MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

PRINCIPALS
Robert J. Michaud, P.E.
Ronald D. Desrosiers, P.E., PTOE
Daniel J. Mills, P.E., PTOE

MEMORANDUM

DATE: November 3, 2014

TO: Mr. Marc Levin
Chestnut Hill Realty
300 Independence Drive
Chestnut Hill, MA 02467

FROM: Robert J. Michaud, P.E. – Managing Principal
Courtney E. Jones, P.E. – Senior Transportation Engineer

RE: **Supplemental Sight Line Assessment**
Proposed Development – The Residences at Kesseler Woods
Lagrange Street – Newton, MA

MDM Transportation Consultants, Inc. (MDM) has prepared this technical memorandum to document compliance with applicable sight line criteria for the proposed crosswalk and driveway for The Residences at Kesseler Woods on Lagrange Street in Newton, Massachusetts. This evaluation updates our prior sight line evaluation as documented in the July 23, 2014 traffic impact assessment (TIA) to reflect updated site plans and topographic survey/field measurements along Lagrange Street.

Key findings of the preliminary traffic assessment are as follows:

- *Measured Travel Speeds.* The 85th percentile travel speeds along Lagrange Street adjacent to the Site are 36 mph for the eastbound travel direction and 37 mph for the westbound travel direction. These travel speeds present the appropriate basis upon which driveway and crosswalk sight lines are compared to criteria set by the American Association of State Highway and Transportation Officials (AASHTO).

- *Adequate Driveway Sight Lines.* The existing available sight lines along Lagrange Street exceed AASHTO's recommended Stopping Sight Distance (SSD) criteria for the regulatory speed limit and observed 85th percentile travel speeds. Proposed driveway and roadside grading along the north side of Lagrange Street will also provide intersection sight distance (ISD) that meets or exceeds the minimum recommended and ideal recommended sight line criteria for the posted speed limit and 85th percentile travel speeds. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within driveway sight lines be maintained at a height of 2 feet or less above the finished roadway grade to ensure unobstructed lines of sight; site plans by others will be updated to reflect this recommendation.

- *Adequate Crosswalk Visibility.* The existing available sight lines to the center of the proposed crosswalk along Lagrange Street will exceed AASHTO's recommended SSD criteria for the regulatory speed limit as well as for the observed 85th percentile travel speeds along Lagrange Street.

Measured Travel Speeds

Vehicle speeds were obtained for the Lagrange Street eastbound and westbound travel directions using a radar-based automatic traffic recorder (ATR) in May 2014. **Table 1** summarizes the regulatory posted speed and observed average and 85th percentile speeds for Lagrange Street adjacent to the Site. Field data are provided in the **Attachments**.

TABLE 1
SPEED STUDY RESULTS – LAGRANGE STREET

Travel Direction	Posted Speed Limit	Travel Speed	
		Average[1]	85th Percentile[2]
Eastbound	30	32	36
Westbound	30	33	37

[1] Arithmetic Mean.
[2] The speed at or below which 85 percent of the vehicles are traveling.

As summarized in **Table 1**, the mean (average) travel speed on Lagrange Street traveling eastbound is 32 mph and traveling westbound is 33 mph. The 85th percentile travel speed was observed to be 36 mph for the eastbound travel direction and 37 mph for the westbound travel direction. The observed 85th percentile travel speeds therefore provide an appropriate basis for determining sight line requirements for the proposed driveway and crosswalks locations.

Driveway Sight Line Evaluation

An evaluation of sight lines was conducted at the site driveway location providing access to the proposed residential building and proposed crosswalk along Lagrange Street to ensure that minimum recommended sight lines are available. The evaluation documents sight lines under proposed conditions for vehicles as they relate to Lagrange Street with comparison to recommended guidelines.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[1] reference two types of sight distance which are relevant along Lagrange Street: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements were compared to minimum SSD and ISD recommendations for the regulatory and observed 85th percentile travel speeds in the Site driveway and crosswalk proximity.

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 Lagrange Street or a pedestrian within the crosswalk. 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 eastbound and westbound Lagrange Street approaches to the site driveway and crosswalk. **Table 2** presents a summary of the available SSD and AASHTO's recommended SSD based on posted and ambient travel speeds along Lagrange Street.

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

TABLE 2
STOPPING SIGHT DISTANCE SUMMARY
LAGRANGE STREET APPROACHES TO SITE DRIVEWAY/ CROSSWALK

Approach/ Travel Direction	Available SSD	AASHTO Recommended[1] Posted Speed Limit[2]	Average Travel Speed[3]	85th Percentile Travel Speed[4]
Proposed Site Driveway				
Eastbound	290± Feet	190 Feet	205 Feet	245 Feet
Westbound	360± Feet	190 Feet	215 Feet	255 Feet
Proposed Crosswalk				
Eastbound	280± Feet	190 Feet	205 Feet	245 Feet
Westbound	355± Feet	190 Feet	215 Feet	255 Feet

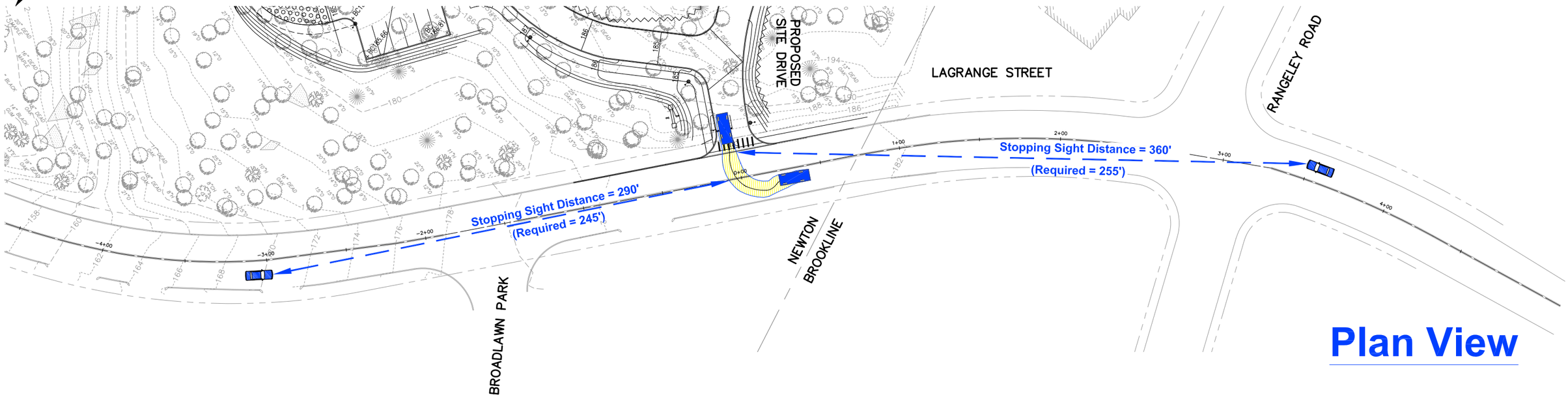
[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet.
[2]Regulatory posted speed = 30 mph
[3]Avg observed travel speeds = 32 mph EB and 33 mph WB
[4]85th percentile observed travel speeds = 36 mph EB and 37 mph WB

As summarized in **Table 2,** analysis results indicate that the existing available sight lines exceed AASHTO's recommended SSD criteria for both travel directions along Lagrange Street for the 85th percentile travel speeds. The SSD profiles for the eastbound and westbound Lagrange Street approaches to the proposed site driveway and proposed crosswalk, based on available topographical survey and field measurements, is shown in **Figure 1** and **Figure 2.** Stopping sight distance calculations are provided in the **Attachments.**

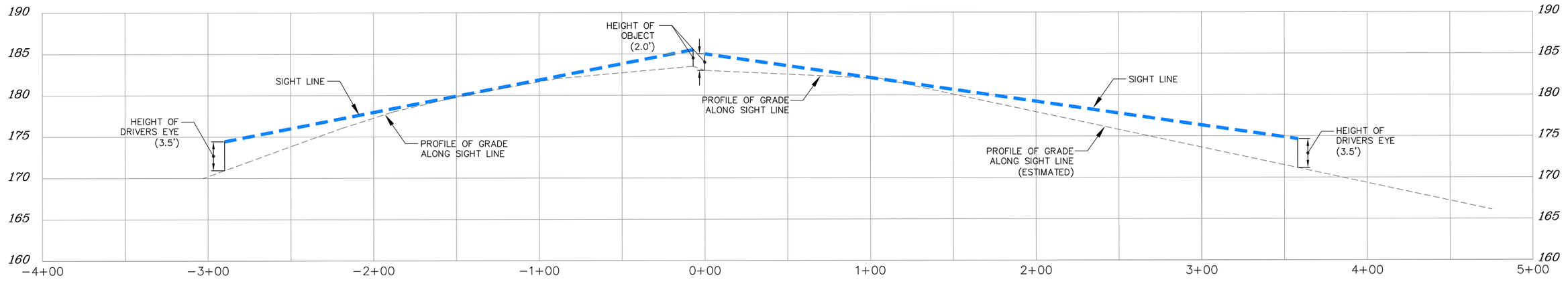
Intersection Sight Distance

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 proposed site driveway approach to Lagrange Street is proposed to be under STOP sign control and the ISD in question relates to the ability to turn left or turn right onto Lagrange Street.

Stopping Sight Distance



Plan View



Profile View

Site Plan Source: Stantec

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers
28 Lord Road, Suite 280
Marlborough, MA 01752

Scale: As Noted
DWG No. 765 Sight Line Profiles (10-31-2014).dwg

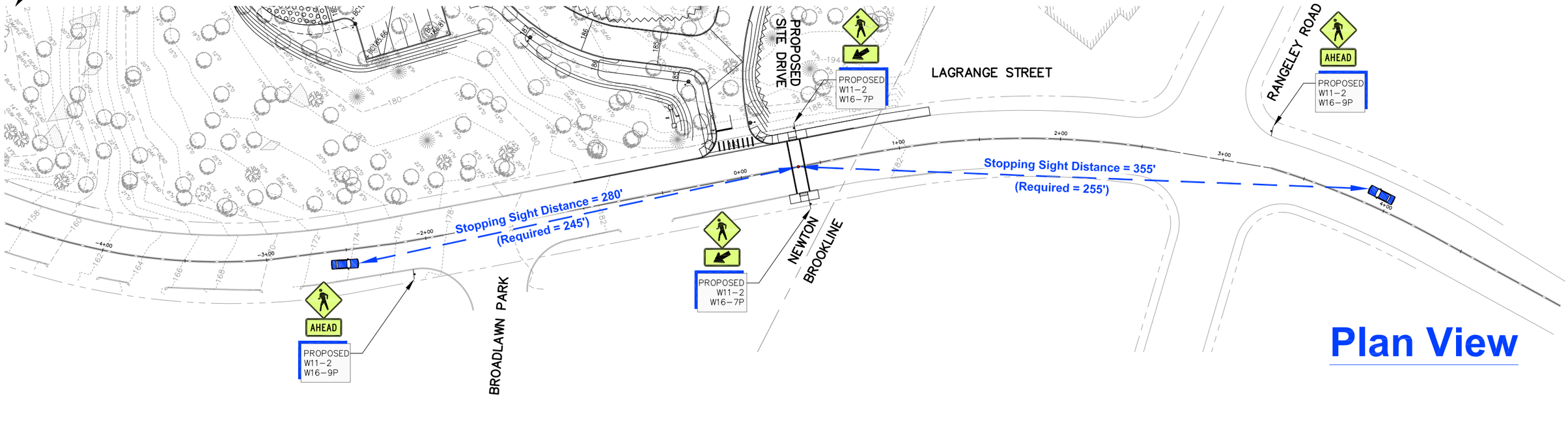
Date: October 2014
Project No. 765

Proposed Residential Development
Newton, Massachusetts

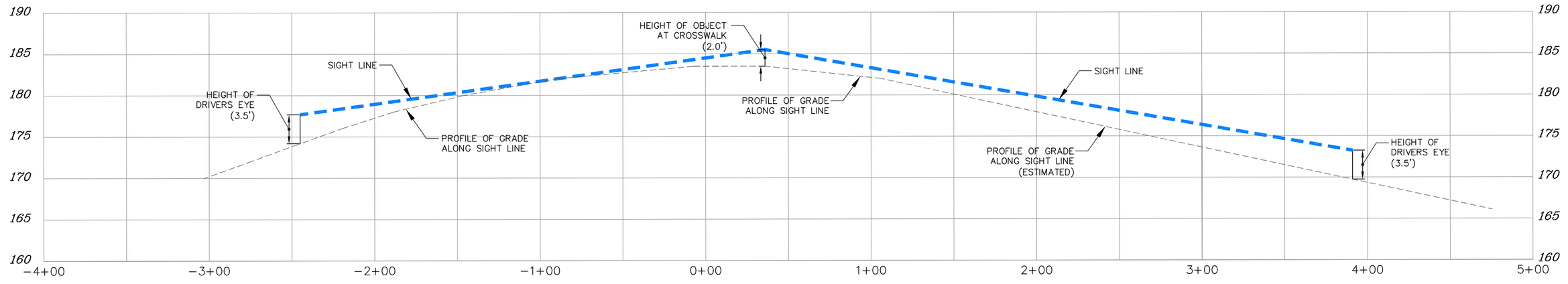
GRAPHIC SCALE
HORIZ. SCALE IN FEET
0 15 30 60 120
0 3 6 12 24
VERT. SCALE IN FEET

Figure 1
Stopping Sight Distance Analysis

Stopping Sight Distance at Crosswalk



Plan View



Profile View

Site Plan Source: Stantec

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Scale: As Noted
DWG No. 765 Sight Line Profiles (10-31-2014) SSD-Crosswalk.dwg

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Newton, Massachusetts

GRAPHIC SCALE
HORIZ. SCALE IN FEET
0 15 30 60 120
0 3 6 12 24
VERT. SCALE IN FEET

Figure 2
Stopping Sight Distance Analysis at Crosswalk

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 (14.5 feet from the edge of travel lane) for the eastbound and westbound directions along Lagrange Street. **Table 3** presents a summary of the available ISD for the departure from the proposed site driveway and AASHTO's recommended minimum and ideal ISD.

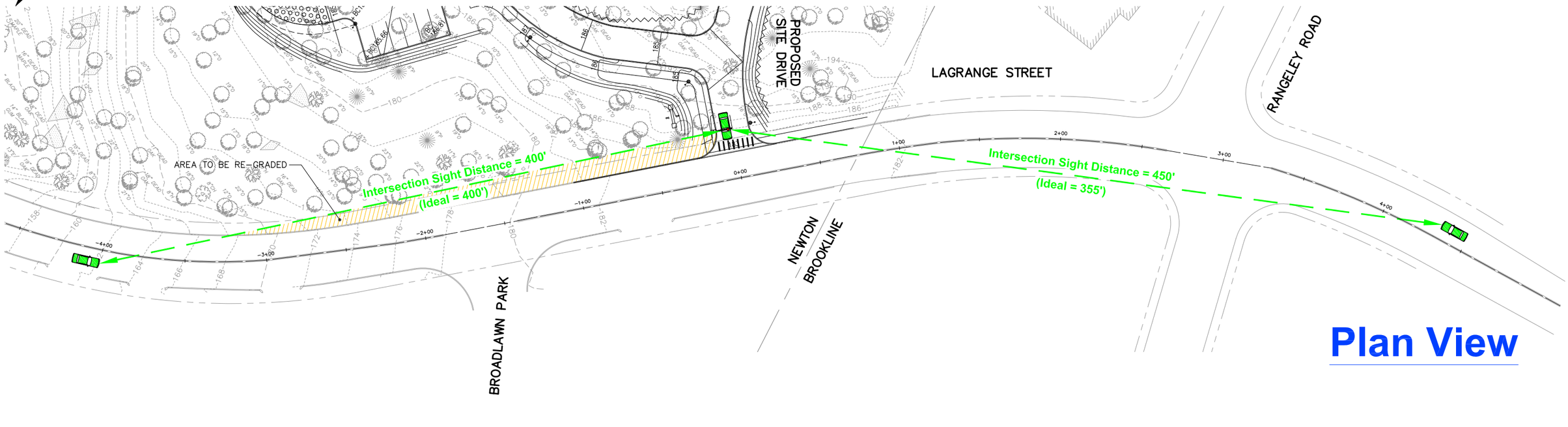
TABLE 3
INTERSECTION SIGHT DISTANCE SUMMARY
SITE DRIVEWAY DEPARTURE TO LAGRANGE STREET

Approach/ Travel Direction	Available SSD[3]	AASHTO Minimum[1] Posted Speed Limit[4]	AASHTO Minimum[1] 85th Percentile Travel Speed[5]	AASHTO Ideal[2] 85th Percentile Travel Speed
Looking East	410± Feet	190 Feet	255 Feet	355 Feet
Looking West	400± Feet	190 Feet	245 Feet	400 Feet

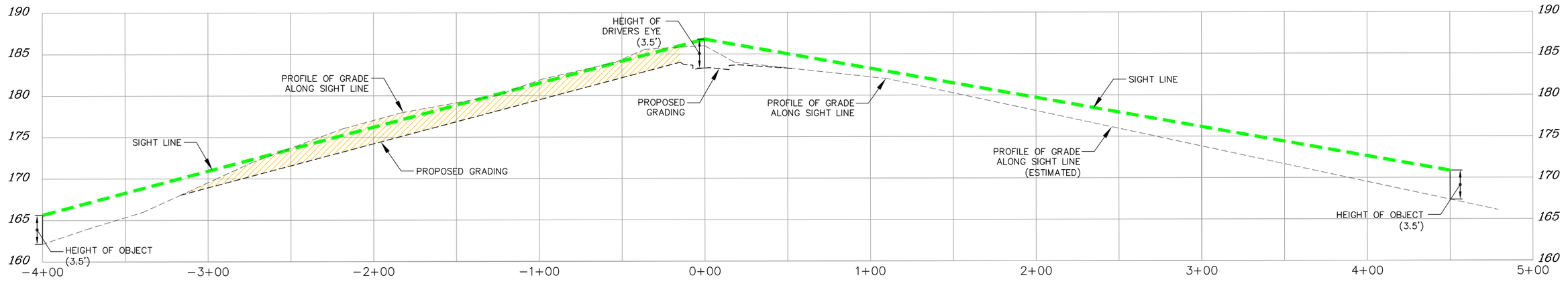
[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet and adjustments for roadway grade if required. Minimum value as noted represents SSD per AASHTO guidance.
[2]Based on AASHTO criteria, with a time gap of 7.5 seconds for left turns and 6.5 seconds for right turns.
[3]Assumes clearing of on-site vegetation and re-grading.
[4]Regulatory posted speed = 30 mph
[5]85th percentile observed travel speeds = 36 mph EB and 37 mph WB

The results of the ISD analysis presented in **Table 3** indicate that with clearing and grading associated with construction of the proposed site driveway, the available sight lines looking east and west from the driveway onto Lagrange Street will exceed the recommended minimum (safety based criteria) and ideal (convenience based criteria) sight line requirements from AASHTO for the posted speed limit and 85th percentile travel speeds. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within driveway sight lines be maintained at a height of 2 feet or less above the finished roadway grade to ensure unobstructed lines of sight; current site plans are consistent with this recommendation. The ISD profiles looking east and west onto Lagrange Street from the proposed site driveway, based on a topographical survey and field measurements, is shown in **Figure 3**.

Intersection Sight Distance



Plan View



Profile View

Site Plan Source: Stantec

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Scale: As Noted
DWG No. 765 Sight Line Profiles (10-31-2014) ISD.dwg

Date: October 2014
Project No. 765

Proposed Residential Development
Newton, Massachusetts

GRAPHIC SCALE
HORIZ. SCALE IN FEET
0 15 30 60 120
0 3 6 12 24
VERT. SCALE IN FEET

Figure 3
Intersection Sight Distance Analysis

CONCLUSIONS

In summary, this evaluation confirms that stopping sight distance (SSD) for the eastbound and westbound Lagrange Street approaches to the proposed site driveway and proposed crosswalk exceed AASHTO's recommended SSD criteria for both travel directions along Lagrange Street based on the regulatory speed limit and measured 85th percentile travel speeds. Proposed driveway and roadside grading along the north side of Lagrange Street will also provide intersection sight distance (ISD) that meets or exceeds the minimum recommended and ideal recommended sight line criteria for the posted and 85th percentile travel speeds. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within driveway sight lines be maintained at a height of 2 feet or less above the finished roadway grade to ensure unobstructed lines of sight; site plans by others will be updated to reflect this recommendation.

Appendices

- Speed Data
- Sight Distance Calculations

□ Speed Data

MDM Transportation Consultants, Inc.
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508-303-0370
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E/W: Lagrange Street
Between Rangeley Road and Broadlawn Park
Newton/Brookline, MA

Site Code: 76500001
Station ID:

765 Lagrange Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/07/14	0	0	0	1	9	4	1	0	0	0	0	0	0	0	15	38
01:00	0	0	0	1	3	1	0	0	0	0	0	0	0	0	5	36
02:00	0	0	1	0	1	3	0	0	0	0	0	0	0	0	5	38
03:00	0	0	0	2	2	5	1	0	0	0	0	0	0	0	10	39
04:00	0	0	0	2	5	12	4	2	0	0	0	0	0	0	25	42
05:00	0	0	1	4	55	51	19	0	0	0	0	0	0	0	130	40
06:00	1	6	5	42	247	140	11	3	0	0	0	0	0	0	455	38
07:00	48	32	73	125	251	97	2	0	0	0	0	0	0	0	628	35
08:00	0	18	41	131	246	66	6	0	0	0	0	0	0	0	508	35
09:00	0	7	13	64	253	113	4	0	0	0	0	0	0	0	454	37
10:00	2	4	8	63	187	57	7	0	0	0	0	0	0	0	328	36
11:00	5	3	12	61	159	59	4	0	0	0	0	0	0	0	303	36
12 PM	2	0	12	66	158	72	5	0	0	0	0	0	0	0	315	37
13:00	2	3	5	51	156	55	10	0	0	0	0	0	0	0	282	37
14:00	1	3	11	71	191	75	2	0	0	0	0	0	0	0	354	36
15:00	0	6	15	68	157	67	4	1	0	0	0	0	0	0	318	36
16:00	4	9	9	64	179	65	7	0	0	0	0	0	0	0	337	36
17:00	2	2	13	70	233	64	6	0	0	0	0	0	0	0	390	36
18:00	1	3	9	63	187	58	1	0	0	0	0	0	0	0	322	36
19:00	0	6	11	37	99	64	3	0	0	0	0	0	0	0	220	37
20:00	0	2	9	34	111	33	3	1	0	0	0	0	0	0	193	36
21:00	1	1	5	13	49	22	3	0	0	0	0	0	0	0	94	37
22:00	0	0	0	12	49	26	6	0	0	0	0	0	0	0	93	38
23:00	0	0	2	3	14	9	1	0	0	0	0	0	0	0	29	38
Total	69	105	255	1048	3001	1218	110	7	0	0	0	0	0	0	5813	

Percentiles

15th Percentile :	26 MPH
50th Percentile :	32 MPH
85th Percentile :	36 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	32 MPH
10 MPH Pace Speed :	29-38 MPH
Number in Pace :	4075
Percent in Pace :	70.1%
Number of Vehicles > 30 MPH :	4336
Percent of Vehicles > 30 MPH :	74.6%

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Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/08/14	0	0	1	4	5	11	0	0	0	0	0	0	0	0	21	38
01:00	0	0	1	1	2	2	0	0	0	0	0	0	0	0	6	37
02:00	0	0	0	1	7	2	0	0	0	0	0	0	0	0	10	36
03:00	0	0	1	2	4	5	1	0	0	0	0	0	0	0	13	39
04:00	0	0	0	2	7	7	3	1	0	0	0	0	0	0	20	41
05:00	0	3	0	5	49	49	17	0	1	0	0	0	0	0	124	40
06:00	0	2	5	47	224	165	13	1	0	0	0	0	0	0	457	38
07:00	9	27	51	142	323	93	6	0	0	0	0	0	0	0	651	35
08:00	3	21	42	162	215	54	3	0	0	0	0	0	0	0	500	34
09:00	0	4	13	93	257	91	6	0	1	0	0	0	0	0	465	36
10:00	3	4	15	53	159	66	6	0	0	0	0	0	0	0	306	36
11:00	4	4	12	77	181	54	3	0	0	0	0	0	0	0	335	36
12 PM	2	6	15	67	180	46	4	1	0	0	0	0	0	0	321	35
13:00	2	7	11	68	155	54	2	0	0	0	0	0	0	0	299	36
14:00	0	2	14	67	194	69	7	0	0	0	0	0	0	0	353	36
15:00	4	3	12	58	188	68	3	2	0	0	0	0	0	0	338	36
16:00	0	7	11	79	164	59	5	0	0	0	0	0	0	0	325	36
17:00	4	6	14	65	215	74	5	0	0	0	0	0	0	0	383	36
18:00	3	5	12	62	188	82	6	0	0	0	0	0	0	0	358	37
19:00	0	2	7	47	132	44	7	0	0	0	0	0	0	0	239	36
20:00	2	0	6	37	106	34	3	0	0	0	0	0	0	0	188	36
21:00	1	3	2	24	66	22	3	1	0	0	0	0	0	0	122	36
22:00	1	2	4	12	50	23	4	0	0	0	0	0	0	0	96	37
23:00	0	0	0	5	25	10	3	0	0	0	0	0	0	0	43	38
Total	38	108	249	1180	3096	1184	110	6	2	0	0	0	0	0	5973	

Percentiles

15th Percentile :	26 MPH
50th Percentile :	32 MPH
85th Percentile :	36 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	32 MPH
10 MPH Pace Speed :	29-38 MPH
Number in Pace :	4219
Percent in Pace :	70.6%
Number of Vehicles > 30 MPH :	4398
Percent of Vehicles > 30 MPH :	73.6%

Summary

15th Percentile :	26 MPH
50th Percentile :	32 MPH
85th Percentile :	36 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	32 MPH

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Station ID:

765 Lagrange Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
05/07/14	0	0	0	14	24	13	2	0	0	0	0	0	0	0	53	37
01:00	0	1	1	7	7	4	3	0	0	0	0	0	0	0	23	39
02:00	0	0	0	0	6	1	1	0	0	0	0	0	0	0	8	38
03:00	0	0	2	1	2	1	2	0	0	0	0	0	0	0	8	42
04:00	0	0	0	0	6	4	0	0	0	0	0	0	0	0	10	38
05:00	0	0	0	1	2	9	1	1	0	0	0	0	0	0	14	41
06:00	1	1	1	8	41	28	8	3	0	0	0	0	0	0	91	39
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16:00	1	11	18	137	422	154	4	0	0	0	0	0	0	0	747	36
17:00	0	4	3	111	453	166	7	1	0	0	0	0	0	0	745	36
18:00	0	1	4	97	345	135	12	1	0	0	0	0	0	0	595	37
19:00	3	3	7	81	232	92	7	0	0	0	0	0	0	0	425	36
20:00	0	0	6	82	174	60	2	0	0	0	0	0	0	0	324	36
21:00	0	2	7	82	99	30	1	1	0	0	0	0	0	0	222	35
22:00	0	1	4	30	83	30	2	0	0	0	0	0	0	0	150	36
23:00	0	1	0	15	63	35	7	0	0	0	0	0	0	0	121	38
Total	9	71	142	1203	3585	1568	137	8	0	0	0	0	0	0	6723	

Percentiles

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	29-38 MPH
Number in Pace :	4975
Percent in Pace :	74.0%
Number of Vehicles > 30 MPH :	5298
Percent of Vehicles > 30 MPH :	78.8%

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05/08/14	0	1	1	6	27	7	3	0	0	0	0	0	0	0	45	37
01:00	0	1	0	3	15	5	2	0	0	0	0	0	0	0	26	38
02:00	0	1	1	0	8	2	1	0	0	0	0	0	0	0	13	37
03:00	0	0	3	2	0	3	0	0	0	0	0	0	0	0	8	38
04:00	0	1	0	1	5	3	0	0	0	0	0	0	0	0	10	37
05:00	0	0	1	4	10	13	1	0	0	0	0	0	0	0	29	38
06:00	0	1	5	14	34	28	10	3	0	0	0	0	0	0	95	40
07:00	1	3	7	25	139	116	10	1	0	0	0	0	0	0	302	38
08:00	0	2	6	55	128	92	10	1	0	0	0	0	0	0	294	38
09:00	0	2	8	45	124	58	7	1	0	0	0	0	0	0	245	37
10:00	0	2	8	46	124	54	8	0	0	0	0	0	0	0	242	37
11:00	3	7	10	46	131	70	7	1	0	0	0	0	0	0	275	37
12 PM	0	3	11	60	176	93	11	0	0	0	0	0	0	0	354	37
13:00	1	3	10	53	201	91	3	0	0	0	0	0	0	0	362	37
14:00	1	4	7	61	234	113	9	0	0	0	0	0	0	0	429	37
15:00	3	8	20	111	403	148	6	1	0	0	0	0	0	0	700	36
16:00	0	14	23	131	435	139	8	0	0	0	0	0	0	0	750	36
17:00	0	2	1	88	494	168	6	0	0	0	0	0	0	0	759	36
18:00	1	3	10	100	357	163	8	0	1	0	0	0	0	0	643	37
19:00	0	1	6	86	291	94	8	0	0	0	0	0	0	0	486	36
20:00	0	2	3	66	172	52	7	1	0	0	0	0	0	0	303	36
21:00	0	4	12	78	123	41	6	0	0	0	0	0	0	0	264	36
22:00	1	1	2	31	77	37	4	0	0	0	0	0	0	0	153	37
23:00	1	0	1	19	66	43	4	1	0	0	0	0	0	0	135	38
Total	12	66	156	1131	3774	1633	139	10	1	0	0	0	0	0	6922	

Percentiles

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	29-38 MPH
Number in Pace :	5174
Percent in Pace :	74.7%
Number of Vehicles > 30 MPH :	5557
Percent of Vehicles > 30 MPH :	80.3%

Summary

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	33 MPH

□ Sight Distance Calculations

Stopping Sight Distance

Posted Speed Limit

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	30	110.25	75.4	185.7
Direction 2	WB	30	110.25	77.4	187.6

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	30	30
Grade	0.05	0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

Average Observed Travel Speeds

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	32	117.6	85.8	203.4
Direction 2	WB	33	121.275	93.6	214.9

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	32	33
Grade	0.05	0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

85th Percentile Observed Travel Speeds

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	36	132.3	108.6	240.9
Direction 2	WB	37	135.975	117.7	253.6

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	36	37
Grade	0.05	0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Posted (Regulatory) Speed Limit

Proposed Site Driveway ISD = 1.47 * 30 * 7.5 = 331 ft **SAY 335 ft**
(left-turn from a stop)

Proposed Site Driveway ISD = 1.47 * 30 * 6.5 = 287 ft **SAY 290 ft**
(right-turn from a stop)

Observed 85th Percentile Speeds

Proposed Site Driveway ISD = 1.47 * 36 * 7.5 = 397 ft **SAY 400 ft**
(left-turn from a stop)

Proposed Site Driveway ISD = 1.47 * 37 * 6.5 = 354 ft **SAY 355 ft**
(right-turn from a stop)