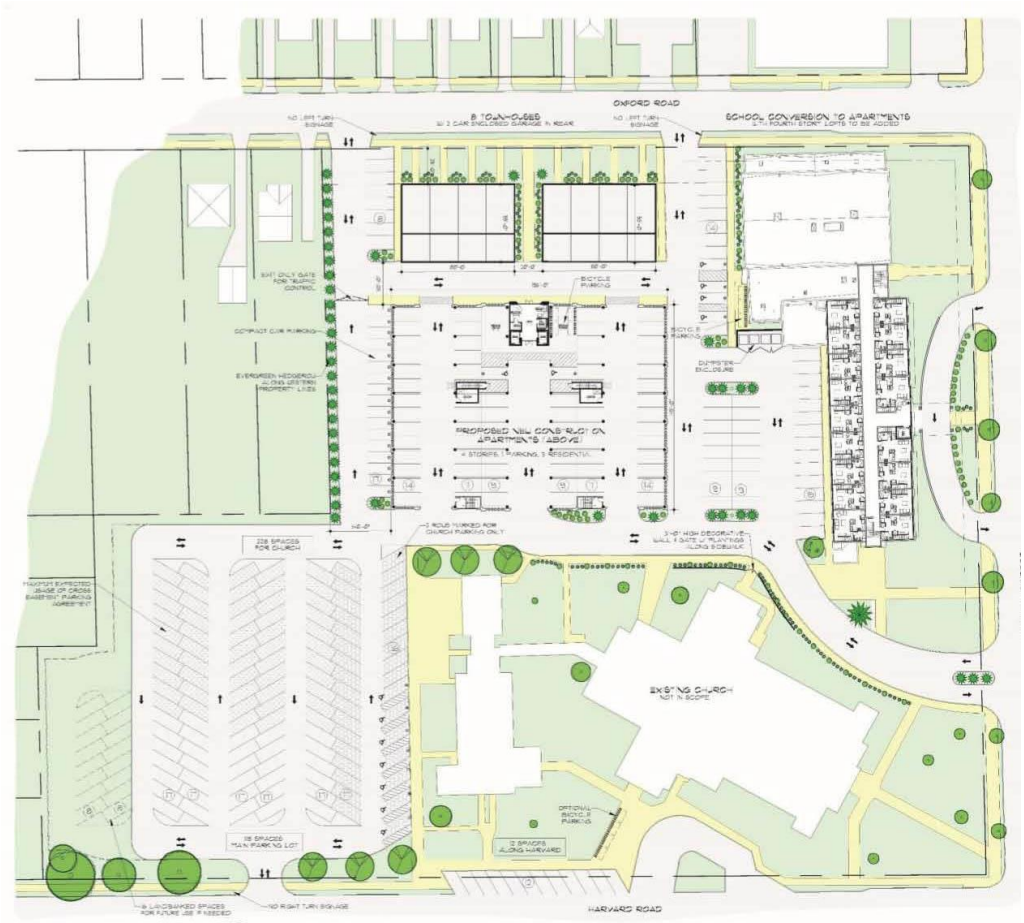
TRAFFIC IMPACT STUDY FOR PROPOSED

THE BERKLEY

PLANNED UNIT DEVELOPMENT

BERKLEY, MI



Prepared for
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CONTENTS

TRAFFIC IMPACT STUDY FOR PROPOSED
"THE BERKLEY" PUD

EXECUTIVE SUMMARY

This study examines the potential traffic impacts of constructing 130 apartments and eight residential condominium units immediately north of Our Lady of Salette Catholic Church, on Coolidge Highway in the City of Berkley. The apartments will be located both in the site's existing two attached buildings north of the church and in a new three-level structure above the existing parking lot. Access to the parking spaces serving the new residential units will occur at four locations: the existing church driveway on Coolidge, two drives on Oxford Road, and one drive on Harvard Road. A one-way pick-up/drop-off drive is also proposed on Coolidge, but this drive will not include any parking and no attempt has been made in this study to forecast the amount of traffic the drive may serve. The proposed development is assumed to be completed and fully occupied within two years.

Ordinarily the number of residential units proposed in this case would not warrant a traffic study examining anything more than the site's access drives (based on the amount of peak-hour traffic potentially generated). However, to more fully identify potential traffic impacts to neighboring residents, this study also evaluates the four intersections surrounding the block in question (Oxford/Kipling, Oxford/Coolidge, Harvard/Coolidge, and Harvard/Kipling).

This report documents the traffic study by reviewing existing conditions, the potential conditions in 2019 in the hypothetical absence of proposed development, and the expected conditions in 2019 with both potential background traffic growth and the development fully occupied. Recommendations are offered regarding actions that might be taken by the applicant and the City to minimize the impacts of the new residential traffic.

The study's key findings, conclusions, and recommendations are as follows:

- Based on national trip generation sampling at apartments and residential condominiums, the proposed 130 apartments and eight condominiums can be expected to generate a total of about 74 one-way vehicle trips in the AM peak hour (14 entering and 60 exiting) and a total of about 97 one-way vehicle trips in the PM peak hour (63 entering and 34 exiting). Given the expected demographics of the residents (e.g., to include significant numbers of senior citizens), the actual trip generation in this case may be even less.

- Levels of service have been assigned on an A-F grading scale based average delays estimated by a traffic model. Most levels of service in the study area are and will remain A or B (i.e., excellent or very good). Only the stop-sign-controlled Oxford approaches to Coolidge incur (and will continue to incur) lower levels. This is relatively common, however, along an arterial as well-traveled as Coolidge.

- Given the alternative ingress and egress routes available to the new residents, and the good levels of service afforded by the traffic signal at Harvard and Coolidge, relatively few

trips are likely to be made along the residential streets west of the site. Even in the hypothetical absence of restrictions at the site drives on Oxford and Harvard, *this study predicts that no more than 4-6 directional peak-hour site trips would occur on Kipling to the north or south as an alternative to using Coolidge (i.e., one every 10-15 minutes).*

- Overall, the neighborhood traffic impacts of the proposed development will be negligible. However, to ensure that these very small impacts are absolutely minimized, Giffels Webster recommends the following:

  - The existing site access drive on Coolidge should serve only entering and exiting right turns. At a minimum, No Left Turn signs should be installed on both sides of NB Coolidge as well as the driveway itself. The effectiveness of this regulation would be enhanced by inserting a triangular island in the mouth of the driveway (if feasible).

  - Although few new residents are expected to use neighborhood streets west of the site, the City and/or applicant may wish to post turn restrictions at the site driveways on Oxford and Harvard. If so, these should include No Left Turns signs on the exiting side of both Oxford driveways and a No Right Turn sign on the exiting side of the Harvard driveway. The effectiveness of these regulations would be enhanced by providing a typical curb radius on the side of each driveway nearest Coolidge and a zero or minimum radius on the side of each driveway nearest the neighborhood (typically a 5-ft minimum radius is desirable to ensure efficient street sweeping and snow removal).

  - Enforcement of the above turn restrictions should be discussed with the City. The applicant has offered to include penalties within unit leases pertaining to violations.

  - Ample directional signing should be posted within the site parking lots to encourage departing residents with destinations to the north to drive through the site to Harvard and take advantage of the signal at Coolidge. A cross-access easement with the church would be appropriate. Although less important, signing to direct residents with destinations to the south to exit via the existing site driveway on Coolidge would also be desirable.

  - The City should proceed to add permissive-protected left-turn phasing at the Coolidge/11 Mile signal at the earliest opportunity, to address the existing EB left-turn backups observed in the PM peak hour.

TRAFFIC IMPACT STUDY FOR PROPOSED "THE BERKLEY" PUD

INTRODUCTION

This study examines the potential traffic impacts of constructing 130 apartments and eight residential condominium units immediately north of Our Lady of Salette Catholic Church, on Coolidge Highway in the City of Berkley, (Figures 1-3). The apartments will be located both in the site's existing two attached buildings north of the church and in a new three-level structure above the existing parking lot (Figure 4). Access to the parking spaces serving the new residential units will occur at four locations: the existing church driveway on Coolidge, two drives on Oxford Road, and one drive on Harvard Road. A one-way pick-up/drop-off drive is also proposed on Coolidge, but this drive will not include any parking and no attempt has been made in this study to forecast the amount of traffic the drive may serve. The proposed development is assumed to be completed and fully occupied within two years.

Ordinarily the number of residential units proposed in this case would not warrant a traffic study examining anything more than the site's access drives (based on the amount of peak-hour traffic potentially generated). However, to more fully identify potential traffic impacts to neighboring residents, this study also evaluates the four intersections surrounding the block in question (per Figure 2, Oxford/Kipling, Oxford/Coolidge, Harvard/Coolidge, and Harvard/Kipling).

This Giffels Webster report documents the traffic study by reviewing existing conditions, the potential conditions in 2019 in the hypothetical absence of proposed development, and the expected conditions in 2019 with both potential background traffic growth and the development fully occupied. Recommendations are offered regarding actions that might be taken by the applicant and the City to minimize the impacts of the new residential traffic.

EXISTING CONDITIONS

Land Uses

As can be seen in Figure 3, the site borders a section of Coolidge lined by a variety of commercial uses. The parcel on which the former school building is situated is now zoned Office, and the rear of the site is now zoned Multiple Family (as a transition to the Single Family district to the west). The proposed development will consolidate the parcels as a Planned Unit Development (PUD).

Roadway Network

All roads in the immediate area are under the jurisdiction of the City of Berkley. Coolidge Highway has a posted speed limit of 30 mph, two through lanes in each direction, and a center left-turn lane at the signalized intersection of Harvard and Coolidge (Appendix B). All nearby local streets have a 25-mph speed limit and are controlled by stop signs: EB-WB at Oxford/Coolidge and NB-SB at both Oxford/Kipling and Harvard/Kipling. The existing church driveway on Coolidge is regulated by two stop signs and two No Left Turn signs on its eastbound approach to Coolidge (Figure 5).

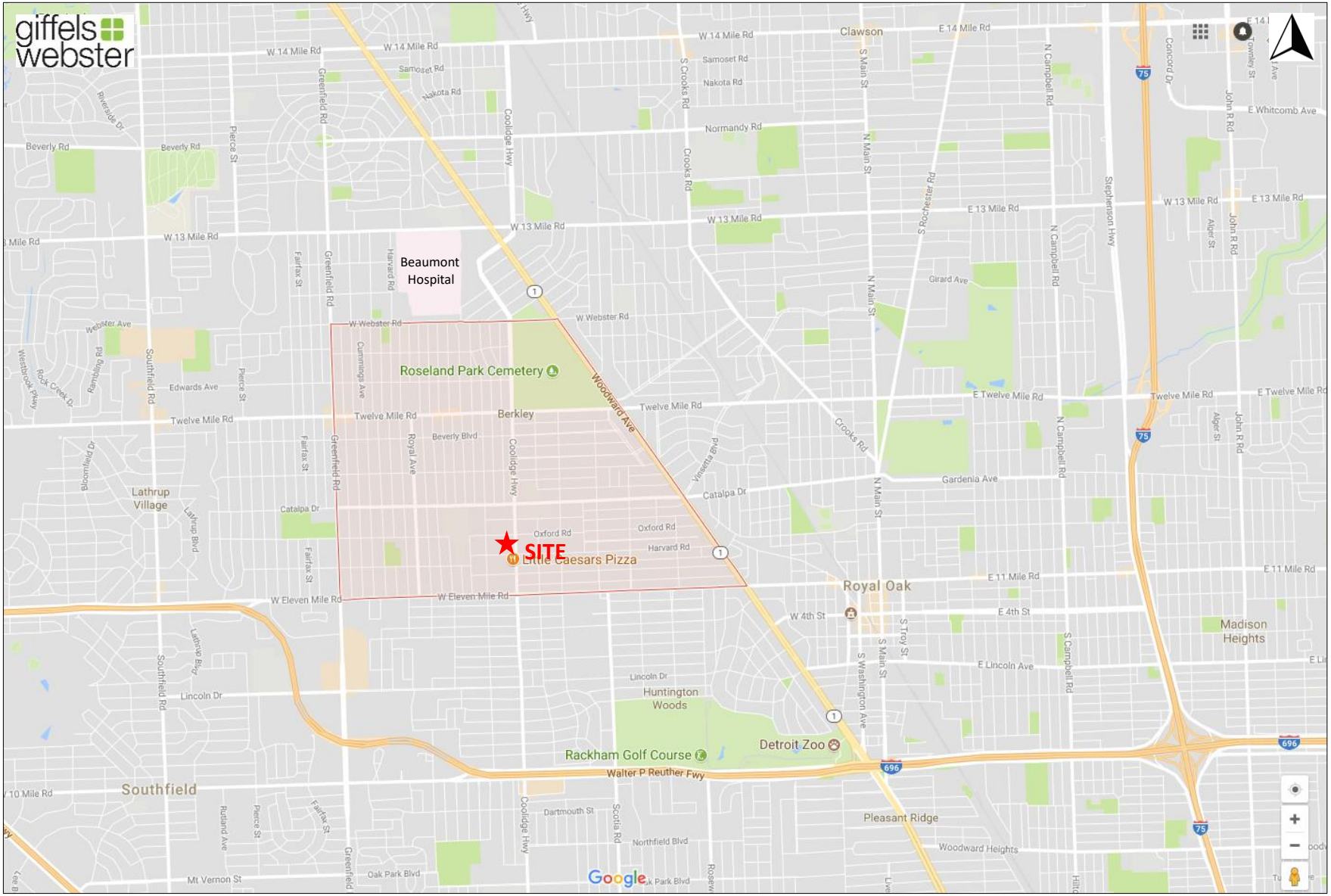


Figure 1. Vicinity Map

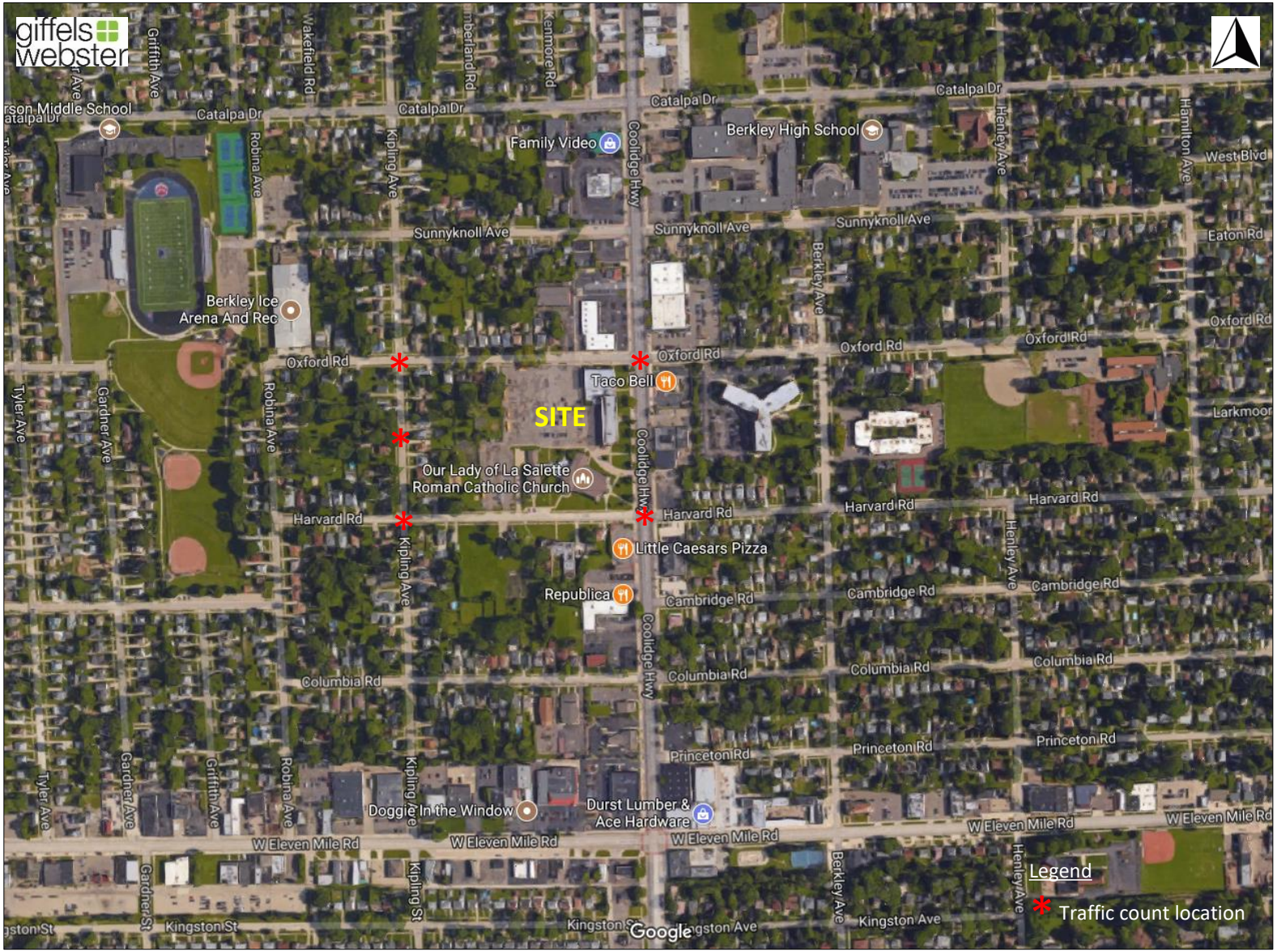


Figure 2. Site Location in Southern Berkley

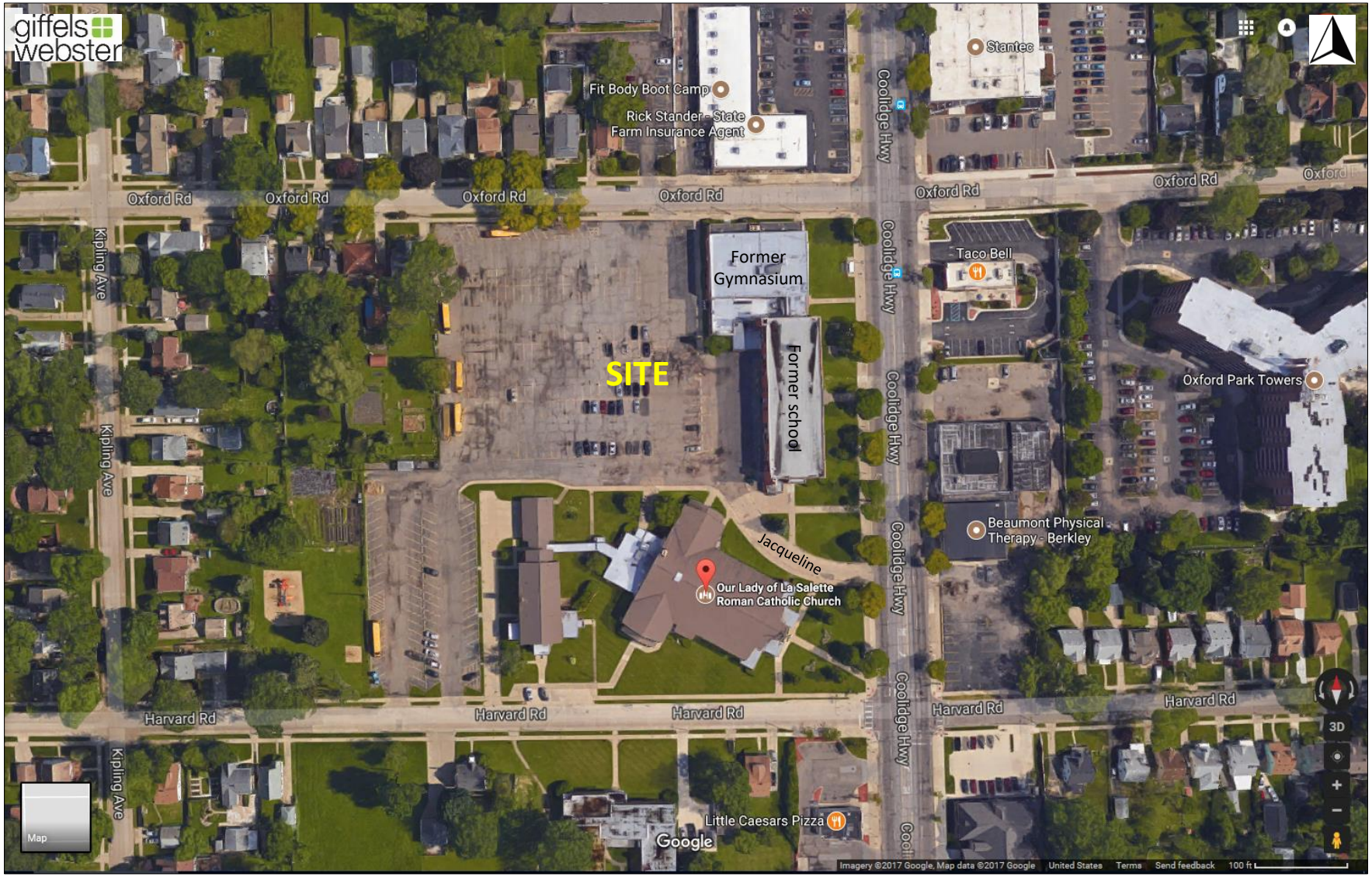
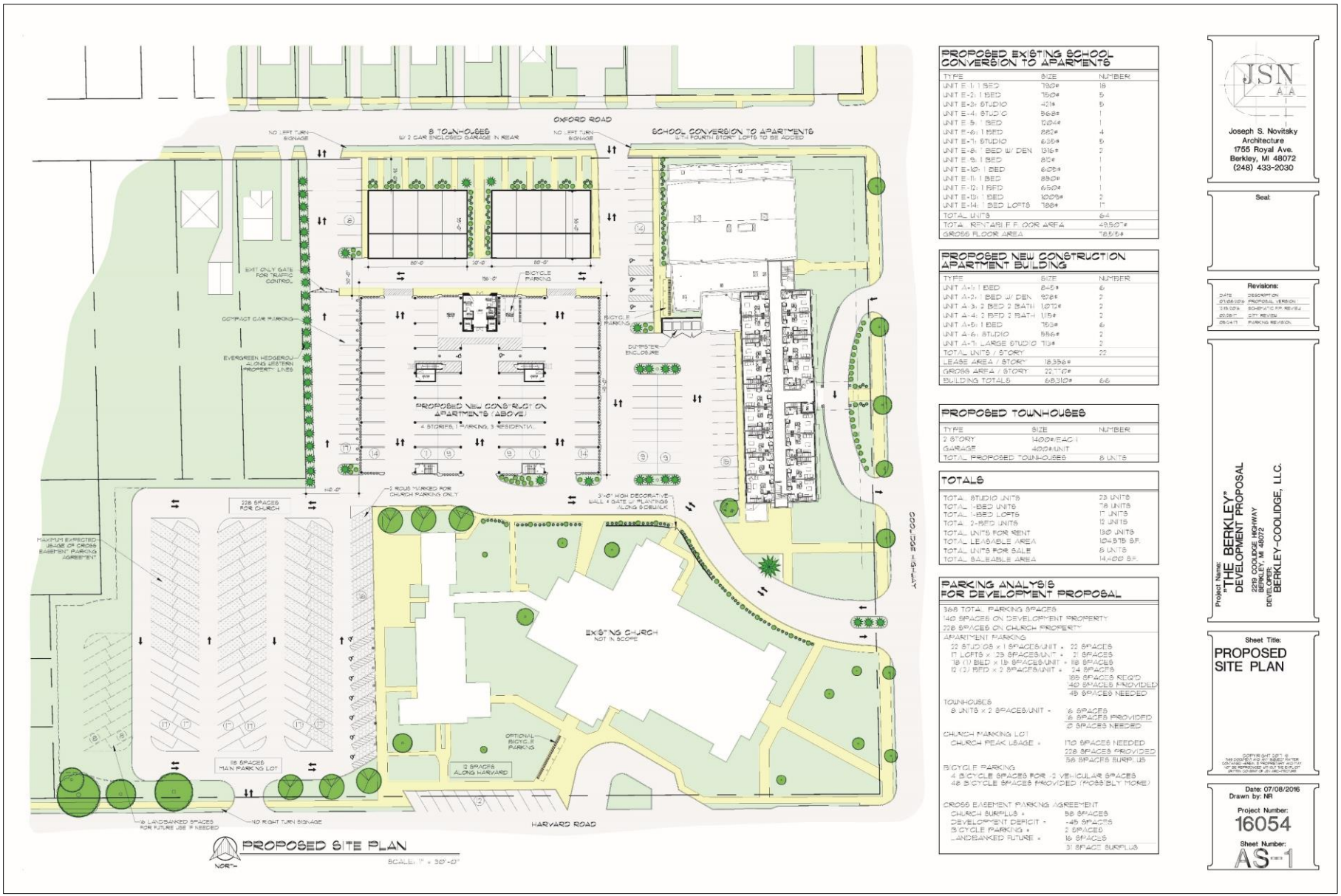


Figure 3. Site Aerial



PROPOSED EXISTING SCHOOL CONVERSION TO APARMENTS

TYPE	SIZE	NUMBER
UNIT E-1: 1 BED	790#	18
UNIT E-2: 1 BED	750#	5
UNIT E-3: STUDIO	421#	5
UNIT E-4: STUDIO	568#	1
UNIT E-5: 1 BED	1204#	1
UNIT E-6: 1 BED	882#	4
UNIT E-7: STUDIO	635#	5
UNIT E-8: 1 BED W/ DEN	1316#	2
UNIT E-9: 1 BED	812#	1
UNIT E-10: 1 BED	605#	1
UNIT E-11: 1 BED	850#	1
UNIT E-12: 1 BED	650#	1
UNIT E-13: 1 BED	1009#	2
UNIT E-14: 1 BED LOFTS	788#	1*
TOTAL UNITS		64
TOTAL RENTABLE F.F. FLOOR AREA		49,507#
GROSS FLOOR AREA		78,515#

PROPOSED NEW CONSTRUCTION APARTMENT BUILDING

TYPE	SIZE	NUMBER
UNIT A-1: 1 BED	845#	6
UNIT A-2: 1 BED W/ DEN	928#	2
UNIT A-3: 2 BED 2 BATH	1,072#	2
UNIT A-4: 2 BED 2 BATH	1,154#	2
UNIT A-5: 1 BED	753#	6
UNIT A-6: STUDIO	556#	2
UNIT A-7: LARGE STUDIO	719#	2
TOTAL UNITS / STORY		22
LEASE AREA / STORY	18,356#	
GROSS AREA / STORY	22,770#	
BUILDING TOTALS	68,310#	66

PROPOSED TOWNHOUSES

TYPE	SIZE	NUMBER
2 STORY	1400#/EACH	
GARAGE	400#/UNIT	
TOTAL PROPOSED TOWNHOUSES		8 UNITS

TOTALS

TOTAL STUDIO UNITS	23 UNITS
TOTAL 1-BED UNITS	78 UNITS
TOTAL 1-BED LOFTS	11 UNITS
TOTAL 2-BED UNITS	12 UNITS
TOTAL UNITS FOR RENT	130 UNITS
TOTAL LEASABLE AREA	104,578 S.F.
TOTAL UNITS FOR SALE	8 UNITS
TOTAL SALEABLE AREA	14,400 S.F.

PARKING ANALYSIS FOR DEVELOPMENT PROPOSAL

368 TOTAL PARKING SPACES
140 SPACES ON DEVELOPMENT PROPERTY
228 SPACES ON CHURCH PROPERTY

APARTMENT PARKING
22 STUDIOS x 1 SPACES/UNIT = 22 SPACES
11 LOFTS x 1.25 SPACES/UNIT = 21 SPACES
78 (1) BED x 1.5 SPACES/UNIT = 118 SPACES
12 (2) BED x 2 SPACES/UNIT = 24 SPACES
185 SPACES REQ'D
140 SPACES PROVIDED
45 SPACES NEEDED

TOWNHOUSES
8 UNITS x 2 SPACES/UNIT = 16 SPACES
16 SPACES PROVIDED
0 SPACES NEEDED

CHURCH PARKING LOT
CHURCH PEAK USAGE = 170 SPACES NEEDED
228 SPACES PROVIDED
58 SPACES SURPLUS

BICYCLE PARKING
4 BICYCLE SPACES FOR 2 VEHICULAR SPACES
48 BICYCLE SPACES PROVIDED (CROSSBY MORE)

CROSS EASEMENT PARKING AGREEMENT
CHURCH SURPLUS = 58 SPACES
DEVELOPMENT DEFICIT = -45 SPACES
BICYCLE PARKING = 2 SPACES
LANDBANKED FUTURE = 16 SPACES
31 SPACE SURPLUS

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Seal:

Revisions:

DATE	DESCRIPTION
07/08/2016	PROPOSAL VERSION
2/15/2016	SCHEMATIC P.R. REVIEW
02/26/11	CITY REVIEW
05/24/11	PARKING REVISION

Project Name:
"THE BERKLEY"
DEVELOPMENT PROPOSAL
2219 COOLIDGE HIGHWAY
BERKLEY, MI 48072
DEVELOPER:
BERKLEY-COOLIDGE, LLC.

Sheet Title:
PROPOSED SITE PLAN

Date: 07/08/2016
Drawn by: NR

Project Number:
16054

Sheet Number:
AS-1

Figure 4. Architectural Site Plan

Figure 5. Exiting Existing Church Driveway on Coolidge

Traffic Volumes

The websites of both the Southeast Michigan Council of Governments (SEMCOG) and Road Commission for Oakland County (RCOC) were first searched for past traffic volumes along Coolidge near the site. The nearest pertinent findings were for a point 1½ miles north of the site, in the City of Royal Oak. In the year 2015, SEMCOG reported that Coolidge 0.25 mile south of Woodward carried a two-way Annual Average Daily Traffic (AADT) volume of 12,935 vehicles (see appendix Table C-1).

SEMCOG also reported hourly traffic volumes on Coolidge at 12 Mile Road (Figure C-1). In the 5-6 p.m peak hour, the volume on the intersection's northbound approach constituted a typical 9.55% of the daily volume. This finding can be used to expand later hourly counts to a daily basis.

The following new traffic counts were conducted for the current study:

- Turning-movement volumes at selected intersections, in the typical 7-9 a.m. and 4-6 p.m. commuting peak periods. Coolidge/Oxford and Coolidge/Harvard were counted (via a video-based system) by TDC, LLC on Tuesday, 7-18-17, and Oxford/Kipling and Harvard/ Kipling were counted (manually) by Giffels Webster staff on Wednesday, 7-26-17.

- Automated directional (tube) counts on Kipling about half way between Oxford and Harvard, from midday on Tuesday, 7-25-17 to midday on Thursday, 7-27-17.

As can be seen by the church calendar (Figure C-2), there were no special traffic-generating events at Our Lady of Salette while these traffic counts were underway. Detailed count data appear in Appendix C. Current peak-hour turning-movement volumes are illustrated in Figure 6 (below).

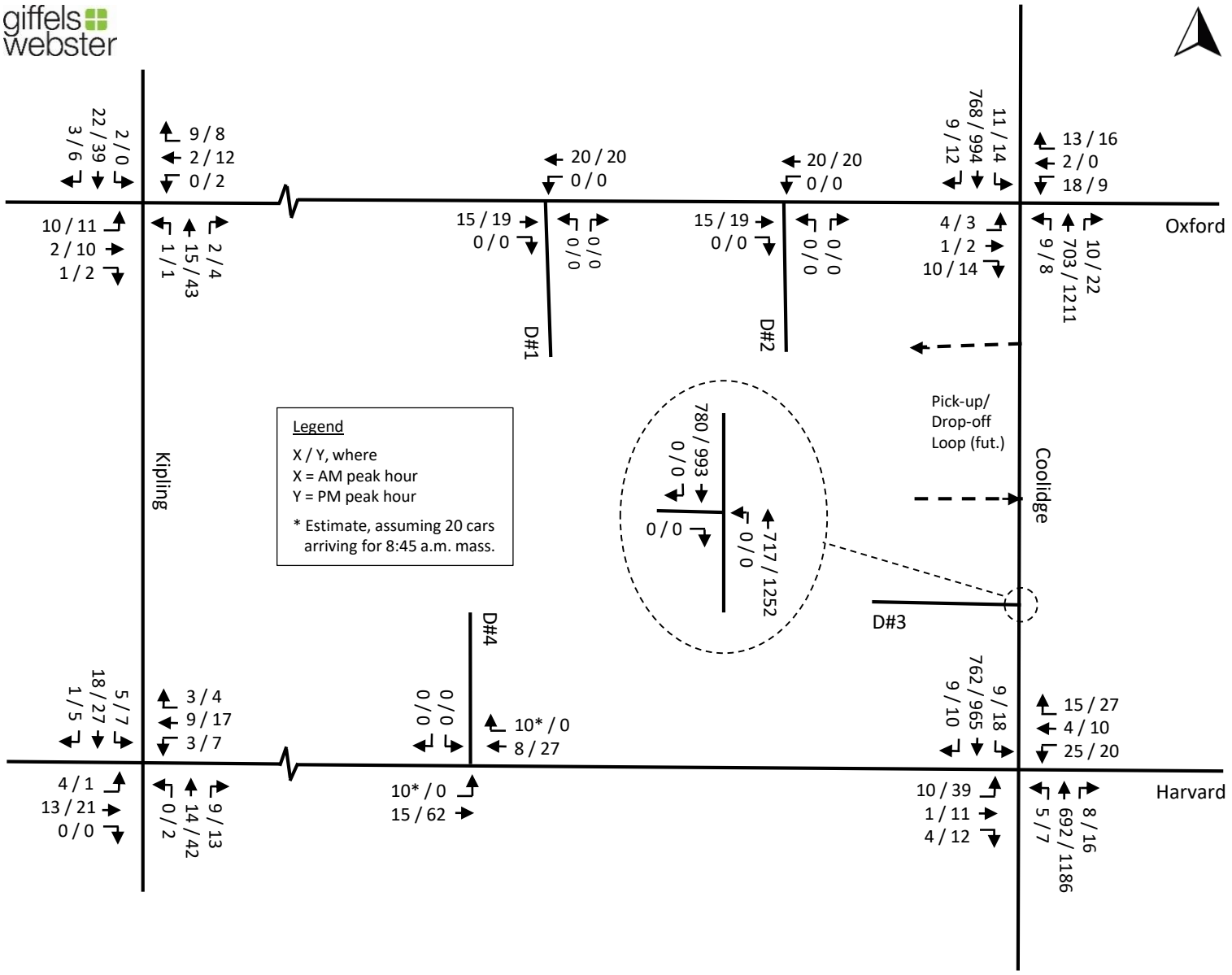

Figure 6. Current Weekday Peak-Hour Traffic Volumes

Current peak-hour volumes could potentially increase in September when school resumes. Given that this would be (strictly speaking) a future condition, discussion of the issue is reserved for the section below on future background traffic volumes.

Based on the average two-way PM peak-hour volume counted for this study on Coolidge adjacent to the site (2,250 vehicles) – and the percentage that volume likely constitutes of the daily volume (9.55%) – the approximate daily volume at the site is on the order of 23,500 vehicles. In contrast, the average daily volume actually counted on Kipling was found to be less than 800 vehicles.

FUTURE CONDITIONS

Land Uses

A 16-unit condominium development (Harvard Commons) is now under construction on the south side of Harvard just west of the church. This is the only other development in the general area expected to increase current traffic on area streets. This increase is forecasted below.

Roadway Network

Two planned road improvements in the area were identified:

- Later this year, the pavement surface on Coolidge will be improved between 11 and 12 Mile Roads. This project will also improve the pavement markings; near the site, the centerline tapers leading into the dedicated left-turn lanes at the Harvard signal will be lengthened somewhat – to 100 ft – more suitable for the street's 30-mph speed limit.

- The signal at Coolidge and 11 Mile will – at a point in time not yet confirmed – be upgraded to provide permissive-protected left-turn phasing. This improvement should prove very effective at reducing the eastbound left-turn backups noted in this study in the PM peak period.

Background Traffic

Future background volumes represent the traffic activity likely to be present upon site build-out, but in its hypothetical absence. Customarily, the levels of service afforded these volumes are predicted in order to have a proper basis for assessing the marginal impacts of adding site development traffic.

In this study, the first potential source of future traffic increases could be the resumption of normal school schedules this fall. Interestingly, however, traffic volumes collected throughout the year on major roads in southeast Michigan by SEMCOG (Table C-2) confirm the national trend that July and August are actually the most heavily traveled months of the year – at least as indicated by daily traffic volumes. While similar data do not appear to be readily available for particular hours of the day, previous work by Giffels Webster suggests that traffic volumes in the morning commuting peak

period could be on the order of 4-5% higher when school is in session than when it is not; hence, this study conservatively assumes a 5% increase in the counted AM peak-hour volumes with the fall resumption of school. Since school activities generally are negligible in the afternoon commuting peak period, however, current volumes in the PM peak hour were assumed to remain unchanged.

The second potential source of future traffic increases is increased regional economic activity. Traffic volumes on major roads in relatively mature areas – such as the Coolidge corridor – can generally be expected to grow at sustained rates of 1-2% per year. Indeed, the SEMCOG volumes listed in Table C-1 show that the daily volume on Coolidge ¼ mile south of Woodward grew at an average rate of 1.5% per year between 2013 and 2015. Over the two-year build-out expected for The Berkley, 2017 volumes can therefore be expected to increase by a total of about 3%.

Combining the two above sources of potential future traffic growth, this study assumes that the background volumes counted in the study area this July will increase 8% in the AM peak hour and 3% in the PM peak hour. These adjustments are illustrated in appendix Figure D-1.

The third and final source of future background traffic increases is other nearby land development (e.g., Harvard Commons, the 18-unit condominium development cited above). Per trip generation rates published by the Institute of Transportation Engineers, this development can be expected to generate about 13 one-way vehicle trips in the AM peak hour (2 entering and 11 exiting) and about 15 one-way vehicle trips in the PM peak hour (10 entering and 5 exiting). In appendix Figure D-2, these forecasted background trips are assigned to the study area based on current traffic patterns.

Finally, the combined peak-hour background volumes expected in the 2019 build-out year are shown in Figure 7 (below). These volumes were determined by adding the movement-specific volumes illustrated in Figures D-1 and D-2.

Trip Generation

Site-generated traffic was forecasted in this study using the data and application guidelines most recently recommended by the Institute of Transportation Engineers (ITE). Table 1 (below) also presents a trip generation forecast for the prior operation of the 1,000-student parochial school whose building will now be converted to apartments. Note that that *the school had the potential for generating nearly as many one-way vehicle trips in the AM peak hour alone as the proposed apartments (site-wide) can be expected to generate over the entire 24-hour typical weekday. An office reuse of the former school building – per existing zoning – would also generate significantly more peak-hour trips than the proposed apartments.*

Trip Distribution

In studies of this scale, it is common to assume that site-generated trips will be distributed according to current traffic patterns, the proposed site access and internal circulation, and professional judgment. Current traffic on Coolidge was found to be 48% to the north in the AM peak hour and

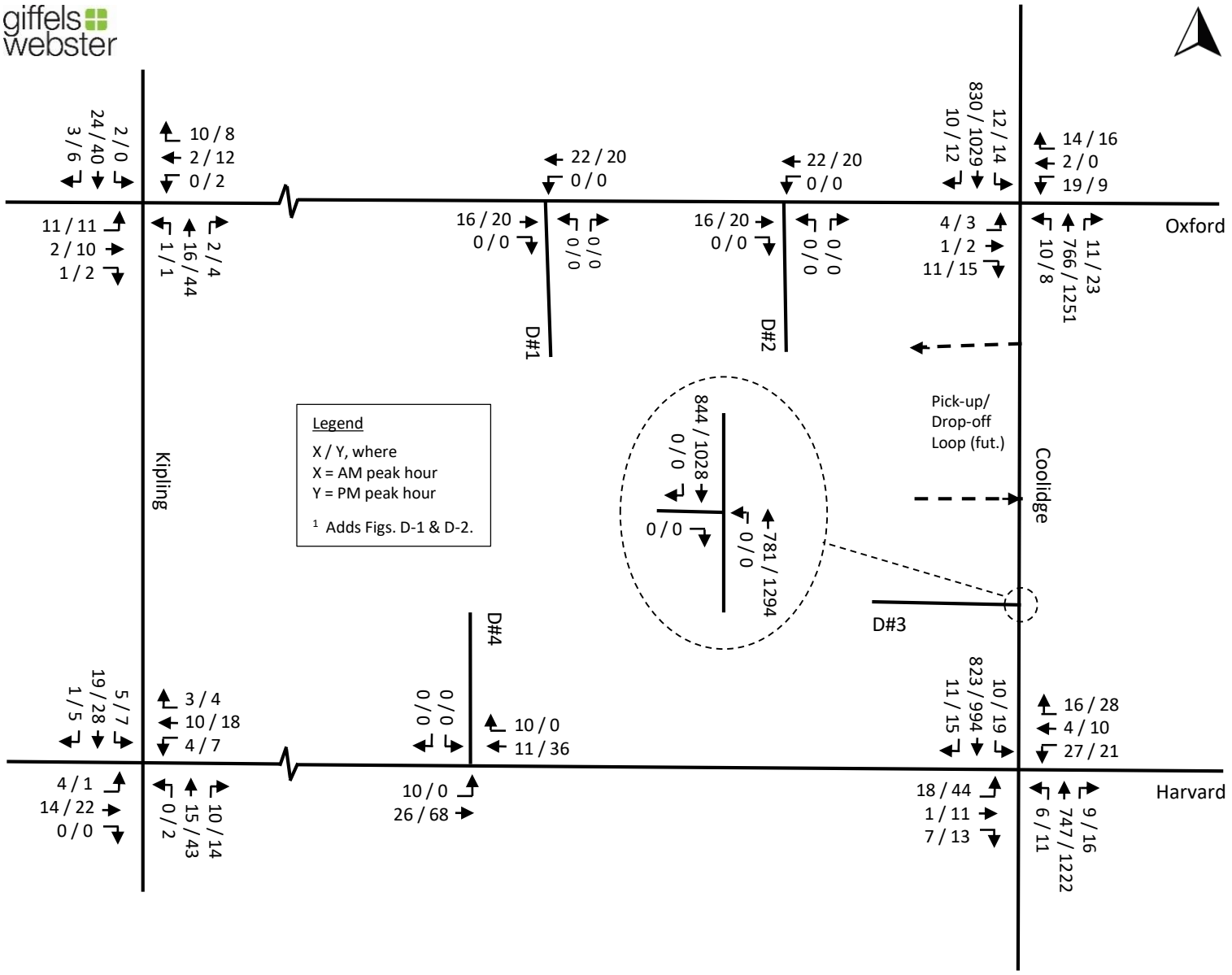

Figure 7. Future Background Weekday Peak-Hour Volumes[1]

Table 1. Trip Generation Comparison[1]

Land Use	ITE Use #	Size	Daily Trips	AM Peak-Hour Trips			PM Peak-Hour Trips		
				In	Out	Total	In	Out	Total
Proposed Residential PUD									
Residential Condo	230	8 d.u.	71	1	6	7	5	3	8
Apartment	220	130 d.u.	911	13	54	67	58	31	89
Totals			982	14	60	**74**	63	34	**97**
% of Daily Trips				1.4%	6.1%	7.5%	6.4%	3.5%	9.9%
% of Peak-Hour Trips				19%	81%	100%	65%	35%	100%
Former Catholic School									
Private School (K-8)	534	1,000 students	Unk.	497	406	**903**	284	321	**605**
% of Peak-Hour Trips				55%	45%	100%	47%	53%	100%

[1] Forecast based on rate data and methodology recommended by the Institute of Transportation Engineers in its *Trip Generation Manual – 9th Edition* (2012).

Note: The AM peak hour of site traffic, for both uses, typically coincides with the AM peak hour of adjacent street traffic (often approximately 8-9 a.m.). While the PM peak hour of residential traffic coincides with the PM peak hour of adjacent street traffic (often 5-6 p.m.), the PM peak hour of school traffic generally occurs sometime in the mid-afternoon (2-4 p.m.).

46% from the north in the PM peak hour. Given that a significant share of prospective apartment tenants are expected to be employed at Beaumont Hospital (at Coolidge and 13 Mile), these directional splits were both rounded to 50%, with the remaining 50% (in both peak hours) assumed to be to/from the south.

Although the intersection of Coolidge and 11 Mile was not evaluated in detail in this study, the potential split of site traffic at that intersection is relevant to the possible use of the area's residential streets. Eleven Mile west of Coolidge interchanges with I-696 at Southfield Road. However, given the well-known congestion at that interchange and the less impeded direct route to I-696 afforded by Coolidge, the share of southerly site traffic using 11 Mile to/from the west is assumed to be 20% (equal to 10% of all site traffic). The share using the preferred route to/from I-696 – Coolidge – is assumed to be 60% (equal to 30% of all site traffic). The remaining 20% (or 10% of all site traffic) is assumed to travel 11 Mile to/from the east (e.g., to or through downtown Royal Oak). Table 2 (below) summarizes the overall trip distribution used in this study.

In distributing site-generated traffic nearer the site, consideration was also given to typical travel times via neighborhood streets versus direct access to/from Coolidge. To assist this review, travel time runs were made via alternative routes during the more heavily trafficked 4-6 p.m. peak period of Monday, July 24, 2017. Table 3 summarizes the results of these runs.

Table 2. Overall Trip Distribution

To/From	Via	Percent of All Site Trips	
		AM Peak Hour	PM Peak Hour
North	Coolidge N	50%	50%
West-Southwest	11 Mile W	10%	10%
South	Coolidge S / I-696	30%	30%
East-Southeast	11 Mile E	10%	10%
Total		100%	100%

Table 3. Average Travel Times in PM Peak Period

To/From	Trip Type	Via	Avg. Travel Time (min)[1]
North	Site to Coolidge/Wiltshire	Oxford-Coolidge	2.6
		Oxford-Kipling-Catalpa-Coolidge[2]	2.3
	Coolidge/Wiltshire to Site	Coolidge-Oxford	1.5
		Coolidge-Catalpa-Kipling-Oxford	2.3
Southwest	Site to 11 Mile/Kipling	Harvard-Coolidge-11 Mile	1.8
		Harvard-Kipling-11 Mile	1.0
	11 Mile/Kipling to Site	11 Mile-Coolidge-Harvard	2.8
		Kipling-Harvard	1.1

[1] Each value is the average of four runs in the 4-6 p.m. period of Monday, July 24, 2017 (weather sunny and pleasant).

[2] To take advantage of the traffic signal at Catalpa/Coolidge for turning left (to north). Although not evaluated, a more reasonable route to an existing signal would be through the site to Harvard, to turn left at Harvard/Coolidge.

Table 3 can be summarized for the worst-case PM peak hour as follows:

- Site traffic departing to the north can be expected to take roughly as long to reach a point north of Catalpa using Kipling (to access Coolidge at the Catalpa signal) as approaching Coolidge directly via Oxford (the 0.3-minute difference is insignificant given the limited sample size). Using the Harvard signal to go north is likely to be quickest.

- Returning from the north, using Coolidge to a direct right turn at Oxford is clearly significantly quicker (by 0.8 minute) than back-tracking via Catalpa and Kipling.

- Site traffic departing to the southwest can be expected to reach 11 Mile west of Kipling somewhat quicker using Kipling than using Coolidge; however, many drivers tend to prefer using major roads, especially when that use is limited to right turns (as here).

- Due to the relatively long delays currently experienced turning left from 11 Mile onto Coolidge in the PM peak hour, using that route to reach the site – as opposed to turning left onto Kipling and approaching the site via that street – now takes about 2½ times longer (delays turning left from 11 Mile onto Kipling were found to be minimal). That difference will likely diminish substantially once the signal phasing at 11 Mile and Coolidge is enhanced as described above.

Given all of the above, the expected trip distribution is described in detail in Figure 8.

Traffic Assignment

Peak-hour site traffic was assigned to study area intersections by applying the trip distribution percentages shown in Figure 8 to the trip generation totals listed in Table 1. See Figure 9.

Finally, total peak-hour traffic at site build-out was forecasted by adding the site traffic from Figure 9 to the future background traffic shown earlier in Figure 7. See Figure 10.

IMPACT ANALYSES

Method and Criteria

Intersection capacity analyses were conducted using the *Synchro 9 Light* computerized traffic model, based on methodologies contained in the Transportation Research Board's *2010 Highway Capacity Manual.* The primary objective of such analyses is to determine the *level of service,* a qualitative measure of the "ease" of traffic flow based on vehicular delay. Analytical models are used to estimate the average control delay for specific vehicular (through or turning) movements – and in the case of all-way stop-controlled and signalized intersections – each approach and the overall intersection as well. The models account for lane configuration, grade (if any), type of traffic control, traffic volume and composition, and other traffic flow parameters.

Level of service (LOS) is expressed on a letter grading scale, with A being the highest level and F being the lowest level. Achieving an overall intersection and/or approach LOS of D or better is the normal objective in an urban or suburban area; however, LOS of E or worse may be unavoidable for some turning movements onto heavily traveled roads, especially when those movements are controlled by stop signs as opposed to signals.

Table 4 (following the three figures below) defines LOS, in terms of average control delay per vehicle, for signalized intersections and un-signalized intersections, respectively.

Level of Service Results

Detailed *Synchro* printouts appear in Appendix E. The evaluations represented by these printouts determined how well various intersections and driveways are or can be expected to operate under current, future background, and future total (background-plus-site) traffic volumes – all under the

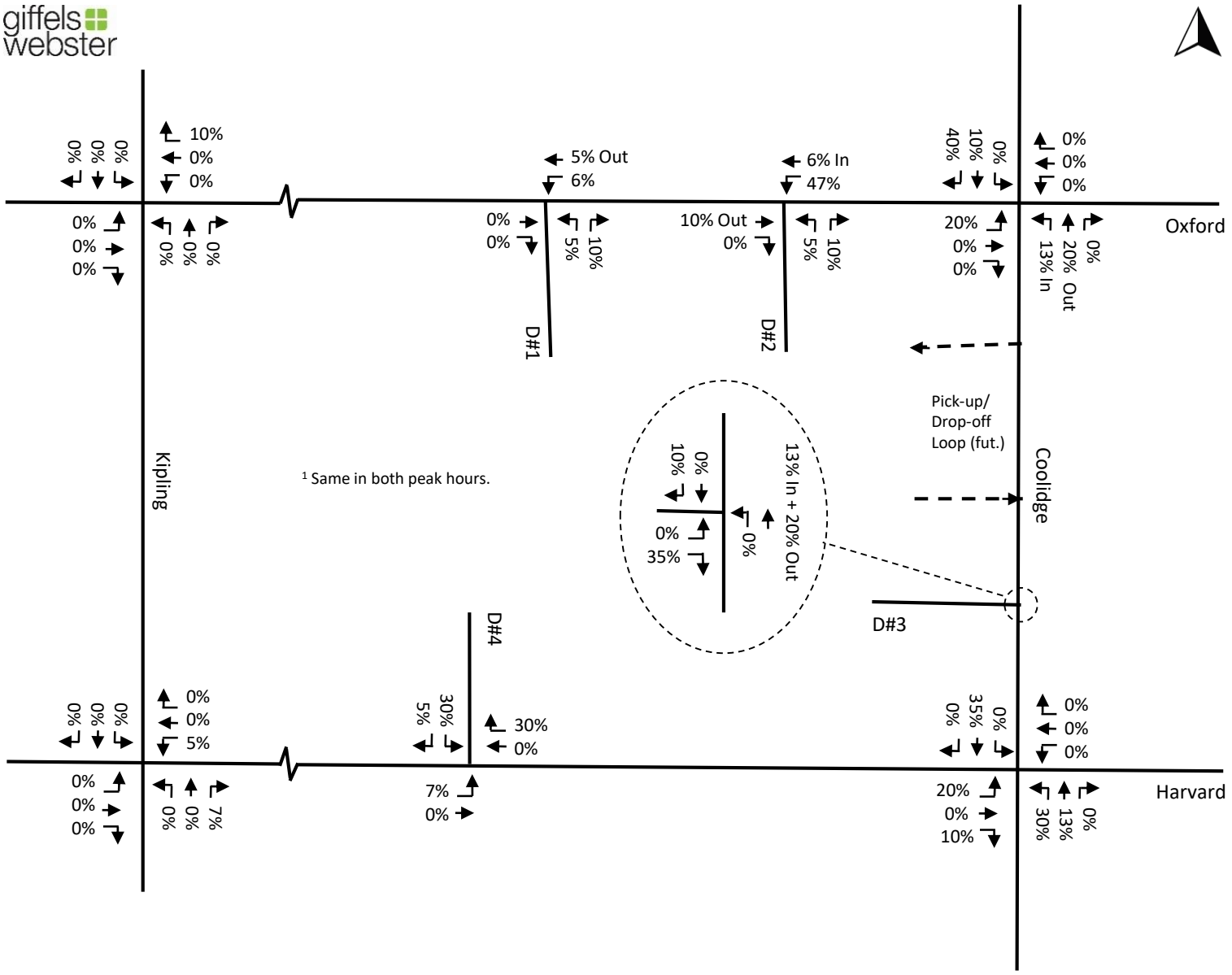

Figure 8. Expected Trip Distribution[1]

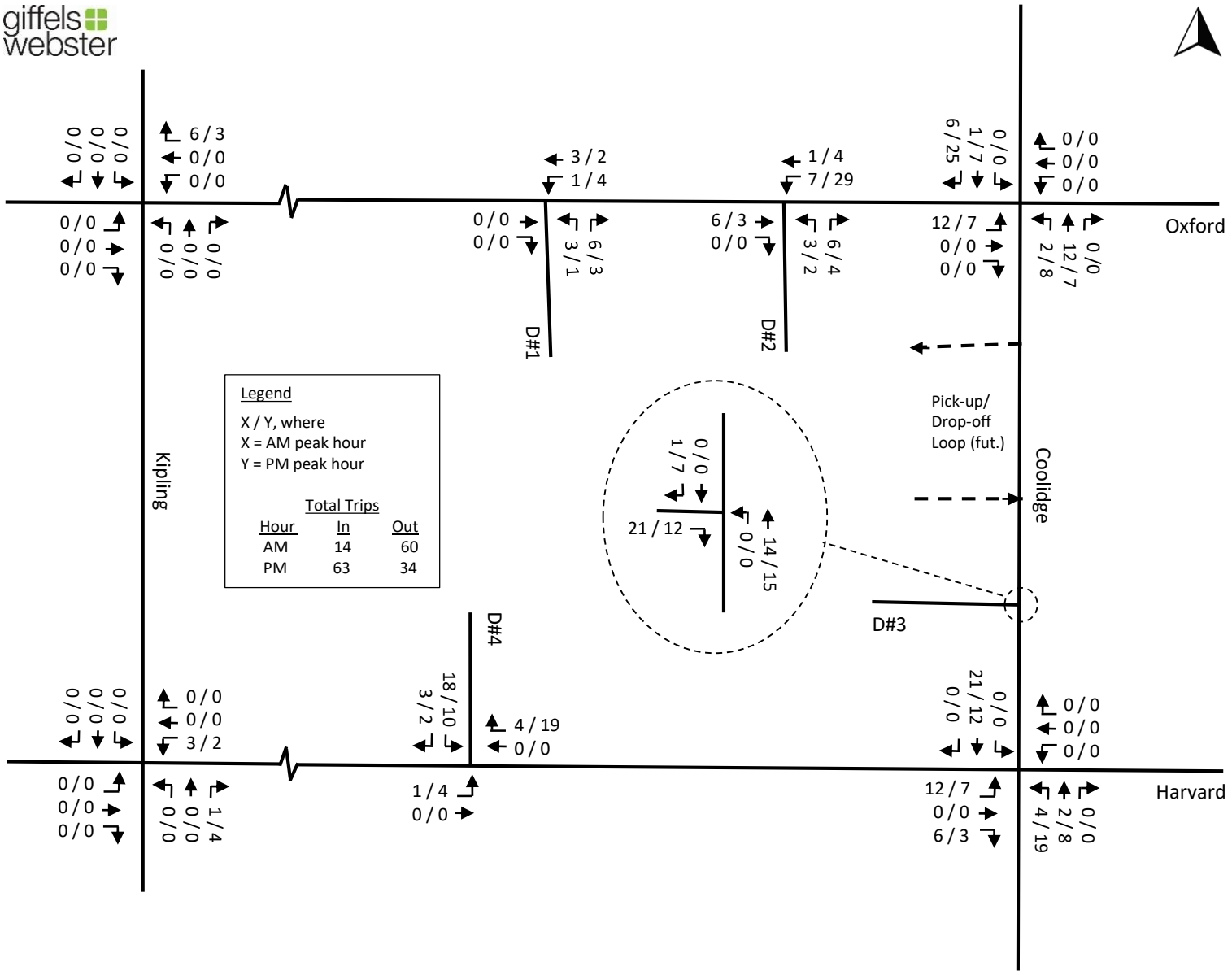

Figure 9. Site-Generated Trips

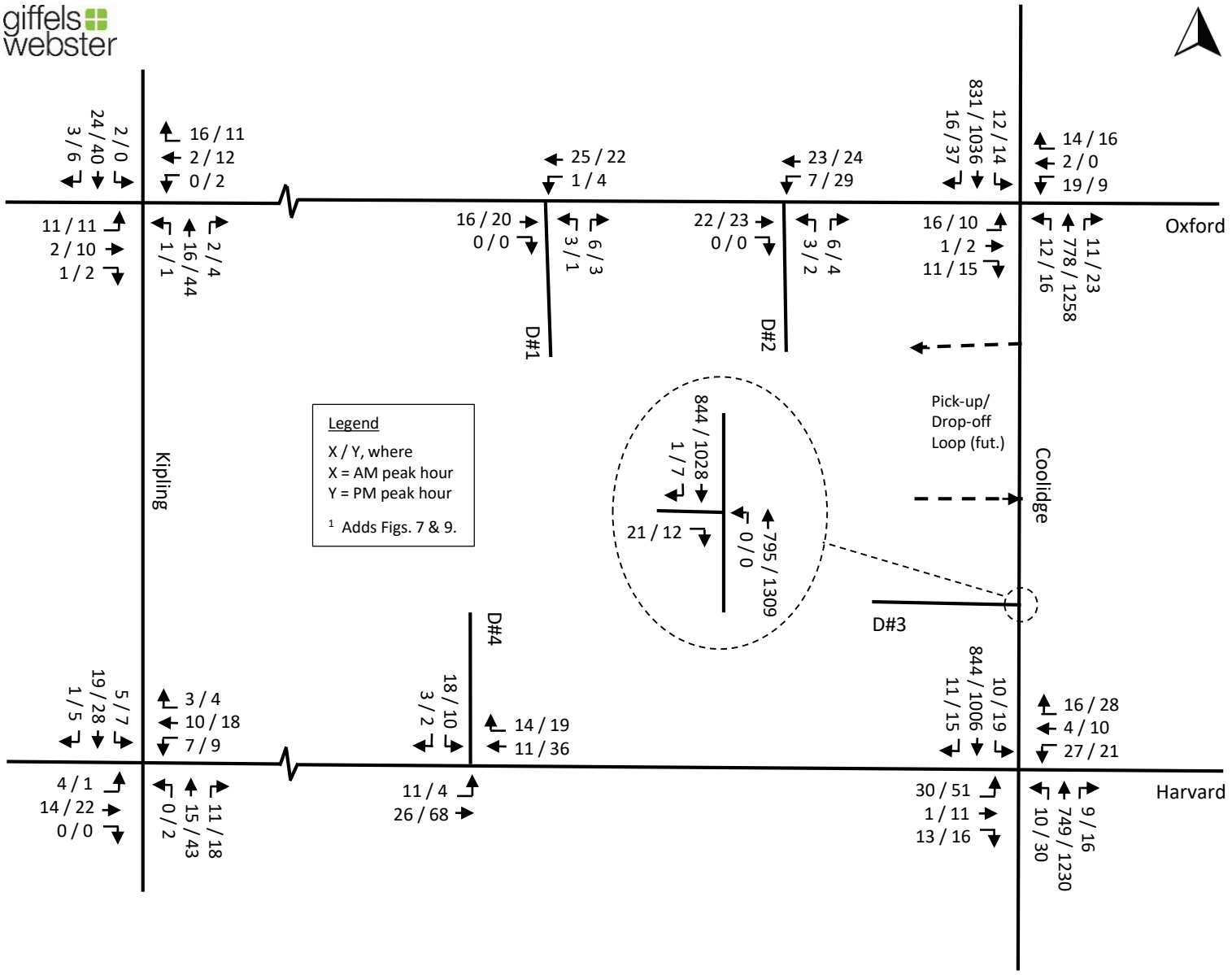

Figure 10. Future Total Weekday Peak-Hour Volumes[1]

Table 4. Level of Service Criteria

Level of Service	Control Delay per Vehicle (sec)	
	Signalized Intersections	Un-signalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

assumption that there would be no changes in existing intersection design or traffic controls, and that – as a hypothetical worst-case – nothing is done at site access drives to discourage use of neighborhood streets west of the site.

The results of the level-of-service (LOS) analyses are summarized in Tables 5-12. Key findings revealed by these tables are as follows:

- At Oxford and Kipling (Table 5), all LOS are and will remain A.

- At both site access drives on Oxford (Tables 6-7), all future LOS will also be A.

- Given the stop signs on the Oxford approaches to Coolidge, the LOS on the WB approach is already D in the AM peak hour and F in the PM peak hour (Table 8). The levels of service on the EB approach are currently somewhat better – C in the AM peak hour and E in the PM peak hour. The assumed background traffic growth in the AM peak hour (including the resumption of a normal school schedule) will diminish the EB and WB levels that hour by one grade (to D and E, respectively).

- Under the assumed trip distribution – wherein 40% of the site traffic exiting to the north makes a left turn from Oxford onto Coolidge – average delays on the EB approach could be roughly double the forecasted background delays. Given the demonstrated sensitivity of these delays to the volumes of site traffic turning left there (only 7 vehicles in the PM peak hour and 12 vehicles in the AM peak hour), it is clear that action(s) to encourage use of the Harvard signal instead would likely be very effective in mitigating the situation.

- At the site access drive on Coolidge (Table 9) – assuming that left turns entering as well as exiting are prohibited there in the interest of safety – exiting traffic would enjoy a LOS of B.

- At the signalized intersection of Harvard and Coolidge (Table 10), almost all levels of service are and will remain a very satisfactory B. The only exceptions are for the SB left turn onto Harvard, which operates and will continue to operate at a still very acceptable C. The LOS for NB left turns is expected to change from a B for background traffic alone to C with the addition of site traffic.

Table 5. Levels of Service at Oxford and Kipling

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic							
EB	L	10	7.3	A	11	7.3	A
WB	L	0	-	-	2	7.3	A
NB*	L + T + R	18	9.3	A	48	9.8	A
SB*	L + T + R	27	9.3	A	45	9.8	A
Future Background Traffic							
EB	L	11	7.3	A	11	7.3	A
WB	L	0	-	-	2	7.3	A
NB*	L + T + R L	19	9.4	A	49	9.8	A
SB*	L + T + R L	29	9.4	A	46	9.8	A
Future Total (Background + Site) Traffic							
EB	L	11	7.3	A	11	7.3	A
WB	L	0	-	-	2	7.3	A
NB*	L + T + R	19	9.4	A	49	9.9	A
SB*	L + T + R	29	9.4	A	46	9.8	A

* Stop-sign control

Table 6. Levels of Service at Oxford and Driveway #1

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Future Total (Background + Site) Traffic							
WB	L	1	7.3	A	4	7.3	A
NB*	L + R	9	8.6	A	4	8.5	A

Table 7. Levels of Service at Oxford and Driveway #2

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Future Total (Background + Site) Traffic							
WB	L	7	7.3	A	29	7.3	A
NB*	L + R	9	8.7	A	6	8.7	A

Table 8. Levels of Service at Oxford and Coolidge

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic							
EB*	L + T + R	15	22.4	C	19	43.9	E
WB*	L + T + R	33	32.6	D	25	63.1	F
NB	L	9	9.7	A	8	10.6	B
SB	L	11	9.3	A	14	11.9	B
Future Background Traffic							
EB*	L + T + R	16	25.2	D	20	49.3	E
WB*	L + T + R	35	40.8	E	25	75.1	F
NB	L	10	10.1	B	8	10.8	B
SB	L	12	9.6	A	14	12.2	B
Future Total (Background + Site) Traffic							
EB*	L + T + R	28	48.4	E	27	104.4	F
WB*	L + T + R	35	42.7	E	25	85.6	F
NB	L	12	10.1	B	16	11.1	B
SB	L	12	9.6	A	14	12.2	B

* Stop-sign control

Table 9. Levels of Service at Coolidge and Driveway #3

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic[1]							
NB	L	0	-	-	0	-	-
EB*	R	0	-	-	0	-	-
Future Background Traffic[1]							
NB	L	0	-	-	0	-	-
EB*	R	0	-	-	0	-	-
Future Total (Background + Site) Traffic							
NB	L	0	-	-	0	-	-
EB*	R	21	11.8	B	12	13.1	B

[1] Absent site redevelopment, current weekday peak-hour use of this driveway is negligible.

Table 10. Levels of Service at Harvard and Coolidge

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic							
Intersection		1544	12.9	B	2321	16.0	B
EB	L + T + R	15	17.9	B	62	18.7	B
WB	L + T + R	44	18.4	B	57	18.8	B
NB	L	5	15.0	B	7	18.3	B
	T + R	700	12.4	B	1202	16.5	B
SB	L	9	14.4	B	18	21.8	C
	T + R	771	12.9	B	975	14.9	B
Future Background Traffic							
Intersection		1679	13.4	B	2404	16.4	B
EB	L + T + R	26	18.2	B	68	18.8	B
WB	L + T + R	47	18.4	B	59	18.9	B
NB	L	6	15.8	B	11	19.1	B
	T + R	756	12.8	B	1238	17.0	B
SB	L	10	15.0	B	19	22.6	C
	T + R	834	13.4	B	1009	15.3	B
Future Total (Background + Site) Traffic							
Intersection		1724	13.6	B	2453	16.5	B
EB	L + T + R	44	18.7	B	78	19.1	B
WB	L + T + R	47	18.4	B	59	18.9	B
NB	L	10	16.2	B	30	20.7	C
	T + R	758	12.8	B	1246	17.1	B
SB	L	10	15.1	B	19	22.8	C
	T + R	855	13.5	B	1021	15.4	B

Table 11. Levels of Service at Harvard and Driveway #4

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic							
EB	L	10	7.3	A	0	-	-
SB*	L + R	0	-	-	0	-	-
Future Background Traffic							
EB	L	10	7.3	A	0	-	-
SB*	L + R	0	-	-	0	-	-
Future Total (Background + Site) Traffic							
EB	L	11	7.3	A	4	7.4	A
SB*	L + R	21	9.1	A	12	9.3	A

* Stop-sign control

Table 12. Levels of Service at Harvard and Kipling

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic							
EB	L	4	7.3	A	1	7.3	A
WB	L	3	7.3	A	7	7.3	A
NB*	L + T + R	23	9.1	A	57	9.7	A
SB*	L + T + R	24	9.4	A	39	9.7	A
Future Background Traffic							
EB	L	4	7.3	A	1	7.3	A
WB	L	4	7.3	A	7	7.3	A
NB*	L + T + R	25	9.2	A	59	9.7	A
SB*	L + T + R	25	9.4	A	40	9.8	A
Future Total (Background + Site) Traffic							
EB	L	4	7.3	A	1	7.3	A
WB	L	7	7.3	A	9	7.3	A
NB*	L + T + R	26	9.2	A	63	9.7	A
SB*	L + T + R	25	9.5	A	40	9.8	A

- At the site access drive on Harvard (Table 11), all LOS are and will remain A.

- At Harvard and Kipling (Table 12), all LOS are and will remain A.

KEY FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

- Based on national trip generation sampling at apartments and residential condominiums, the proposed 130 apartments and eight condominiums can be expected to generate a total of about 74 one-way vehicle trips in the AM peak hour (14 entering and 60 exiting) and a total of about 97 one-way vehicle trips in the PM peak hour (63 entering and 34 exiting). Given the expected demographics of the residents (e.g., to include significant numbers of senior citizens), the actual trip generation in this case may be even less.

- Levels of service have been assigned on an A-F grading scale based average delays estimated by a traffic model. Most levels of service in the study area are and will remain A or B (i.e., excellent or very good). Only the stop-sign-controlled Oxford approaches to Coolidge incur (and will continue to incur) lower levels. This is relatively common, however, along an arterial as well-traveled as Coolidge.

- Given the alternative ingress and egress routes available to the new residents, and the good levels of service afforded by the traffic signal at Harvard and Coolidge, relatively few trips are likely to be made along the residential streets west of the site. Even in the hypothetical absence of restrictions at the site drives on Oxford and Harvard, *this study predicts that no more than 4-6 directional peak-hour site trips would occur on Kipling to the north or south as an alternative to using Coolidge (i.e., one every 10-15 minutes).*

- Overall, the neighborhood traffic impacts of the proposed development will be negligible. However, to ensure that these very small impacts are absolutely minimized, Giffels Webster recommends the following:

  - The existing site access drive on Coolidge should serve only entering and exiting right turns. At a minimum, No Left Turn signs should be installed on both sides of NB Coolidge as well as the driveway itself. The effectiveness of this regulation would be enhanced by inserting a triangular island in the mouth of the driveway (if feasible).

  - Although very few of the new residents are expected to use neighborhood streets west of the site, the City and/or applicant may wish to post turn restrictions at the site driveways on Oxford and Harvard. If so, these should include No Left Turns signs on the exiting side of both Oxford driveways and a No Right Turn sign on the exiting side of the Harvard driveway. The effectiveness of these regulations would be enhanced by providing a typical curb radius on the side of each driveway nearest Coolidge and a zero or minimum radius on the side of each driveway nearest the neighborhood (typically a 5-ft minimum radius is desirable to ensure efficient street sweeping and snow removal).

- Enforcement of the above turn restrictions should be discussed with the City. The applicant has offered to include penalties within unit leases pertaining to violations.

- Ample directional signing should be posted within the site parking lots to encourage departing residents with destinations to the north to drive through the site to Harvard and take advantage of the signal at Coolidge. A cross-access easement with the church would be appropriate. Although less important, signing to direct residents with destinations to the south to exit via the existing site driveway on Coolidge would also be desirable.

- The City should proceed to add permissive-protected left-turn phasing at the Coolidge/11 Mile signal at the earliest opportunity, to address the existing EB left-turn backups observed in the PM peak hour.