

MEMORANDUM

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FROM: Mr. Jeffrey S. Dirk, P.E., PTOE, FITE
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DATE: July 5, 2023

REF: 7902

SUBJECT: Hanover Crossing – 2023 Traffic Monitoring Program
Hanover, Massachusetts

Vanasse & Associates, Inc. (VAI) are pleased to submit the results of the 2023 Traffic Monitoring Program for Hanover Crossing located at 1775 Washington Street (Route 53) in Hanover, Massachusetts. This document has been prepared in fulfillment of the Traffic Monitoring Program requirements specified in the December 16, 2019 Decision of the Town of Hanover Planning Board and in the April 14, 2020 Massachusetts Department of Transportation (MassDOT) Section 61 Finding that have been issued for Hanover Crossing. As required therein, the results of the 2023 Traffic Monitoring Program are being submitted to MassDOT, the Towns of Hanover and Norwell, the Boston Region Metropolitan Planning Organization, and the Greater Attleboro-Taunton Regional Transit Authority (GATRA).

The purpose of the Traffic Monitoring Program is to document the traffic characteristics of Hanover Crossing as it is developed and to identify traffic volumes and traffic patterns at the driveways that serve the property. In addition, the Traffic Monitoring Program also serves to identify changes in traffic volumes along Woodland Drive, a local access roadway that intersects Route 53 and serves the residential community situated between Route 53 and Webster Street (Route 123). As Hanover Crossing is further developed, the Traffic Monitoring Project will document the elements of the Transportation Demand Management (TDM) Program that have been implemented and the effectiveness of TDM Program at reducing single-occupancy vehicle (SOV) travel.

The results of the 2023 Traffic Monitoring Program have indicated the following:

1. As configured and occupied as of May 2023, Hanover Crossing was shown to generate approximately 20,851 vehicle trips on an average weekday and approximately 22,623 vehicle trips on a Saturday (both two-way, 24-hour volumes) as measured on the driveways serving Hanover Crossing, with approximately 763 vehicle trips during the weekday morning peak-hour, 1,772 vehicle trips during the weekday evening peak-hour and 2,503 vehicle trips during the Saturday midday peak-hour;



2. In comparison to the projected traffic volumes as presented in the October 2019 *Single Environmental Impact Report* (the “October 2019 SEIR”) prepared for Hanover Crossing,¹ the actual measured 2023 traffic volumes associated with Hanover Crossing were found to be approximately 8 percent lower on an average weekday and 34 percent lower on a Saturday. Peak-hour traffic volumes were found to be approximately 9 percent higher during the weekday morning peak-hour, 9 percent lower during the weekday evening peak-hour and 8 percent higher during the Saturday midday peak-hour;
3. The traffic volume increase identified during the weekday morning peak-hour is, in part, attributable to the contractors that were on-site associated with the construction of the new uses that are associated with Hanover Crossing that have not yet opened and cut-through traffic that uses Hanover Crossing Way to travel between Route 53 and Mill Street. In all instances, the traffic volume variation during the weekday and Saturday peak hours between the measured traffic volumes and the traffic volume predictions for the constructed portion of Hanover Crossing are within 10 percent;
4. Travel patterns observed at the driveways serving Hanover Crossing were generally found to be consistent (within 10 percent) with the trip distribution pattern presented in the October 2019 SIER;
5. Traffic volumes on Woodland Drive west of Route 53 were found to be lower than those observed in 2019, with variations to the traffic volumes measured in 2022 found to range from an increase of 100 vehicles on an average weekday to a decrease of 23 vehicles on a Saturday (both variations over a 24-hour period). Similarly, the measured traffic volumes during the peak hours were found to be lower than those observed in 2019, with variations to the peak-hour traffic volumes measured in 2022 found to range from a reduction of 12 vehicles during the weekday morning peak-hour to an increase of 46 vehicles during the Saturday midday peak-hour. The observed traffic volume variations are attributable to general traffic growth in the area, including that associated with the Hanover Crossing;
6. With the exception of the Mill Street/Mill Pond Drive/Hanover Crossing Way intersection, the monitored intersections were found to have motor vehicle crash rates that were below the MassDOT average crash rates for similar intersections. A review of the most recent crash data for the Mill Street/Mill Pond Drive/Hanover Crossing Way intersection indicates that the improvements that have been advanced by the Town at the intersection (all-way stop control) have resulted in a reduction in the reported number of motor vehicle crashes that are occurring at the intersection as evidenced by the decline in crashes that have occurred since 2018, with no (0) crashes reported in 2019 and 2020 based on the MassDOT crash data; and
7. All movements at the monitored intersections were shown to operate at a level-of-service (LOS) of “D” or better with the exception of specific movements from side streets and driveways at the unsignalized intersections along Route 53 during the weekday evening and Saturday midday peak-hours, which were identified to operate at or over capacity (i.e., LOS “E” or “F”) due to the relatively large volume of conflicting traffic along Route 53 during the peak periods.

The following summarizes the results of the 2023 Traffic Monitoring Program.

¹*Single Environmental Impact Report*, Transportation Impact Assessment, Hanover Crossing, 1775 Washington Street, Hanover, Massachusetts, EEA No. 16032; VAI; October 2019.



PROJECT STATUS AND BUILD-OUT

Hanover Crossing entails the phased reconstruction of the former Hanover Mall and associated outparcel buildings to provide 598,535± square feet (sf) of retail, restaurant, grocery and entertainment space centered around an open-air courtyard, with a 297-unit multifamily residential community to be constructed in the eastern portion of the site. Prior to the demolition of portions of the enclosed mall, the Hanover Mall encompassed 833,481± sf of retail, restaurant and entertainment space and associated appurtenances that are supported by 3,509 parking spaces. Hanover Crossing represents an overall reduction in the amount of retail/restaurant/entertainment space that was historically situated within the site.

The Hanover Crossing property encompasses approximately 106.4± acres of land that is bounded by the Southeast Expressway (Route 3) and commercial properties to the north; Mill Street, commercial properties, areas of open and wooded space, and low-lying wetland areas to the south; Route 3, South Street, and a residential property to the east; and Route 53 and commercial properties to the west. Access to Hanover Crossing is provided by way of four (4) existing driveways that intersect the east side of Route 53 and two (2) full access driveways that intersect the north side of Mill Street, with the eastern Mill Street driveway aligned opposite Mill Pond Drive. The northernmost unsignalized driveway adjacent to the Buffalo Wild Wings restaurant is under construction as of the date of publication of this assessment and is being reconfigured to provide full access to Hanover Crossing under traffic signal control (exiting movements from this driveway were previously limited to right-turn only).

On-site parking will be provided for 3,486 parking spaces (3,040 parking spaces to support the commercial uses and 446 parking spaces to support the multifamily residential community). In addition, 214 parking spaces have been “landbanked” in order to meet the parking requirements of the Hanover Zoning Bylaw.

Table 1 summarizes the current build-out by land use for Hanover Crossing at the time of completion of the traffic counts that form the basis of the 2023 Traffic Monitoring (April/May 2023).



Table 1
HANOVER CROSSING TENANCY - MAY 2023

| Land Use/Tenant | Constructed to Date (April/May 2023) |
|--------------------------------|---|
| <i>Commercial Component:</i> | |
| Buffalo Wild Wings | 6,184 sf |
| Dick's Sporting Goods | 50,047 sf |
| Macy's | 101,664 sf |
| Macy's Furniture | 12,945 sf |
| Mattress Firm | 4,000 sf |
| Panera | 4,700 sf |
| Petco | 16,951 sf |
| Trader Joe's | 8,200 sf |
| Chipotle Mexican Grill | 2,400 sf |
| Old Navy | 12,513 sf |
| Ryan Family Amusements | 30,016 sf |
| Sullivan's Castle Island | 6,140 sf |
| Showcase Theaters | 38,143 sf |
| 110 Grill Restaurant | 6,053 sf |
| Total Commercial Space: | 299,956 sf |
| <i>Supermarket Component:</i> | |
| Market Basket | 92,500 sf |
| <i>Residential Component:</i> | |
| Multifamily Dwellings | 134 units |

In addition, construction workers are on-site on a daily basis. The traffic volumes associated with Hanover Crossing as measured in April and May 2023 and documented herein include: i) the occupied residential and commercial portions of Hanover Crossing; ii) construction workers/contractors; iii) non-Hanover Crossing related traffic that uses the looped roadway network to travel between Route 53 and Mill Street; and iv) traffic volumes associated with the Chick-fil-A restaurant and the Prime Buick and Mercedes-Benz of Hanover automobile dealerships that use Hanover Crossing Way.



TRAFFIC MONITORING PROGRAM STUDY AREA

The traffic monitoring program study area contains the driveways that serve Hanover Crossing along Route 53 (4 locations) and Mill Street (2 locations), as well as Woodland Drive at and approaching Route 53. The specific traffic monitoring locations are listed below and are depicted on Figure 1:

1. Route 53 at the Route 3 Southbound Ramps and Hanover Crossing Way
2. Route 53 at the Hanover Crossing North Driveway (adjacent to Buffalo Wild Wings)



Legend:

-  **Signalized Intersection**
-  **Unsignalized Intersection**

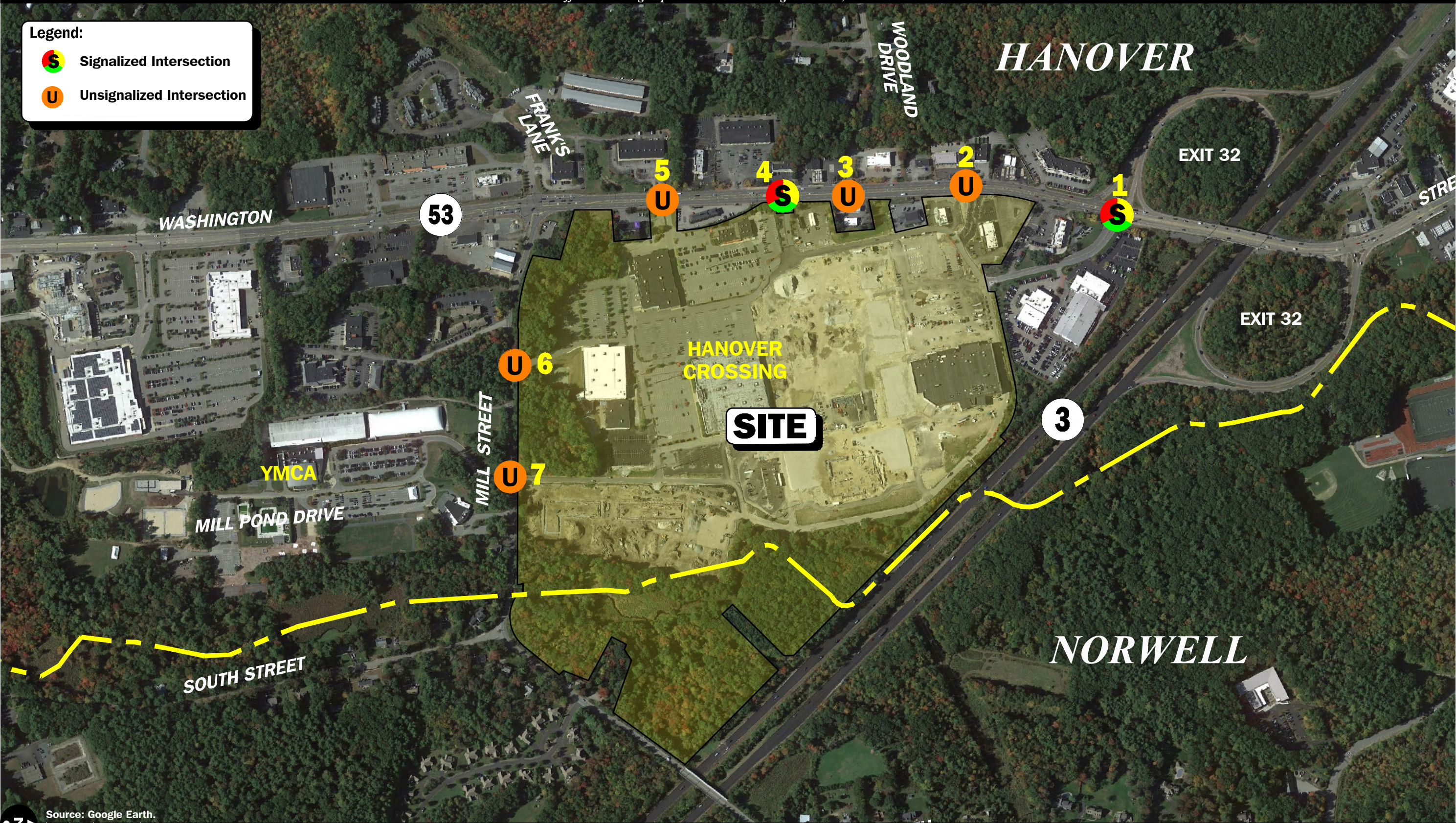


Figure 1
Site Location and Study Area Map

3. Route 53 at Woodland Drive and the Mobil Station Driveway
4. Route 53 at the Hanover Crossing Center Driveway
5. Route 53 at the Hanover Crossing South Driveway and the 1376 Washington Street Driveway
6. Mill Street at the Hanover Crossing West Driveway
7. Mill Street at Mill Pond Drive and the Hanover Crossing East Driveway

DATA COLLECTION

Traffic volumes for the 2023 Traffic Monitoring Program were obtained from automatic traffic recorder (ATR) counts and turning movement counts (TMCs) conducted in April and May 2023. The ATR counts were conducted on each of the driveways serving Hanover Crossing and on Woodland Drive, west of Route 53, over a continuous 24-hour, seven (7) day, week-long period in order to record the traffic characteristics of Hanover Crossing and traffic volumes along Woodland Drive over an extended period. Weekday morning (7:00 to 9:00 AM), weekday evening (4:00 to 6:00 PM) and Saturday midday (11:00 AM to 2:00 PM) peak-period TMCs were also performed at the study area intersections. All traffic counts were conducted during the last week of April and/or during the first week of May 2023 while public schools were in regular session.

Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, 2019 (pre-COVID-19) MassDOT seasonal adjustment factors for Urban Groups 4-7 roadways (minor arterials, minor and major collectors and local roads and streets, which includes the functional classifications for Route 53, Mill Street and Woodland Drive) were reviewed.² Based on a review of this data, it was determined that traffic volumes for the months of April and May are approximately 8 percent and 12 percent *above* average-month conditions, respectively. As such, the April and May traffic volumes were decreased by 8 percent and 12 percent, respectively, in order to be representative of average-month conditions within the study area and to be consistent with the conditions that were assessed in the October 2019 SEIR.³ ***No adjustment was made to the measured volumes entering or exiting Hanover Crossing to account for the season fluctuation of traffic volumes.***

Based on updated guidance from MassDOT,⁴ adjustments to account for the impact on traffic volumes and trip patterns resulting from the COVID-19 pandemic for traffic counts taken on or after March 1, 2022 are *not recommended* in areas where the adjacent land uses are not predominantly office properties. As the study area roadways and intersections serve a diverse range of land uses (primarily residential and restaurant/retail), a pandemic-related adjustment was not required.

The 2023 adjusted average-month, average weekday daily and Saturday traffic volumes for the study area roadways are summarized in Table 2 and graphically depicted on Figure 2. The 2023 Existing average-month peak-hour traffic volumes are graphically depicted on Figures 3, 4 and 5 for the weekday morning, weekday evening, and Saturday midday peak hours, respectively.

²Massachusetts Highway Department Statewide Traffic Data Collection 2019 Weekday Seasonal Factors.

³Ibid.

⁴*Traffic and Safety Engineering 25% Design Submission Guidelines*; MassDOT; Revised March 31, 2022.



Table 2
2023 EXISTING TRAFFIC-VOLUME SUMMARY – AVERAGE-MONTH CONDITIONS

| Location | Average Weekday Daily ^a | Weekday Morning Peak Hour | | Weekday Evening Peak Hour | | Saturday Daily ^a | Saturday Midday Peak Hour | |
|--|------------------------------------|---------------------------|--------------------------|---------------------------|--------------------------|-----------------------------|---------------------------|--------------------------|
| | | Volume ^b | Directional Distribution | Volume ^b | Directional Distribution | | Volume ^b | Directional Distribution |
| Hanover Crossing Way, east of Route 53 | 4,120 | 165 | 60.0% WB | 341 | 82.1% WB | 4,199 | 427 | 74.0% EB |
| Hanover Crossing Rte. 53 North Driveway | 3,036 | 169 | 81.0% EB | 354 | 74.6% EB | 3,631 | 497 | 67.8% EB |
| Hanover Crossing Rte. 53 Center Driveway | 5,758 | 202 | 51.5% EB | 492 | 57.7% WB | 6,247 | 713 | 54.6% WB |
| Hanover Crossing Rte. 53 South Driveway | 4,564 | 123 | 70.7% EB | 280 | 61.8% EB | 4,859 | 406 | 68.5% EB |
| Hanover Crossing Mill Street West Driveway | 1,464 | 46 | 52.2% SB | 144 | 63.2% SB | 1,701 | 245 | 53.9% NB |
| Hanover Crossing Mill Street East Driveway | 1,665 | 57 | 64.9% NB | 161 | 53.4% NB | 1,986 | 215 | 64.7% NB |
| Woodland Drive, west of Rte. 53 | 2,508 | 145 | 55.9% EB | 221 | 58.4% WB | 2,543 | 290 | 51.7% WB |

^aVehicles per day.

^bVehicles per hour.

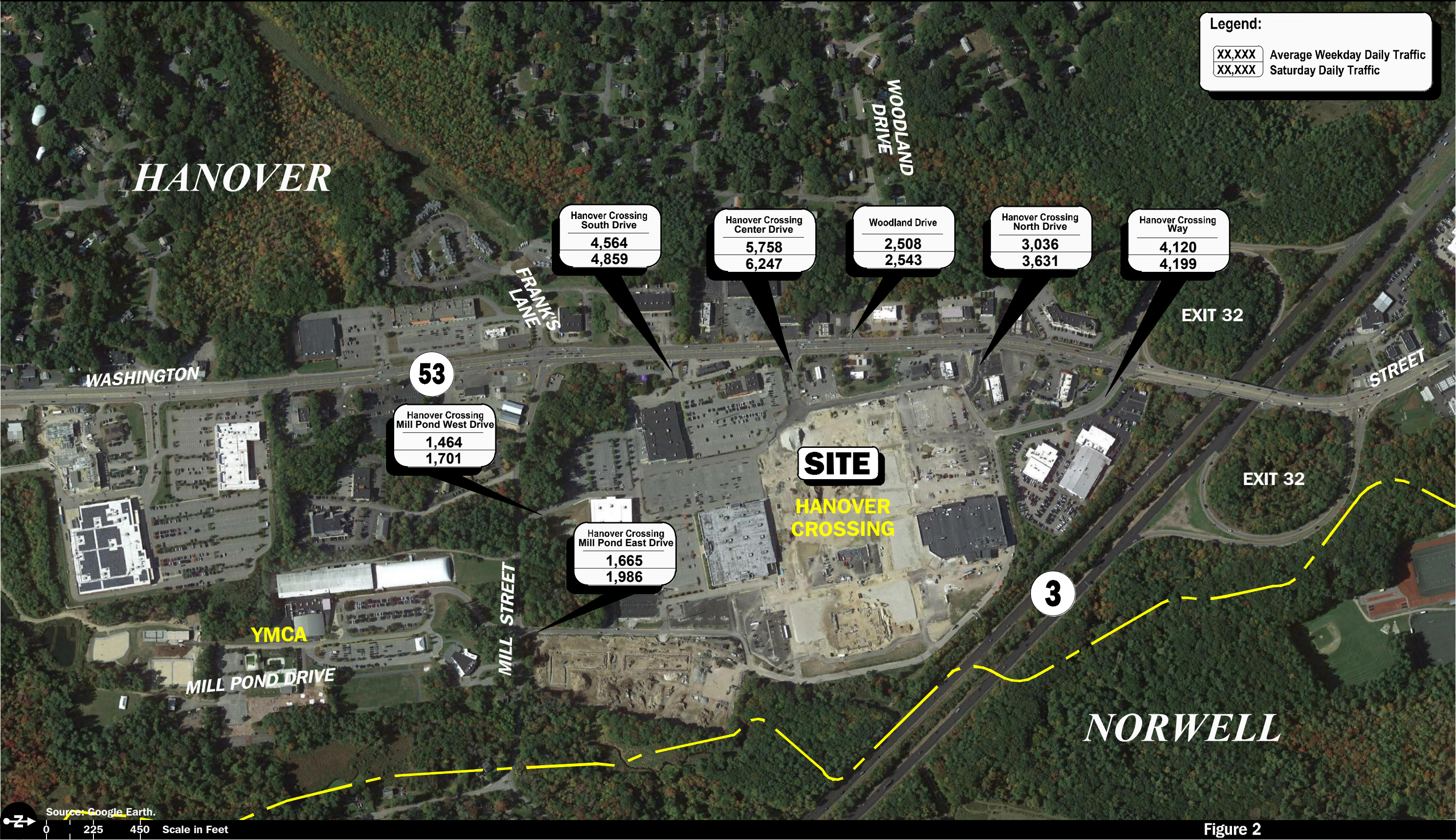
EB = eastbound; WB = westbound; NB = northbound; SB = southbound.

Traffic Volume Comparison

Table 3 summarizes the traffic volumes as collected on the study roadways in 2019 as a part of the October 2019 SEIR to the data collected in 2022 and 2023 as a part of the Hanover Crossing Traffic Monitoring Program.

As can be seen in Table 3, average weekday daily, Saturday daily and peak-hour traffic volumes on the driveways serving Hanover Crossing have increased from the conditions that were measured in 2022 and are attributable to the continued build-out of the approved development program. Since the completion of the 2022 Traffic Monitoring Report, approximately 92,865± sf of additional retail/entertainment and restaurant space has been constructed within Hanover Crossing, the Market Basket Supermarket (92,500± sf) has opened, and 134 multifamily residential units are occupied. In addition, and as previously noted, the 2023 traffic volumes also include construction-related traffic associated with the continued build-out of Hanover Crossing, cut-through traffic using Hanover Crossing Way to travel between Route 53 and Mill Street, and traffic volumes associated with the Chick-fil-A restaurant and the Prime Buick and Mercedes-Benz of Hanover automobile dealerships that use Hanover Crossing Way.





Legend:
XX,XXX Average Weekday Daily Traffic
XX,XXX Saturday Daily Traffic

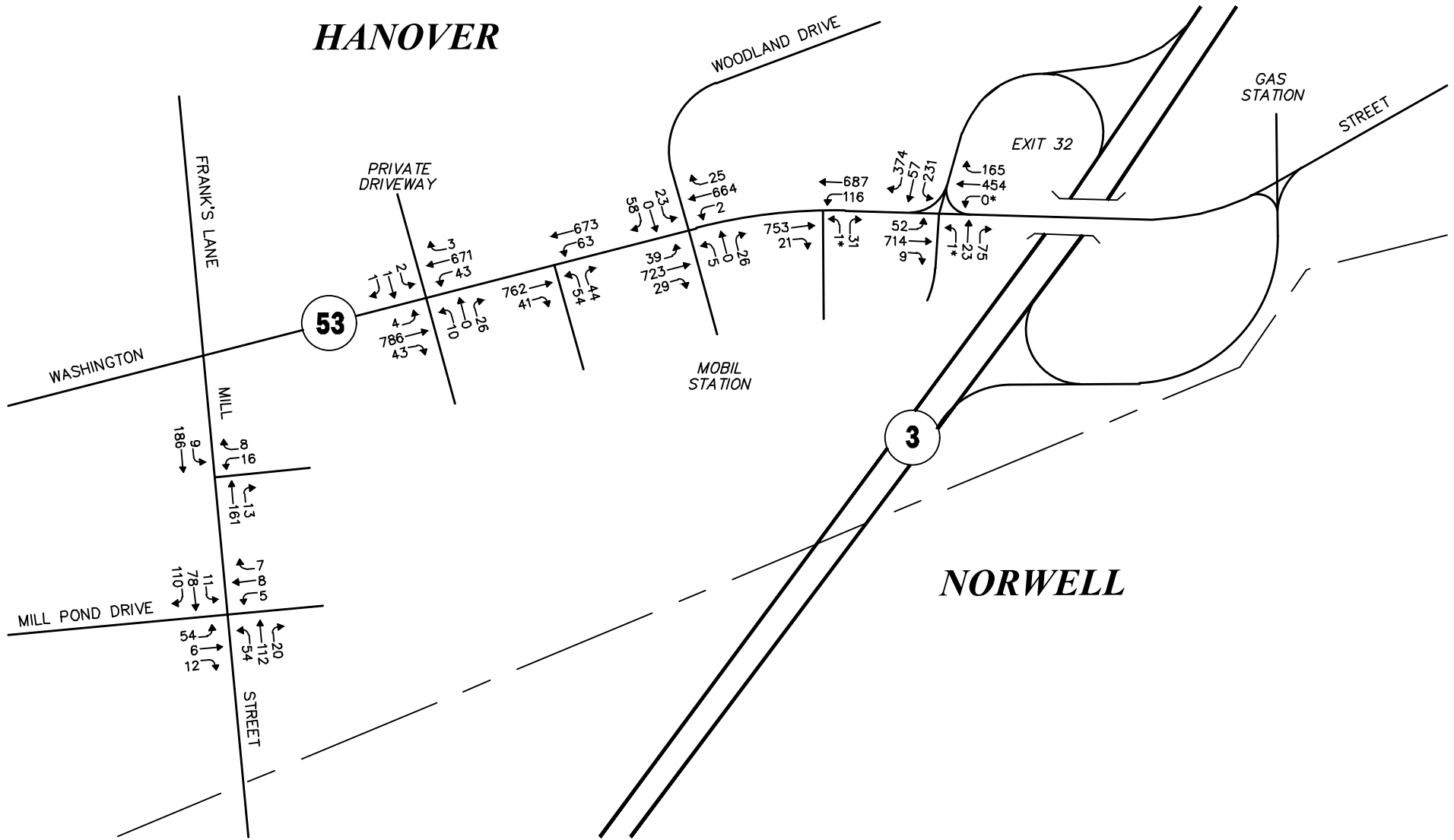
SITE

**HANOVER
CROSSING**

NORWELL

Figure 2
2023 Average-Month
Average Weekday and Saturday
Traffic Volumes

HANOVER



*Illegal movement.

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

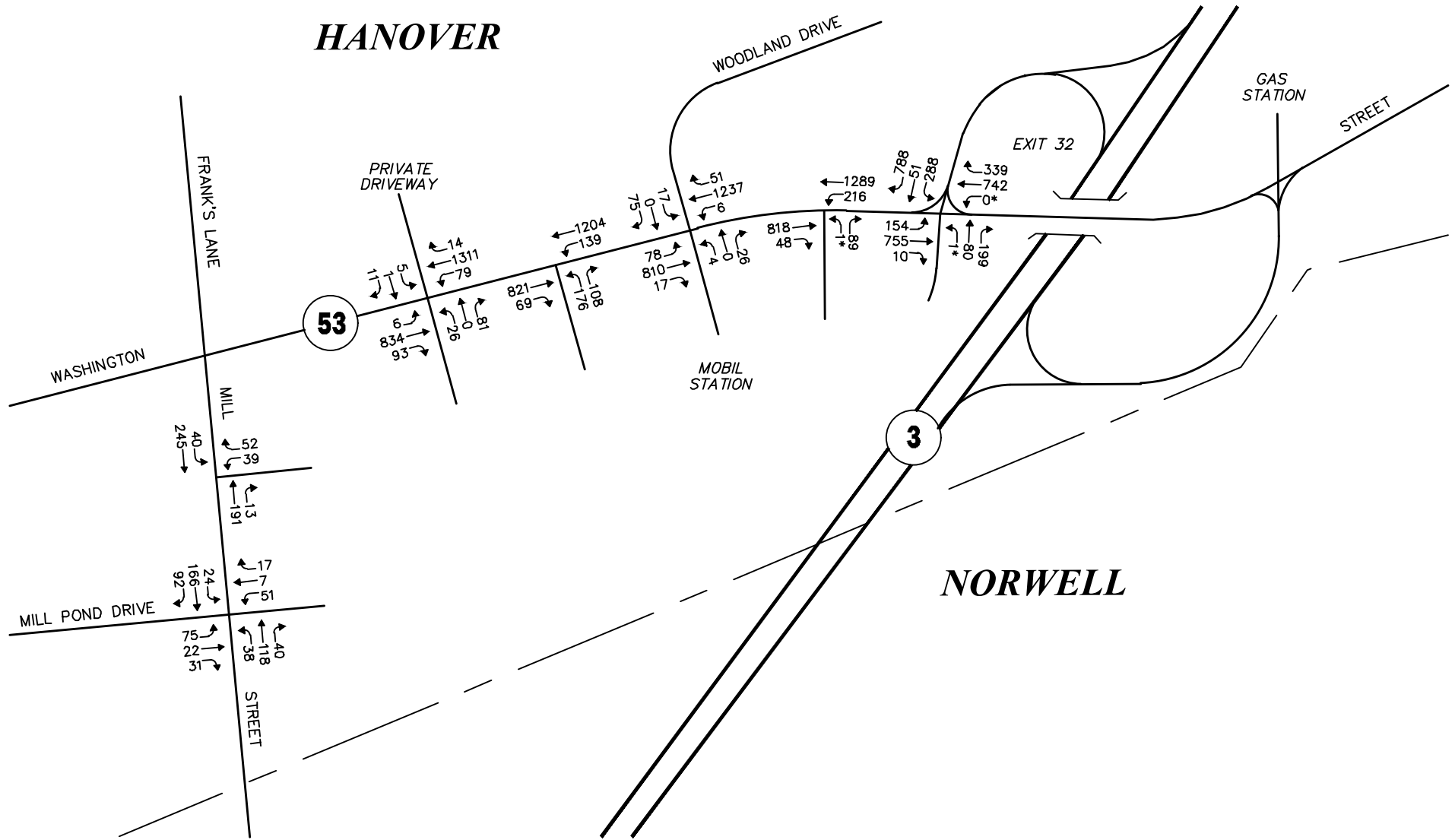


Not to Scale



Figure 3

2023 Existing
Average-Month
Weekday Morning
Peak-Hour Traffic Volumes



*Illegal movement.

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.



Not to Scale

Figure 4

2023 Existing
Average-Month
Weekday Evening
Peak-Hour Traffic Volumes





Not to Scale



Vanasse &
Associates inc

Figure 5

**2023 Existing
Average-Month
Saturday Midday
Peak-Hour Traffic Volumes**

Table 3
PEAK-HOUR TRAFFIC VOLUME COMPARISON

| Location | Average Weekday Daily ^a | | | Weekday Morning Peak-Hour ^b | | | Weekday Evening Peak-Hour ^b | | | Saturday Daily ^a | | | Saturday Midday Peak-Hour ^b | | |
|--|------------------------------------|-------------------|-------|--|------|------|--|------|------|-----------------------------|-------|-------|--|------|------|
| | 2019 ^c | 2022 ^d | 2023 | 2019 | 2022 | 2023 | 2019 | 2022 | 2023 | 2019 ^d | 2022 | 2023 | 2019 | 2022 | 2023 |
| Hanover Crossing Way, east of Route 53 | 3,011 | 1,119 | 4,120 | 134 | 40 | 165 | 271 | 99 | 341 | 2,888 | 1,067 | 4,199 | 260 | 117 | 427 |
| Hanover Crossing Rte. 53 North Driveway | 3,367 | 1,532 | 3,036 | 126 | 58 | 169 | 303 | 133 | 354 | 4,644 | 1,721 | 3,631 | 418 | 186 | 497 |
| Hanover Crossing Rte. 53 Center Driveway | 5,344 | 3,928 | 5,758 | 158 | 134 | 202 | 481 | 359 | 492 | 6,566 | 3,997 | 6,247 | 591 | 491 | 713 |
| Hanover Crossing Rte. 53 South Driveway | 3,211 | 2,407 | 4,564 | 95 | 88 | 123 | 289 | 234 | 280 | 4,888 | 3,306 | 4,859 | 440 | 403 | 406 |
| Hanover Crossing Mill Street West Driveway | 1,778 | 670 | 1,464 | 33 | 32 | 46 | 160 | 118 | 144 | 2,433 | 577 | 1,701 | 219 | 145 | 245 |
| Hanover Crossing Mill Street East Driveway | 3,244 | 1,168 | 1,665 | 138 | 32 | 57 | 292 | 61 | 161 | 3,855 | 1,438 | 1,986 | 347 | 60 | 215 |
| Woodland Drive, west of Rte. 53 | 3,156 | 2,408 | 2,508 | 207 | 157 | 145 | 284 | 218 | 221 | 3,100 | 2,566 | 2,543 | 279 | 244 | 290 |

^aVehicles per day.

^bVehicles per hour.

^cEstimated using a K factor of 0.09 applied to the weekday evening peak-hour traffic volume for the average weekday daily and to the Saturday midday peak-hour for the Saturday traffic volume. The K factor was obtained from Table 2 of the October 2019 SEIR.

^dTraffic volumes as measured at the driveways obtained from the 2022 Hanover Crossing Traffic Monitoring Report.



Traffic volumes on Woodland Drive west of Route 53 were found to be lower than those observed in 2019, with variations to the traffic volumes measured in 2022 found to range from an increase of 100 vehicles on an average weekday to a decrease of 23 vehicles on a Saturday (both variations over a 24-hour period). Similarly, the measured traffic volumes during the peak hours were found to be lower than those observed in 2019, with variations to the peak-hour traffic volumes measured in 2022 found to range from a reduction of 12 vehicles during the weekday morning peak-hour to an increase of 46 vehicles during the Saturday midday peak-hour. The observed traffic volume variations are attributable to general traffic growth in the area, including that associated with the Hanover Crossing.

HANOVER CROSSING TRAFFIC CHARACTERISTICS

As discussed in a previous section, ATR counts were conducted on the driveways serving Hanover Crossing in April and May 2023 over a continuous 24-hour, seven day period. Table 4 presents a comparison of the traffic volumes measured at the driveways serving Hanover Crossing in 2023 to the traffic volume projections for the uses that have been constructed and occupied as of May 2023 as defined in Table 1. The traffic volume projections were developed using trip-generation data provided by the Institute of Transportation Engineers (ITE)⁵ for Land Use Codes (LUCs) 221, *Multifamily Housing (Mid-Rise)*; 820, *Shopping Center*; and 850, *Supermarket*. The 10th Edition of Trip Generation was used to be consistent with the methodology that was used in the October 2019 SEIR to establish the traffic characteristics of Hanover Crossing.

⁵*Trip Generation, 10th Edition*; Institute of Transportation Engineers; Washington, D.C.; 2017.



Table 6
HANOVER CROSSING
TRAFFIC-VOLUME SUMMARY AND COMPARISON

| Time Period/Direction | (A) 2023 Measured Traffic Volumes ^a | (B) Projected Traffic Volumes ^b | (C=A-B) Difference | (C/B x 100%) Percent Difference |
|------------------------------------|---|---|-----------------------|---------------------------------------|
| Average Weekday Daily ^c | 20,851 | 22,782 | -1,931 | -8% |
| <i>Weekday Morning Peak Hour:</i> | | | | |
| Entering | 453 | 411 | | |
| Exiting | 309 | 290 | | |
| Total | 762 | 701 | +61 | +9% |
| <i>Weekday Evening Peak Hour:</i> | | | | |
| Entering | 845 | 975 | | |
| Exiting | 927 | 996 | | |
| Total | 1,772 | 1,971 | -199 | -10% |
| Saturday Daily | 22,623 | 34,232 | -11,609 | -34% |
| <i>Saturday Midday Peak Hour:</i> | | | | |
| Entering | 1,333 | 1,197 | | |
| Exiting | 1,170 | 1,124 | | |
| Total | 2,503 | 2,321 | +182 | +8% |

^aSum of traffic count data as measured in April and May 2023 on the driveways that serve Hanover Crossing and includes contractors and non-Hanover Crossing traffic using Hanover Crossing Way.

^bBased on the use of ITE LUC 221, *Multifamily (Mid-Rise)* (134 dwellings); LUC 820, *Shopping Center* (299,956 sf); and LUC 850, *Supermarket* (92,500 sf); with a reduction applied to account for internal trips.

^cAverage of the traffic-volume data collected Tuesday through Thursday (average weekdays).

As can be seen in Table 6, Hanover Crossing as configured and occupied as of May 2023, was observed to generate approximately 20,851 vehicle trips on an average weekday and approximately 22,623 vehicle trips on a Saturday (both two-way, 24-hour volumes) as measured on the driveways serving Hanover Crossing,⁶ with approximately 762 vehicle trips (453 vehicles entering and 309 exiting) during the weekday morning peak-hour, 1,772 vehicle trips (845 vehicles entering and 927 exiting) during the weekday evening peak-hour and 2,503 vehicle trips (1,333 vehicles entering and 1,170 exiting) during the Saturday midday peak-hour.

In comparison to the traffic-volume projections for Hanover Crossing as configured and occupied as of May 2023, the measured traffic volumes were found to be approximately 1,931 vehicle trips (8 percent) lower on an average weekday and 11,609 vehicle trips (34 percent) lower on a Saturday. Peak-hour traffic volumes were found to be approximately 61 vehicle trips (9 percent) higher during the weekday morning peak-hour, 199 vehicle trips (10 percent) lower during the weekday evening peak-hour and 182 vehicle trips (8 percent) higher during the Saturday midday peak-hour. The traffic volume increase identified during the weekday morning peak-hour is, in part, attributable to the contractors that were on-site associated

⁶Inclusive of construction workers and cut-through traffic (i.e., non-Hanover Crossing related) using Hanover Crossing Way to travel between Route 53 and Mill Street.



with the construction of the new uses that are associated with Hanover Crossing that have not yet opened, cut-through traffic that uses Hanover Crossing Way to travel between Route 53 and Mill Street, and traffic volumes associated with the Chick-fil-A restaurant and the Prime Buick and Mercedes-Benz of Hanover automobile dealerships that use Hanover Crossing Way. ***In all instances, the traffic volume variation during the weekday and Saturday peak hours between the measured traffic volumes and the traffic volume predictions for the constructed portion of Hanover Crossing are within 10 percent.***

HANOVER CROSSING TRIP DISPERSAL

Travel patterns were observed at the driveways serving Hanover Crossing along Route 53 and Mill Street in conjunction with the TMCs in order to evaluate the dispersal of trips to Route 53 and Mill Street. Figure 6 depicts the trip distribution at each of the driveways that serve Hanover Crossing as observed in April/May 2023 and the assumed trip distribution pattern that was presented in the October 2019 SEIR.

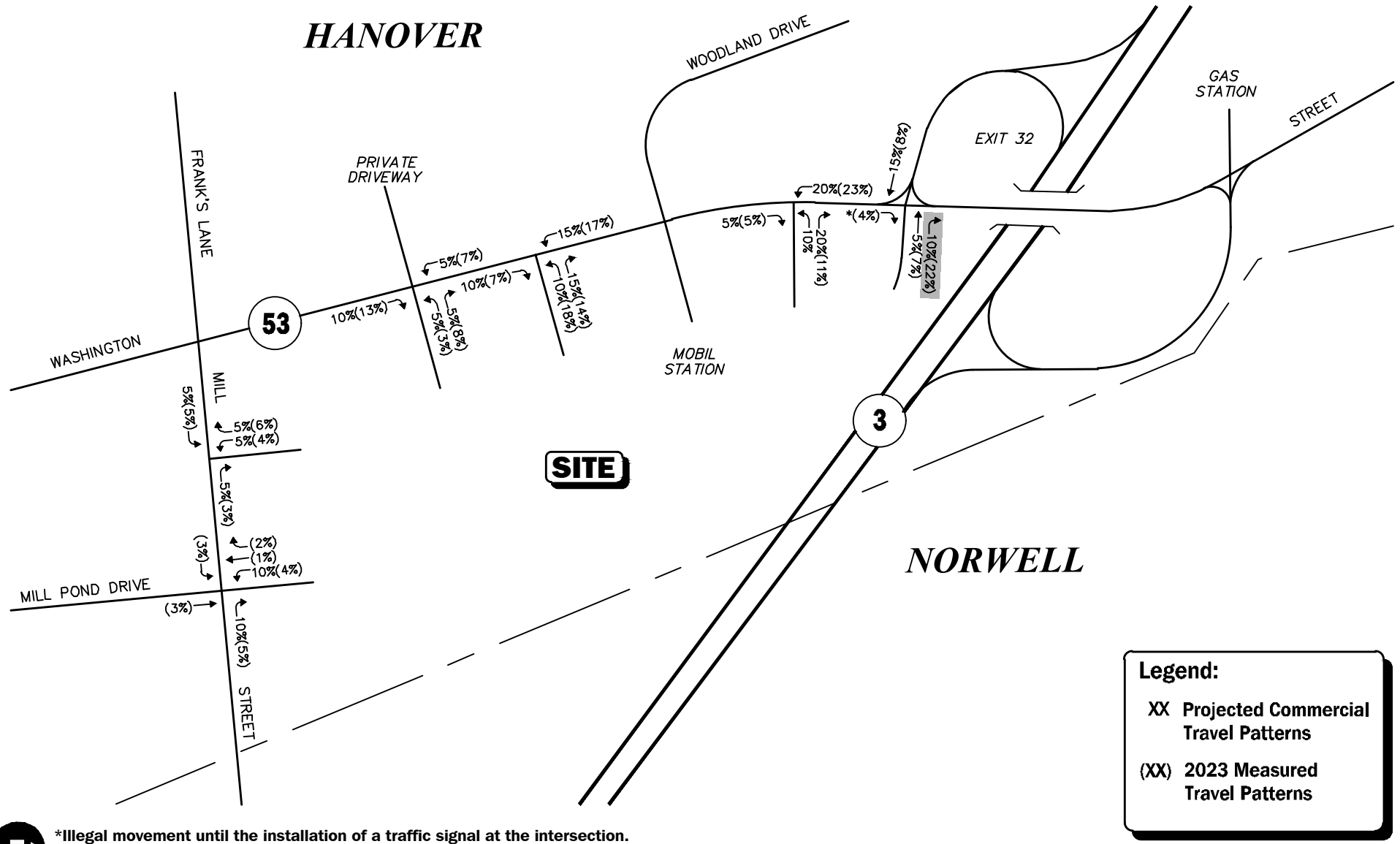
With the exception of the right-turn movement from Hanover Crossing Way to Route 53 northbound at the Route 53/Route 3 Southbound Ramps/Hanover Crossing Way intersection, the observed trip distribution at the driveways that serve Hanover Crossing were found to be within 10 percent of the assumed trip distribution pattern that was presented in the October 2019 SEIR. Approximately 22 percent of the trips exiting Hanover Crossing were observed to use Hanover Crossing Way to travel north on Route 53 vs. a predicted assignment of 10 percent of trips. This variation is off-set by a reduction in the predicted trip assignment for right-turn movements exiting the Hanover Crossing north driveway of approximately 9 percent from the trip assignment that was presented in the October 2019 SEIR (11 percent observed vs. 20 percent predicted) and may be attributed to motorist's desire to use (or avoid) the traffic signal at the Route 53/Route 3 Southbound Ramps/Hanover Crossing Way intersection. With the planned installation of the traffic control signal at the Hanover Crossing north driveway as a part of the continued build-out of Hanover Crossing, it is expected that there will be further adjustments in the trip distribution pattern for Hanover Crossing that will be documented as a part of future traffic monitoring reports.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2016 through 2020, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, roadway and weather conditions, and day of occurrence, and presented in Table 4.

As can be seen in Table 4, with the exception of the Mill Street/Mill Pond Road/Hanover Crossing Way intersection, the study area intersections were found to have experienced an average 2.6 or fewer reported motor vehicle crashes per year over the five-year review period and were found to have motor vehicle crash rates *below* the MassDOT statewide and District average crash rates for similar intersections for the MassDOT Highway Division District in which the intersections are located (District 5). The majority of crashes occurred on a weekday; during daylight; under clear weather conditions; and involved angle-type collisions that resulted in property damage only.





 *Illegal movement until the installation of a traffic signal at the intersection.
Not to Scale

Figure 6

2023 Existing
Travel Patterns

Table 4
MOTOR VEHICLE CRASH DATA SUMMARY^a

| | Rte. 53/ Rte. 3 SB Ramps/ Hanover Mall Dr. | Rte.53/ North Mall Dwy. | Rte. 53/ Center Mall Dwy. | Rte. 53/ South Mall Dwy. | Mill St./ West Mall Dwy. | Mill St./ Mill Pond Dr./ Hanover Mall Dr. | Rte. 53/ Woodland Dr. |
|------------------------------------|--|-------------------------------|---------------------------------|--------------------------------|--------------------------------|---|--------------------------|
| Traffic Control Type: ^b | TS | U | TS | U | U | U | U |
| <i>Year:</i> | | | | | | | |
| 2016 | 4 | 3 | 0 | 0 | 0 | 6 | 5 |
| 2017 | 2 | 5 | 0 | 2 | 0 | 3 | 1 |
| 2018 | 4 | 2 | 0 | 1 | 0 | 7 | 1 |
| 2019 | 3 | 1 | 0 | 0 | 0 | 0 | 1 |
| <u>2020</u> | <u>0</u> | <u>2</u> | <u>1</u> | <u>1</u> | <u>0</u> | <u>0</u> | <u>5</u> |
| Total | 13 | 13 | 1 | 4 | 0 | 16 | 13 |
| Average | 2.60 | 2.60 | 0.20 | 0.80 | 0.00 | 3.20 | 2.60 |
| Rate ^c | 0.19 | 0.26 | 0.02 | 0.08 | 0.00 | 1.17 | 0.27 |
| MassDOT Crash Rate: ^d | 0.78/0.75 | 0.57/0.57 | 0.78/0.75 | 0.57/0.57 | 0.57/0.57 | 0.57/0.57 | 0.57/0.57 |
| Significant? ^e | No | No | No | No | No | Yes | No |
| <i>Type:</i> | | | | | | | |
| Angle | 6 | 2 | 0 | 1 | 0 | 16 | 12 |
| Rear-End | 4 | 2 | 1 | 1 | 0 | 0 | 1 |
| Head-On | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| Sideswipe | 2 | 3 | 0 | 1 | 0 | 0 | 0 |
| Fixed Object | 1 | 3 | 0 | 0 | 0 | 0 | 0 |
| Pedestrian/Bicycle | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| <u>Unknown/Other</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| Total | 13 | 13 | 1 | 4 | 0 | 16 | 13 |
| <i>Day of Week:</i> | | | | | | | |
| Monday through Friday | 8 | 10 | 0 | 4 | 0 | 12 | 10 |
| Saturday | 1 | 1 | 0 | 0 | 0 | 3 | 1 |
| <u>Sunday</u> | <u>4</u> | <u>2</u> | <u>1</u> | <u>0</u> | <u>0</u> | <u>1</u> | <u>2</u> |
| Total | 13 | 13 | 1 | 4 | 0 | 16 | 13 |
| <i>Conditions:</i> | | | | | | | |
| Clear | 9 | 8 | 1 | 1 | 0 | 9 | 12 |
| Cloudy | 1 | 3 | 0 | 2 | 0 | 3 | 1 |
| Rain | 0 | 2 | 0 | 1 | 0 | 3 | 0 |
| Snow/Ice | 2 | 0 | 0 | 0 | 0 | 1 | 0 |
| <u>Not Reported</u> | <u>1</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| Total | 13 | 13 | 1 | 4 | 0 | 16 | 13 |
| <i>Lighting:</i> | | | | | | | |
| Daylight | 11 | 11 | 0 | 4 | 0 | 13 | 11 |
| Dawn/Dusk | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Dark (Road Lit) | 2 | 2 | 1 | 0 | 0 | 3 | 1 |
| <u>Dark (Road Unlit)</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| Total | 13 | 13 | 1 | 4 | 0 | 16 | 13 |
| <i>Severity:</i> | | | | | | | |
| Property Damage Only | 7 | 8 | 0 | 3 | 0 | 9 | 9 |
| Personal Injury | 5 | 5 | 1 | 1 | 0 | 6 | 4 |
| Fatality | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <u>Not Reported</u> | <u>1</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>1</u> | <u>0</u> |
| Total | 13 | 13 | 1 | 4 | 0 | 16 | 13 |

^aSource: MassDOT Safety Management/Traffic Operations Unit records, 2016 through 2020.

^bTraffic Control Type: U = unsignalized; TS = traffic signal.

^cCrash rate per million vehicles entering the intersection.

^dStatewide/District crash rate.

^eThe intersection crash rate is significant if it is found to exceed the MassDOT statewide and/or District crash rate for the MassDOT Highway Division District in which the Project is located (District 5).



The Mill Street/Mill Pond Drive/Hanover Crossing Way intersection was found to have experienced a total of 16 reported motor vehicle crashes over the five-year review period, or an average of 3.2 crashes per year, the majority of which occurred on a weekday; during daylight; under clear weather conditions; and involved angle-type collisions that resulted in property damage only. The intersection was identified to have a motor vehicle crash rate that was *above* the MassDOT statewide and District average crash rates for similar intersections. The Town has advanced safety-related improvements at the intersection that include the implementation of all-way STOP-sign control, which appear to have resulted in a reduction in the reported number of motor vehicle crashes that are occurring at the intersection as evidenced by the decline in crashes that have occurred since 2018, with no (0) crashes reported in 2019 and 2020 based on the MassDOT crash data.

A review of the MassDOT statewide High Crash Location List indicated that there are no Highway Safety Improvement Program (HSIP) eligible high crash locations within the study area. In addition, no (0) crashes were reported within the study area over the five-year review period that resulted in a fatality. The detailed MassDOT Crash Rate Worksheets are attached.

Motor vehicle crash information has been requested from the Hanover Police Department for the study area intersections. To the extent so desired by the Town and MassDOT, a supplement to this assessment will be prepared once the crash reports have been acquired.

TRAFFIC OPERATIONS ANALYSIS

In order to assess operating conditions at the study area intersections, a detailed traffic operations analysis (motorist delays, vehicle queuing and level of service (LOS)) was performed under 2023 traffic volume conditions. Capacity analysis provide an indication of how well transportation facilities serve the traffic demands placed upon them, with vehicle queuing analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

In brief, six levels of service are defined for each type of facility. They are given letter designations ranging from A to F, with LOS “A” representing the best operating conditions and LOS “F” representing congested or constrained operations. An LOS of “E” is representative of a transportation facility that is operating at its design capacity with an LOS of “D” generally defined as the limit of “acceptable” traffic operations. Since the level of service of a traffic facility is a function of the flows placed upon it, such a facility may operate at a wide range of levels of service depending on the time of day, day of week, or period of the year. The Synchro® intersection capacity analysis software, which is based on the analysis methodologies and procedures presented in the 6th Edition *Highway Capacity Manual* (HCM)⁷ was used to complete the level-of-service and vehicle queue analyses.

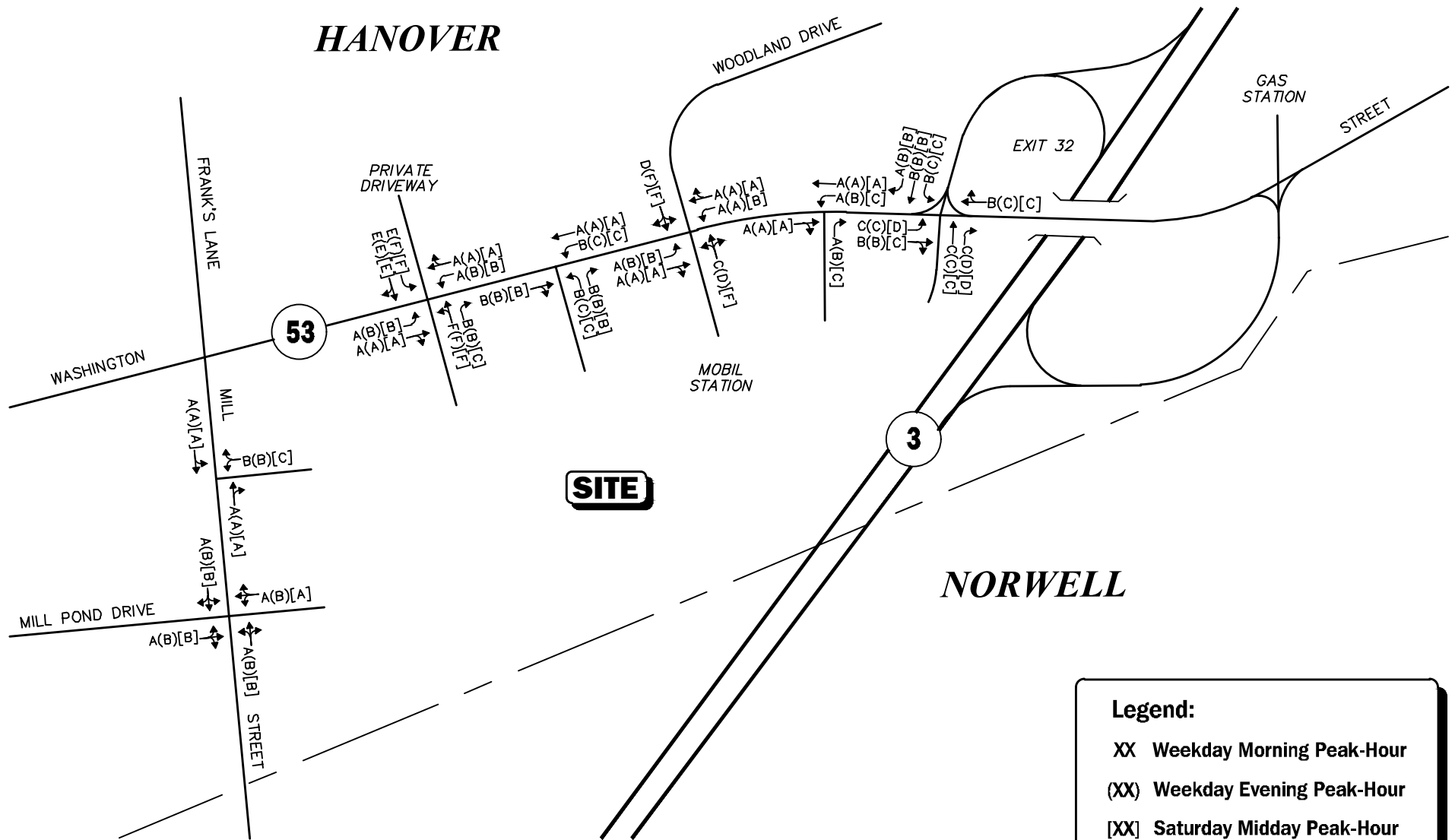
Analysis Results

The results of the intersection capacity analysis are summarized on Figure 7, with the detailed analysis results attached. For context, we note that an LOS of “D” or better is generally defined as “acceptable” operating conditions.

As can be seen on Figure 7, all movements at the study area intersections were shown to operate at LOS D or better during the peak hours with the exception of specific movements from side streets and driveways

⁷*Highway Capacity Manual*, Transportation Research Board; Washington, DC; 2016.





at the unsignalized intersections along Route 53 during the weekday evening and Saturday midday peak-hours.

Vehicles exiting Woodland Drive, the Mobil station driveway located opposite Woodland Drive, the Hanover Crossing south driveway and the driveway to 1376 Washington Street were shown to operate at or over capacity (i.e., LOS “E” or “F”) during the weekday evening and/or Saturday midday peak hours as a result of the relatively large volume of conflicting traffic traveling along Route 53 during those time periods, which is generally consistent with the analysis results that were presented in the October 2019 TIA.

SUMMARY

VAI has completed the 2023 Traffic Monitoring Program for Hanover Crossing located at 1775 Washington Street (Route 53) in Hanover, Massachusetts. This document has been prepared in fulfillment of the Traffic Monitoring Program requirement specified in the December 16, 2019 Decision of the Town of Hanover Planning Board and in the April 14, 2020 MassDOT Section 61 Finding issued for Hanover Crossing. The results of the 2023 Traffic Monitoring Program have indicated the following:

1. As configured and occupied as of May 2023, Hanover Crossing was shown to generate approximately 20,851 vehicle trips on an average weekday and approximately 22,623 vehicle trips on a Saturday (both two-way, 24-hour volumes) as measured on the driveways serving Hanover Crossing, with approximately 763 vehicle trips during the weekday morning peak-hour, 1,772 vehicle trips during the weekday evening peak-hour and 2,503 vehicle trips during the Saturday midday peak-hour;
2. In comparison to the projected traffic volumes as presented in the October 2019 SEIR prepared for Hanover Crossing, the actual measured 2023 traffic volumes associated with Hanover Crossing were found to be approximately 8 percent lower on an average weekday and 34 percent lower on a Saturday. Peak-hour traffic volumes were found to be approximately 9 percent higher during the weekday morning peak-hour, 9 percent lower during the weekday evening peak-hour and 8 percent higher during the Saturday midday peak-hour;
3. The traffic volume increase identified during the weekday morning peak-hour is, in part, attributable to the contractors that were on-site associated with the construction of the new uses that are associated with Hanover Crossing that have not yet opened and cut-through traffic that uses Hanover Crossing Way to travel between Route 53 and Mill Street. In all instances, the traffic volume variation during the weekday and Saturday peak hours between the measured traffic volumes and the traffic volume predictions for the constructed portion of Hanover Crossing are within 10 percent;
4. Travel patterns observed at the driveways serving Hanover Crossing were generally found to be consistent (within 10 percent) with the trip distribution pattern presented in the October 2019 SIER;
5. Traffic volumes on Woodland Drive west of Route 53 were found to be lower than those observed in 2019, with variations to the traffic volumes measured in 2022 found to range from an increase of 100 vehicles on an average weekday to a decrease of 23 vehicles on a Saturday (both variations over a 24-hour period). Similarly, the measured traffic volumes during the peak hours were found to be lower than those observed in 2019, with variations to the peak-hour traffic volumes measured in 2022 found to range from a reduction of 12 vehicles during



the weekday morning peak-hour to an increase of 46 vehicles during the Saturday midday peak-hour. The observed traffic volume variations are attributable to general traffic growth in the area, including that associated with the Hanover Crossing;

6. With the exception of the Mill Street/Mill Pond Drive/Hanover Crossing Way intersection, the monitored intersections were found to have motor vehicle crash rates that were below the MassDOT average crash rates for similar intersections. A review of the most recent crash data for the Mill Street/Mill Pond Drive/Hanover Crossing Way intersection indicates that the improvements that have been advanced by the Town at the intersection (all-way stop control) have resulted in a reduction in the reported number of motor vehicle crashes that are occurring at the intersection as evidenced by the decline in crashes that have occurred since 2018, with no (0) crashes reported in 2019 and 2020 based on the MassDOT crash data; and
7. All movements at the monitored intersections were shown to operate at LOS “D” or better with the exception of specific movements from side streets and driveways at the unsignalized intersections along Route 53 during the weekday evening and Saturday midday peak-hours, which were identified to operate at or over capacity (i.e., LOS “E” or “F”) due to the relatively large volume of conflicting traffic along Route 53 during the peak periods.

The construction of Hanover Crossing is on-going and includes specific improvements to roadways and intersections as defined in the MassDOT Section 61 Finding and those required in the Planning Board Decision. As specified in these documents, Prep Hanover Real Estate, LLC will perform traffic monitoring on an annual basis upon issuance of the first Certificate of Occupancy and thereafter for a period not to exceed 5 years after full build-out. Subsequent monitoring will document the elements of the TDM Program that have been implemented and the results of employee and patron travel mode surveys as Hanover Crossing approaches completion.

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