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PRINCIPALS
Robert J. Michaud, P.E.
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MEMORANDUM

DATE: May 7, 2015

TO: Mr. Bruce Levine
Equity Industrial Partners
145 Rosemary Street, Suite E
Needham, MA 02194

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, P.E. – Senior Project Manager

RE: **Proposed Office Expansion**
2 Wells Avenue – Newton, Massachusetts

MDM Transportation Consultants, Inc. (MDM) has prepared this traffic impact assessment (TIA) for a proposed office expansion at 2 Wells Avenue in Newton, Massachusetts. This memorandum describes existing (baseline) traffic conditions for adjacent roadways, trip generation characteristics of the proposed development, quantifies incremental traffic impacts of the Site development on area roadways, provides a parking assessment, and evaluates safety-related conditions at key study locations that provide access to the Site.

Key findings of the traffic assessment are as follows:

- *Baseline Traffic Volumes.* Wells Avenue just north of the Site carries approximately 12,376 vehicles per day (vpd) on weekdays. Peak hour traffic flow on Wells Avenue is approximately 8 to 10 percent of the daily flow with directional flow heavily skewed southbound during the weekday morning peak traffic hour (85% SB) and heavily skewed northbound during the weekday evening peak hour (75% NB). The travel patterns are highly consistent commuter travel patterns for an office park.

- *Safety Characteristics.* Study intersections exhibit below-average crash rates based on historic crash data; safety countermeasures are therefore not warranted. Likewise, the available sight lines at the site driveway intersections Wells Avenue exceed the recommended sight line requirements from AASHTO for the posted speed limit and observed travel speeds.

- *Site Traffic Generation.* The expansion project is estimated to generate approximately 83 new vehicle trips during the weekday morning peak hour and 78 new vehicle trips during the weekday evening peak hour.

- *Adequate Roadway Capacity.* As part of the project the two existing driveways that provide access/egress to the Site along Wells Avenue will be retained. The intersection of Wells Avenue with the proposed site driveways are expected to operate below capacity at LOS D or better during the weekday morning and weekday evening peak hours under future year conditions. Incremental traffic increases at the study intersections due to the proposed development generally result in inconsequential changes in intersection operations compared to No-Build conditions. Therefore, no additional roadway improvements are warranted to accommodate the expansion project. Furthermore, The proposed expansion project will not alter operating conditions compared to No-Build conditions, therefore, will have no impact on the proposed improvement plans by the City at the nearby Nahanton Street intersections with Wells Avenue and Winchester Street.

- *Adequate Parking Supply.* Under proposed conditions, the Site is estimated to have a demand of 408 parking spaces relative to the overall parking supply of 477 parking spaces. This results in a projected surplus of approximately 14 percent (69 parking spaces). This level of parking surplus will accommodate normal daily fluctuation in peak parking demands, seasonal considerations, and other factors that may impact parking efficiencies within the Site.

In summary, trip generation for the office expansion is projected to be nominal with approximately 1 new vehicle per minute on average during commuter peak hours. MDM finds that incremental traffic associated with the proposed expansion is not expected to materially impact operating conditions at the study intersections. Study intersections exhibit below-average crash rates based on historic crash data; safety countermeasures are therefore not warranted. Likewise, the available sight lines at the site driveway intersections Wells Avenue exceed the recommended minimum (safety based criteria) and ideal (convenience based criteria) sight line requirements from AASHTO for the posted speed limit and observed travel speeds. Under proposed conditions, the Site is estimated to have a demand of 408 parking spaces relative to the overall parking supply of 477 parking spaces. This results in a projected surplus of approximately 14 percent (69 parking spaces). This level of parking surplus will accommodate normal daily fluctuation in peak parking demands, seasonal considerations, and other factors that may impact parking efficiencies within the Site.

PROJECT DESCRIPTION

Existing Conditions

The existing site consists of a fully leased 68,740± square foot (sf) office building with approximately 264 total employees. Existing marked on-site parking includes 293 total parking spaces consisting of 286 general parking spaces and 7 handicapped parking spaces. Access to the site is currently provided via two full-access/egress driveways along Wells Avenue. The site location relative to area roadways is shown in **Figure 1.**

Proposed Conditions

Under the proposed site programming an expansion of 66,510± sf will be constructed resulting in an overall building size of 132,598± sf. CCS Companies, which current uses Suite 100 as a high density calling center with 184± employees will vacate 32,472± sf of office space while the tenants of the 34,038 sf (80± employees) are expected to remain. Under proposed conditions the 132,598 sf office building is projected to accommodate 416± employees based on normal building occupancy rates[1]. Employee density calculations are provided in the **Attachments**. The on-site parking supply will be increased by 184± spaces for a total on-site parking supply of 477± marked spaces. Under proposed conditions 34 bicycle parking spaces (30 indoor spaces and 4 outdoor spaces) will be added to accommodate an alternative transportation option. Access/egress to the facility will remain via the two existing site driveways along Wells Avenue. A preliminary site plan rendering prepared by Nitsch Engineering is presented in **Figure 2.**

EXISTING TRAFFIC & SAFETY CHARACTERISTICS

An overview of existing roadway conditions, traffic volumes, safety characteristics, and public transportation facilities serving the area is provided below.

Roadways

Nahanton Street

Nahanton Street is classified by the Massachusetts Department of Transportation (MassDOT) as an urban minor arterial under local (Town) jurisdiction within the study area. Nahanton Street an east-west roadway. The roadway generally provides a single travel lane in each direction with additional turn lanes provided at its major intersections. A bituminous sidewalk is provided along the southern side of the roadway to the west of Wells Avenue. Within the study area, the posted (regulatory) speed limit along Nahanton Street is 35 miles per hour mph in the eastbound direction and 30 mph in the westbound direction. Land uses along Nahanton Street include an office park, the Jewish Community Centers of Greater Boston, a golf course, farm land and residential uses.

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[1]*Trip Generation,* Ninth Edition; Institute of Transportation Engineers; Washington, DC; 2012. ITE average employee density of 3.14 employees per 1,000 sf times 132.598 sf = 416± employees.

Figure 1

Site Location

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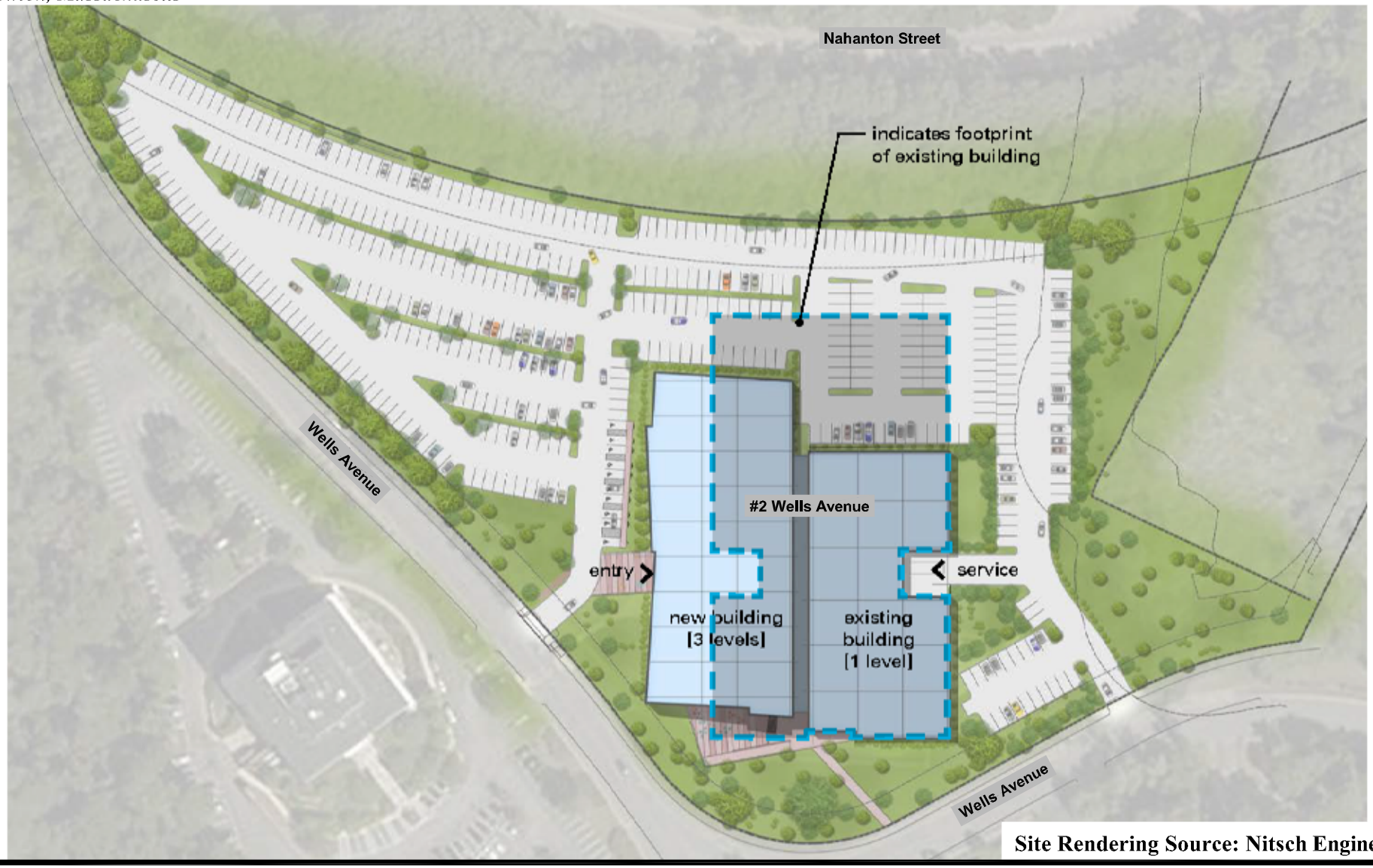

Site Rendering Source: Nitsch Engineering

Figure 2

Preliminary Site Plan
(Office Expansion - 2 Wells Avenue)

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Wells Avenue

Wells Avenue is classified by the Massachusetts Department of Transportation (MassDOT) as a local roadway under local (Town) jurisdiction within the study area. Wells Avenue an office park loop roadway that provides one wide single travel lane in each direction. Bituminous sidewalks are provided along the both sides of the roadway throughout the office park. Land uses along Wells Avenue include office buildings, the Boston Sports Club, and educational uses.

Winchester Street

Winchester Street is classified by the Massachusetts Department of Transportation (MassDOT) as and urban collector roadway under local (Town) jurisdiction within the study area. Winchester Street provides on travel lane in each direction connecting Nahanton Street to the South with Route 9/ Centre Street to the north. In the immediate study area, bituminous sidewalks are provided along the both sides of the roadway. Land uses along Winchester Street in the study area include the Jewish Community Centers of Greater Boston, a golf course, farm land and residential uses.

Baseline Traffic Data

Existing Trip Generation – 2 Wells Avenue

Estimated trip generation for the existing office uses at the Site has been determined based on turning movement counts conducted at the Site Driveway intersections with Wells Avenue in June 2014. **Table 1** presents the 2 Wells Avenue office building's existing trip generation characteristics during the study periods.

TABLE 1
EXISTING TRIP GENERATION – 2 Wells Avenue

Period/Direction	Existing Site Trips[1,2]	Existing Trip Rate[2] Per Employee	Existing Trip Rate[2] Per 1,000 sf
Weekday Morning Peak Hour:			
Entering	79	0.30	1.15
Exiting	8	0.03	0.12
Total	87	0.33	1.27
Weekday Evening Peak Hour:			
Entering	10	0.04	0.15
Exiting	65	0.24	0.94
Total	75	0.28	1.09

[1] Turning movement counts at the 2 Wells Avenue Site Driveways in June 2014; the existing building is 68,740± gsf of office uses with 264± total employees.
[2] Observed Trips per employee and per 1,000 sf.

As summarized in **Table 1**, the existing office building at 2 Wells Avenue currently generates approximately 87 vehicle trips (79 entering and 8 exiting) during the weekday morning peak hour and 75 vehicle trips (10 entering and 65 exiting) during the weekday evening peak hour.

Peak Hour Traffic

Traffic volume data was collected in May/June 2014 during the weekday morning (7:00 – 9:00 AM) and weekday evening (4:00 – 6:00 PM) peak periods. Review of MassDOT permanent count station data indicates that May/June are above-average traffic months (both approximately 5 percent higher than average month conditions). In order to provide a conservative analysis, no seasonal adjustment (reduction) of the data was made to the May/June traffic volume counts. Turning movement counts and permanent count station data are provided in the **Attachments**. The resulting existing (baseline) weekday morning and weekday evening peak-hour traffic volumes for the study intersections are depicted in **Figure 3** and **Figure 4**.

Daily Traffic Counts

Daily traffic volumes along Wells Avenue between the site driveway and Nahanton Street were collected in June 2014 using an automatic traffic recorder (ATR) using radar technology with results summarized in **Table 2**.

TABLE 2
ROADWAY TRAFFIC-VOLUME SUMMARY – WELLS AVENUE

Roadway	Weekday Daily Volume (vpd)[1]	Weekday AM Peak Hour Volume (vph)[2]	Weekday AM Peak Hour Percent of Daily Traffic[3]	Weekday AM Peak Hour Peak Flow Direction	Weekday PM Peak Hour Volume (vph)	Weekday PM Peak Hour Percent of Daily Traffic	Weekday PM Peak Hour Peak Flow Direction
Wells Avenue	12,376	1,135	9%	85% SB[4]	1,292	10%	75% NB[4]

[1]Two-way daily traffic expressed in vehicles per day.
[2]Two-way peak-hour volume expressed in vehicles per hour.
[3]The percent of daily traffic that occurs during the peak hour.
[4]NB = northbound, SB = Southbound

As summarized in **Table 2,** Wells Avenue just north of the Site carries approximately 12,376 vehicles per day (vpd) on weekdays. Peak hour traffic flow on Wells Avenue is approximately 8 to 10 percent of the daily flow with directional flow heavily skewed southbound during the weekday morning peak traffic hour (85% SB) and heavily skewed northbound during the weekday evening peak hour (75% NB). The travel patterns are highly consistent commuter travel patterns for an office park.

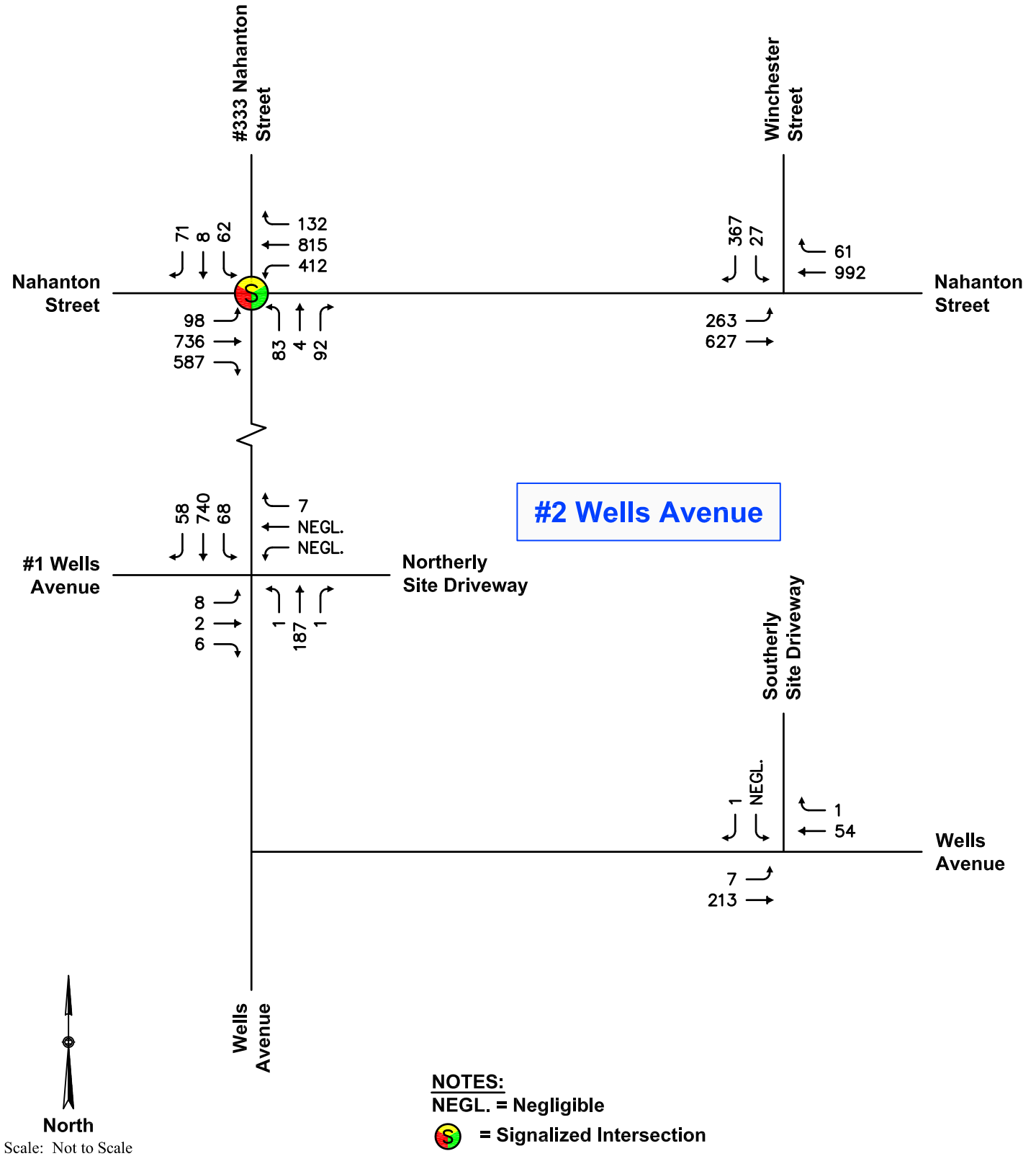

Figure 3

Baseline Condition
Weekday Morning Peak Hour
Traffic Volumes

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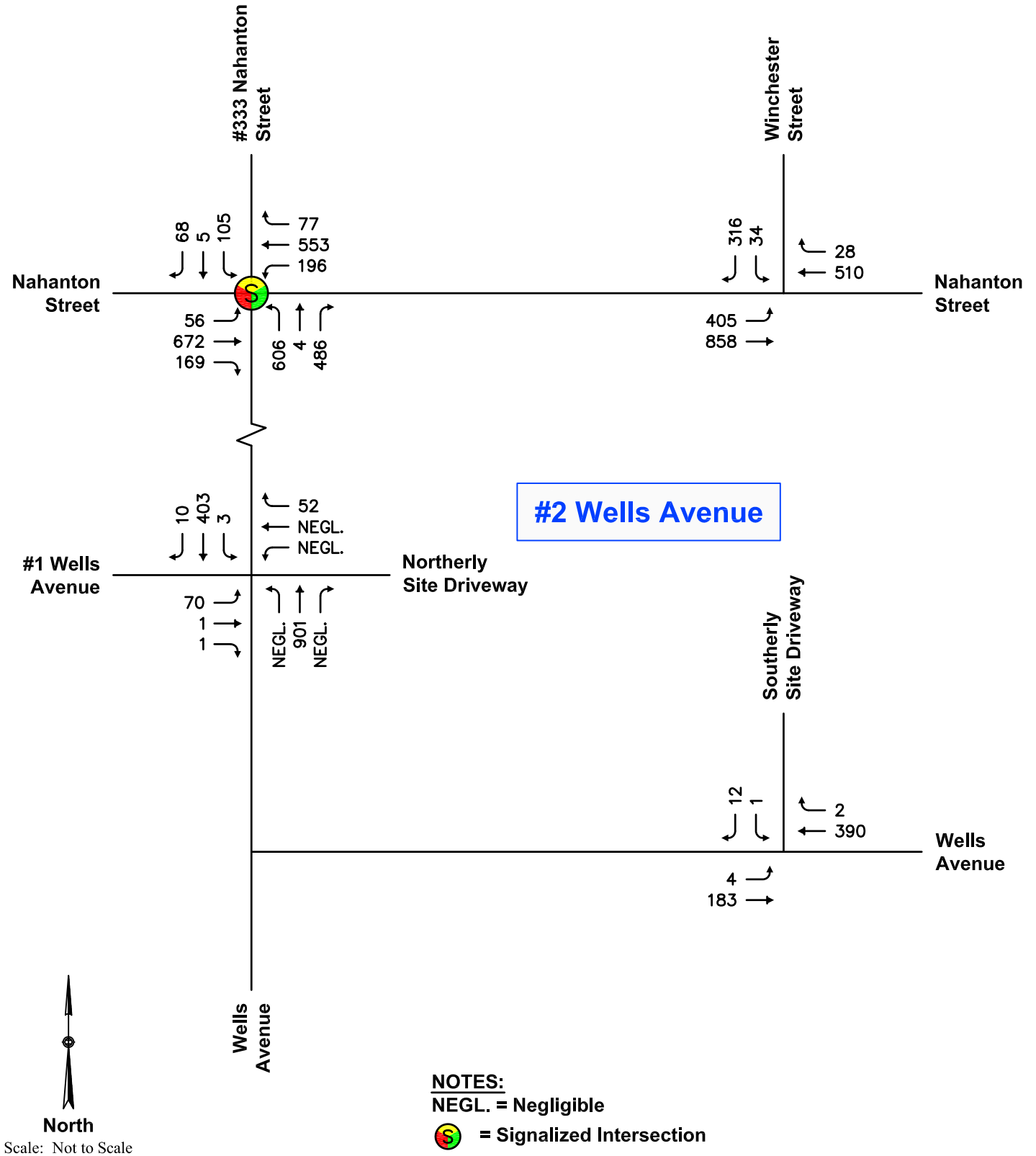

Figure 4

Baseline Condition
Weekday Evening Peak Hour
Traffic Volumes

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Date: May 2015
Dwg No. 770 MR02.dwg

Observed Travel Speeds

Vehicle speeds were obtained for the northbound and southbound travel directions on Wells Avenue in the vicinity of the site driveways in May 2014 using an ATR machine equipped with speed radar. **Table 3** summarizes the average and 85th percentile speeds for the location and time period studied. Speed data is provided in the **Attachments**.

TABLE 3
SPEED STUDY RESULTS – WELLS AVENUE

Travel Direction	Posted Speed Limit (mph)	Observed Travel Speed (mph)	
		Mean[2]	85th Percentile[3]
Northbound	30	29	33
Southbound	30	32	35

[1]Regulatory (prima facie) speed limit.
[2]Arithmetic mean.
[3]The speed at or below which 85 percent of the vehicles are traveling.

As summarized in **Table 3**, the mean (average) travel speed on Wells Avenue traveling northbound is 29 mph and the 85th percentile travel speed is 33 mph. In the southbound direction, the mean travel speed is 32 mph and the 85th percentile travel speed is 35 mph. The speed study results are highly consistent with the regulatory speed limit and were collected for use in the sight line evaluations presented in a subsequent section of this report.

Intersection Crash History

Crash trends and safety characteristics for study area intersections are evaluated using the MassDOT crash database for the City of Newton for the four-year period 2009 through 2012 (the most recent available data). Crash data for the study intersections is summarized in **Table 4** with detailed data provided in the **Attachments.**

Crash rates are calculated for the study area intersections and are summarized in **Table 4**. The calculated crash rate quantifies the number of crashes per million entering vehicles. MassDOT has determined the official District 6 (which includes the City of Newton) crash rate to be 0.58 for unsignalized intersections and 0.76 for signalized intersections. This rate represents MassDOT's "average" crash experience for District 6 communities and serves as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the district average, some form of safety countermeasures may be warranted for further evaluation.

TABLE 4
INTERSECTION CRASH SUMMARY
2009 THROUGH 2012[1]

Data Category	Nahanton Street at Wells Avenue	Nahanton Street at Winchester street
Traffic Control	Signalized	Unsignalized
Crash Rate[2]	**0.43**	**0.26**
District 3 Avg[3]	0.76	0.58
Year:		
2009	7	3
2010	5	3
2011	4	2
2012	2	0
Total	**18**	**8**
Type:		
Angle	7	1
Rear-End	4	0
Head-On	1	1
Sideswipe	2	2
Single Vehicle	4	4
Other/Unknown	0	0
Severity:		
P. Damage Only	14	5
Personal Injury	4	2
Fatality	0	0
Unknown	0	1
Conditions:		
Dry	14	4
Wet	2	2
Snow	0	2
Other/Unknown	2	0
Time:		
7:00 to 9:00 AM	2	0
4:00 to 6:00 PM	7	0
Rest of Day	9	8

[1] Source: MassDOT Crash Database
[2] Crashes per million entering vehicles
[3] District 6 averages = 0.76 (signalized) and 0.58 (unsignalized)

As summarized in **Table 4**:

- *Nahanton Street at Wells Avenue.* There are a total of eighteen (18) crashes reported at the Nahanton Street/Wells Avenue signalized intersection during the four-year study period. The resulting crash rate for the intersection is 0.43 which is below the District 6 average of 0.76 for signalized intersections. Four of the crashes involved single vehicle type crashes with fixed objects and six (6) crashes involved parked vehicles. The majority (78%) resulted in property damage only under dry roadway conditions (78%). Half (50%) occurred during the weekday morning or evening peak periods. No fatalities were reported and one pedestrian-related incident was reported during the four-year study period.

- *Nahanton Street at Winchester Street.* There are a total of eight (8) crashes reported at the Nahanton Street/ Winchester Street unsignalized intersection during the four-year study period. The resulting crash rate for the intersection is 0.26 which is below the District 6 average of 0.58 for unsignalized intersections. The crashes included four (4) single vehicle-type crashes, two (2) sideswipe type crash, one (1) angle type crash, and one (1) head on collision. The majority resulted in property damage only (75%) with half under wet/ snowy roadway conditions. None of the crashes were reported during the weekday morning and evening peak periods

- *Wells Avenue at Site Driveways.* There were no reported crashes at the existing site driveway intersections with Wells Avenue during the four-year study period.

In summary, the study intersections all experienced crash rates below the District 6 average and no immediate safety countermeasures are warranted based on the crash history at the study intersections.

Public Transportation Facilities

The Massachusetts Bay Transportation Authority (MBTA) operates the following bus and commuter rail lines in the site vicinity (specific route and schedule information is provided in the **Attachments.**

- **Route 52 – Dedham Mall or Charles River Loop – Watertown Yard:** This bus line provides weekday service between Watertown Yard to the north and the Dedham Mall to the south. This bus service provides a stop at the intersection of Nahanton Street and Winchester Street and stops at the Newton Centre "T" station. This bus service generally provides service on weekdays during the morning, midday and early evening periods.

- **Newton Centre – Green Line:** The green line "D" branch provides service between Riverside Station and Lechmere Station with connections to the blue, orange, red, and silver lines. This subway rail service generally operates approximately every 10 minutes on weekdays.

As a conservative measure, no credit (reduction) in site trips was taken in the following section as a result of the available public transportation services.

Sight Line Evaluation

An evaluation of sight lines was conducted at the site driveway locations to ensure that minimum recommended sight lines are available at the site driveway intersections with Wells Avenue. The evaluation documents sight lines under proposed conditions for vehicles as they relate to Wells Avenue with comparison to recommended guidelines.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[2] reference two types of sight distance which are relevant at the site driveway intersections along Wells Avenue: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the site driveway intersections with Wells Avenue were compared to minimum SSD and ISD recommendations for the regulatory speed limit in the area as well as ambient travel speeds recorded along Wells Avenue near the site.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting onto Wells Avenue. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet level pavement. Adjustment factors are applied to account for roadway grades when applicable.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the Wells Avenue approaches to the site driveways. **Table 5** presents a summary of the available SSD as they relate to Wells Avenue and AASHTO's recommended SSD based on posted and observed ambient travel speeds along Wells Avenue.

[2] *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2011.

TABLE 5
STOPPING SIGHT DISTANCE SUMMARY
WELLS AVENUE APPROACHES TO SITE DRIVEWAYS

Approach/ Travel Direction	Available SSD	AASHTO Recommended[1]		
		Posted Speed Limit (30 mph)	Average Observed Speed[2]	85th Percentile Observed Speed[3]
Wells Avenue at Northerly Site Driveway				
Northbound	>500 Feet	200 Feet	190 Feet	230 Feet
Southbound	>500 Feet	200 Feet	215 Feet	250 Feet
Wells Avenue at Southerly Site Driveway				
Eastbound	>375 Feet	80 Feet[4]	--	--
Westbound	>400 Feet	200 Feet	--	--

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet.
[2]Average Speed on Wells Avenue: 29 mph NB, 32 mph SB.
[3]85th Percentile travel speed on Wells Avenue: 33 mph NB, 35 mph NB
[4]Based on 15 mile per hour travel speed for vehicles turning from Wells Avenue

As summarized in **Table 5,** analysis results indicate that the existing available sight lines exceed AASHTO's recommended SSD criteria for both travel directions along Wells Avenue. Stopping sight distance calculations are provided in the **Attachments.**

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "*...If the available sight distance for an entering ...vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions...To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.*" AASHTO's ISD criteria are defined into several "cases". In this case, the site driveway approaches to the intersections are under "STOP"-sign control and the ISD in question relates to the ability to turn left or turn right onto Wells Avenue.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (between 8.0 feet and 14.5 feet from edge of travel way) for the travel directions along Wells Avenue. **Table 6** presents a summary of the available ISD for the departure from the site driveways and AASHTO's recommended ISD.

TABLE 6
INTERSECTION SIGHT DISTANCE SUMMARY
SITE DRIVEWAY DEPARTURES TO WELLS AVENUE

		AASHTO Minimum[1]		AASHTO Ideal[1]
Approach/ Travel Direction	Available ISD	Posted Speed Limit (30 mph)	85th Percentile Observed Speed[2]	Posted Speed Limit (30 mph)
Wells Avenue at Northerly Site Driveway				
Looking South	>500 Feet	200 Feet	230 Feet	335 Feet
Looking North	>500 Feet	200 Feet	250 Feet	335 Feet
Wells Avenue at Southerly Site Driveway				
Looking West	375± Feet[3]	80 Feet[4]	--	165 Feet
Looking East	400± Feet	200 Feet	--	335 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet and adjustments for roadway grade if required. Minimum value as noted represents SSD per AASHTO guidance.
[2]85th Percentile travel speed on Wells Avenue: 33 mph NB, 35 mph NB
[3]Measure distance with clear visibility to the Wells Avenue Loop Road intersection to the west.
[4]Based on 15 mile per hour travel speed for vehicles turning from Wells Avenue

The results of the ISD analysis presented in **Table 6** indicate that the available sight lines looking north and south from the site driveways onto Wells Avenue exceed the recommended sight line requirements from AASHTO for the posted speed limit and observed travel speeds. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within the driveway sight lines should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight.

PROJECTED FUTURE TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. For this evaluation, a five-year planning horizon (year 2019) was selected consistent with industry standard guidelines.

To determine the impact of Site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), includes existing (baseline) traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated Site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of planned area roadway improvements, future No-Build traffic volumes and projected Build traffic volumes.

Planned Area Roadway Improvements

Route 128/I-95 Add-a-lane Project – Kendrick Street Interchange

MassDOT is planning improvements (project 603711) along Route 128/I-95 includes the addition of a travel lane and shoulder from just south of Kendrick Street to just north of Route 9, installing a new connector/distributer roads between Highland Avenue and Kendrick Street, installing a new 5-lane Kendrick Street bridge over Route 128/I-95 and installing a new interchange with both northbound and southbound ramps to/from Kendrick Street. The improvements are aimed at improving access for the business parks along Kendrick Street and have been estimate to shift traffic flow patterns along Kendrick Street and Nahanton Street. Projected peak hour traffic volume shifts along Nahanton Street at Wells Avenue and Winchester Street prepared by McMahon Associates as part of the MassDOT Add-a-lane project is provided in the **Attachments**.

Nahanton Street at Winchester Street

The City of Newton is planning improvements which include geometric improvements and installing a fully actuated traffic signal at this location. The construction is expected to improve vehicular, bicycle and pedestrian movements. Geometric improvements include the addition of an exclusive right turn lane along Nahanton Street and providing an exclusive left turn departure lane and an exclusive right turn departure lane from Winchester Street. An alternative improvement plan would include the installation of a modern roundabout at said intersection; however, this alternative appears unfeasible given existing right-of-way constraints.

Nahanton Street at Wells Street

The City of Newton has identified short term and long term improvements to the signalized intersection of Nahanton Street and Wells Street. Short term improvements include traffic signal optimization, upgrading traffic signal equipment and installing an actuated pedestrian crossing of Nahanton Street and associated pedestrian traffic signal equipment. Long term improvements being considered include geometric improvements and replacing the traffic signal with a modern roundabout. Given the limited specifics regarding the long term improvements, for analysis purposes only the short term improvements are included in the future year analysis conditions.

The three (3) improvement projects have been assumed to be complete under future No-Build and Build conditions. Therefore, the future capacity analysis is reflective of the improvements.

Background Growth

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

Nearby permanent count station data published by MassDOT indicates a declining (-0.3 percent per year) growth rate. For purposes of this evaluation, a 0.5 percent growth rate was used (2.5 percent increase over a 5-year horizon). This growth rate is higher than historic rates, and, as such, is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area and traffic associated with other potential small developments or vacancies in the area. MassDOT permanent count station data and background growth calculations are provided in the **Attachments.**

Additionally, there are two (2) site-specific area development projects identified that may increase traffic at the study intersection compared to baseline conditions:

- ***Proposed Residential Development – 135 Wells Avenue***: This development is a proposed residential apartment development to be located at 135 Wells Avenue in Newton MA. As proposed, the project will include the demolition of the 62,000± sf Boston Sports Club (BSC) and the construction of 334 apartment units and a co-work café (6,000 sf). Traffic associated with this development was estimated based on the Traffic Impact and Access Study prepared for the project. The Site-specific trip tracings are provided in the **Attachments**.

- ***Center 128***: This development is a permitted 740,000 sf general office development that is proposed at 400 First Avenue in Needham, MA. Traffic associated with this development was estimated based on the Site-specific trip tracings that were prepared for the project which are provided in the **Attachments**.

2019 No-Build Traffic Volume Networks

In summary, to account for future traffic growth in the study area future No-Build traffic volumes are developed by increasing the baseline volumes by approximately 2.5 percent (0.5 percent compounded annually over 5 years), as well as traffic associated with specific area developments and projected traffic shifts due to MassDOT's Add-a-lane project. The resulting 2019 No-Build traffic volumes are displayed in **Figure 5** and **Figure 6**.

Site Traffic

The trip basis for the expansion project is based on industry standard ITE trip generation rates based on projected employee levels of the site. The trip generation estimates for the proposed office expansion development are provided for the weekday morning and weekday evening periods, which correspond to the critical analysis periods for the proposed use and adjacent street traffic flow. New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation*[3] for the Land Use Code (LUC) 710 – General Office Building applied to the projected increase of 152± employees (increase at the Site from 264± to 416± employees).

Table 7 presents the trip-generation estimates for the proposed office expansion based on ITE methodology.

TABLE 7
TRIP-GENERATION

	Site Trips		
Period/Direction	**Existing Site Trips (264± employees)[1]**	**Expansion (152± employees) [2]**	**Total (416± employees)**
Weekday Morning Peak Hour:			
Entering	79	**+73**	152
Exiting	8	**+10**	18
Total	87	**+83**	170
Weekday Evening Peak Hour:			
Entering	10	**+13**	23
Exiting	65	**+65**	130
Total	75	**+78**	153

[1]Turning movement counts at the 2 Wells Avenue Site Driveways in June 2014; the existing building is 68,740± gsf of office uses with 264± total employees.
[2]Based on ITE LUC 710 trip rates (regression model) applied to 152 employees prorated out of 416 total employees.

[3]*Trip Generation*, Ninth Edition; Institute of Transportation Engineers; Washington, DC; 2012.

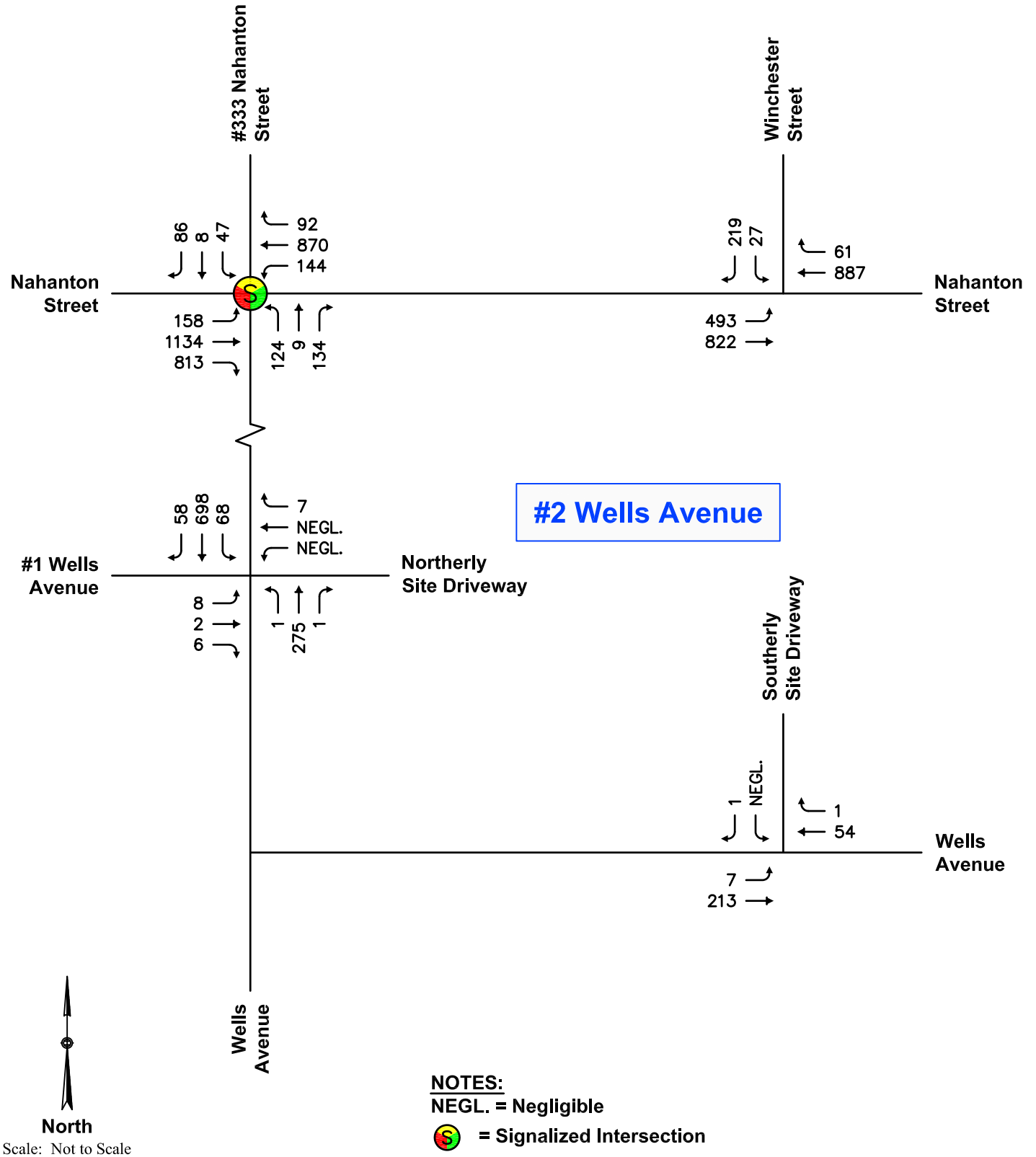

Figure 5

2019 No-Build Condition
Weekday Morning Peak Hour
Traffic Volumes

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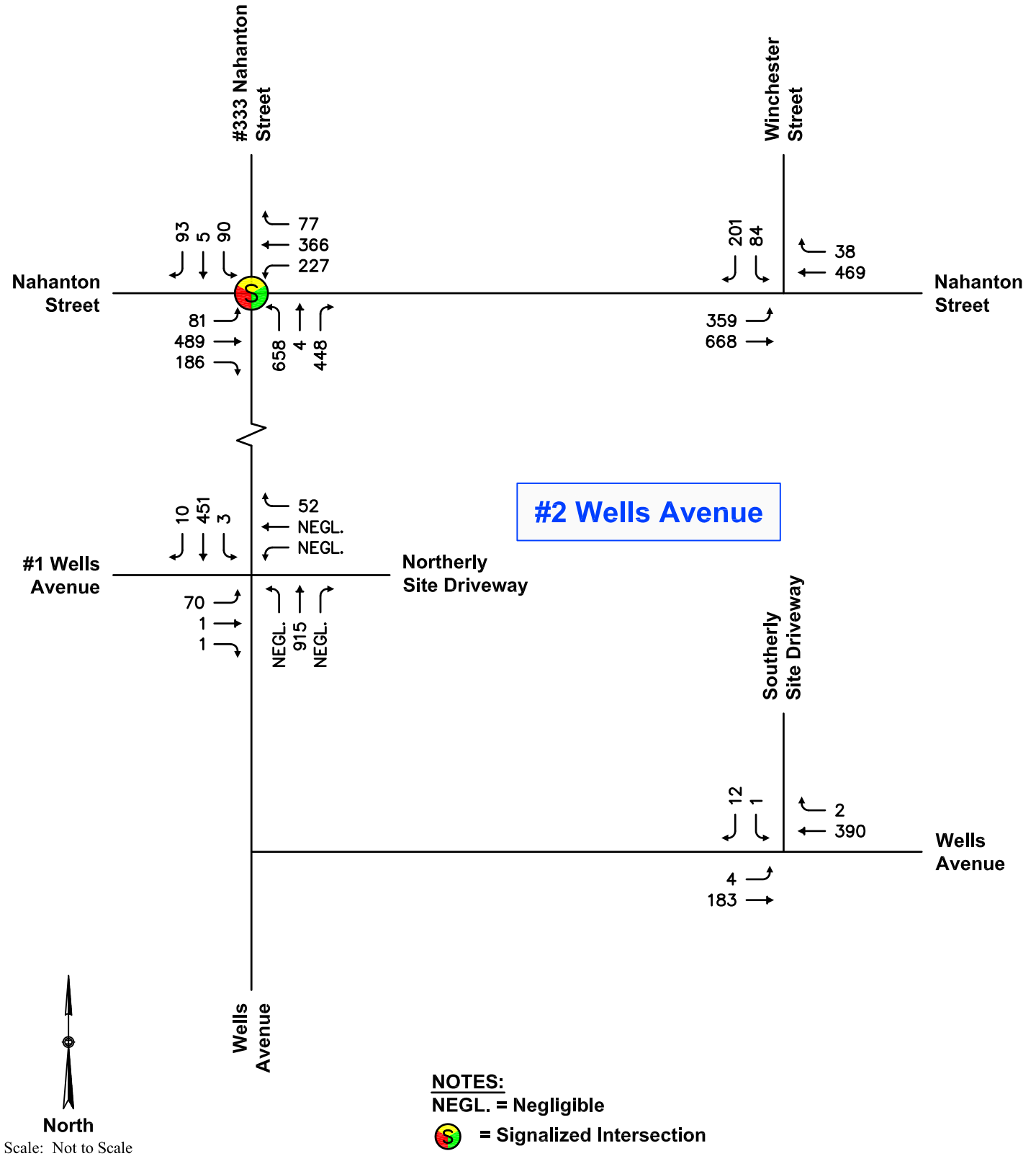

Figure 6

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2019 No-Build Condition
Weekday Evening Peak Hour
Traffic Volumes

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As summarized in **Table 7**, the re-tenanting of what is now a high density call center with a standard office tenant and 66,510± sf office expansion project is estimated result in 152± additional employees at the Site. The project will generate approximately 83 additional vehicle trips (73 entering and 10 exiting) during the weekday morning peak hour and 78 additional vehicle trips (13 entering and 65 exiting) during the weekday evening peak hour. Trip generation calculations are provided in the **Attachments**.

Trip Distribution

The directional distribution of development-generated trips on the roadway network is a function of a number of variables including local area populations and the efficiency of the roadways leading to the Site. Existing (baseline) travel patterns and volumes of the adjacent roadway system as well as Journey to work census data served as the primary basis for determining the trip distribution pattern for the proposed development. The resulting trip distribution for new trips is presented in **Figure 7**. Trip distribution calculations are provided in the **Attachments.**

Development-related trips for the proposed Site are assigned to the roadway network using the ITE trip-generation estimates shown in **Table 7** and the distribution patterns presented in **Figure 7**. Development-related trips at each intersection approach for the weekday morning, and weekday evening peak hours are quantified in **Figure 8** and **Figure 9**.

2019 Build Traffic Conditions

2019 Build condition traffic volumes are derived by adding the incremental traffic increases for the office expansion at the Site to the 2019 No-Build conditions. **Figure 10** and **Figure 11** present the 2019 Build condition traffic-volume networks for the weekday morning, weekday evening and Saturday midday peak hours.

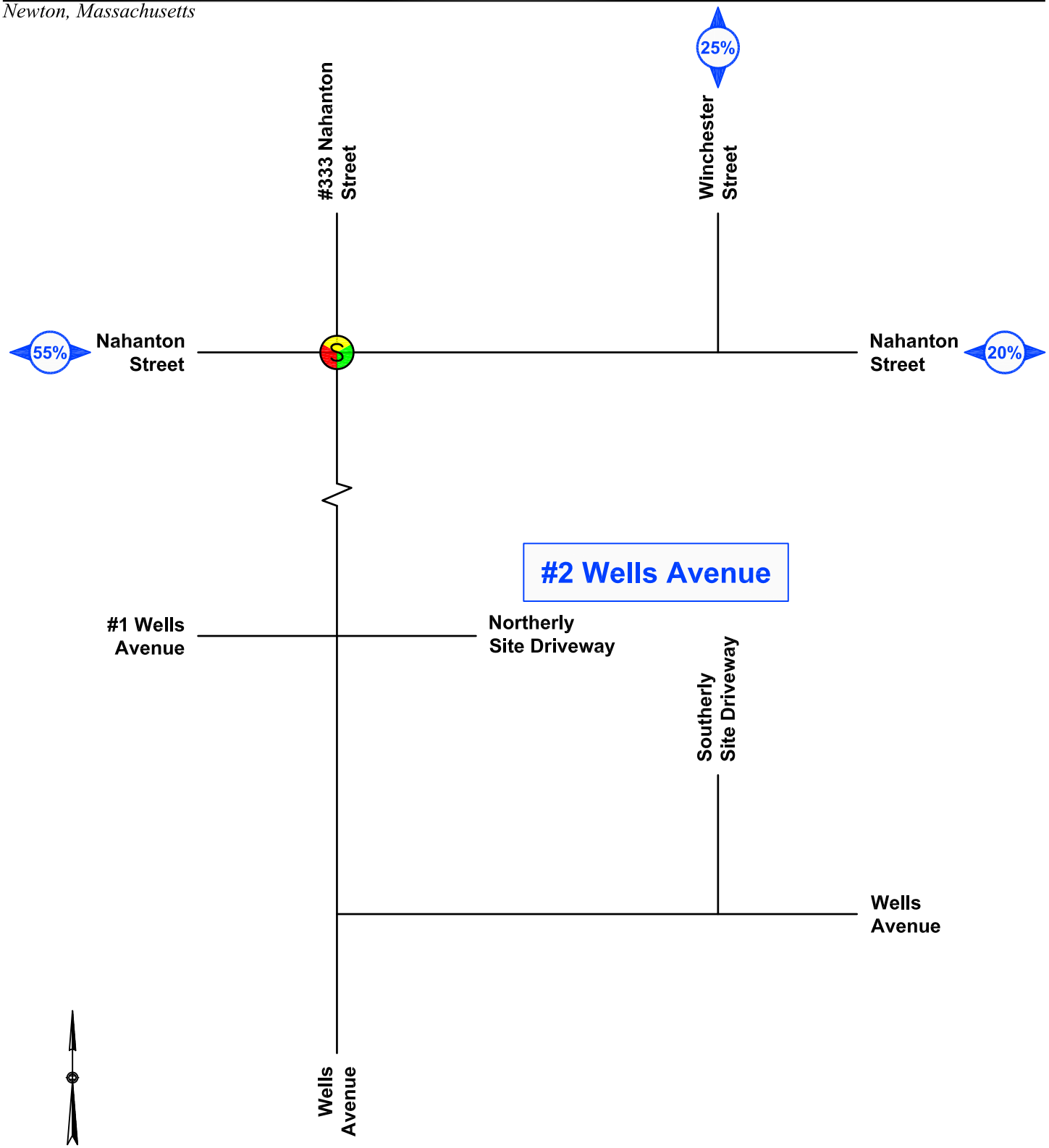

Figure 7

Trip Distribution

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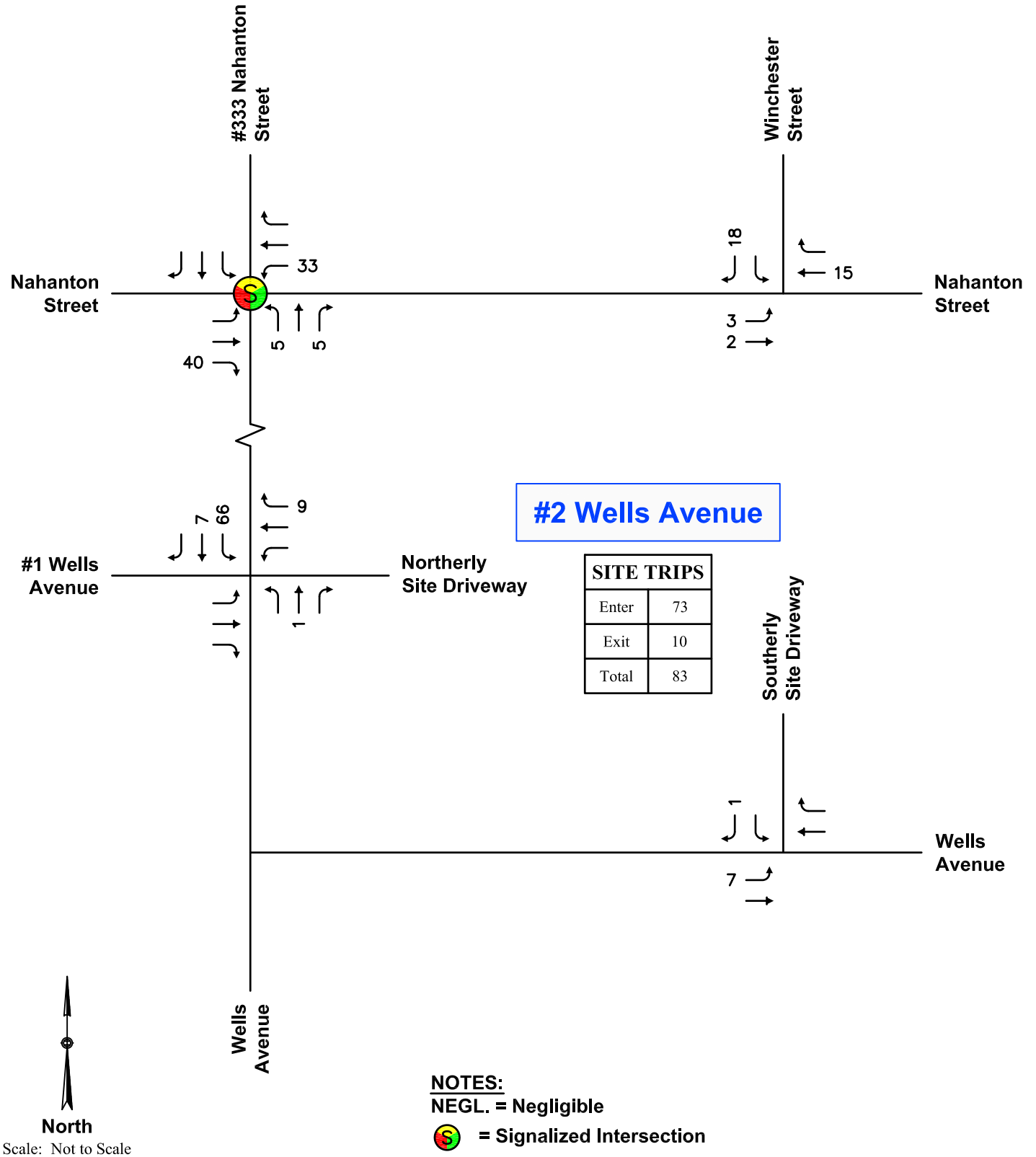

Figure 8

Site-Generated Trips
Weekday Morning Peak Hour

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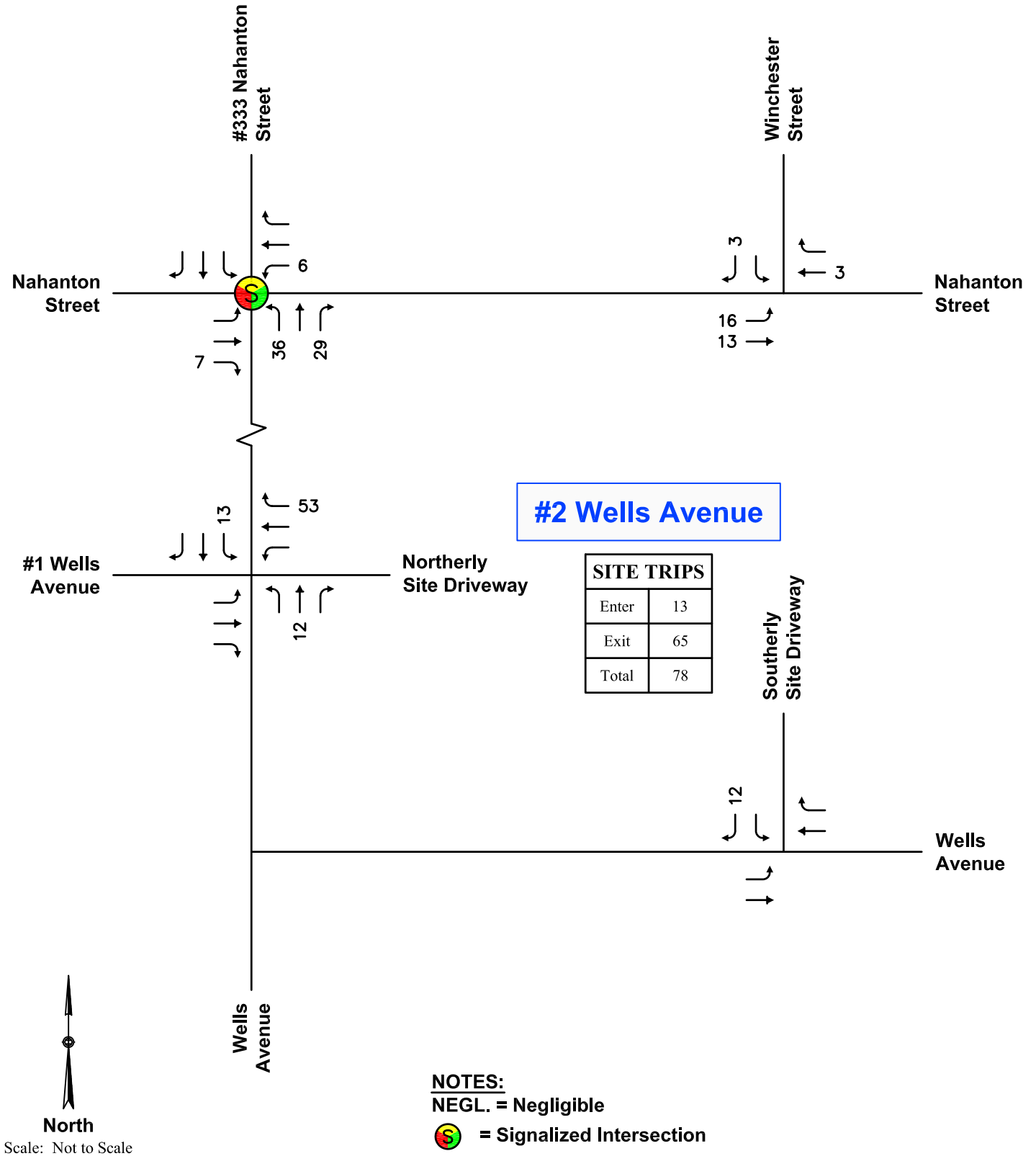

Figure 9

Site-Generated Trips
Weekday Evening Peak Hour

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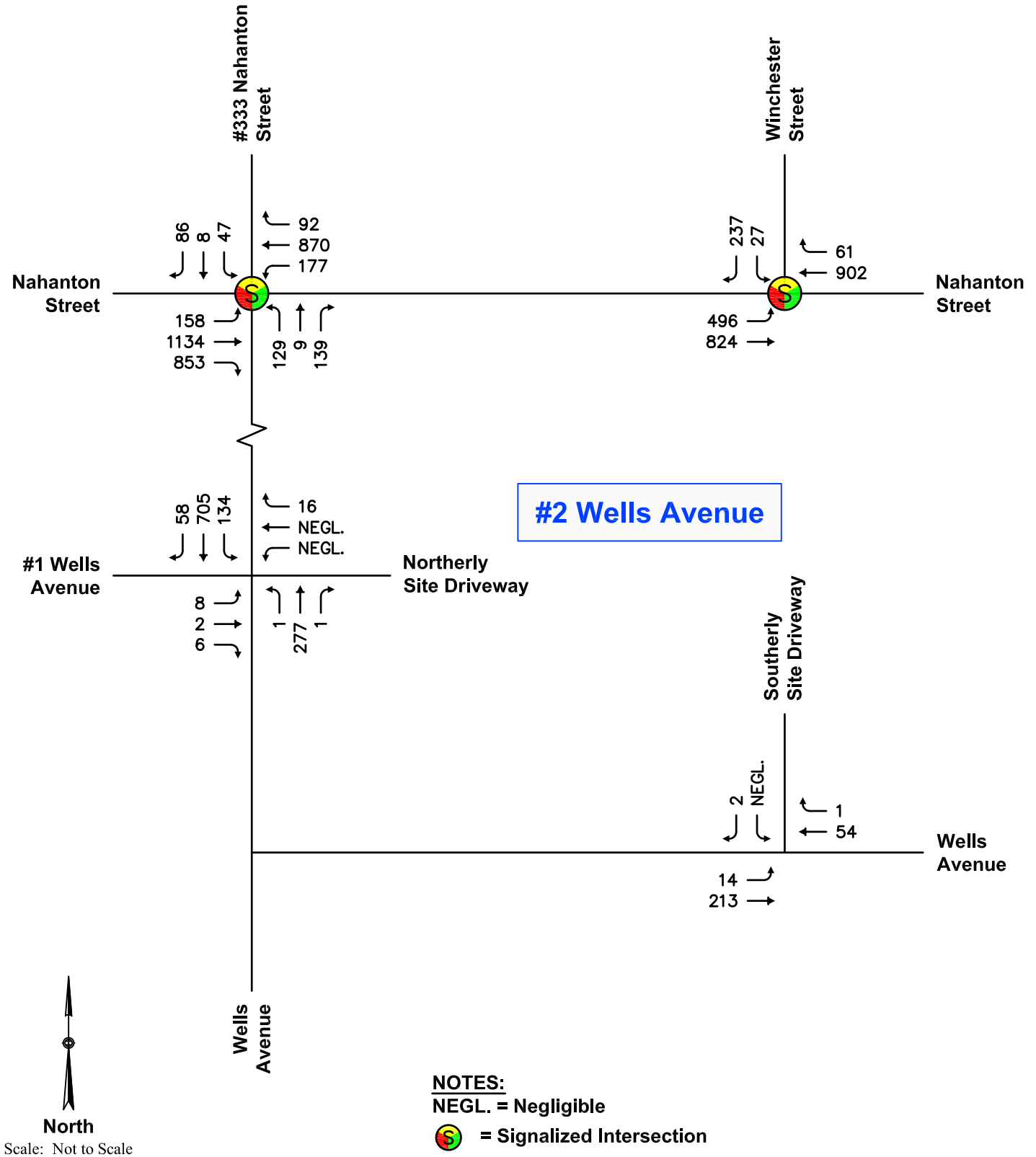

Figure 10

2019 Build Condition
Weekday Morning Peak Hour
Traffic Volumes

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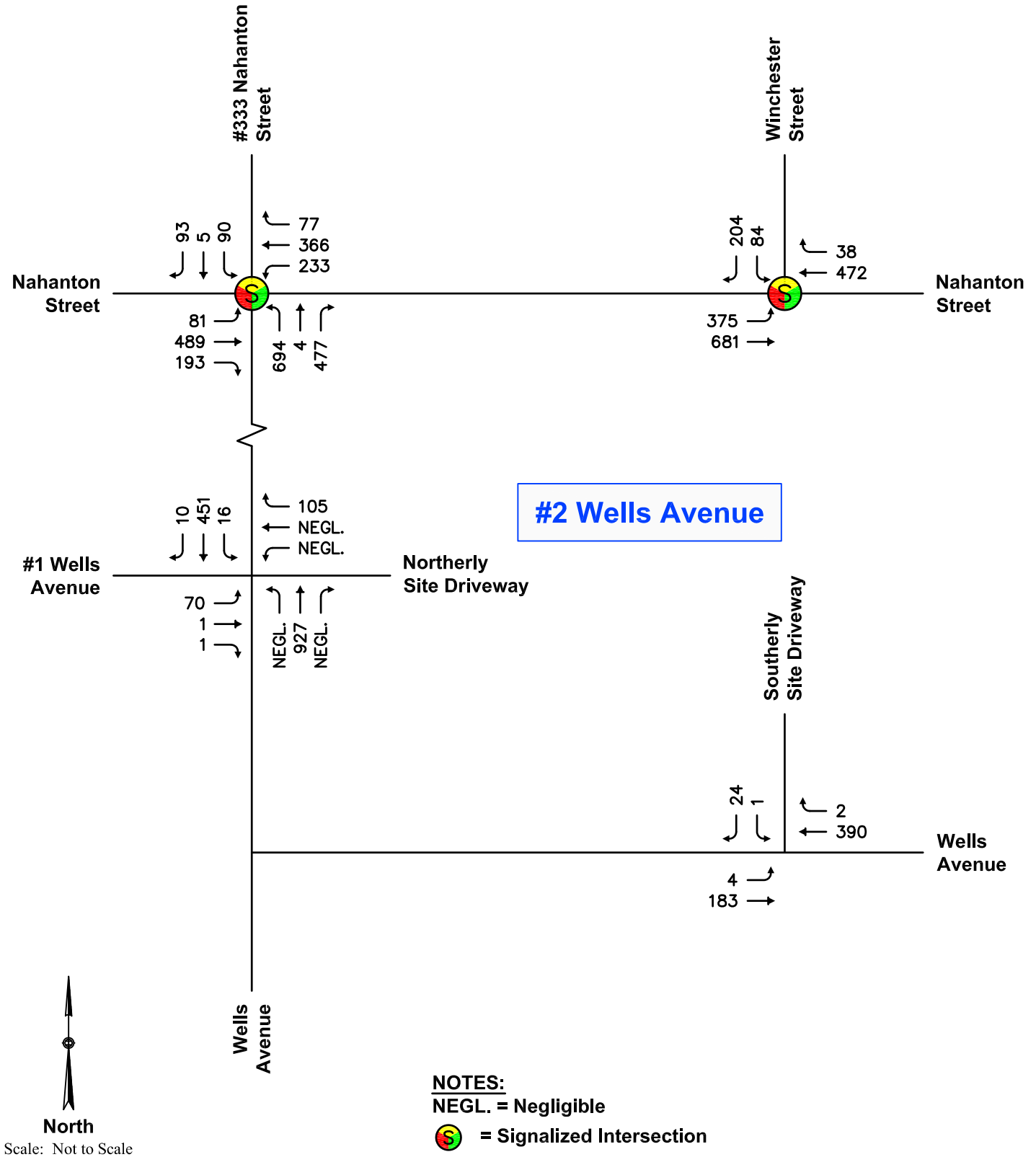

Figure 11

2019 Build Condition
Weekday Evening Peak Hour
Traffic Volumes

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OPERATIONS ANALYSIS

This section provides an overview of operational analysis methodology, an assessment of driveway operations under existing (baseline) and projected future No-Build and Build conditions, a summary of the vehicular queues at the adjacent signalized intersection and a review of the banks drive-thru operations.

Analysis Methodology

Intersection capacity analyses are presented in this section for the Baseline, No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

Analysis Results

Level-of-Service (LOS) analyses were conducted for the Baseline, No-Build, and Build conditions for the study intersections. The results of the intersection capacity are summarized below in **Table 8** and **Table 9**. Detailed analysis results are presented in the **Attachments**.

TABLE 8
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY MORNING PEAK HOUR

Period	Approach	2014 Baseline			2019 No-Build			2019 Build		
		v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Nahanton Street at	Eastbound	0.70	11	B	>1.0	44	D	>1.0	46	D
Wells Avenue/	Westbound	0.96	34	C	0.90	27	C	0.91	29	C
JCC Driveway	Northbound	0.56	31	C	0.84	44	D	0.87	46	D
	Southbound	0.39	26	C	0.40	25	C	0.42	25	C
	Overall	**0.96**	**23**	**C**	**>1.0**	**38**	**D**	**>1.0**	**40**	**D**
Nahanton Street at	Eastbound	0.42	14	B	0.92	21	C	0.93	22	C
Winchester Street	Westbound	n/a[4]	n/a	n/a	0.94	37	D	0.95	39	D
	Southbound	>1.0	>50	F	0.29	15	B	0.32	16	B
	Overall	n/a	n/a	n/a	**0.94**	**27**	**C**	**0.95**	**28**	**C**
Wells Avenue at	EB Exit	0.09	25	C	0.09	26	D	0.12	32	D
Northern Site Driveway	WB Exit	0.01	9	A	0.01	10	A	0.02	10	A
	Northbound	0.00	8	A	0.00	9	A	0.00	9	A
	Southbound	0.05	10	A	0.06	8	A	0.11	8	A
Wells Avenue at	Eastbound	0.01	7	A	0.01	7	A	0.01	7	A
Southern Site Driveway	SB Exit	0.00	9	A	0.00	9	A	0.00	9	A

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

TABLE 9
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY EVENING PEAK HOUR

Period	Approach	2014 Baseline			2019 No-Build			2019 Build		
		v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Nahanton Street at	Eastbound	>1.0	>80	F	0.92	39	D	0.92	38	D
Wells Avenue/	Westbound	>1.0	>80	F	0.89	47	D	0.90	48	D
JCC Driveway	Northbound	>1.0	60	E	>1.0	>80	F	>1.0	>80	F
	Southbound	0.50	19	B	0.37	14	B	0.40	15	B
	Overall	**>1.0**	**>80**	**F**	**>1.0**	**59**	**E**	**>1.0**	**67**	**E**
Nahanton Street at	Eastbound	0.42	11	B	0.63	8	A	0.65	8	A
Winchester Street	Westbound	n/a[4]	n/a	n/a	0.74	22	C	0.74	23	C
	Southbound	>1.0	>50	F	0.32	10	A	0.33	10	A
	Overall	n/a	n/a	n/a	**0.74**	**12**	**B**	**0.74**	**13**	**B**
Wells Avenue at	EB Exit	>1.0	>50	F	>1.0	>50	F	>1.0	>50	F
Northern Site Driveway	WB Exit	0.23	22	C	0.24	23	C	0.49	32	D
	Northbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Southbound	0.01	11	B	0.01	11	B	0.03	11	B
Wells Avenue at	Eastbound	0.01	8	A	0.01	8	A	0.01	8	A
Southern Site Driveway	SB Exit	0.03	12	B	0.03	12	B	0.05	12	B

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

As summarized in **Tables 8 – 9**:

- *Nahanton Street at Wells Avenue/ JCC Driveway.* Under future No-Build conditions, capacity analyses indicate that the signalized study intersection will operate at LOS D (overall) or better during the morning peak hour and will continue to operate with long delay at LOS E (overall) during the weekday evening peak hour. Under future Build conditions, capacity analyses indicate that the signalized intersection will incur nominal increases in delay due to the proposed office expansion project. Long range geometric improvements are proposed by the City at this location which is aimed at improving operations and queue management. The proposed expansion project will not alter operating conditions compared to No-Build conditions, therefore, will have no impact on the long range improvement plans by the City.

- *Nahanton Street at Winchester Street.* Under existing conditions, southbound movements from the unsignalized study intersection onto Nahanton Street generally operate at with long delays during the peak hours. With the installation by the City under future No-Build conditions, capacity analyses indicate that the signalized intersection will operate at LOS C (overall) or better during peak hours. Under Build conditions the intersection will continue to operate at LOS C (overall) or better with nominal increases in delay due to the proposed expansion project.

- *Wells Avenue at Site Driveway(s).* As part of the project the two existing driveways that provide access/egress to the Site along Wells Avenue will be retained. The intersection of Wells Avenue with the proposed Site Driveway is expected to operate below capacity at LOS D or better during the weekday morning and weekday evening peak hours under future year conditions.

In summary, incremental traffic increases at the study intersections due to the proposed development generally result in inconsequential changes in intersection operations compared to No-Build conditions. Therefore, no additional roadway improvements are warranted to accommodate the expansion project.

Signal Queue Impacts

The estimated average and 95th percentile vehicle queue lengths for the signalized study intersections for the Baseline, No-build and Build conditions are presented in **Table 10** and **Table 11**. The estimated queue lengths are based on the capacity analysis results provided using Synchro® computer software.

TABLE 10
VEHICLE QUEUE ANALYSIS SUMMARY
NAHANTON STREET AT WELLS AVENUE

Approach	Storage Length (feet)	2014 Baseline Average Queue Length[1]	2014 Baseline 95th Percentile Queue Length[1]	2019 No-Build Average Queue Length[1]	2019 No-Build 95th Percentile Queue Length[1]	2019 Build Average Queue Length[1]	2019 Build 95th Percentile Queue Length[1]
Weekday Morning Peak Hour							
Eastbound L	175±	<25	49	<25	83	<25	87
Eastbound T	>1000	248	435	759	1035	785	1035
Eastbound R	175±	<25	47	59	175	66	193
Westbound L	250±	52	171	28	89	48	132
Westbound TR	>1000	466	849	433	791	459	791
Northbound L	>1000	45	92	72	174	77	181
Northbound TR	125±	<25	43	<25	59	<25	60
Southbound L	120±	31	68	25	63	26	63
Southbound TR	>1000	<25	43	<25	50	<25	50
Weekday Evening Peak Hour							
Eastbound L	175±	<25	40	27	53	27	53
Eastbound T	>1000	523	740	290	478	290	478
Eastbound R	175±	27	77	<25	59	<25	60
Westbound L	250±	70	178	85	223	89	233
Westbound TR	>1000	469	686	248	409	248	409
Northbound L	>1000	441	651	518	733	565	783
Northbound TR	125±	79	182	38	116	50	139
Southbound L	120±	47	108	38	82	38	86
Southbound TR	>1000	<25	27	<25	31	<25	31

[1]Average and 95th percentile queue lengths are reported in feet per lane.

TABLE 11
VEHICLE QUEUE ANALYSIS SUMMARY
NAHANTON STREET AT WINCHESTER STREET

Approach	Storage Length (feet)	2014 Baseline		2019 No-Build		2019 Build	
		Average Queue Length[1]	95th Percentile Queue Length[1]	Average Queue Length[1]	95th Percentile Queue Length[1]	Average Queue Length[1]	95th Percentile Queue Length[1]
Weekday Morning Peak Hour							
Eastbound L	400±			226	427	230	432
Eastbound T	950±			110	166	111	167
Westbound T	>1000	Unsignalized		455	722	470	741
Westbound R	250±			<25	<25	<25	<25
Southbound L	200±			<25	42	<25	42
Southbound TR	>1000			48	100	57	113
Eastbound L	400±			39	124	45	138
Eastbound T	950±			89	145	91	149
Westbound T	>1000	Unsignalized		143	242	146	244
Westbound R	250±			<25	<25	<25	<25
Southbound L	250±			27	76	27	76
Southbound TR	>1000			<25	34	<25	34

[1]Average and 95th percentile queue lengths are reported in feet per lane.

As summarized in **Table 10** and **Table 11**, average and 95th percentile vehicle queues at the signalized study intersection are generally contained within available storage lanes during weekday morning and weekday evening peak hours under existing and No-Build conditions. The proposed office expansion project results in negligible increases in vehicle queues compared to No-Build conditions (approximately 1 vehicle or less). Long range geometric improvements are proposed by the City at the Nahanton Street/Wells Avenue intersection to enhance both operations and queue management.

PARKING EVALUATION

This section identifies existing parking characteristics associated with the 2 Wells Avenue property to determine the likely parking supply needs to support the proposed office building expansion. The evaluation includes an inventory of the existing site parking supply; a manual survey of peak parking demands (parking accumulation counts); and resulting site-specific parking generation rates.

Existing Parking Inventory

The Site includes a fully leased 68,740± (264± employees) office building. Existing marked on-site parking includes 293 total parking spaces consisting of 286 general parking spaces and 7 handicapped parking spaces.

In summary, the existing parking supply at the Site totals 4.2 spaces per 1,000 gsf of building area and 1.1 spaces per employee. The existing rates for the Site are higher than the ITE *Parking Generation*[4] peak design parking demand rates for office uses (3.45 spaces per 1,000 gsf and 0.98 vehicles per employee).

Observed Peak Parking Demand

A parking accumulation survey was conducted to identify parking trends within the Sites parking areas on Wednesday, May 28, 2014 between 7:00 AM and 6:00 PM. The existing parking layout for the Site is presented in **Figure 12** and is divided into parking zones for inventory purposes. Parking accumulation survey results for the study period are provided in the **Appendix.**

Key findings of the parking survey are as follows:

- The Site generates a peak of approximately 184 parked vehicles at 10:30 AM on weekdays.
- The observed parking vacancy during peak the period is approximately 109 parking spaces (37%).
- The observed peak parking demand rate for the Site is 2.64 spaces per 1,000 gsf of occupied space and 0.70 spaces per employee.

In summary, observed parking rates for the Site result in a peak period parking surplus of approximately 109 spaces (37%).

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[4] *Institute of Transportation Engineers Parking Generation*, 4th Edition, Washington DC, 2010.

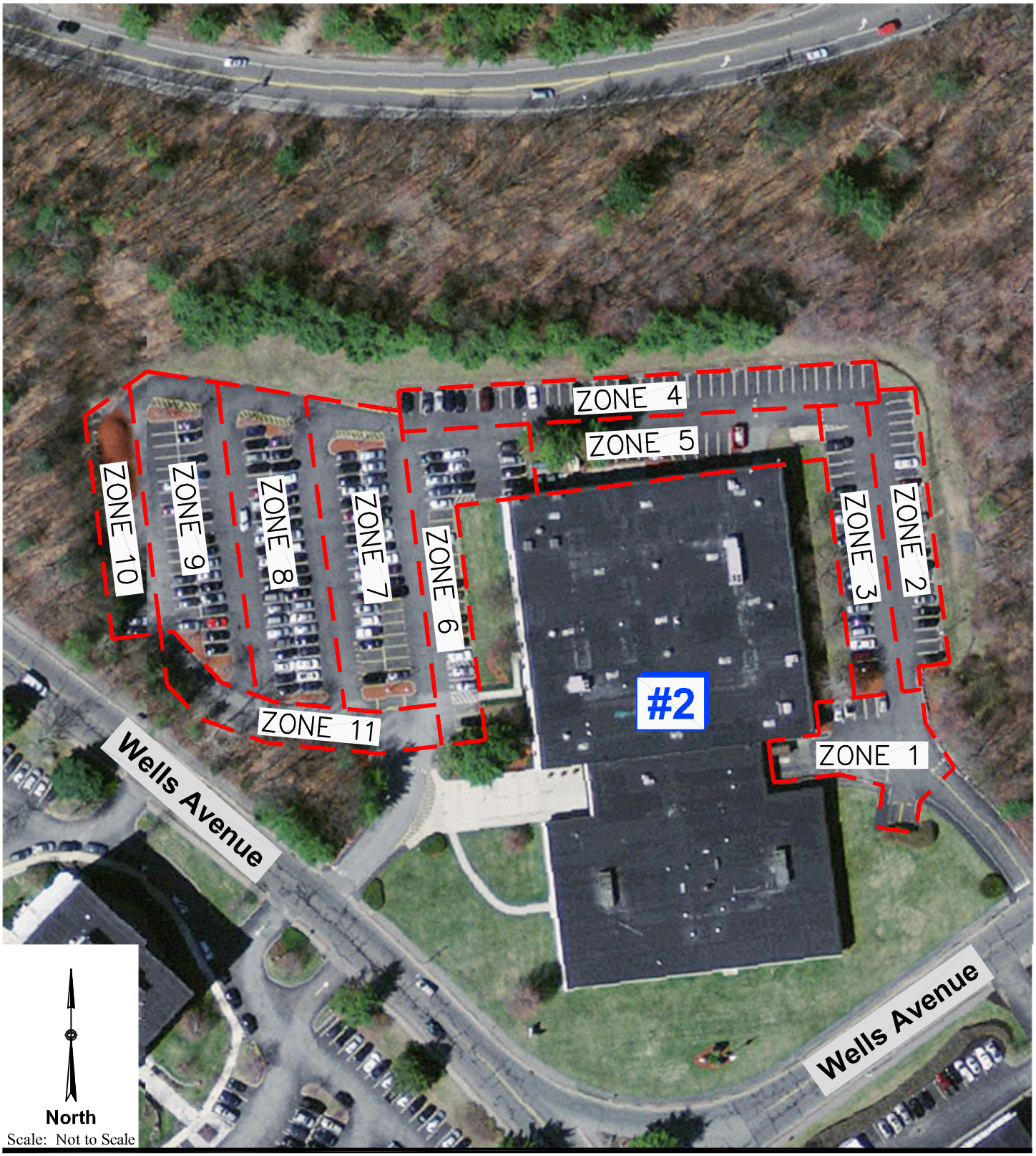

Figure 12

Parking Zones

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Peak Parking Demand – Build Conditions

Under the proposed site programming an expansion of 66,510± sf will be constructed resulting in an overall building size of 132,598± sf. CCS Companies, which current uses Suite 100 as a high density calling center with 184± employees will vacate 32,472± sf of office space while the tenants of the 34,038 sf (80± employees) are expected to remain. Under proposed conditions the 132,598 sf of office building is will accommodate 416± employees based on normal building occupancy rates. The on-site parking supply will be increased by 184± spaces for a total on-site parking supply of 477± marked spaces. Under proposed conditions 34 bicycle parking spaces (30 indoor spaces and 4 outdoor spaces) will be added to accommodate an alternative transportation option.

By applying the ITE *Parking Generation* peak design parking demand rate of 0.98 vehicles per employee to 416± total employee's results in a peak parking demand of 408 parking spaces, as shown in **Figure 13.** The peak parking demand of 408 can be accommodated by the overall parking supply of 477 parking spaces (3.6 spaces per 1,000 gsf and 1.15 spaces per employee). This results in a projected surplus of approximately 14 percent (69 parking spaces). This level of parking surplus will accommodate normal daily fluctuation in employees, peak parking demands, seasonal considerations, and other factors that may impact parking efficiencies within the Site.

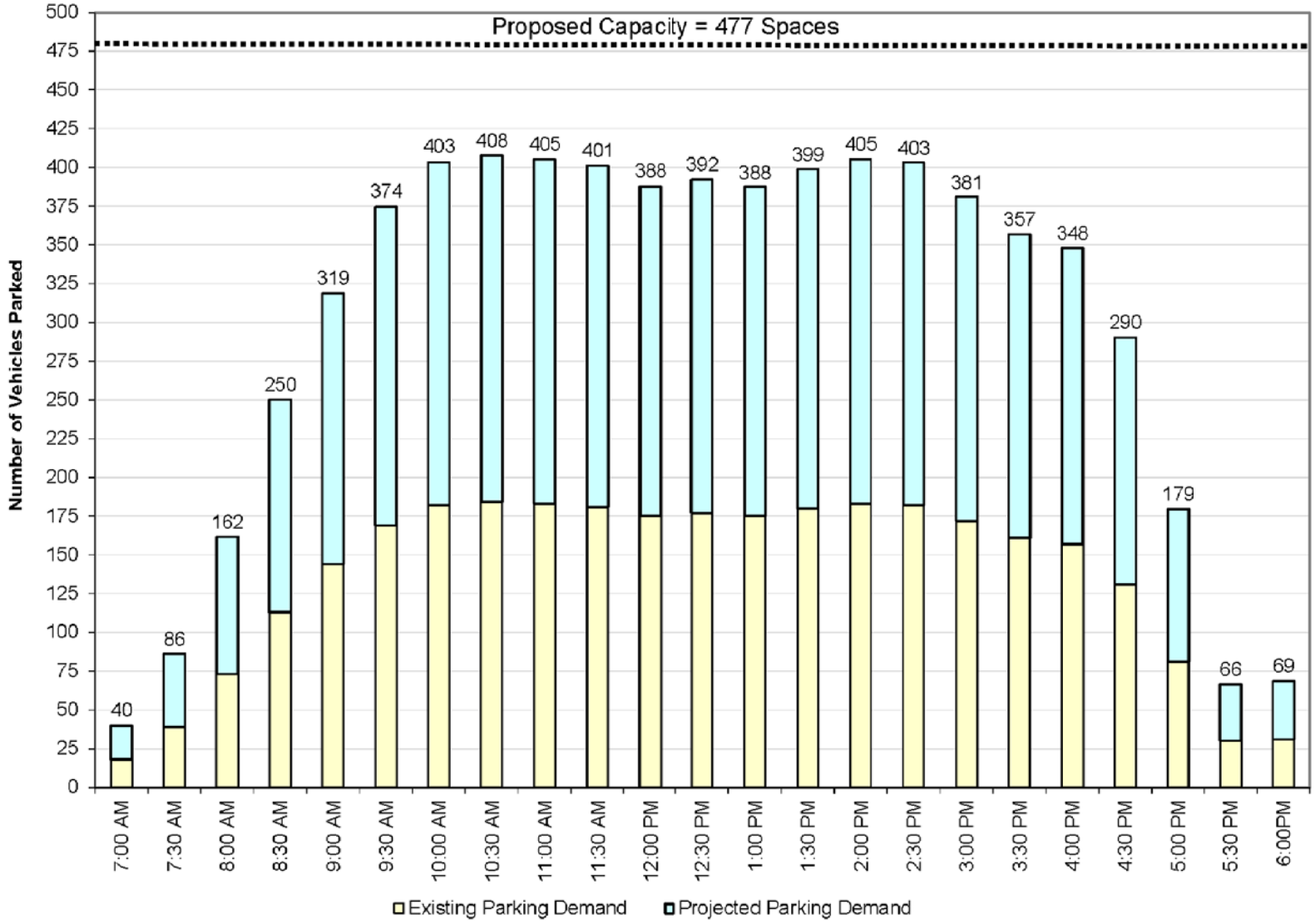

Figure 13

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Projected Weekday Parking Demand

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RECOMMENDATIONS AND CONCLUSIONS

Trip generation for the office expansion is projected to be nominal with approximately 1 new vehicle per minute on average during commuter peak hours. MDM finds that incremental traffic associated with the proposed expansion is not expected to materially impact operating conditions at the study intersections. Study intersections exhibit below-average crash rates based on historic crash data; safety countermeasures are therefore not warranted. Likewise, the available sight lines at the site driveway intersections Wells Avenue exceed the recommended minimum (safety based criteria) and ideal (convenience based criteria) sight line requirements from AASHTO for the posted speed limit and observed travel speeds. Under proposed conditions, the Site is estimated to have a demand of 408 parking spaces relative to the overall parking supply of 477 parking spaces. This results in a projected surplus of approximately 14 percent (69 parking spaces). This level of parking surplus will accommodate normal daily fluctuation in peak parking demands, seasonal considerations, and other factors that may impact parking efficiencies within the Site. Specific improvements include (a) site access improvements and (b) a transportation demand management (TDM) plan.

(a) Site Access Improvements

MDM recommends the following site access design elements which will provide ample capacity to accommodate site-generated traffic while also enhancing safety and capacity:

- STOP signs (R1-1) and STOP line pavement markings are recommended on driveway approaches to Wells Avenue. The signs and pavement markings shall be compliant with the Manual on Uniform Traffic Control Devices (MUTCD).

- Plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less above the adjacent roadway grade within the sight lines in vicinity of the Site driveways in order to continue to provide unobstructed sight lines.

(b) Transportation Demand Management (TDM)

TDM programs include a series of measures that are designed to encourage the use of alternative modes of travel to single-occupant vehicles (SOVs) through influencing the choice of travel modes by employees and customers. The benefits that are derived from an effective TDM program include less congestion on the roadway network; improved air quality; reduced parking demands and the need for construction of new parking spaces; and health benefits through walking and bicycling. The Proponent is committed to reduce auto dependency by employees, patrons and residents by implementing a robust TDM program. These elements are also consistent with the Massachusetts Department of Environmental Protection (MADEP) directive to use all reasonable and feasible mitigation actions to reduce auto emissions. A preliminary list of potential TDM program elements may include the following:

- *TDM Program Coordinator.* An on-site employee will be designated as the TDM Program Coordinator to facilitate the implementation of the TDM program. The Program Coordinator will administer the TDM program and coordinate the elements of the program with tenants. Contact information for the TDM Program Coordinator will be provided to tenants, along with information concerning the TDM program.

- *Route 128 Business Council Membership.* The Project, by and through the Owner, will join the Route 128 Business Council Transportation Management Association (TMA). The TDM Program Coordinator will work with the Route 128 Business Council to develop and manage the TDM Program.

- *Employee Information Packet.* Employees will be provided with an information packet that includes the details of the TDM Program, TDM Program Coordinator contact information, contact information for the Route 128 Business Council, employee incentives for participating in the program, and the benefits of TDM activities. The information packet will be updated on a periodic basis in order to reflect current benefits and services that may be available.

- *Information Posting.* Information concerning the TDM Program will be posed in a central location in employee break rooms, and will include the following information:

    - Contact information for the TDM Program Coordinator
    - Contact information for the Route 128 Business Council
    - Carpool sign-up sheet
    - MBTA bus schedules and fare information
    - MassRIDES program information
    - MassRIDES NuRides sign-up information
    - Local taxi services

  These materials will be reviewed and updated on a quarterly basis in order to ensure that the information is current.

- *Carpool/Rideshare Programs.* A coordinated rideshare program will be offered to employees and will be coordinated by TDM Program Coordinator and the Route 128 Business Council.

- *Route 128 Business Council Shuttle.* The TDM Program Coordinator will coordinate with the Route 128 Business Council to evaluate the feasibility to establish a fixed-route shuttle service to the Area. User costs for the service would be determined by the Route 128 Business Council. The Route 128 Business Council would market the shuttle service to other area commercial and residential developments.

- *Guaranteed-Ride-Home Program.* A "guaranteed-ride-home" program will be provided through the Route 128 Business Council for employees that participate in a registered car/vanpool, use public transportation, walk or bicycle to the site for emergencies that may arise during the workday. The "guaranteed-ride-home" program will be managed by the TDM Program Coordinator and implemented through the Route 128 Business Council.

- *Bicycle Accommodations.* Secure, weather protected bicycle parking will be provided within the Project for use by employees and customers. The facilities will consist of 30 indoor bicycle parking spaces and 4 outdoor parking spaces. In addition, the "guaranteed-ride-home" program policy will apply to employees that bicycle to work.

- *Pedestrian Accommodations.* Internal sidewalks and pathways will be provided within the site, with wheelchair ramps and crosswalks provided where pedestrian crossings are present for barrier free access. In addition, the "guaranteed-ride- home" program policy will apply to employees that walk to work.

- *Alternative Work Arrangements.* Alternative work arrangements such as flextime, compressed workweek and telecommuting will be encouraged to be implemented by tenants for eligible employees with supervisor approval in order to allow employees to balance work and personal commitments, and to reduce traffic and parking demands. The TDM Program Coordinator will facilitate alternative work arrangements with tenants for eligible employees.

- *On-Site and Operational Trip-Reduction Measures.* On-site services to decrease off-site trips by employees including lunch rooms equipped with a microwave and refrigerator will be encouraged to be made available by tenants to employees in employee break rooms. Tenants will also be encouraged to offer direct deposit of employee paychecks as an additional means to reduce off-site trip making.

- *TDM Monitoring Program.* In order to document the success of the trip reduction program, the TDM Program Coordinator, by and through the Route 128 Business Council, will conduct an annual survey of employee participation in the program. The results of the survey will be made available to the City of Newton and will be used, in part, to develop additional strategies as may be necessary to increase and expand participation in the Trip Reduction Program. The monitoring program will commence one year after full occupancy of the Project and continue for a period of five years thereafter.