop traffic projections for the Flagstaff Little America Master Plan.

A. Site Plan

The Little America property is an approximately 537-acre site. For the purpose of this traffic analysis, full development of the site was assumed to include an 18-hole golf course, a hotel, approximately 206,500 square feet of commercial land use, and approximately 1,218 multi-family homes and 211 single family homes. The site plan is shown in **Figure 4**. As shown, the primary access to the site will be via the existing Harold Ranch Road intersection with East Butler Avenue.

B. Site Trip Generation

Trip forecasts for the project were developed based on trip rates published in *Trip Generation, 9th Edition* (Institute of Transportation Engineers, 2012). **Table 2** provides the anticipated trip generation at full buildout of the project. The trip forecasts were adjusted to reflect internal trips made between the retail and residential land uses. Internal trips are trips that have both origins and destinations within the site and thus would not use the external roadway network, and were forecast based on the procedures outlined in the *Trip Generation Handbook (*Institute of Transportation Engineers, 2012*)*. With these adjustments, full buildout of the site is anticipated to generate approximately 26,045 vpd with 2,305 of those trips occurring in the PM peak hour.

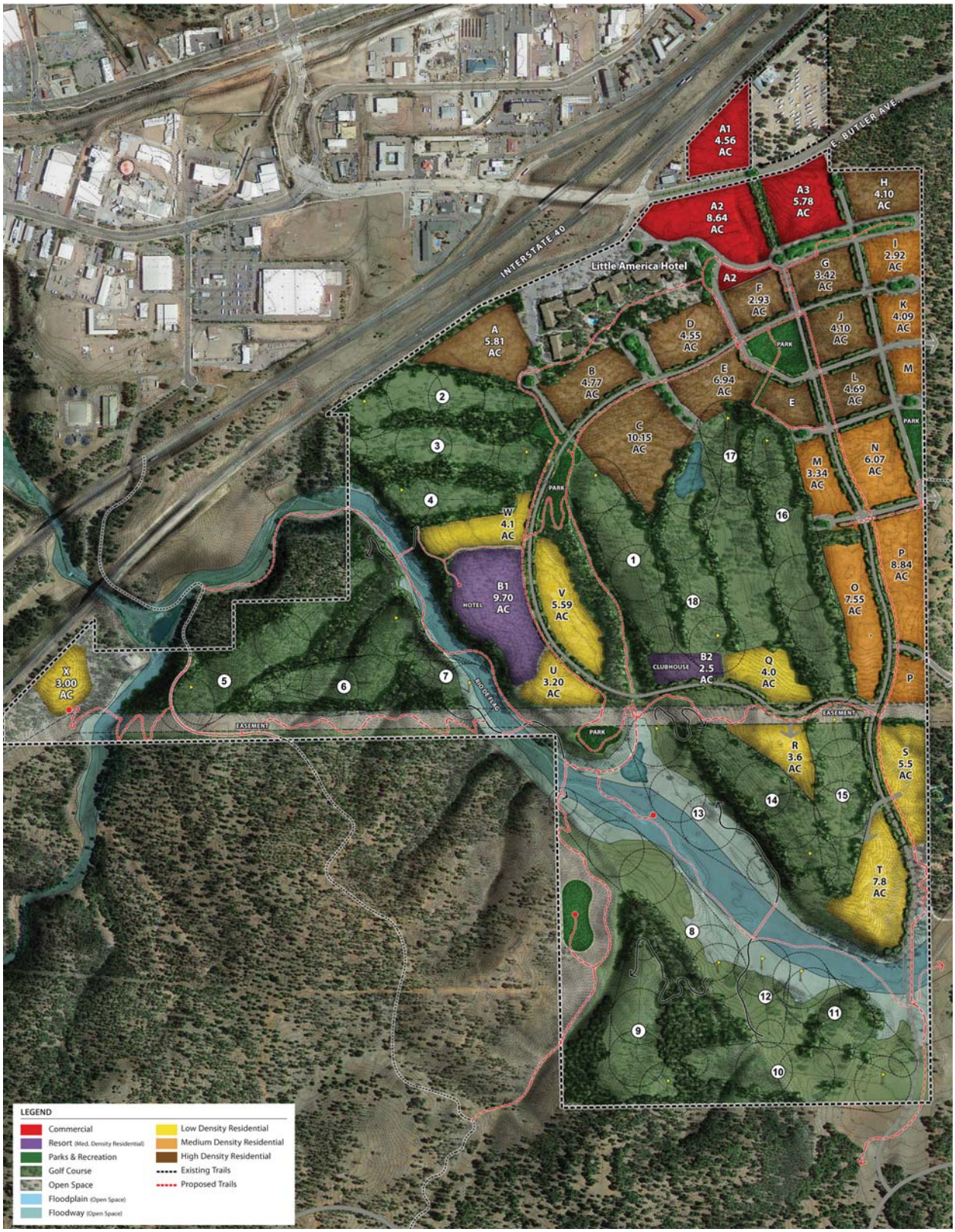

Figure 4
Site Plan

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Table 2. Full Buildout Site Generated Traffic

Parcel	Land Use	Size	Units	Daily	PM Peak Hour		
					In	Out	Total
A	Apartment	116	DU	770	47	25	72
B	Townhome	67	DU	390	23	12	35
C	Townhome	142	DU	830	50	24	74
D	Townhome	73	DU	420	25	13	38
E	Townhome	97	DU	560	34	16	50
F	Townhome	53	DU	310	19	9	28
G	Townhome	62	DU	360	21	11	32
H	Apartment	82	DU	550	33	18	51
I	Townhome	35	DU	200	12	6	18
J	Townhome	66	DU	380	23	11	34
K	Townhome	49	DU	280	17	8	25
L	Townhome	66	DU	380	23	11	34
M	Townhome	40	DU	230	14	7	21
N	Townhome	73	DU	420	25	13	38
O	Townhome	91	DU	530	31	16	47
P	Townhome	106	DU	620	37	18	55
Q	Single Family	16	DU	150	10	6	16
R	Single Family	14	DU	130	9	5	14
S	Single Family	34	DU	320	21	13	34
T	Single Family	31	DU	300	20	11	31
U	Single Family	26	DU	250	16	10	26
V	Single Family	45	DU	430	28	17	45
W	Single Family	33	DU	310	21	12	33
X	Single Family	12	DU	110	8	4	12
A1	Retail	49.658	KSF	4,310	180	195	375
A2	Retail	94.09	KSF	6,530	276	299	575
A3	Retail	62.944	KSF	5,030	211	228	439
B1	Hotel	200	Rooms	1,630	61	59	120
	Golf Course	178.27	Acres	900	18	35	53
Subtotal				***27,630***	***1,313***	***1,112***	***2,425***
Internal Trips (between residential and retail uses)				*-1,585*	*-55*	*-65*	*-120*
Total New Trips				**26,045**	**1,258**	**1,047**	**2,305**

C. Phasing

The development is currently projected to begin construction in 2018 and be completed by 2030. For this report, the years 2020 and 2025 were analyzed as interim development conditions, to assist in determining when the various road system improvements would need to be implemented to ensure the road system operates adequately throughout the development process. **Tables 3** and **4** show the anticipated trip generation for both of these interim years. As shown, in 2020 the site is forecasted to generate approximately 10,830 daily trips, with 946 trips occurring during the PM peak hour, while in 2025 the site is anticipated to generate approximately 18,910 vpd, with 1,671 trips during the peak hour.

Table 3. 2020 Site Generated Traffic

Parcel	Land Use	Size	Units	Daily	PM Peak Hour		
					In	Out	Total
D	Townhome	73	DU	420	25	13	38
E	Townhome	97	DU	560	34	16	50
F	Townhome	53	DU	310	19	9	28
A-1	Retail	47.045	KSF	6,530	276	299	575
A-2	Retail	62.944	KSF	5,030	211	228	439
I	Apartment	41	DU	550	33	18	51
J	Townhome	62	DU	360	21	11	32
K	Townhome	35	DU	200	12	6	18
Subtotal				***11,310***	***511***	***480***	***991***
Internal Trips (between residential and retail uses)				*-480*	*-20*	*-25*	*-45*
Total New Trips				**10,830**	**491**	**455**	**946**

Table 4. 2025 Site Generated Traffic

Parcel	Land Use	Size	Units	Daily	PM Peak Hour		
					In	Out	Total
A	Apartment	116	DU	770	47	25	72
B	Townhome	67	DU	390	23	12	35
C	Townhome	142	DU	830	50	24	74
D	Townhome	73	DU	420	25	13	38
E	Townhome	97	DU	560	34	16	50
F	Townhome	53	DU	310	19	9	28
G	Townhome	62	DU	360	21	11	32
H	Apartment	41	DU	270	16	9	25
I	Townhome	35	DU	200	12	6	18
J	Townhome	66	DU	380	23	11	34
K	Townhome	49	DU	280	17	8	25
L	Townhome	66	DU	380	23	11	34
U	Single Family	26	DU	250	16	10	26
V	Single Family	45	DU	430	28	17	45
W	Single Family	33	DU	310	21	12	33
A2	Retail	94.09	KSF	6,530	276	299	575
A3	Retail	62.944	KSF	5,030	211	228	439
B1	Hotel	200	Rooms	1,630	61	59	120
	Golf Course	178.27	Acres	900	18	35	53
Subtotal				***20,370***	***949***	***820***	***1,769***
Internal Trips (between residential and retail uses)				*-1,320*	*-40*	*-45*	*-85*
Total New Trips				**18,910**	**901**	**770**	**1,671**

D. Trip Distribution and Assignment

Trips to/from the project site were assigned to the external road system using the FMPO's travel demand forecasting model, which considers the internal attractions between the development, the external attractions of the surrounding community, and the level of traffic congestion on the external road system. It is anticipated that by buildout of the project JW Powell Boulevard would extended north and connect with 4th Street, and that there will be a connection between the south portion of Harold Ranch Road and the new JW Powell Boulevard extension. **Figure 5** shows the trip distribution for the project with those planned connections.

Figures 6, 7, and **8** show the daily and PM peak hour site generated traffic on the external and internal roadway networks for 2020, 2025, and 2030, respectively.

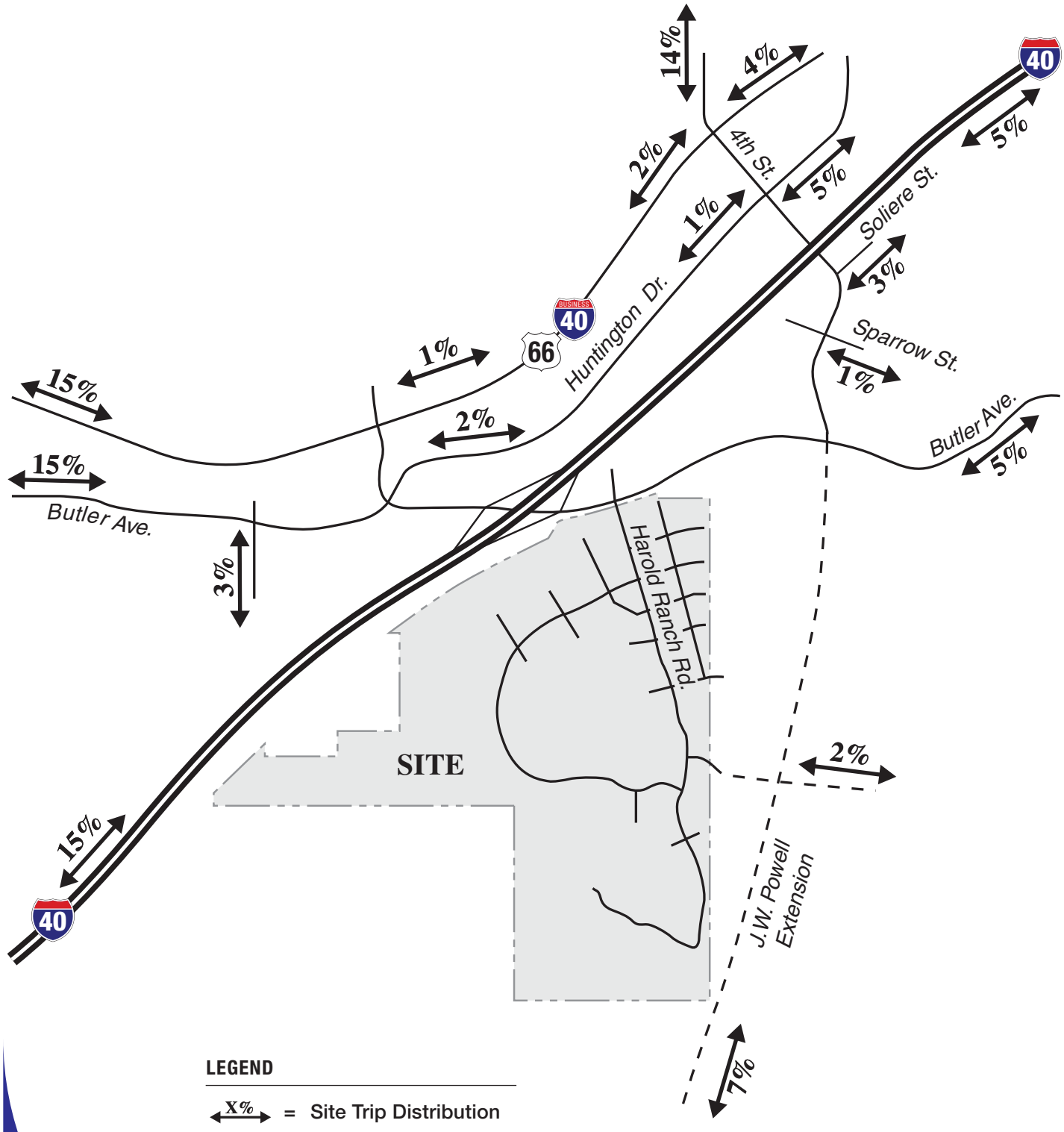

Figure 5
Trip Distribution

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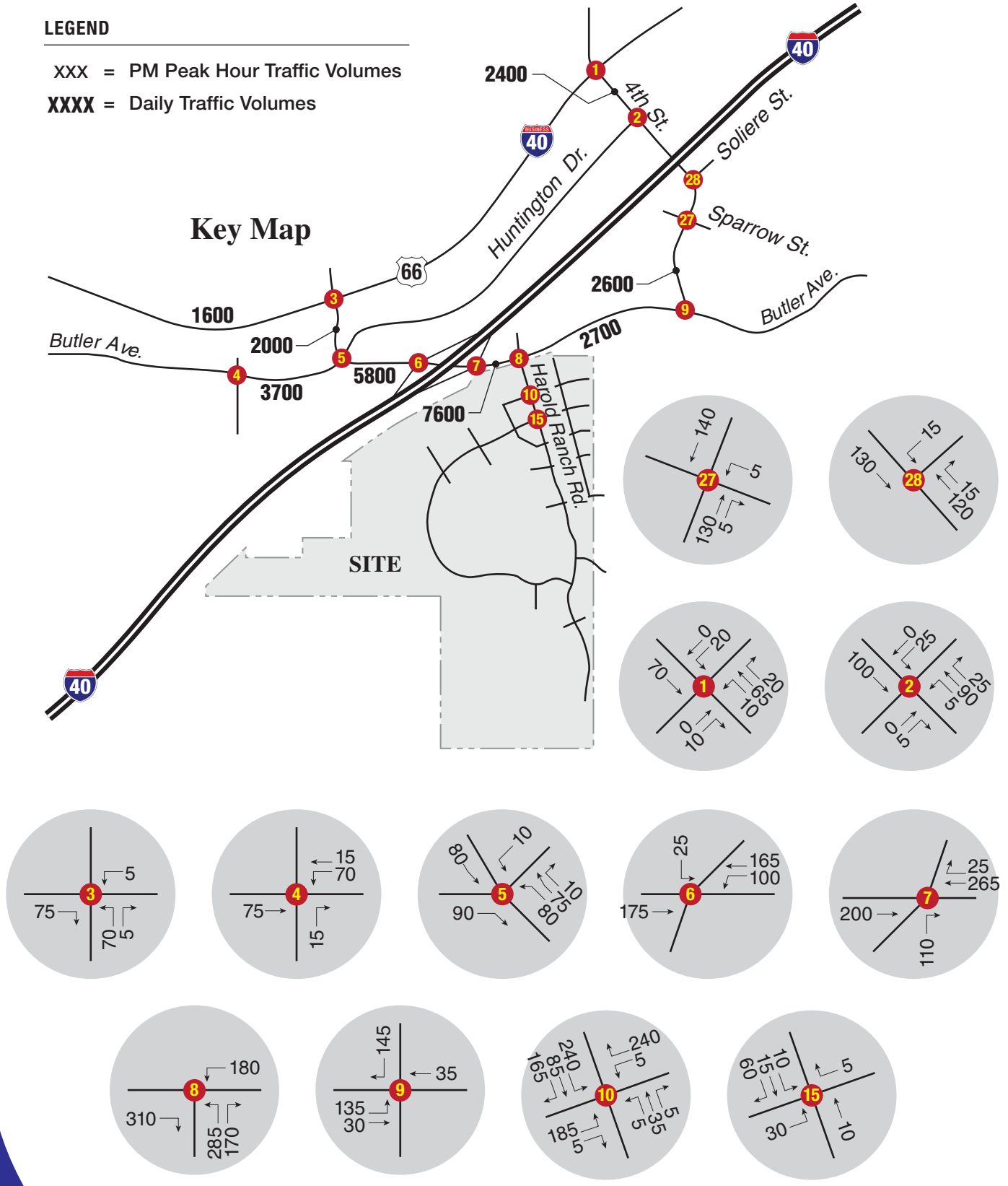

Figure 6

2020 Site Generated Traffic Volumes

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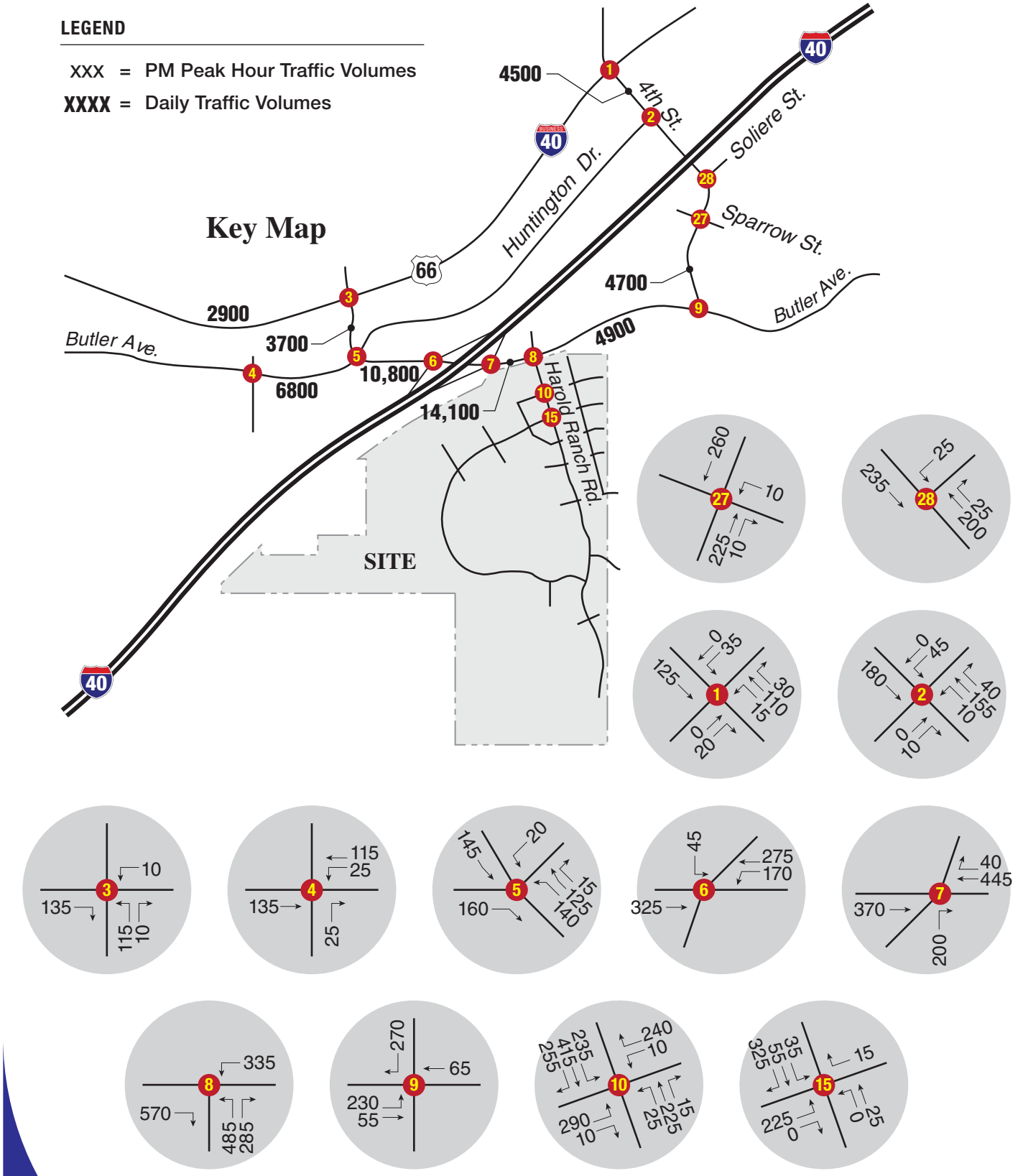

Figure 7
2025 Site Generated Traffic Volumes

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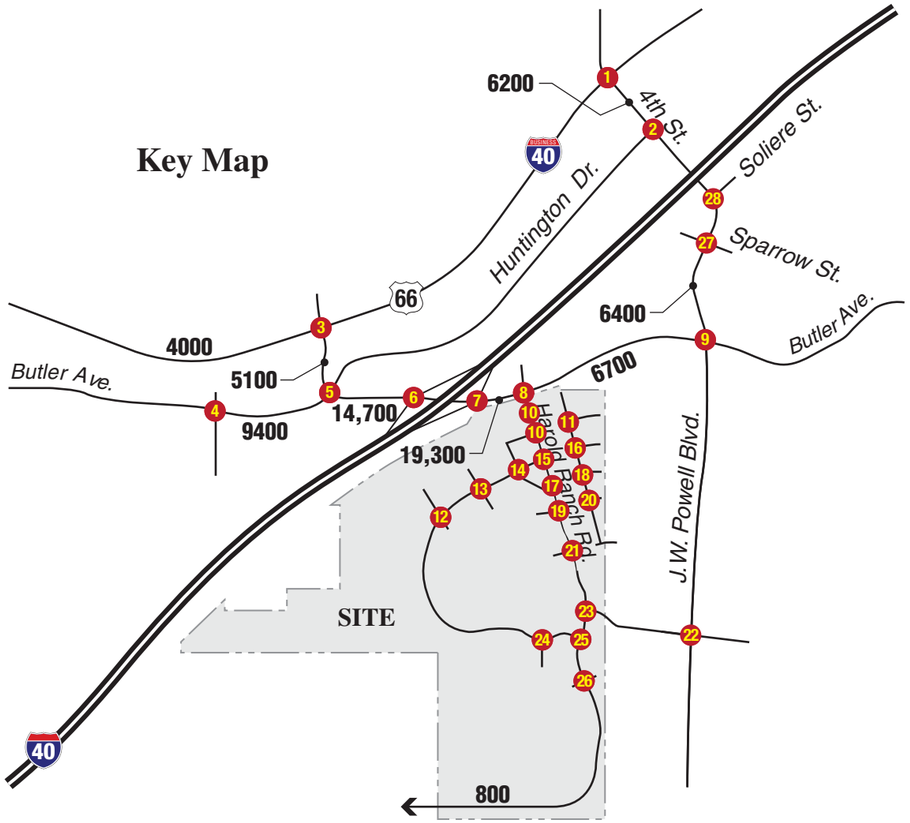
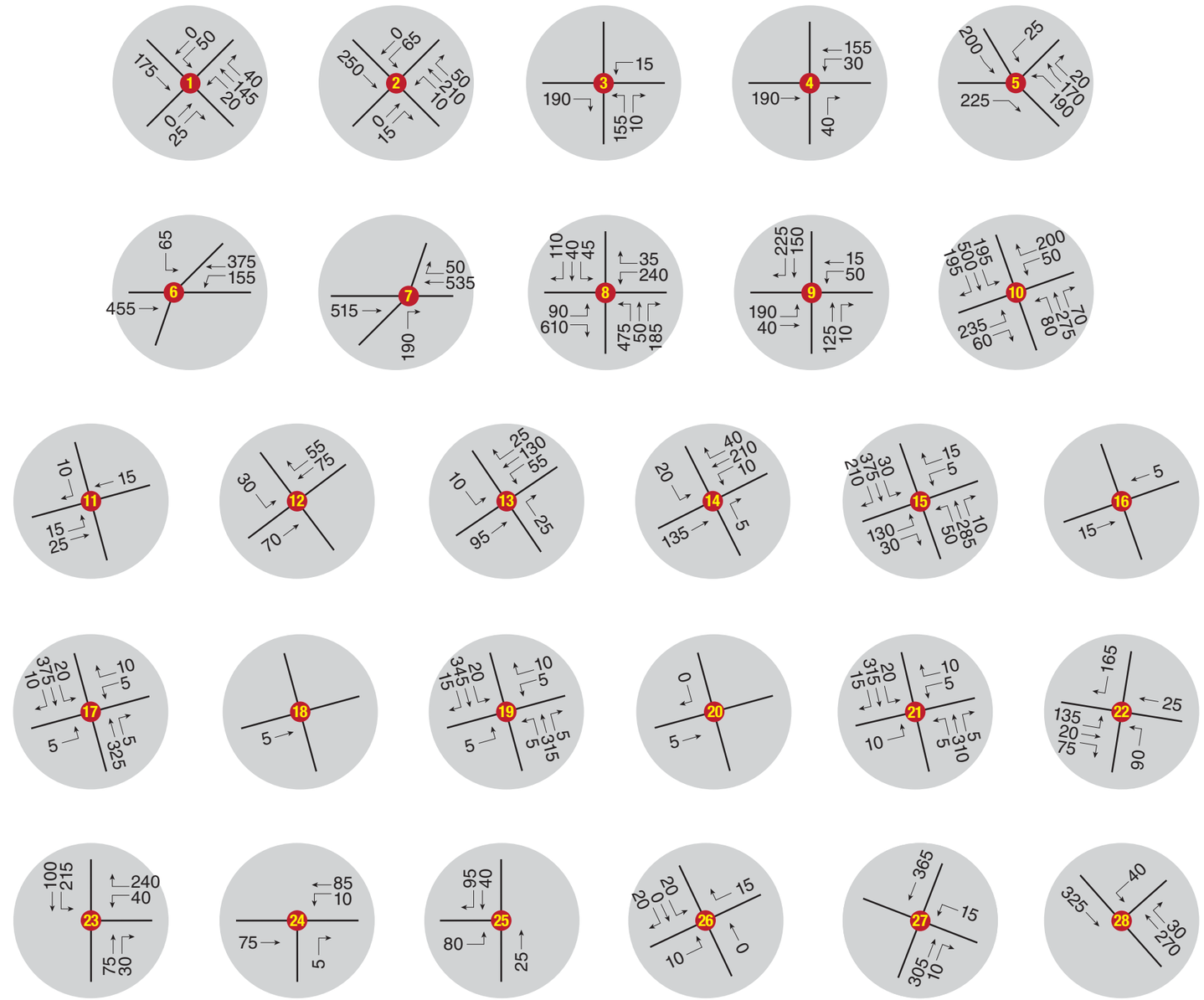
Flagstaff Little America, 13-075, 6/26/13





LEGEND

X	=	PM Peak Hour Signalized Intersection Level of Service
x	=	PM Peak Hour Unsignalized Intersection Level of Service
	=	Stop Sign
	=	Traffic Signal

Figure 8
2030 Site Generated Traffic Volumes

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IV. TRAFFIC IMPACTS – INTERIM YEAR 2020

A. 2020 Background Traffic Conditions

Background traffic represents the component of roadway volume unrelated to the proposed development that is projected to utilize the adjacent roadway system. To generate future traffic forecasts for 2020, background traffic volumes for 2030 were calculated using the projected traffic growth forecasts for each of the external roadways from the Flagstaff MPO's travel demand forecasting model. To obtain 2020 background forecasts, it was assumed that there would be linear annual traffic growth between the existing traffic volumes and the 2030 background conditions. **Figure 9** shows the 2020 background traffic volumes on the external roadways.

As noted previously, ADOT is currently conducting a Design Concept Report for I-40 through the City of Flagstaff and as a part of the project will identify a preferred alternative for the I-40 Butler Avenue interchange. The interchange was identified in 2007 as needing capacity and operational improvements due to the interchange geometrics and heavy truck volumes. There are four alternatives being analyzed:

- Diamond interchange with roundabouts at both ramp terminals
- Signalized Diamond – similar to existing conditions, with additional lanes on Butler Avenue and on the ramps
- Double Crossover (Diverging Diamond) Interchange
- Three Point Urban Interchange

At the time of this analysis, a preferred design alternative had not been selected for the interchange, so for the purposes of this report the signalized diamond alternative was analyzed.

Figure 10 provides the projected levels of service, lane geometry and traffic control for the study area intersections for the 2020 interim year. As shown, all the signalized intersections evaluated are forecast to operate at LOS D or better.

At the unsignalized East Butler/Harold Ranch intersection, the northbound movement is projected to operate at LOS E under background traffic conditions. It is not uncommon, however, for side street movements along high volume roadways such as East Butler Avenue to experience poor levels of service. As noted in Chapter 17 (Unsignalized Intersections) of the Highway Capacity Manual (2000):

> *In evaluating the overall performance of two-way stop control intersections, it is important to consider measures of effectiveness in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th percentile queue lengths. By focusing on a single measure of effectiveness for the worst movement only, such as delay for the minor street left turn, users may make less effective traffic control decisions.*

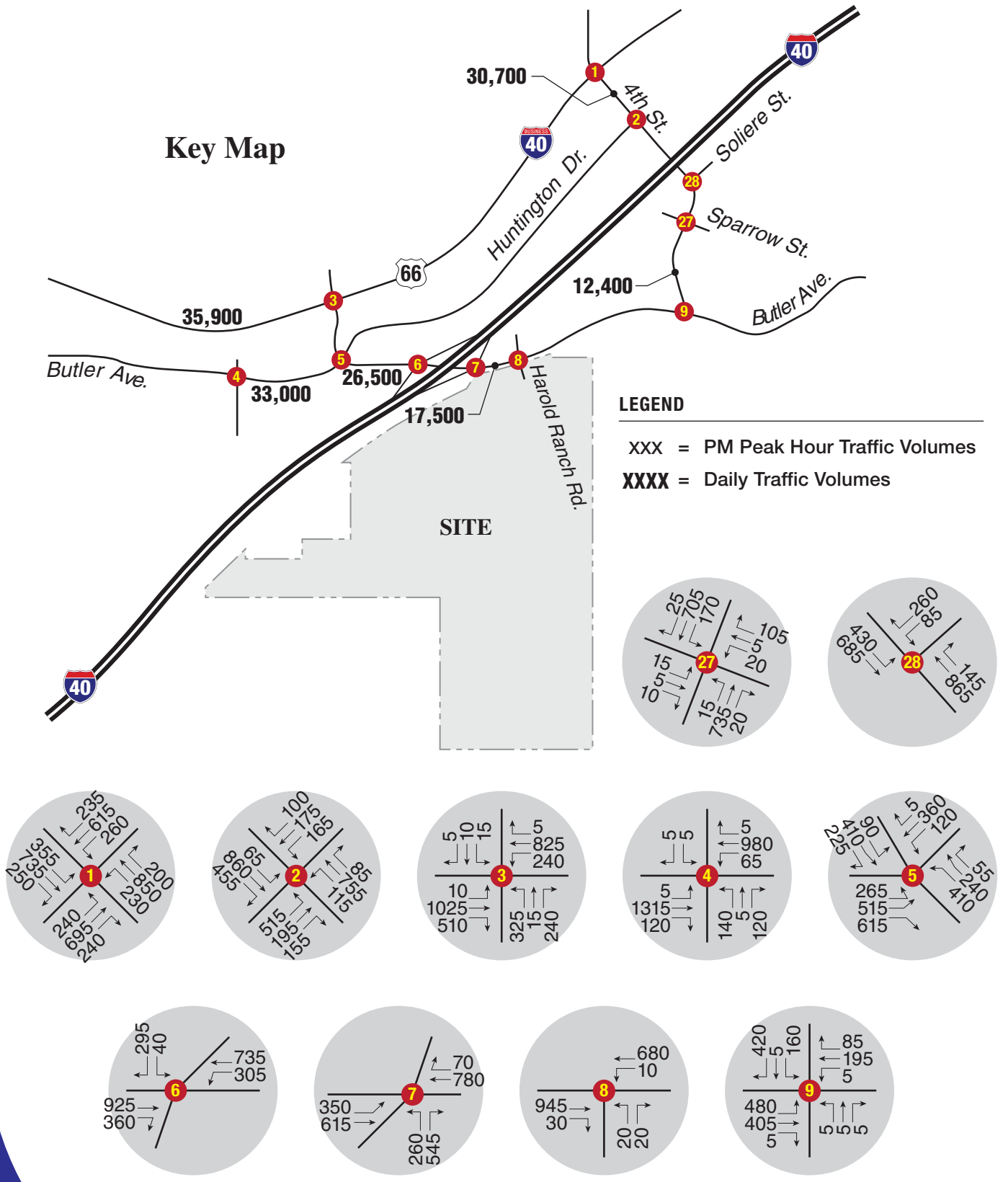

Figure 9
2020 Background Traffic Volumes

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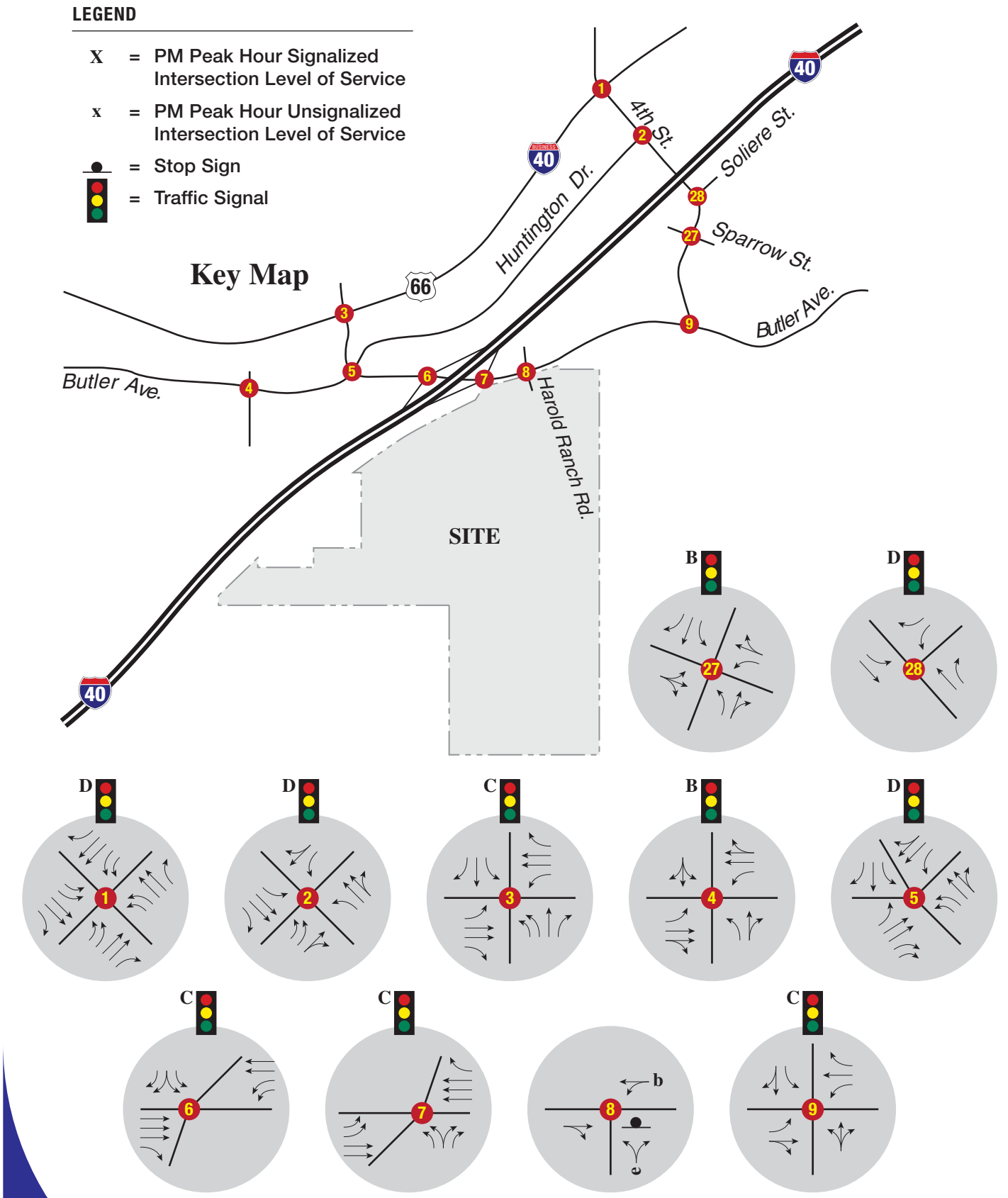

Figure 10
2020 Background Levels of Service

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NORTH

Flagstaff Little America, 13-075, 6/26/13

At the East Butler Avenue/Harold Ranch Road intersection the northbound traffic volumes would be approximately 40 vehicles per hour, the v/c ratio would be 0.33 and the projected 95th percentile queue length would be less than two vehicles. These conditions would not appear to be problematic, so no improvements are recommended at that location.

Appendix C contains the 2020 background level of service worksheets.

B. 2020 Total Traffic Conditions

Site generated traffic volumes from **Figure 6** were added to the 2020 background traffic volumes in **Figure 9** to project the 2020 total traffic volumes shown in **Figure 11**. **Figure 12** shows the 2020 lane geometry and levels of service.

C. 2020 Roadway and Intersection Improvement Needs

The following highlights the locations where improvements are recommended due to the addition of project traffic in the year 2020.

External Intersections

East Butler Avenue / Harold Ranch Road

This intersection would serve as the primary access to the Little America site, and a roundabout is being proposed to accommodate traffic at the intersection. It has been assumed that the roundabout would be constructed to accommodate 2030 traffic conditions with buildout of the project, which would consist of a two lane roundabout with eastbound and northbound right turn bypass lanes. Under this configuration, the roundabout would operate at LOS A.

Butler Avenue / I-40 Ramps

It has been assumed that the I-40/Butler Avenue interchange would be reconstructed to an improved diamond interchange for both the 2020 background analysis and the 2020 analysis with the project. Both ramp terminals at the improved diamond interchange (dual left-turn lanes on the ramps and a total of seven lanes on Butler Avenue between the ramps) would operate at LOS C both without and with the project.

East Butler Avenue / 4th Street

Little America project traffic using 4th Street is anticipated to significantly increase southbound right turn volumes at this intersection. Revising the southbound approach striping at this intersection from a left turn lane + shared through/right lane to a right turn lane + shared left/through lane would increase the volume of right turns on red for that movement and improve operations to LOS C.

Internal (New) Intersections

Harold Ranch Road/Retail Driveway (Internal Intersection #10)

To accommodate 2020 traffic projections, it is recommended that this T intersection include a northbound left-turn lane, a southbound right-turn lane, and eastbound right and left-turn lanes. With this geometry, all yielding turning movements at this intersection would operate at LOS C or better during the PM peak hour. The intersection is not projected to meet signal warrants at this time, so it would initially be stop-controlled on the eastbound approach.

Roadways

East Butler Avenue

East Butler Avenue is planned to be widened to four lanes immediately east of the I-40 interchange, and this four-lane segment should be extended through the Harold Ranch Road intersection to accommodate the two lane roundabout planned for that location. It should transition back to one lane in each direction at the east end of the site.

Appendix D contains the 2020 total level of service worksheets.

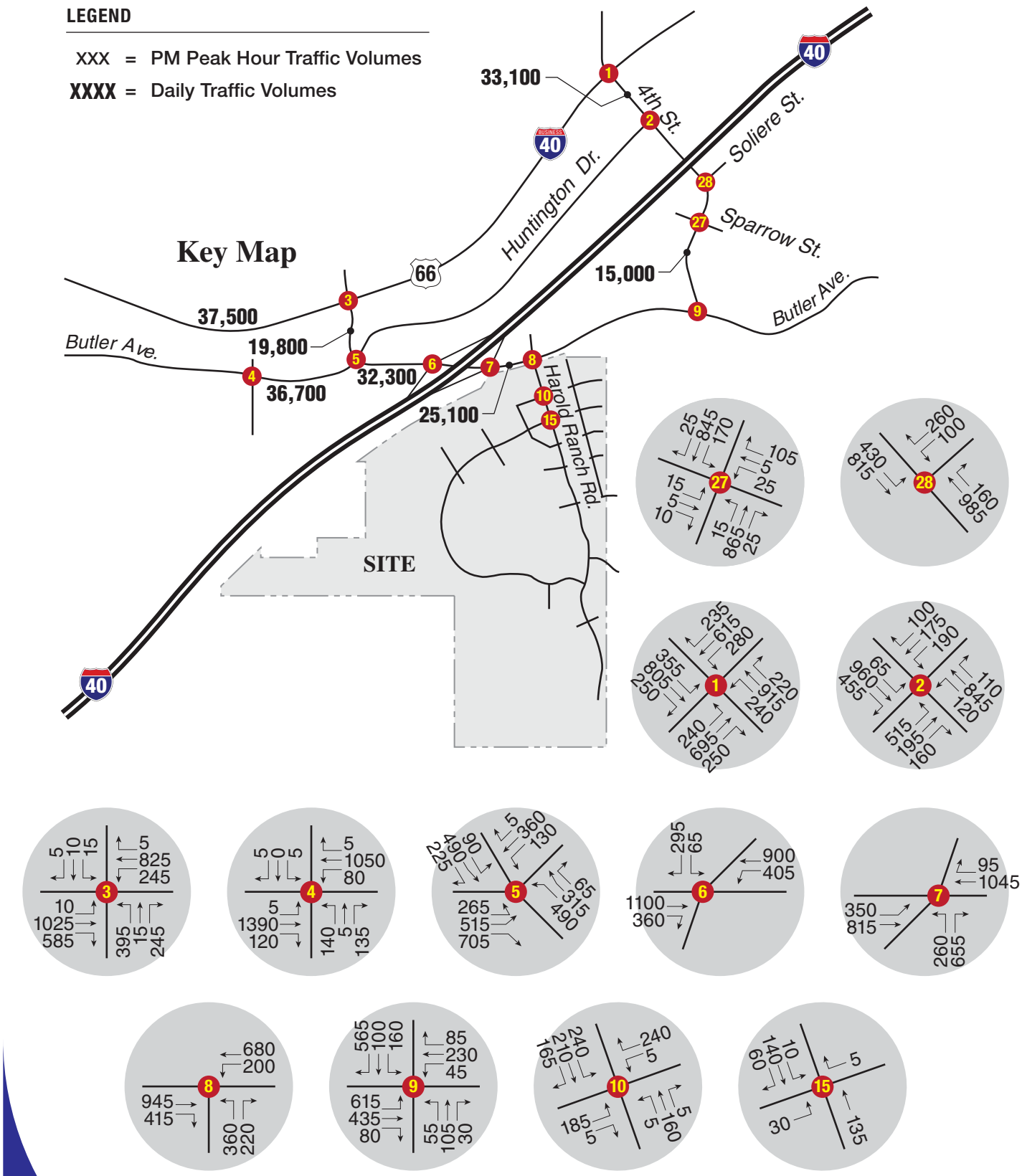


Figure 11
2020 Total Traffic Volumes

FELSBURG HOLT & ULLEVIG

NORTH

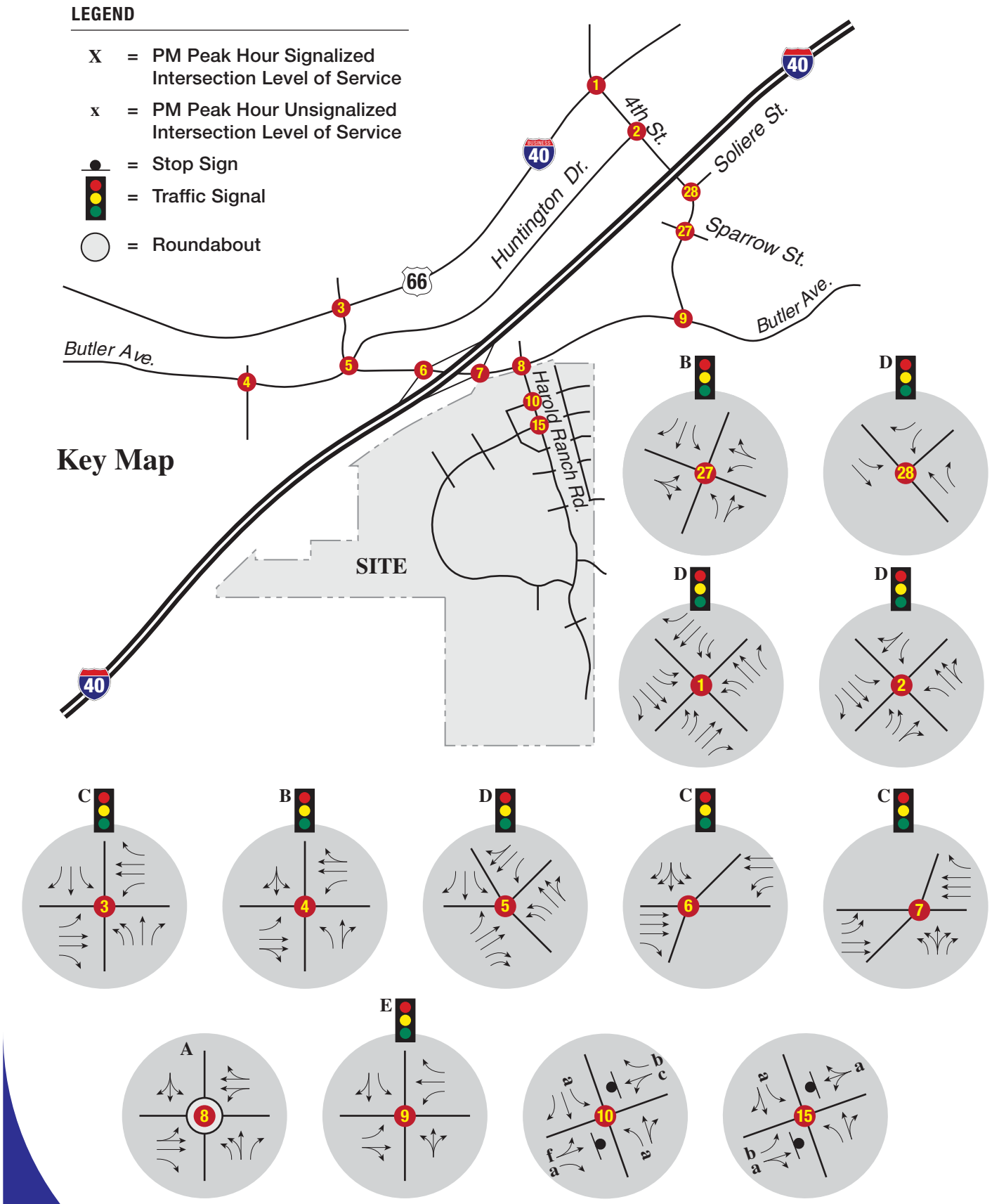


Figure 12
2020 Total Levels of Service

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/26/13

V. TRAFFIC IMPACTS – INTERIM YEAR 2025

A. 2025 Background Traffic Conditions

As with the 2020 interim year, background traffic volumes for the interim year 2025 were calculated assuming linear growth between the existing traffic and the forecasted 2030 background volumes. The 2025 background traffic is shown on **Figure 13**.

Figure 14 provides the projected levels of service, lane geometry and traffic control for the study area intersections for 2025 conditions. All the signalized intersections are forecasted to operate at LOS D or better with the exception of the 4th Street/Soliere intersection, which would operate at LOS F with the current geometry. 4th Street has been identified in the City's long-range transportation plan to be widened to four lanes between East Butler Avenue and the current four lane section south of the Huntington Drive/Industrial Drive intersection, so it is recommended that the two lane segment between Huntington Drive/Industrial Drive and Sparrow Avenue be widened sometime around 2025 to address the poor background levels of service at the Soliere intersection in that interim year.

At the unsignalized East Butler Avenue/Harold Ranch Road intersection the northbound left turn would operate at LOS F, but the northbound traffic volumes would be approximately 45 vehicles per hour, the v/c ratio would be 0.48 and the projected 95th percentile queue length would be two vehicles. These conditions would not appear to be problematic, so no improvements are recommended at that location.

Appendix E contains the 2025 background level of service worksheets.

B. 2025 Total Traffic Conditions

Site generated traffic volumes from **Figure 7** were added to the 2025 background traffic volumes in **Figure 13** to project the 2025 total traffic volumes shown in **Figure 15**. **Figure 16** shows the 2025 lane geometry and levels of service.

It has been assumed that all of the improvements identified for 2020 conditions with the project and 2025 background conditions would be in place for this analysis.

C. 2025 Roadway and Intersection Improvement Needs

The following highlights the locations where additional improvements are recommended to accommodate the additional traffic growth between 2020 and 2025.

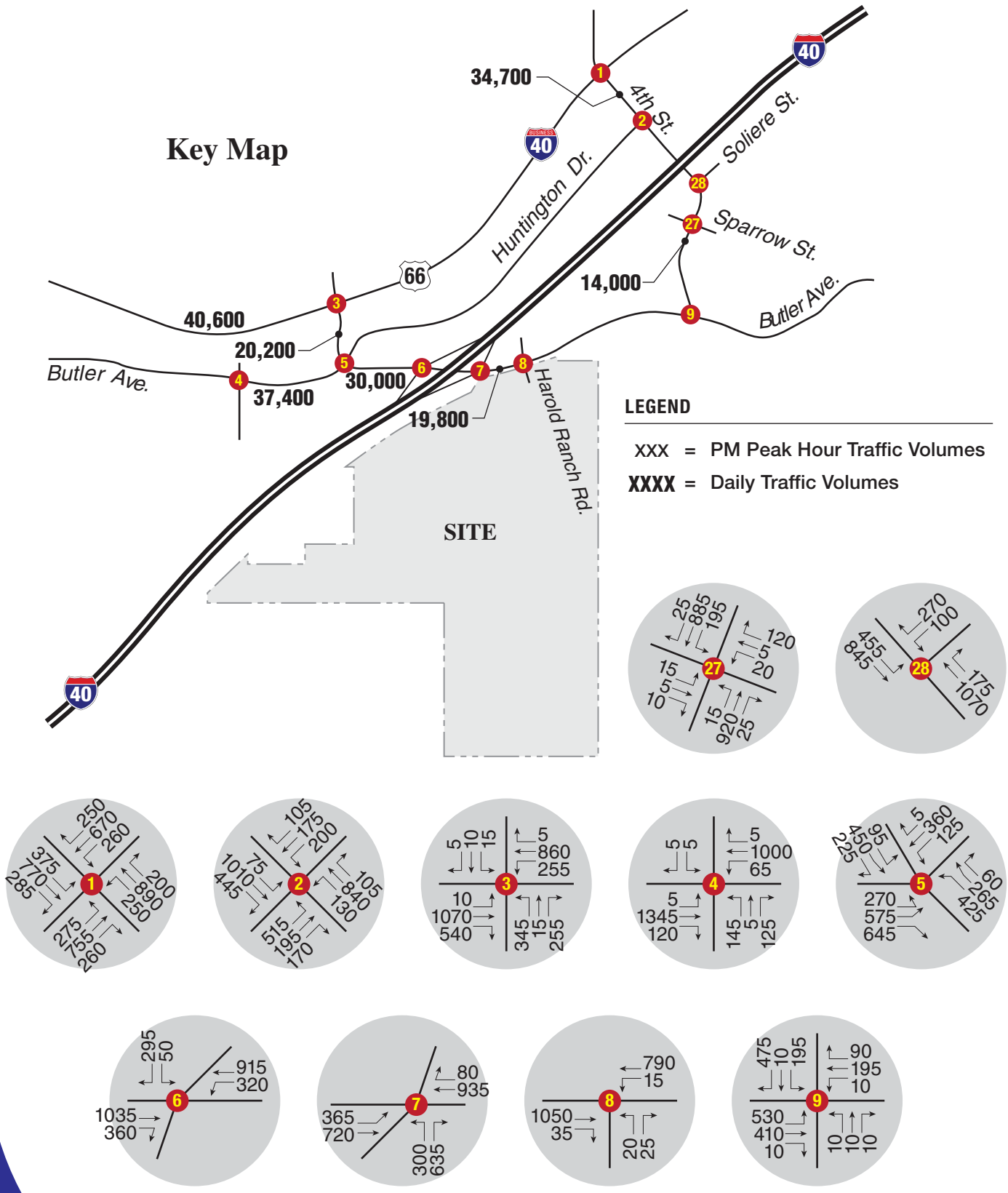
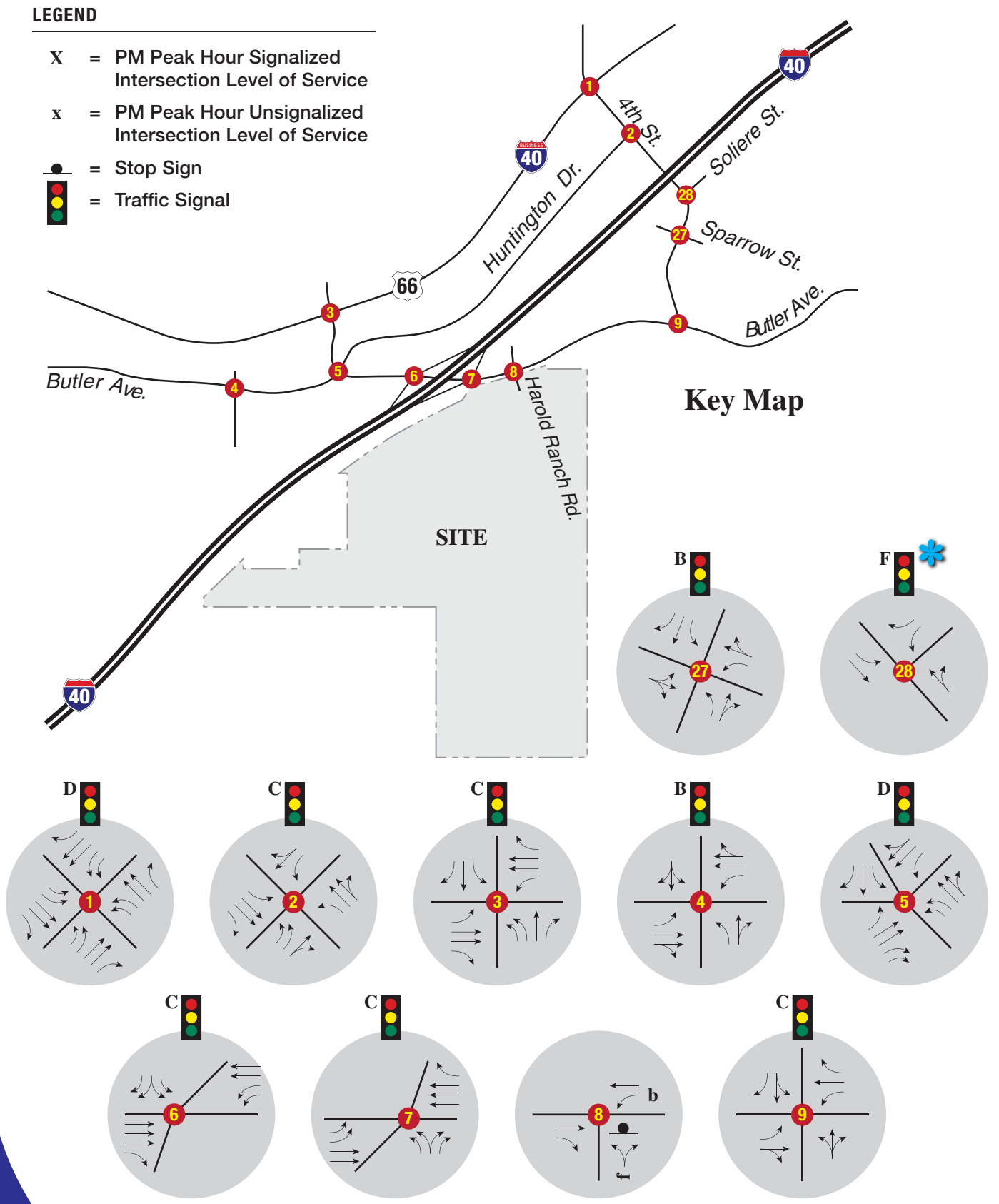


Figure 13
2025 Background Traffic Volumes

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/26/13



Widening 4th Street to Four Lanes Improves Operations to LOS B

Figure 14

2025 Background Levels of Service

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/21/13

External Intersections

Butler Avenue / Ponderosa Parkway / Huntington Drive

This intersection is projected to operate at LOS E with the addition of project traffic. By converting the southbound approach from right + through + left to shared through-right + through + left, and changing the eastbound right turn phasing to protected + overlap to eliminate any safety conflicts that might occur between the dual right turn lanes and the two southbound through lanes, this intersection would improve operations to LOS D.

Internal (New) Intersections

Harold Ranch Road/Retail Driveway (Internal Intersection #10)

The Harold Ranch Road/Retail Driveway intersection is expected to meet signal warrants by 2025 due to the increase in through traffic on Harold Ranch Road and the increase in retail traffic that results from the expansion of the retail center. No additional laneage beyond that identified for 2020 would be required. The signalized intersection would operate at LOS B during the PM peak hour.

Roadways

East Butler Avenue

It is recommended that East Butler Avenue be widened to four lanes between Harold Ranch Road and 4th Street to accommodate the additional background traffic growth on that segment of road.

4th Street

It is recommended that that the two lane segment of 4th Street between Huntington Drive/Industrial Drive and Sparrow Avenue be widened to four lanes to address the poor background levels of service at the Soliere intersection in that interim year.

Appendix F contains the 2025 total level of service worksheets.

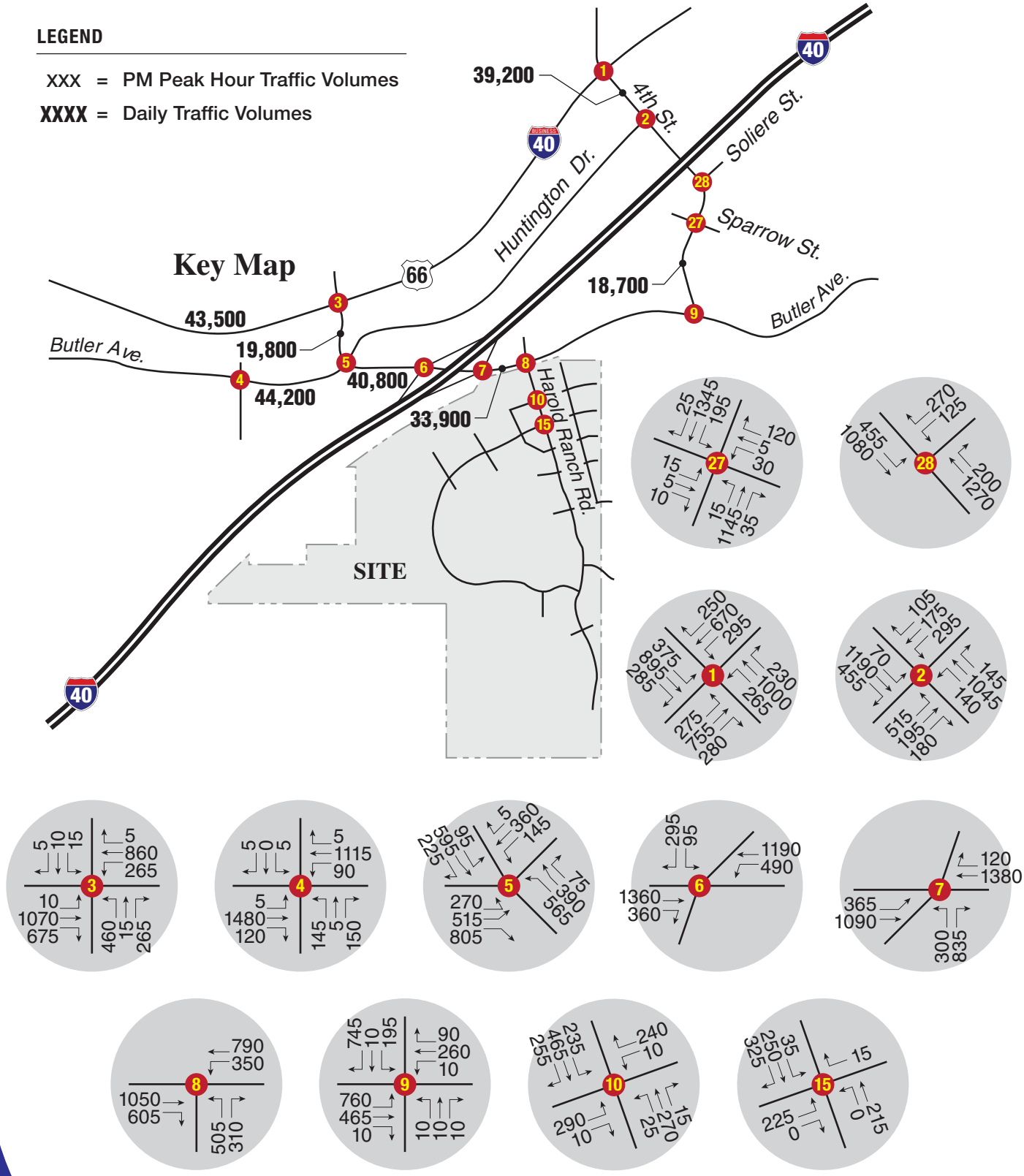
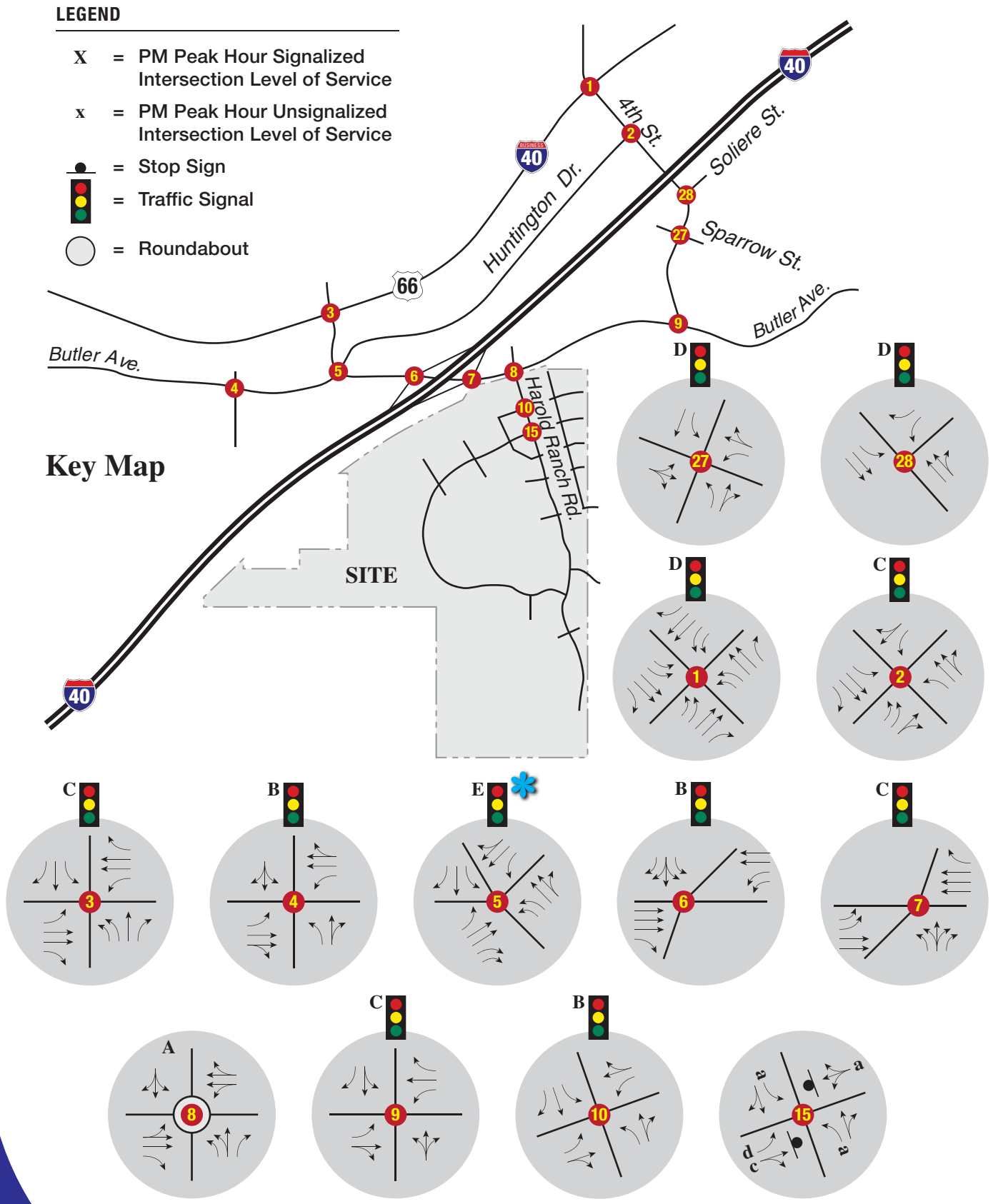


Figure 15
2025 Total Traffic Volumes

FELSBURG HOLT & ULLEVIG

NORTH



Revising the Southbound Approach to RH/TH+TH+LT Improves Operations to LOS D

Figure 16
2025 Total Levels of Service

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/26/13

VI. TRAFFIC IMPACTS – FULL BUILDOUT 2030

A. 2030 Background Traffic Conditions

Background traffic volumes for 2030 were calculated using growth factors from the travel demand model provided by the Flagstaff MPO and are shown on **Figure 17**.

Figure 18 provides the projected levels of service, lane geometry and traffic control for the study area intersections. It has been assumed that the JW Powell Boulevard extension to 4th Street would be completed as part of the background road network.

With the completion of the JW Powell Extension as the fourth leg of the East Butler Avenue/4th Street intersection, it is recommended that the eastbound leg have a left turn lane, two through lanes and a right turn lane, the northbound leg have separate left, through and right turn lanes, the westbound leg have a left turn lane, two through lanes and a right turn lane, and the southbound leg have separate left, through and right turn lanes. With these improvements the intersection would operate at LOS C. Furthermore, it is recommended that East Butler Avenue be widened to four lanes from 4th Street east to the existing five lane section that begins just west of Sinagua Heights Drive, thereby completing the widening of East Butler to two lanes in each direction lanes for all segments east of I-40.

At the unsignalized East Butler Avenue/Harold Ranch Road intersection, the northbound movement would operate at LOS F. The northbound traffic volumes would be approximately 100 vehicles per hour, the v/c ratio would be 0.97 and the projected 95th percentile queue length would be six vehicles. These conditions would suggest that a traffic signal would be appropriate at that location, but the projected side street traffic volumes would not be great enough to warrant a signal.

Appendix G contains the 2030 background level of service worksheets.

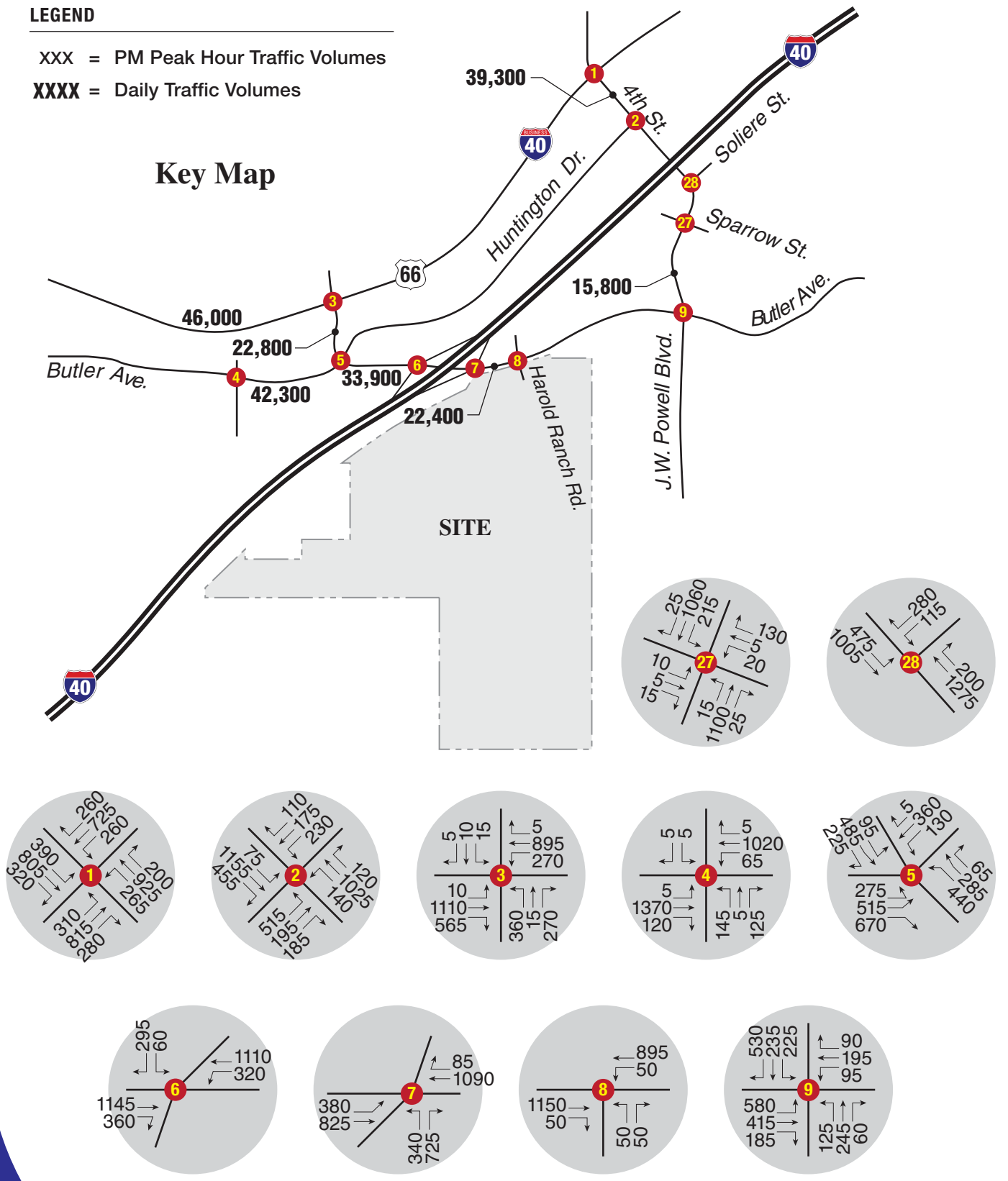


Figure 17
2030 Background Traffic Volumes

FELSBURG HOLT & ULLEVIG

NORTH

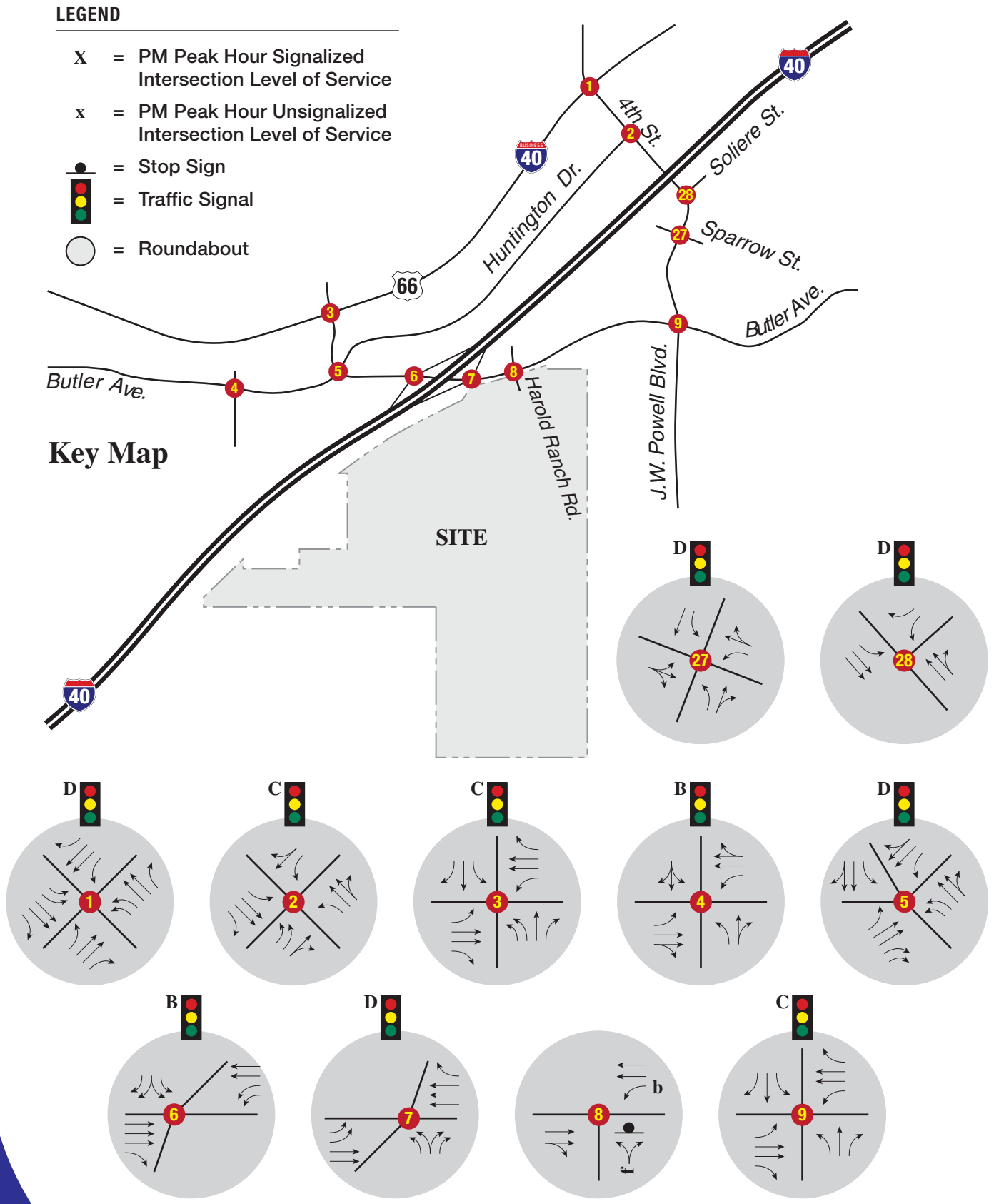


Figure 18
2030 Background Levels of Service

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/20/13

B. 2030 Total Traffic Conditions

Site generated traffic volumes from **Figure 8** were added to the 2030 background traffic volumes in **Figure 17** to estimate the 2030 total traffic volumes. **Figure 19** shows the 2030 total traffic volumes, while **Figure 20** shows the lane geometry and levels of service.

C. 2030 Roadway and Intersection Improvement Needs

The following highlights the traffic operations and improvement needs at the major intersections within the study area.

Existing Intersections

4th Street / US 66

This intersection would operate at LOS D in the long range future (2030) with the project. This level of service meets the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

4th Street / Industrial Drive / Huntington Drive

This intersection would operate at LOS D in the long range future with the project. This level of service meet the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

US 66 / Ponderosa Parkway

This intersection would operate at LOS C in the long range future with the project. This level of service meets the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

Butler Aveue / Babbitt Drive

This intersection would operate at LOS B in the long range future with the project This level of service meet the City's level of service standard of LOS D or better, so no changes in lane geometry at the intersection would be required.

Butler Avenue / Ponderosa Parkway / Huntington Drive

By converting the southbound approach at this intersection from right + through + left to shared through-right + through + left, and changing the eastbound right turn phasing to protected + overlap to eliminate any safety conflicts that might occur between the dual right turn lanes and the two southbound through lanes, this intersection would operate at LOS D with the project.

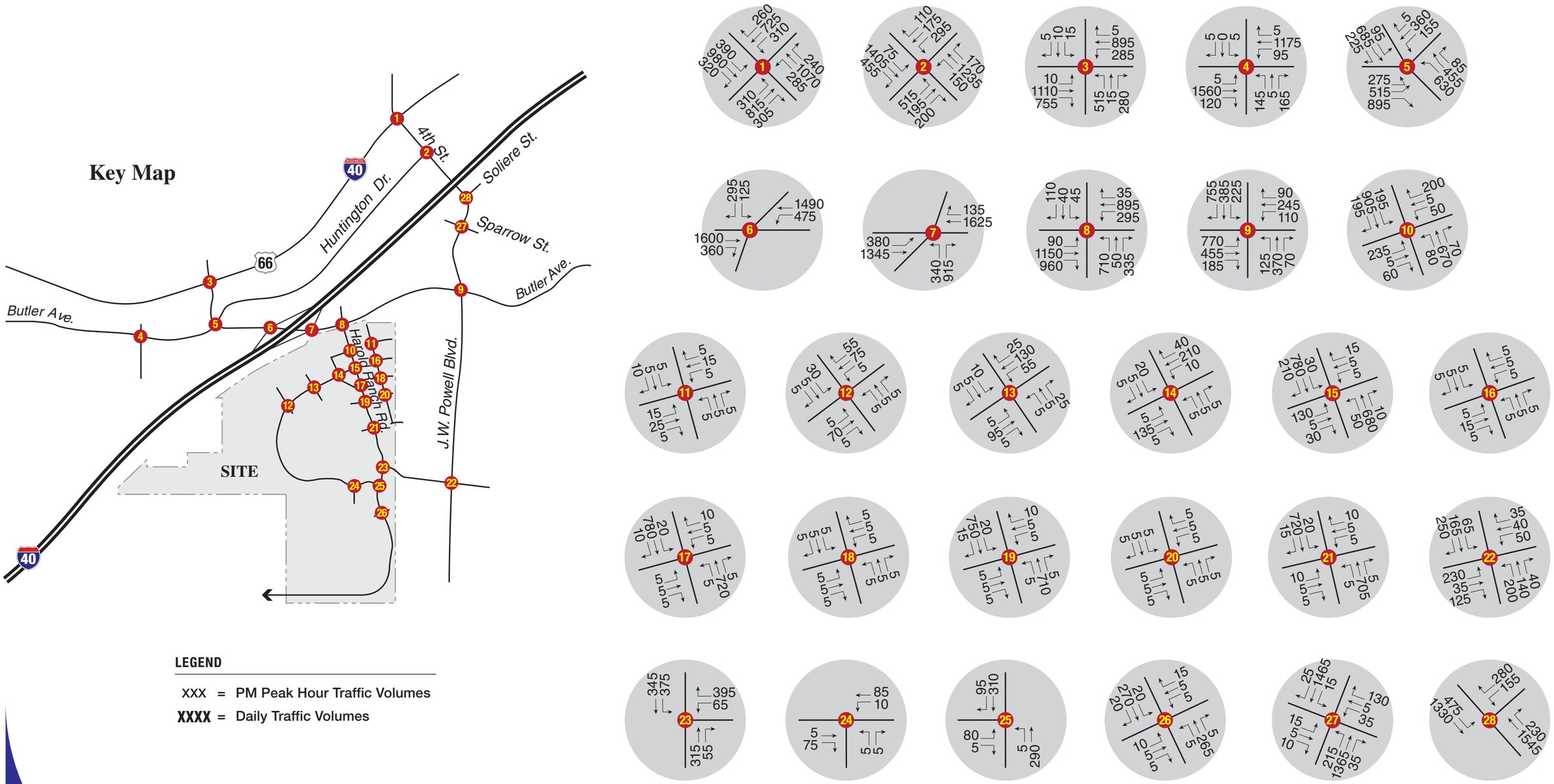
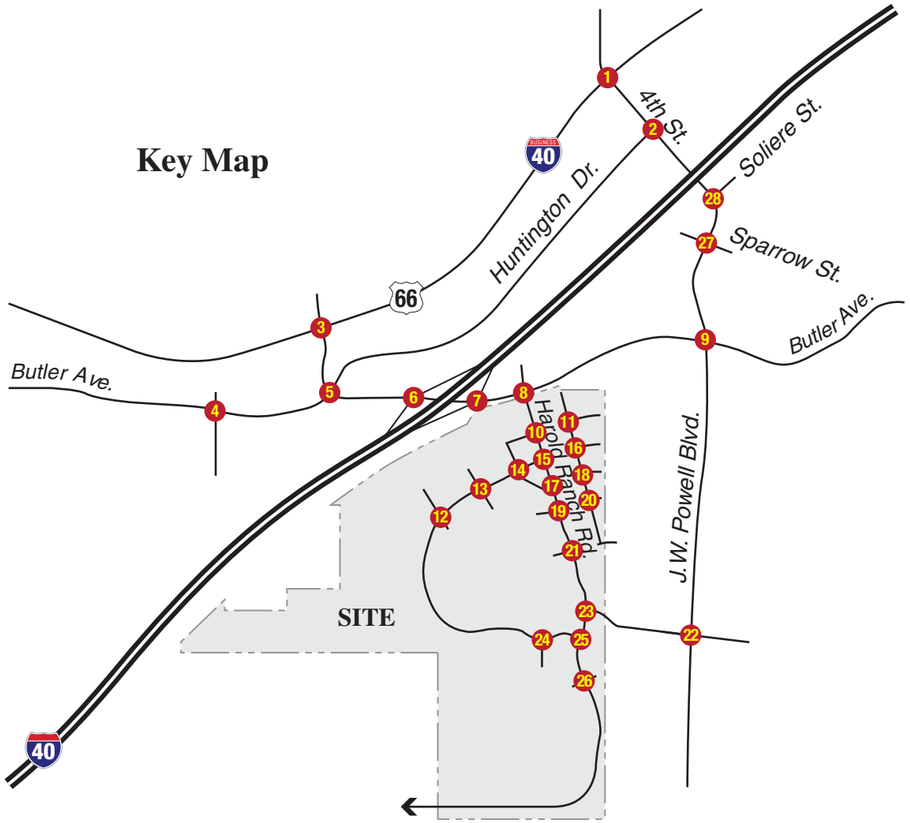


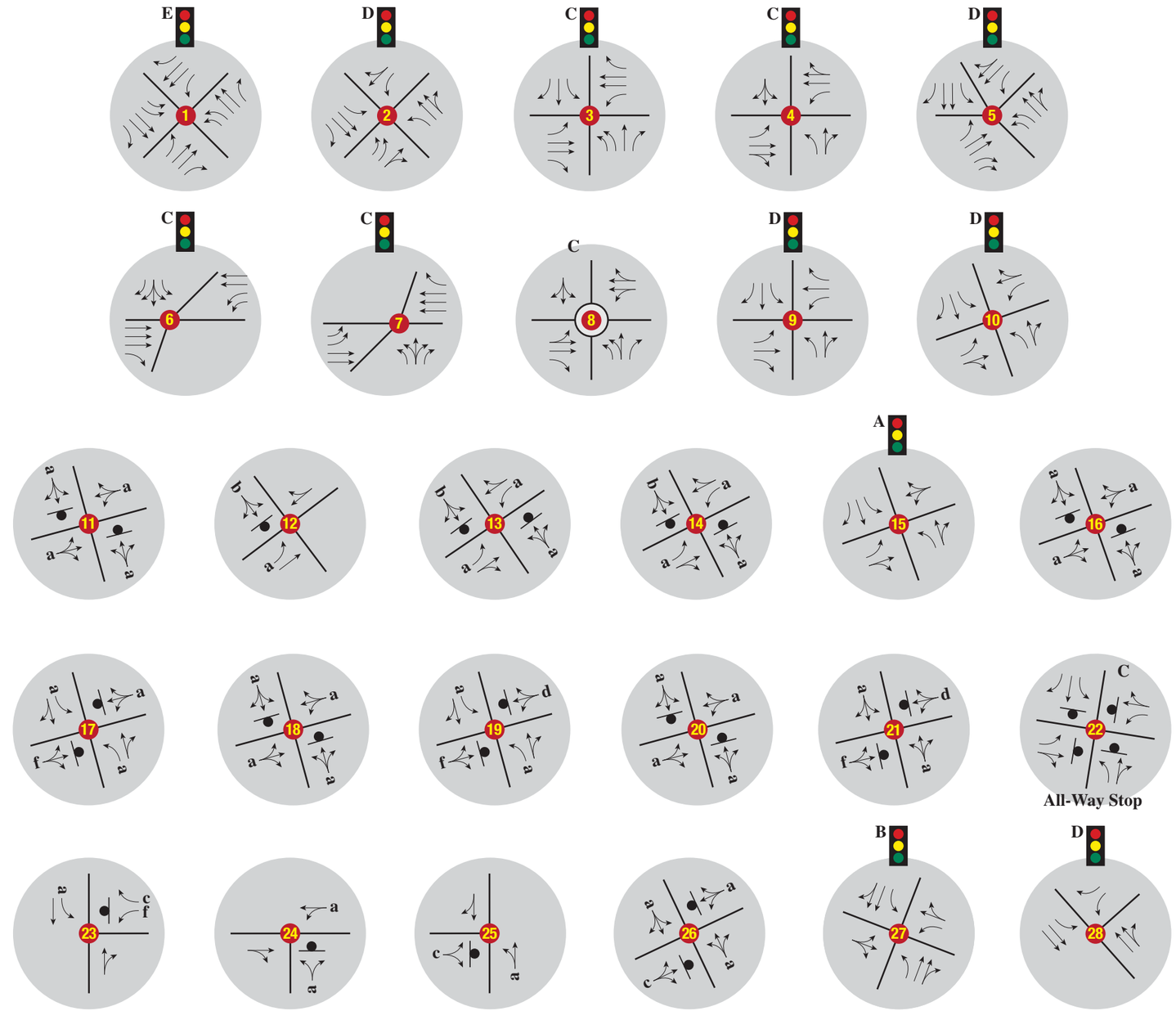
Figure 19
2030 Total Traffic Volumes

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/26/13





LEGEND

X = PM Peak Hour Signalized Intersection Level of Service

x = PM Peak Hour Unsignalized Intersection Level of Service

= Stop Sign

= Traffic Signal

= Roundabout

Figure 20
2030 Total Levels of Service

FELSBURG HOLT & ULLEVIG

NORTH

Flagstaff Little America, 13-075, 6/21/13

Butler Avenue / I-40 Ramps

ADOT is currently conducting a Design Concept Study to determine potential improvements to this interchange. Four designs are currently under consideration; this report analyzed the improved diamond option that includes dual left-turn lanes at the ramps and a total of seven lanes on Butler Avenue between the ramps. With this configuration the westbound ramp intersection would operate at LOS C and the eastbound ramp intersection would operate at LOS D in the long range future with the project. Both are adequate level of service and thus no additional changes in the proposed improved diamond lane geometry would be required.

East Butler Avenue / Harold Ranch Road

This intersection would serve as the main access to the Little America property, and would have roundabout traffic control. To accommodate buildout of the project, the roundabout would have two circulating lanes, an eastbound right turn bypass lane and a northbound right turn bypass lane. Under this configuration the intersection would operate at LOS C with the project.

4th Street / East Butler Avenue / JW Powell Extension

In the long range future it was assumed that the JW Powell Drive extension would be completed and form the south leg of this intersection. To accommodate the JW Powell Extension and the projected traffic volumes on East Butler Avenue and 4th Street, it is recommended that the eastbound leg have a left turn lane, two through lanes and a right turn lane, the northbound leg have separate left, through and right turn lanes, the westbound leg have a left turn lane, two through lanes and a right turn lane, and the southbound leg have separate left, through and right turn lanes. With these improvements the intersection would operate at LOS D.

4th Street / Sparrow Avenue

This study identified a need to widen 4th Street to 4 lanes between East Butler Avenue and Huntington Drive/Industrial Drive to accommodate long range traffic forecasts both without and with project traffic (see roadways discussion below). With 4th Street as a four lane roadway, this intersection would operate at LOS B during the PM peak hour.

4th Street / Soliere Avenue

This study identified a need to widen 4th Street to 4 lanes between East Butler Avenue and Huntington Drive/Industrial Drive to accommodate long range traffic forecasts both without and with project traffic (see roadways discussion below). With 4th Street as a four lane roadway, this intersection is expected to operate at LOS D.

New Intersections

Harold Ranch Road / Retail Driveway (Internal Intersection #10)

This internal intersection south of East Butler Avenue intersection is expected to meet signal warrants at full buildout of the project. It is recommended that the intersection geometry include left turn and right turn lanes on the eastbound approach, a right turn and through lane on the southbound approach, and a left turn and through lane on the northbound approach. With this geometry, the signalized intersection would operate at LOS C during the PM peak hour.

Harold Ranch Road / Hotel and Golf Course Loop Road (Internal Intersection #15)

This internal intersection south of the above intersection is expected to meet signal warrants at full buildout of the project due to projected through traffic volumes on Harold Ranch Road and projected side street volumes associated with the hotel, conference center and golf course. It is recommended that the intersection geometry include a left turn lane and a through/right turn lane on the eastbound approach, a left turn lane and a through/right turn lane on the northbound approach, a single left/through/right turn lane on the westbound approach, and separate left through and right turn lanes on the southbound approach. With this geometry, the signalized intersection would operate at LOS A during the PM peak hour.

Harold Ranch Road / JW Powell Boulevard Extension (Internal Intersection #22)

This intersection of two future public roads would be located south and east of the project. It was initially assumed to have left turn pockets on all four legs, a southbound right turn lane, and stop control on the Harold Ranch Road approaches. With this geometry both side street left turn movements from Harold Ranch onto JW Powell would operate at LOS F, with the eastbound to northbound left turn experiencing v/c ratios greater than 1.0 and queues of 12 vehicles. Traffic volumes are not anticipated to meet signal warrants in 2030, so to mitigate the poor traffic operations, all way stop control is recommended. Under all way stop control the intersection would operate at LOS C, with queues of four vehicles or less on all four approaches.

Roadways

East Butler Avenue

It is recommended that East Butler Avenue be widened to four lanes between I-40 and the existing five lane section east of 4th Street to accommodate the long range future traffic forecasts on that road. The segment between I-40 and the east end of the Little America property should be widened in 2020, the segment between Little America and 4th Street should be widened in 2025, and the segment between 4th Street and the existing five lane section east of 4th Street should be widened in 2030.

4th Street

It is recommended that 4th Street be widened to four lanes between East Butler Avenue and Huntington Drive/Industrial Drive to accommodate the long range future traffic forecasts on that road. The segment between Huntington/Industrial and Sparrow Avenue should be widened in 2025 and the segment between Waterslide Drive and East Butler Avenue should be widened in 2030.

Harold Ranch Road

Based on the long range traffic forecasts, Harold Ranch would function adequately as a two lane roadway. Left turn lanes should be constructed at all key intersections. A southbound right turn lane should also be constructed at the retail driveway intersection and the hotel access road intersection. All other internal roadway intersections should have two way stop control, with Harold Ranch Road functioning as the major (uncontrolled) street.

Appendix H contains the 2030 total level of service worksheets.

D. Alternate Modes

The City of Flagstaff's travel demand model was used to determine the transit trips and the pedestrian/bicycle trips generated by the project. These forecasts include both the internal trips that would stay within the site boundaries and the external trips that would use the surrounding road network (although it would be relatively safe to assume that all of the transit trips would be external trips). **Table 5** shows the results of the evaluation and includes the model's forecast of daily vehicle trips from the site to provide a basis for comparison. As shown, at buildout the site is anticipated to generate approximately 440 daily transit trips (two percent of the total trips generated by the site), and 1,300 daily pedestrian and bicycle trips (four percent of the total). These volumes support the provision of transit service and pedestrian and bicycle facilities along East Butler Avenue to accommodate the off-site alternate mode trips. It is also recommended that the primary roads within the site include bike lanes and sidewalks to accommodate the internal nonmotorized trip needs. Particular consideration should be given to creating convenient nonmotorized connections between the residential areas and the commercial development along East Butler Avenue to encourage the use of alternate modes for the internal trips made between the residences and the shopping center.

Table 5. Daily Transit and Pedestrian/Bicycle Trip Generation for the Site

Travel Mode	Daily Trips	Percent of Total
Vehicle Trips	25,770	94%
Transit Trips	440	2%
Ped/Bike Trips	1,300	4%
Total	**27,510**	**100%**

VII. CONCLUSIONS AND RECOMMENDATIONS

The Little America property is located in the southeast quadrant of the I-40 / Butler Avenue interchange. Existing land uses on the site include the Little America Hotel and the Sinclair gas station and truck stop along East Butler Avenue, but the remainder of the approximately 537-acre parcel is undeveloped. For the purpose of this traffic analysis, full development of the site was assumed to include approximately 1,218 multi-family homes, 211 single family homes, 206,500 square feet of commercial development along East Butler Avenue, a 200-room hotel/conference center, and an 18-hole golf course. The primary access will be via the East Butler Avenue/Harold Ranch Road intersection, which would be improved to roundabout traffic control as part of the project. In the long-term, it is expected that John Wesley Powell Boulevard (JW Powell Boulevard) will be extended up from the south to connect to 4th Street, east of the site, and that Harold Ranch Road will connect to JW Powell Boulevard east of the project site.

Full buildout of the site is anticipated to generate approximately 26,000 external daily vehicle trips, with 2,300 of those trips occurring in the PM peak hour. The site is also forecast to generate approximately 440 daily transit trips and 1,300 daily pedestrian and bicycle trips, which are significantly high enough volumes to support the provision of transit service and pedestrian and bicycle facilities along East Butler Avenue to accommodate the off-site trips.

Construction is currently projected to begin in 2018 and be completed by 2030. Interim development analyses were conducted in 2020 and 2025 to assist in determining when the various road system improvements would need to be implemented to ensure the road system operates adequately throughout the development process. **Table 6** summarizes the intersection, roadway and traffic control improvements required in each interim year and at buildout to mitigate the impacts of both background traffic growth and traffic associated with the project.

Table 6. Road System Improvement Needs Summary

Location	Year		
	2020	2025	2030
Intersections			
Butler/Ponderosa/ Huntington		Convert the southbound approach from RT + TH + LT to RT/TH + TH + LT. Change the eastbound right turn phasing from permitted + overlap to protected + overlap.	
Butler/I-40 Interchange	N/A[1]		
East Butler/ Harold Ranch	Construct a 2 lane roundabout with eastbound to southbound and northbound to eastbound right turn bypass lanes.		
East Butler/4th Street	Change the southbound approach striping to a shared through/left and a right turn lane. Add an overlap phase for the southbound to westbound right turn.		Construct JW Powell Extension as south leg of intersection. Construct the north and south approaches with separate left, through and right turn lanes, and the east and west approaches with a left lane, two through lanes and a right turn lane.
Harold Ranch Road/ Retail Driveway	Construct eastbound left turn and right turn lanes, a northbound left turn lane and a southbound right turn lane.	Signalize	
Harold Ranch Road/ Hotel Access		Construct a southbound right turn lane and an eastbound left turn lane.	Signalize
Harold Ranch Road/JW Powell Boulevard Extension			Construct left turn pockets on all four approaches and a southbound right turn lane. Install all way stop control.

1. ADOT is currently undertaking a study that will identify the preferred design alternative for this interchange. For the purpose of this study a diamond interchange with seven lanes on Butler Road was assumed, and that configuration was able to accommodate buildout traffic forecasts.

Table 5 (cont.). Road System Improvement Needs Summary

Location	Year		
	2020	2025	2030
Roadways			
East Butler Avenue	Widen to 4 lanes between I-40 and Harold Ranch Road	Widen to 4 lanes between Harold Ranch Road and 4th Street	Widen to 4 lanes between 4th Street and the existing five lane section to the east
4th Street		Widen to 4 lanes between Industrial/Huntington and Sparrow Avenue	Widen to 4 lanes between Waterslide Drive and East Butler Avenue
Harold Ranch Road	Construct to Parcels F and J as a two lane road with left turn pockets at internal roadway intersections	Construct to Parcels U and V as a two lane road with left turn pockets at internal roadway intersections	Connect to JW Powell Boulevard Extension