

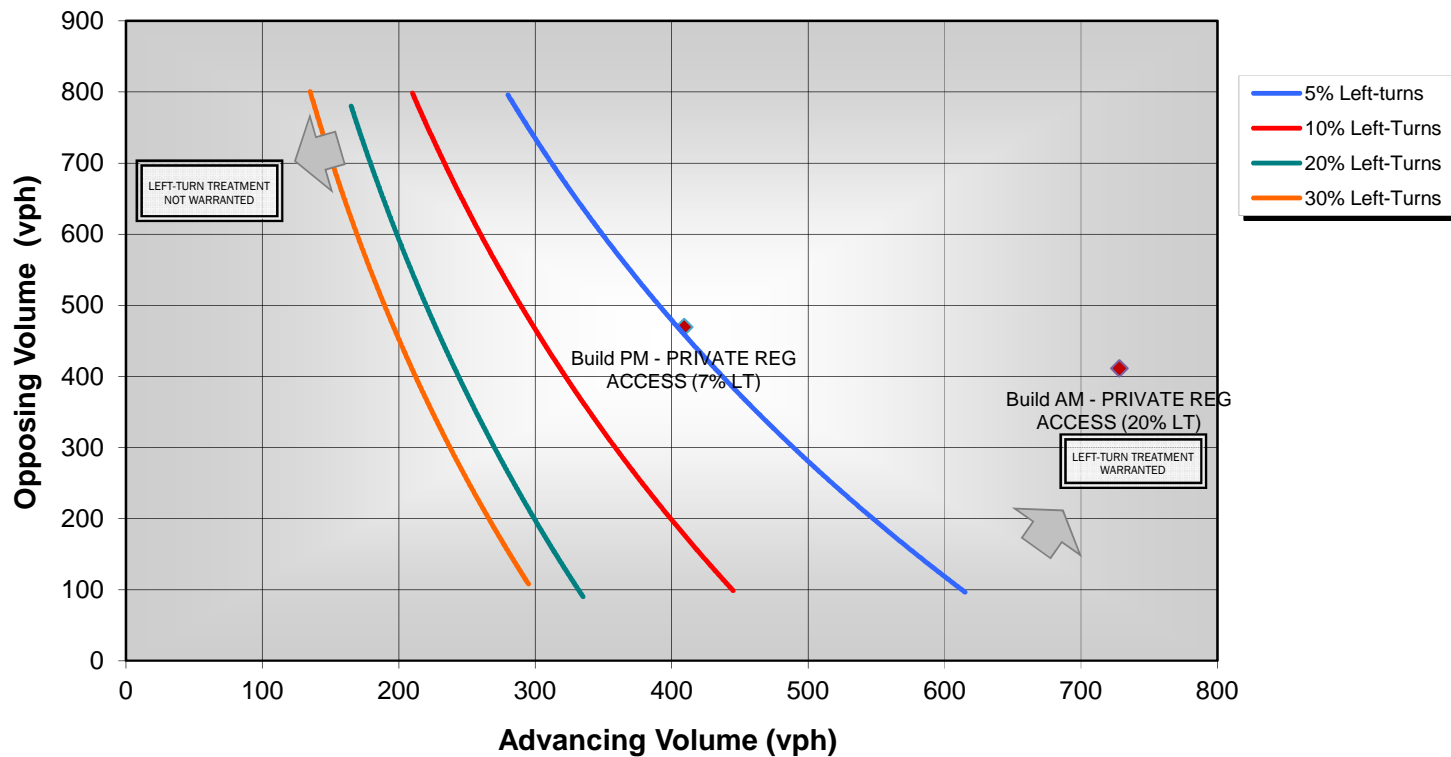
PROJECT NAME: Regeneron Mill Creek  
LOCATION: 3rd Ave Ext & Regeneron Access

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:

## AASHTO Guide for Left-turn Lanes on Two-Lane Highways

Operating Speed: 50 mph



source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

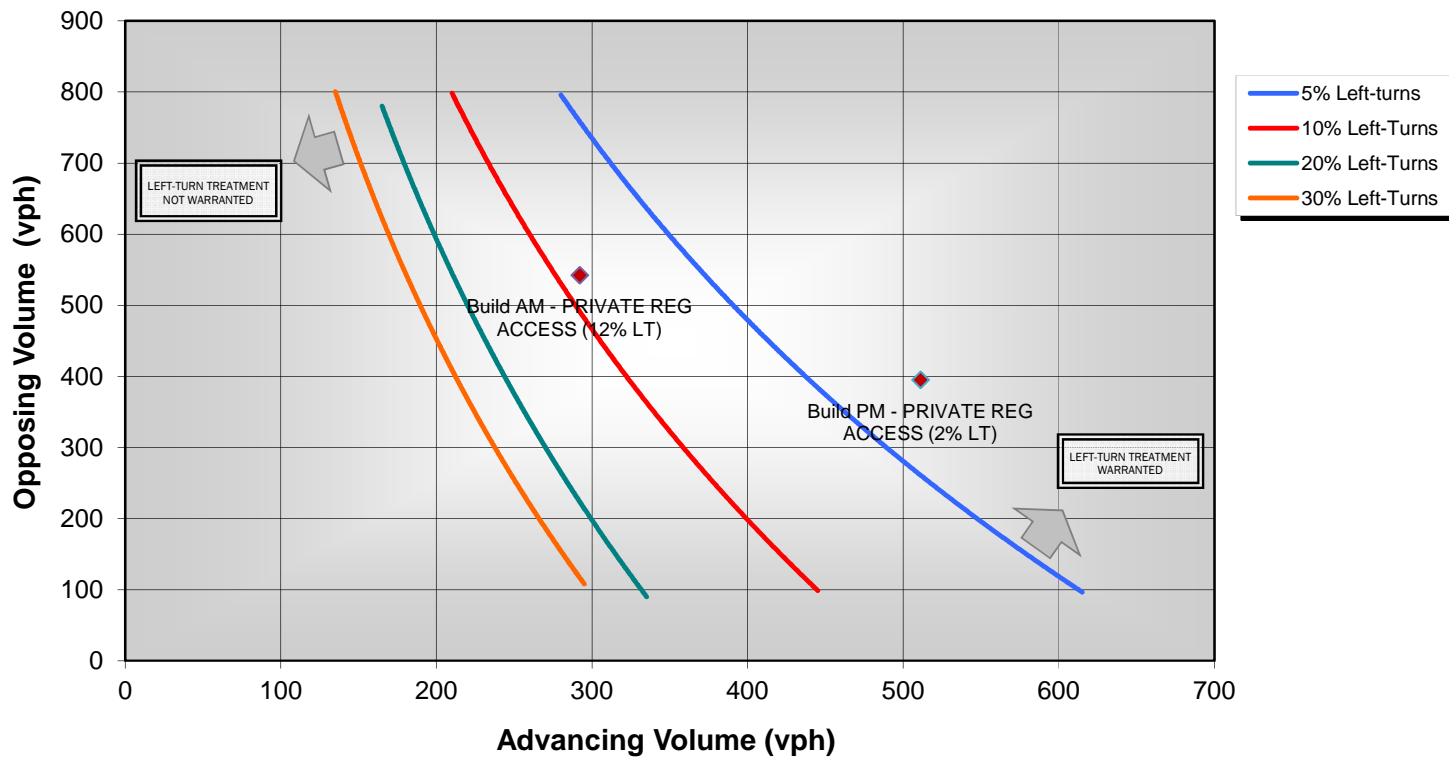
PROJECT NAME: Regeneron Mill Creek  
LOCATION: NY 151 & Tempel Lane

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:

## AASHTO Guide for Left-turn Lanes on Two-Lane Highways

Operating Speed: 50 mph

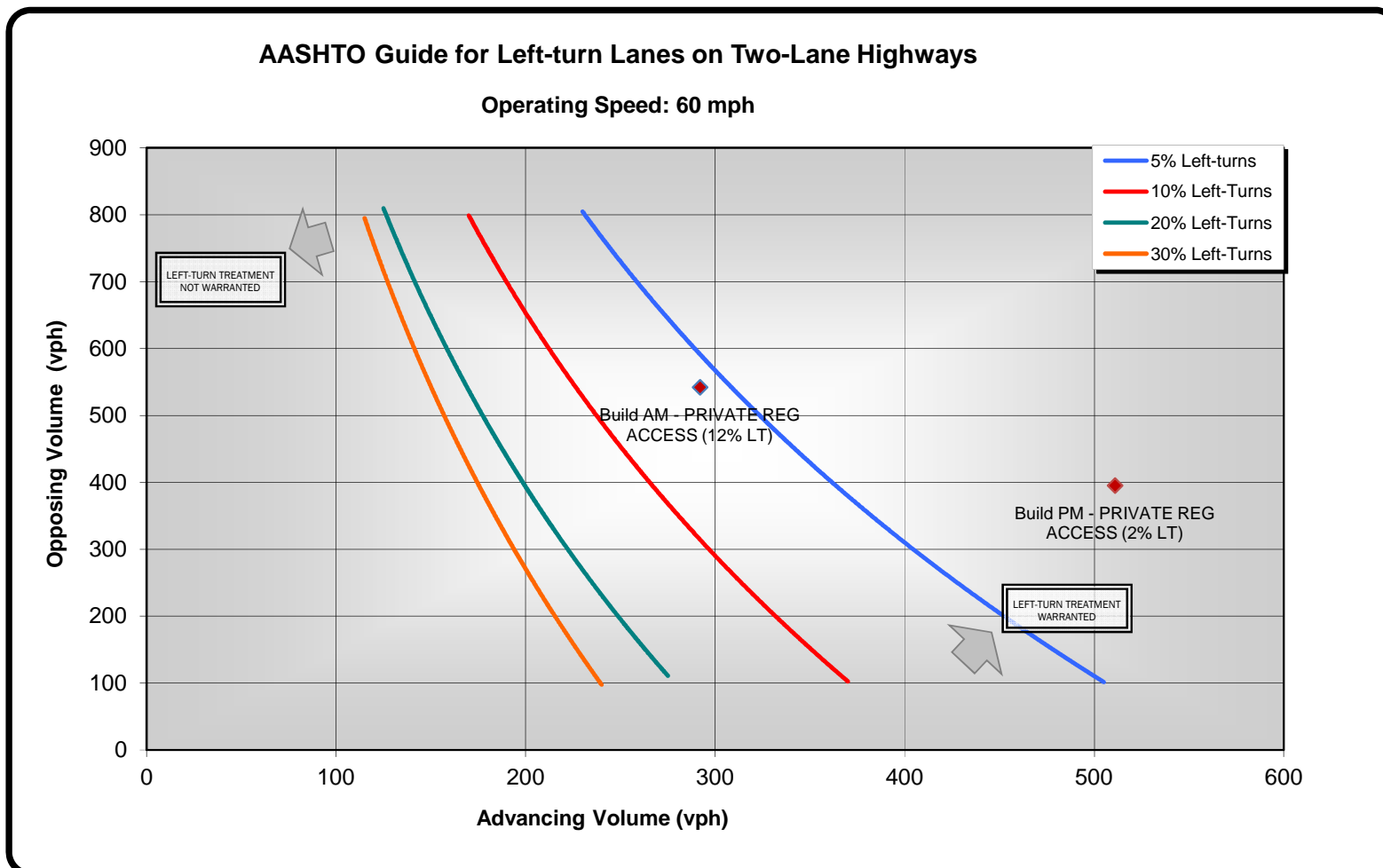


source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

PROJECT NAME: Regeneron Mill Creek  
LOCATION: NY 151 & Tempel Lane

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:

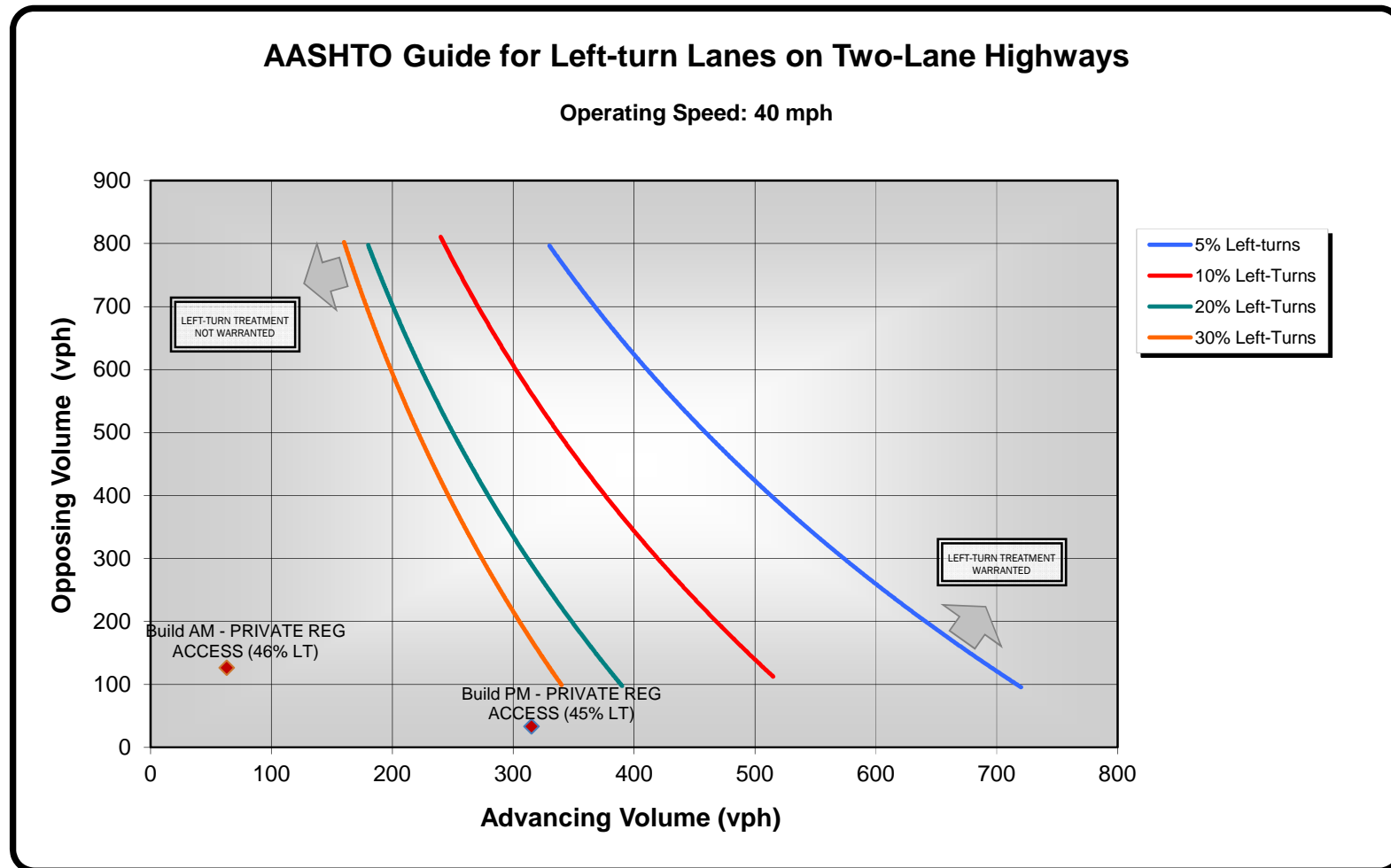


source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

PROJECT NAME: Regeneron Mill Creek  
LOCATION: Tempel Lane & Tempel Farm (Hotel Access)

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:



source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

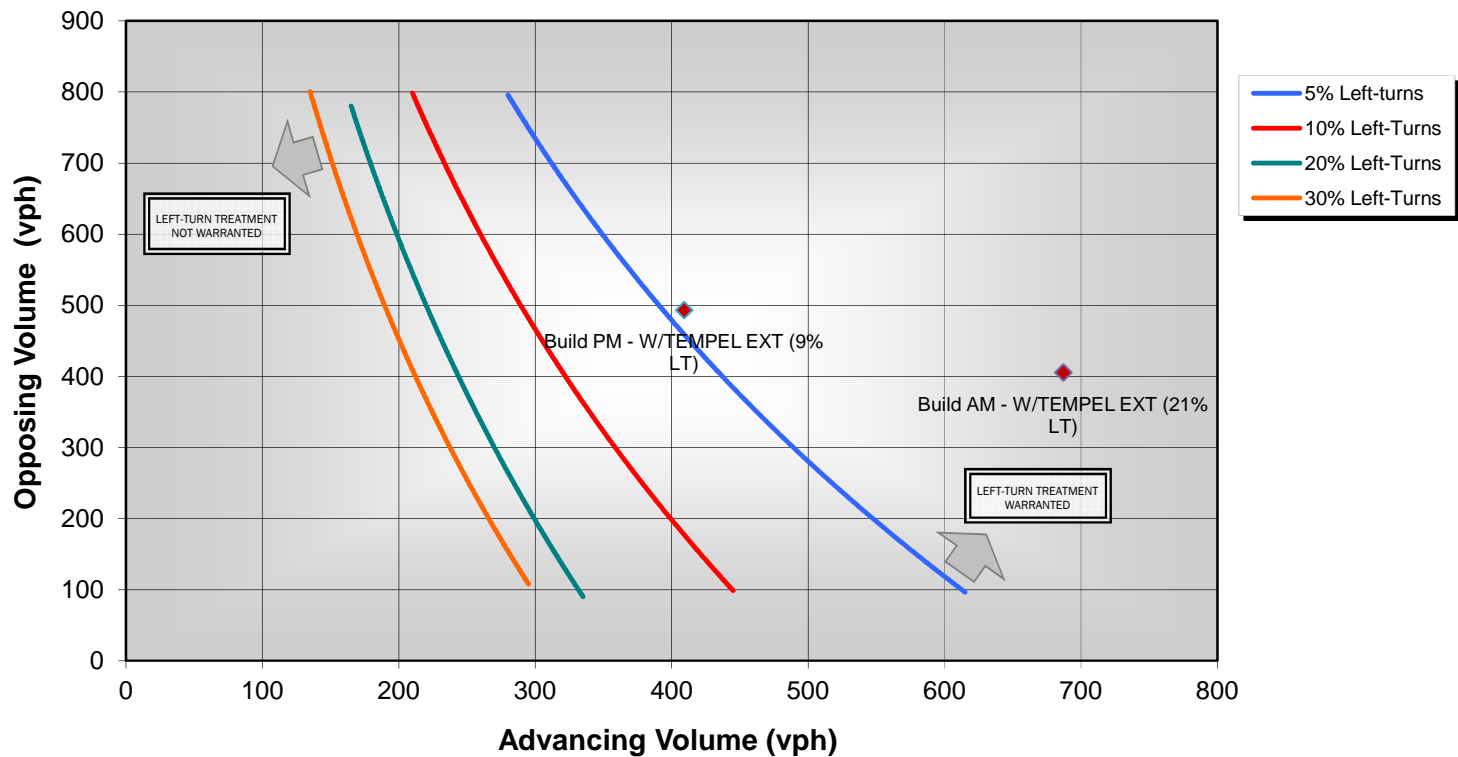
PROJECT NAME: Regeneron Mill Creek  
LOCATION: 3rd Ave Ext & Tempel Lane

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:

## AASHTO Guide for Left-turn Lanes on Two-Lane Highways

Operating Speed: 50 mph



source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

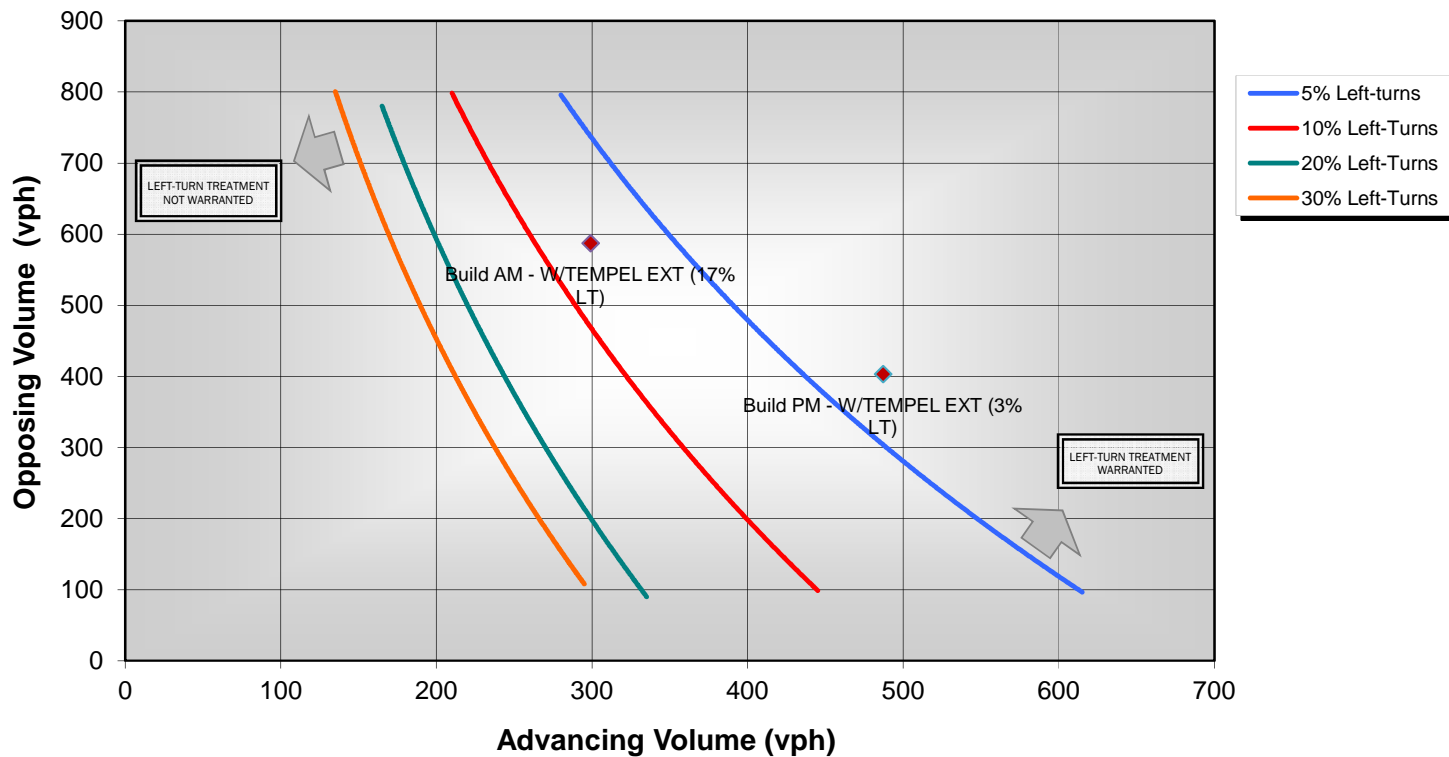
PROJECT NAME: Regeneron Mill Creek  
LOCATION: NY 151 & Tempel Lane

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:

## AASHTO Guide for Left-turn Lanes on Two-Lane Highways

Operating Speed: 50 mph

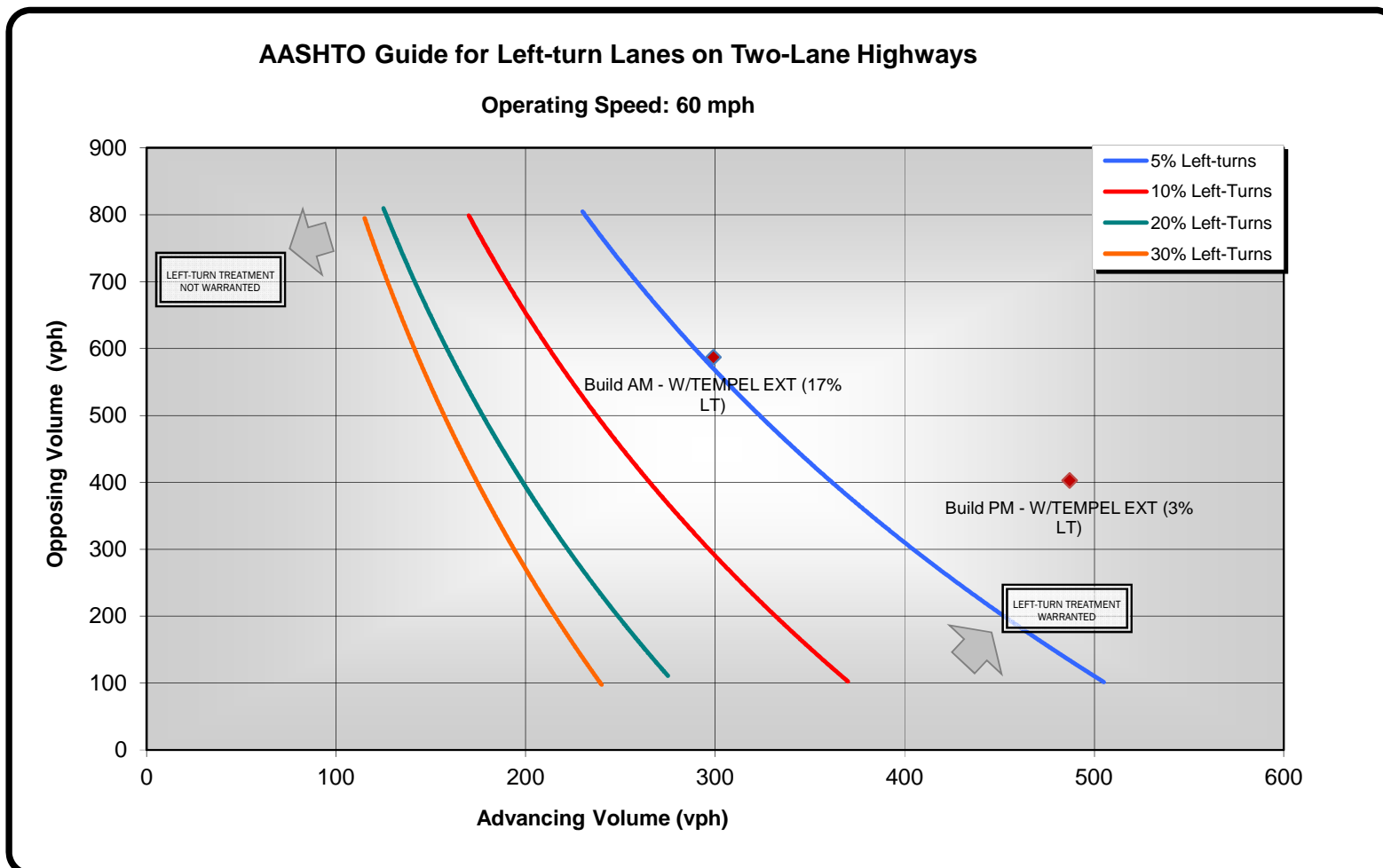


source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

PROJECT NAME: Regeneron Mill Creek  
LOCATION: NY 151 & Tempel Lane

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:

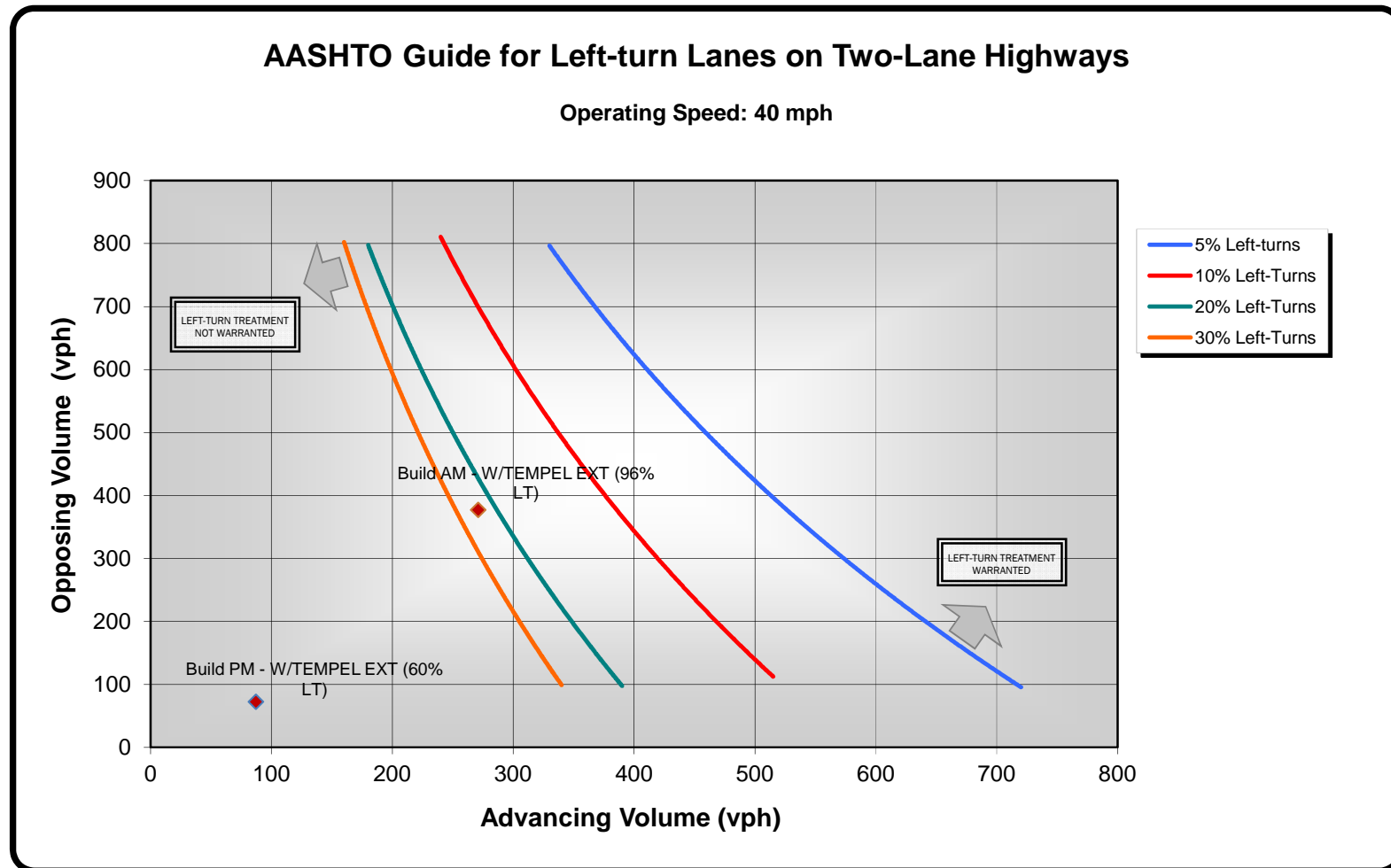


source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

PROJECT NAME: Regeneron Mill Creek  
LOCATION: Tempel Lane & Regeneron Access

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:



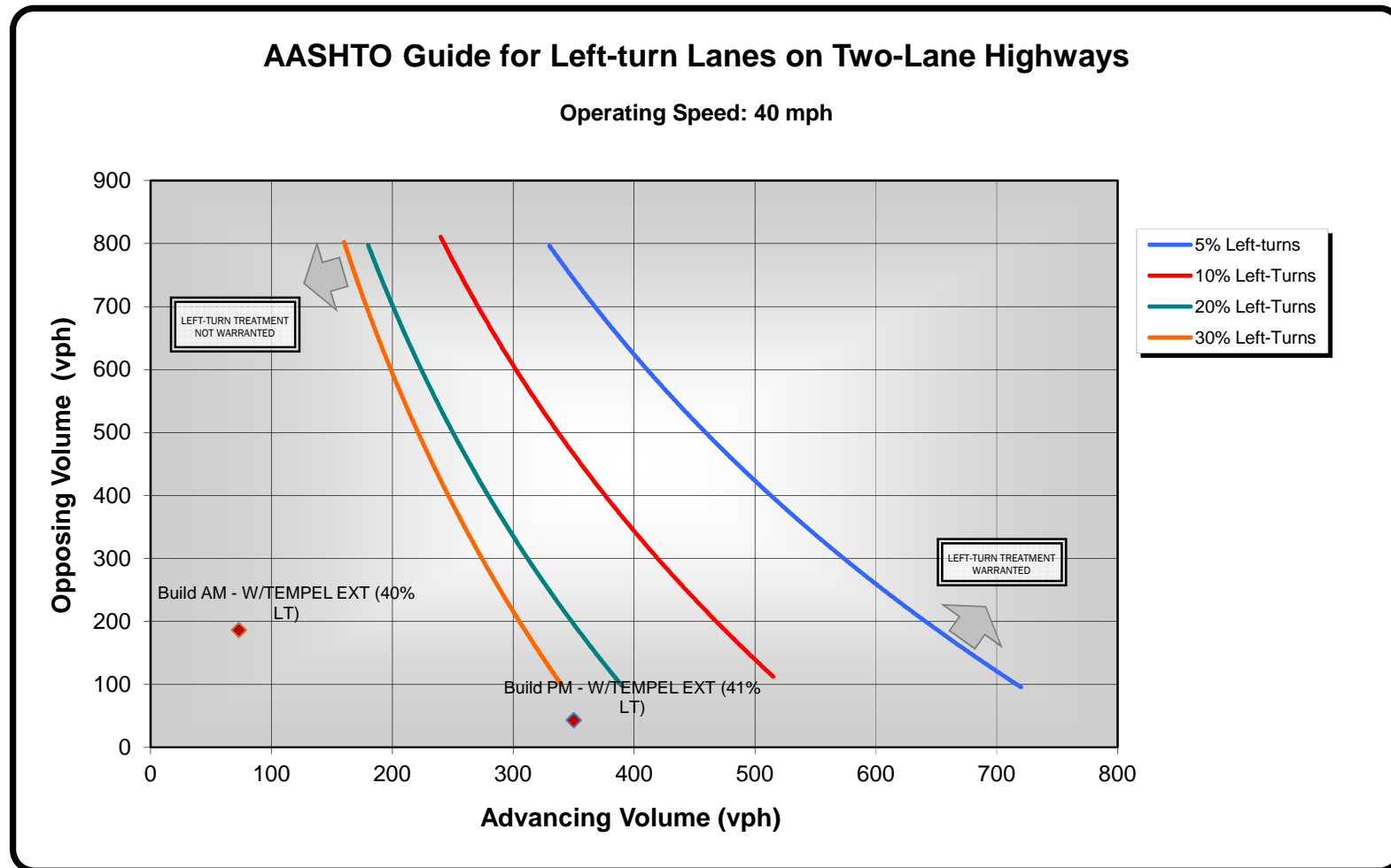
source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23



PROJECT NAME: Regeneron Mill Creek  
LOCATION: Tempel Lane & Tempel Farm (Hotel Access)

DATE: 1/24/2018  
CHA PROJ. #: 33295

DESCRIPTION:



source: A Policy on Geometric Design of Highways and Streets, 6th Edition; American Association of State Highway and Transportation Officials (2011): Table 9-23

## TRAFFIC SIGNAL WARRANT SUMMARY

Project : **Regeneron**  
 Location: **Regeneron Access & 3rd Avenue Extension**  
**East Greenbush, NY**

Analyst: **SEB**  
 Date: **January 30, 2018**  
 Checked By: \_\_\_\_\_  
 CHA Project No. **33295**

Intersection: **Regeneron Access & 3rd Avenue Extension**

Major Street: **3rd Avenue Extension**  
 Minor Street: **Regeneron Access (Alt 1)**

Number of Approach Lanes: **1**  
 Number of Approach Lanes: **2**

Critical Approach Speed: **45** mph  
 Posted Speed Limit: **45** mph

Number of Intersection Approaches: **4**

### Volume Level Criteria

1. Is the critical speed of major street traffic > 40 mph ?   x   Yes        No
2. Is the intersection in a built-up area of isolated community of <10,000 population?        Yes   x   No

Population: **16,500**

If Question 1 or 2 above is answered "Yes", then use "70%" volume level Use: **70** %

### Traffic Volume Input

Analysis Condition: **Full Build without Tempel Farms**

Data Source: **ATR Data & Trip Gen**

	Hourly Volumes												
	6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	284	1,139	594	452	408	492	608	532	497	461	710	878	527
Minor Street (Highest Approach)	32	35	52	41	35	79	78	49	91	140	258	176	58
Pedestrian Volume Crossing Major Street (Total of all crossings)													

Notes:

## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME

Applicable: ☒ Yes ☐ No

Satisfied: ☐ Yes ☒ No

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied. Should be applied only after adequate trial of other alternatives that would cause less delay and inconvenience to traffic has failed to solve the traffic problem.

### Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1 .....	1 .....	500	400	350	280	150	120	105	84
2 or more	1 .....	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1 .....	2 or more	500	400	350	280	200	160	140	112

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	350	284	1,139	594	452	408	492	608	532	497	461	710	878	527
Minor Street (Highest Approach)	140	32	35	52	41	35	79	78	49	91	140	258	176	58

satisfied?

☒

☒

☒

Warrant Criteria Satisfied for Condition A ? **NO**

Number of Hours Satisfied: **3**

### Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1 .....	1 .....	750	600	525	420	75	60	53	42
2 or more	1 .....	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1 .....	2 or more	750	600	525	420	100	80	70	56

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	525	284	1,139	594	452	408	492	608	532	497	461	710	878	527
Minor Street (Highest Approach)	70	32	35	52	41	35	79	78	49	91	140	258	176	58

satisfied?

☒

☒

☒

Warrant Criteria Satisfied for Condition B ? **NO**

Number of Hours Satisfied: **3**

## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME (Con't)

### Combination of Conditions A & B

#### Condition A

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	280	284	1,139	594	452	408	492	608	532	497	461	710	878	527
Minor Street (Highest Approach)	112	32	35	52	41	35	79	78	49	91	140	258	176	58

satisfied?

☒

☒

☒

Warrant Criteria 80% Satisfied for Condition A ? NO

Number of Hours Satisfied: 3

#### Condition B

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	420	284	1,139	594	452	408	492	608	532	497	461	710	878	527
Minor Street (Highest Approach)	56	32	35	52	41	35	79	78	49	91	140	258	176	58

satisfied?

☒

☒

☒

☒

☒

☒

☒

Warrant Criteria 80% Satisfied for Condition A ? NO

Number of Hours Satisfied: 7

Warrant Criteria 80% Satisfied for Conditions A and B? NO

Number of Hours Satisfied: 3

## WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

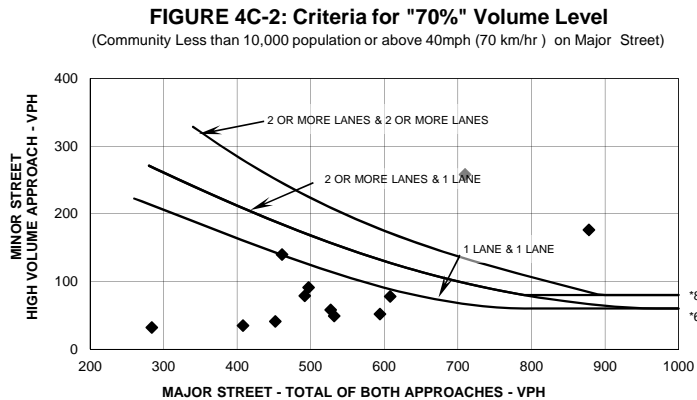
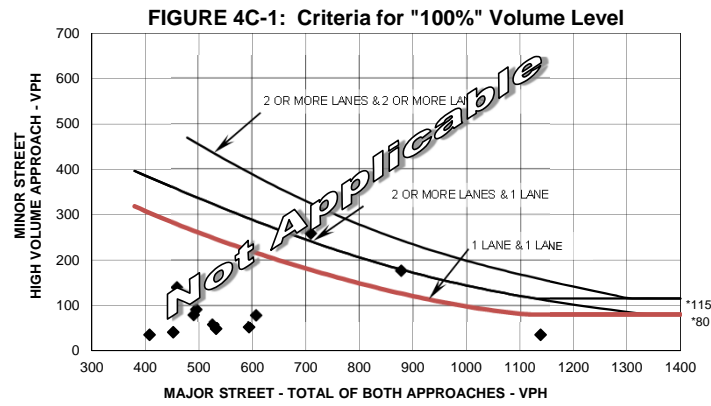
If all four points lie above the appropriate line, then the warrant is satisfied.

Applicable: ☒ Yes ☐ No  
Satisfied: ☐ Yes ☒ No

Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	284	32
7-8 am	1,139	35
8-9 am	594	52
9-10am	452	41
10-11am	408	35
11-12pm	492	79
12-1pm	608	78
1-2pm	532	49
2-3pm	497	91
3-4pm	461	140
4-5pm	710	258
5-6pm	878	176
6-7pm	527	58

Plot four volume combinations on the applicable figure below.



Source: USMUTCD, 2009

### WARRANT 3 - PEAK HOUR VEHICULAR VOLUME

The Peak Hour Volume signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

#### CONDITION A

##### Criteria

##### 1. Total Stopped Time Delay on Minor Approach

Average Delay per vehicle (sec):	AM	28.0	PM	26.2
Peak Hour Volume:		52		258
Total 1-hour stopped delay (veh-hrs):		0.4		1.9
Volume Criteria		5		5
Criteria: 4 veh-hrs for 1-lane approach; or 5 veh-hrs for 2-lane approach				

##### 2. Minor-Street Approach Volume

Minor Street Volume:	258
Number of Approach Lanes:	2
Volume Criteria:	150

Criteria: 100 vph for 1 lane; 150 vph for 2 lanes

##### 3. Intersection Peak-Hour Volume

Total Entering Volume:	1,209
Number of Approaches:	4
Volume Criteria:	800

Criteria: 650 vph for 3 approaches; or  
800 vph for 4 or more approaches

Criteria 1 Satisfied? Yes ☒ No  
Criteria 2 Satisfied? ☒ Yes No  
Criteria 3 Satisfied? ☒ Yes No

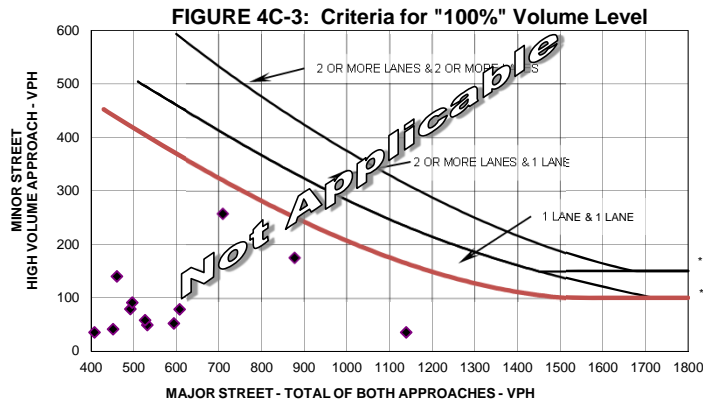
Note: All 3 criteria need to be satisfied for Condition A to be met

#### CONDITION B

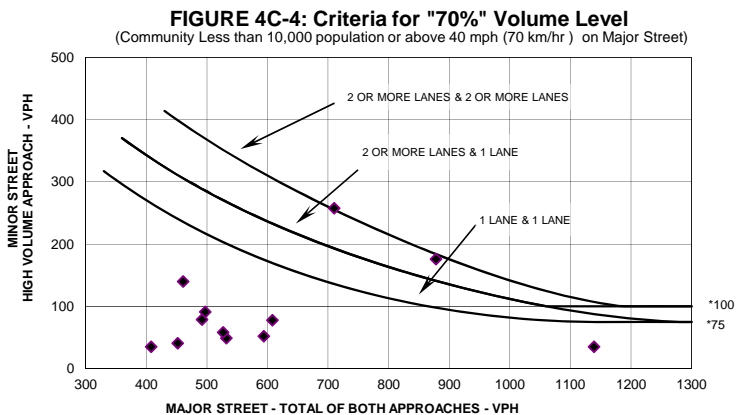
Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	284	32
7-8 am	1,139	35
8-9 am	594	52
9-10am	452	41
10-11am	408	35
11-12pm	492	79
12-1pm	608	78
1-2pm	532	49
2-3pm	497	91
3-4pm	461	140
4-5pm	710	258
5-6pm	878	176
6-7pm	527	58

Plot volume combination on the applicable figure below.



\* Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume threshold for a minor street approach with one lane.



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

Source: USMUTCD, 2009

## TRAFFIC SIGNAL WARRANT SUMMARY

Project : **Regeneron**  
 Location: **Tempel & 3rd Ave Ext**  
**East Greenbush, NY**

Analyst: **SEB**  
 Date: **January 24, 2018**  
 Checked By: \_\_\_\_\_  
 CHA Project No. **33295**

Intersection: **Tempel Lane & 3rd Avenue Extension**

Major Street: **3rd Ave Ext**  
 Minor Street: **Tempel Lane (Alt 2)**

Number of Approach Lanes: **1**  
 Number of Approach Lanes: **2**

Critical Approach Speed: **45** mph  
 Posted Speed Limit: **45** mph

Number of Intersection Approaches: **4**

### Volume Level Criteria

1. Is the critical speed of major street traffic > 40 mph ? ☒ Yes ☐ No
2. Is the intersection in a built-up area of isolated community of <10,000 population? ☐ Yes ☒ No

Population: **16,500**

If Question 1 or 2 above is answered "Yes", then use "70%" volume level Use: **70** %

### Traffic Volume Input

Analysis Condition: **Full Build without Tempel Farms**

Data Source: **ATR Data & Trip Gen**

	Hourly Volumes												
	6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	292	1,092	665	475	425	506	624	547	510	474	729	902	542
Minor Street (Highest Approach)	39	68	112	82	51	90	94	63	108	154	267	186	71
Pedestrian Volume Crossing Major Street (Total of all crossings)													

Notes:

## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME

Applicable: ☒ Yes ☐ No

Satisfied: ☐ Yes ☒ No

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied. Should be applied only after adequate trial of other alternatives that would cause less delay and inconvenience to traffic has failed to solve the traffic problem.

### Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1 .....	1 .....	500	400	350	280	150	120	105	84
2 or more	1 .....	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1 .....	2 or more	500	400	350	280	200	160	140	112

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	350	292	1,092	665	475	425	506	624	547	510	474	729	902	542
Minor Street (Highest Approach)	140	39	68	112	82	51	90	94	63	108	154	267	186	71

satisfied?

☒

☒

☒

Warrant Criteria Satisfied for Condition A ? NO

Number of Hours Satisfied: 3

### Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1 .....	1 .....	750	600	525	420	75	60	53	42
2 or more	1 .....	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1 .....	2 or more	750	600	525	420	100	80	70	56

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	525	292	1,092	665	475	425	506	624	547	510	474	729	902	542
Minor Street (Highest Approach)	70	39	68	112	82	51	90	94	63	108	154	267	186	71

satisfied?

☒

☒

☒

☒

☒

Warrant Criteria Satisfied for Condition B ? NO

Number of Hours Satisfied: 5



## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME (Con't)

### Combination of Conditions A & B

#### Condition A

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	280	292	1,092	665	475	425	506	624	547	510	474	729	902	542
Minor Street (Highest Approach)	112	39	68	112	82	51	90	94	63	108	154	267	186	71
satisfied?		<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

satisfied?



Warrant Criteria 80% Satisfied for Condition A ? **NO**

Number of Hours Satisfied: **4**

#### Condition B

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	420	292	1,092	665	475	425	506	624	547	510	474	729	902	542
Minor Street (Highest Approach)	56	39	68	112	82	51	90	94	63	108	154	267	186	71

satisfied?



Warrant Criteria 80% Satisfied for Condition A ? **YES**

Number of Hours Satisfied: **11**

Warrant Criteria 80% Satisfied for Conditions A and B? **NO**

Number of Hours Satisfied: **4**

## WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

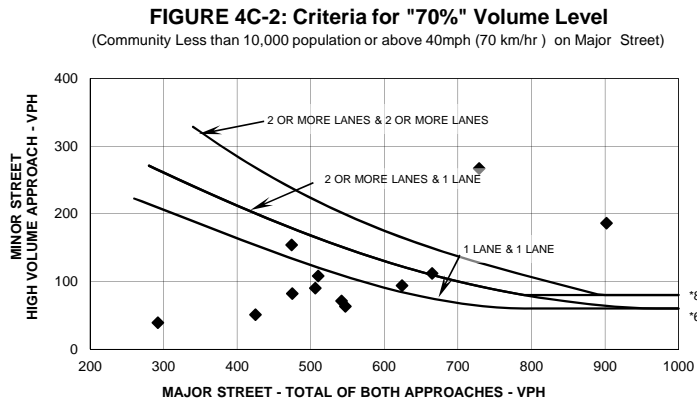
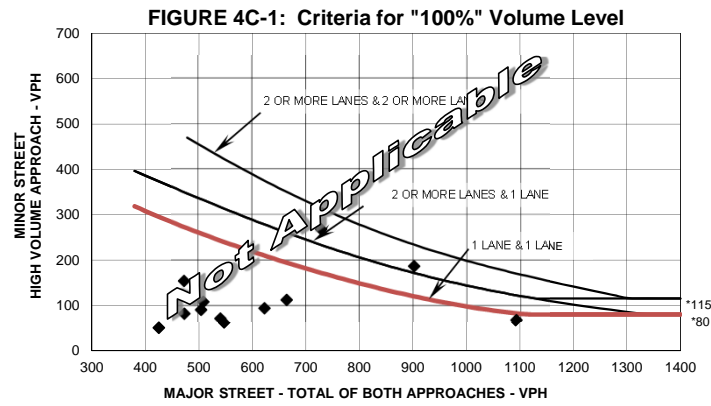
If all four points lie above the appropriate line, then the warrant is satisfied.

Applicable: ☒ Yes ☐ No  
Satisfied: ☐ Yes ☒ No

Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	292	39
7-8 am	1,092	68
8-9 am	665	112
9-10am	475	82
10-11am	425	51
11-12pm	506	90
12-1pm	624	94
1-2pm	547	63
2-3pm	510	108
3-4pm	474	154
4-5pm	729	267
5-6pm	902	186
6-7pm	542	71

Plot four volume combinations on the applicable figure below.



Source: USMUTCD, 2009

### WARRANT 3 - PEAK HOUR VEHICULAR VOLUME

The Peak Hour Volume signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

#### CONDITION A

##### Criteria

##### 1. Total Stopped Time Delay on Minor Approach

Average Delay per vehicle (sec):	AM	53.1	PM	29.9
Peak Hour Volume:		112		268
Total 1-hour stopped delay (veh-hrs):		1.7		2.2
Volume Criteria		5		5

Criteria: 4 veh-hrs for 1-lane approach; or  
5 veh-hrs for 2-lane approach

##### 2. Minor-Street Approach Volume

Minor Street Volume:	268
Number of Approach Lanes:	2
Volume Criteria:	150

Criteria: 100 vph for 1 lane; 150 vph for 2 lanes

##### 3. Intersection Peak-Hour Volume

Total Entering Volume:	1,218
Number of Approaches:	4
Volume Criteria:	800

Criteria: 650 vph for 3 approaches; or  
800 vph for 4 or more approaches

Criteria 1 Satisfied? Yes ☒ No  
Criteria 2 Satisfied? ☒ Yes No  
Criteria 3 Satisfied? ☒ Yes No

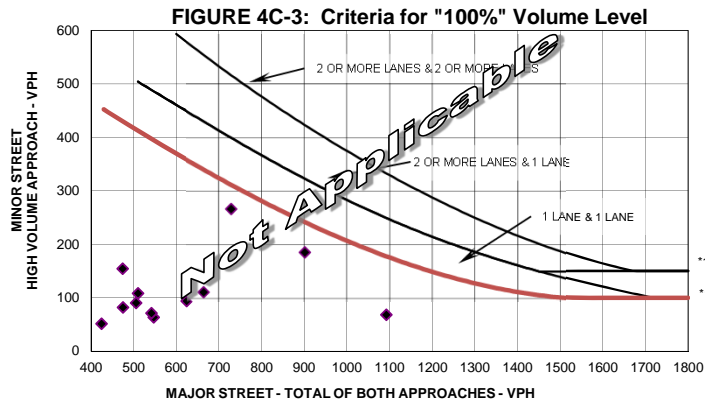
Note: All 3 criteria need to be satisfied for Condition A to be met

#### CONDITION B

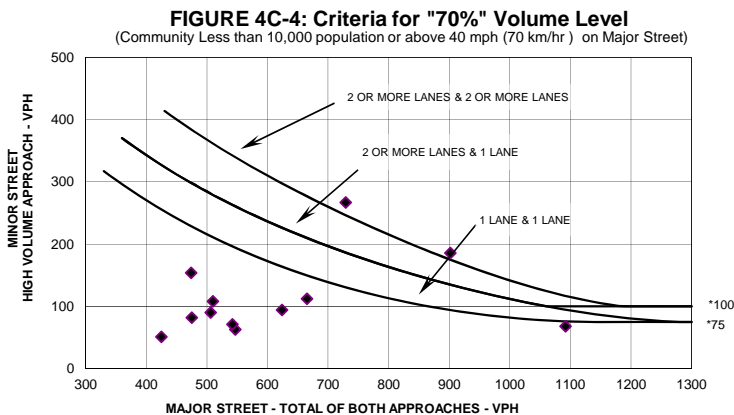
Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	292	39
7-8 am	1,092	68
8-9 am	665	112
9-10am	475	82
10-11am	425	51
11-12pm	506	90
12-1pm	624	94
1-2pm	547	63
2-3pm	510	108
3-4pm	474	154
4-5pm	729	267
5-6pm	902	186
6-7pm	542	71

Plot volume combination on the applicable figure below.



\* Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume threshold for a minor street approach with one lane.



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

Source: USMUTCD, 2009

# TRAFFIC SIGNAL WARRANT SUMMARY

Project : **Regeneron**  
 Location: **Tempel & NYS Route 151**  
**East Greenbush, NY**

Analyst: **SEB**  
 Date: **January 23, 2018**  
 Checked By:   
 CHA Project No. **33295**

Intersection: **Tempel Lane & Red Mill Road (NY Route 151)**

Major Street: **Red Mill Road (NY Route 151)**  
 Minor Street: **Tempel Lane**

Number of Approach Lanes: **1**  
 Number of Approach Lanes: **2**

Critical Approach Speed: **45** mph  
 Posted Speed Limit: **45** mph

Number of Intersection Approaches: **3**

## Volume Level Criteria

1. Is the critical speed of major street traffic > 40 mph ? ☒ Yes ☐ No
2. Is the intersection in a built-up area of isolated community of <10,000 population? ☐ Yes ☒ No

Population: **16,500**

If Question 1 or 2 above is answered "Yes", then use "70%" volume level Use: **70** %

## Traffic Volume Input

Analysis Condition: **Build Sensitivity Analysis**

Data Source: **ATR Data & Trip Gen**

	Hourly Volumes												
	6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	458	834	750	481	394	437	500	460	578	618	851	906	522
Minor Street (Highest Approach)	29	43	58	52	70	115	113	82	115	156	246	193	90
Pedestrian Volume Crossing Major Street (Total of all crossings)													

## Notes:

This Worksheet is for a Private Regeneron Access on 3rd Avenue Extension (Alt 1)

**WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME**Applicable: ☒ Yes ☐ NoSatisfied: ☐ Yes ☒ No

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied. Should be applied only after adequate trial of other alternatives that would cause less delay and inconvenience to traffic has failed to solve the traffic problem.

**Condition A - Minimum Vehicular Volume**

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
<u>Major Street</u>	<u>Minor Street</u>	<u>100%</u>	<u>80%</u>	<u>70%</u>	<u>56%</u>	<u>100%</u>	<u>80%</u>	<u>70%</u>	<u>56%</u>
1 .....	1 .....	500	400	350	280	150	120	105	84
2 or more	1 .....	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1 .....	2 or more	500	400	350	280	200	160	140	112

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	350	458	834	750	481	394	437	500	460	578	618	851	906	522
Minor Street (Highest Approach)	140	29	43	58	52	70	115	113	82	115	156	246	193	90

satisfied?

☒☒☒Warrant Criteria Satisfied for Condition A ? NONumber of Hours Satisfied: 3**Condition B - Interruption of Continuous Traffic**

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
<u>Major Street</u>	<u>Minor Street</u>	<u>100%</u>	<u>80%</u>	<u>70%</u>	<u>56%</u>	<u>100%</u>	<u>80%</u>	<u>70%</u>	<u>56%</u>
1 .....	1 .....	750	600	525	420	75	60	53	42
2 or more	1 .....	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1 .....	2 or more	750	600	525	420	100	80	70	56

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	525	458	834	750	481	394	437	500	460	578	618	851	906	522
Minor Street (Highest Approach)	70	29	43	58	52	70	115	113	82	115	156	246	193	90

satisfied?

☒☒☒☒Warrant Criteria Satisfied for Condition B ? NONumber of Hours Satisfied: 4

## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME (Con't)

### Combination of Conditions A & B

#### Condition A

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	280	458	834	750	481	394	437	500	460	578	618	851	906	522
Minor Street (Highest Approach)	112	29	43	58	52	70	115	113	82	115	156	246	193	90
satisfied?							☑	☑		☑	☑	☑	☑	

satisfied?



Warrant Criteria 80% Satisfied for Condition A ? **NO**

Number of Hours Satisfied: **6**

#### Condition B

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	420	458	834	750	481	394	437	500	460	578	618	851	906	522
Minor Street (Highest Approach)	56	29	43	58	52	70	115	113	82	115	156	246	193	90

satisfied?



Warrant Criteria 80% Satisfied for Condition B ? **YES**

Number of Hours Satisfied: **9**

Warrant Criteria 80% Satisfied for Conditions A and B? **NO**

Number of Hours Satisfied: **6**

## WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

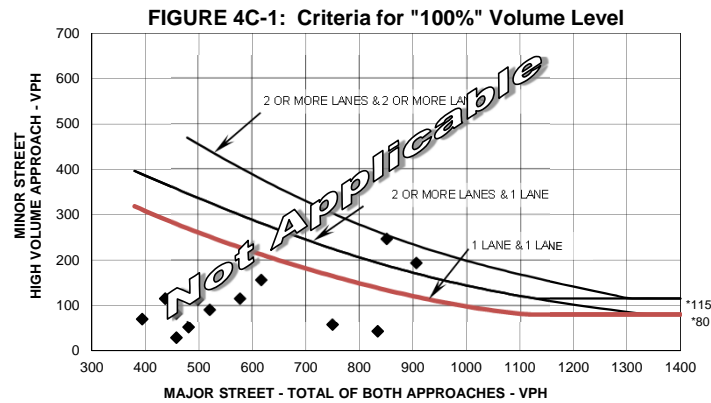
If all four points lie above the appropriate line, then the warrant is satisfied.

Applicable: ☒ Yes ☐ No  
Satisfied: ☐ Yes ☒ No

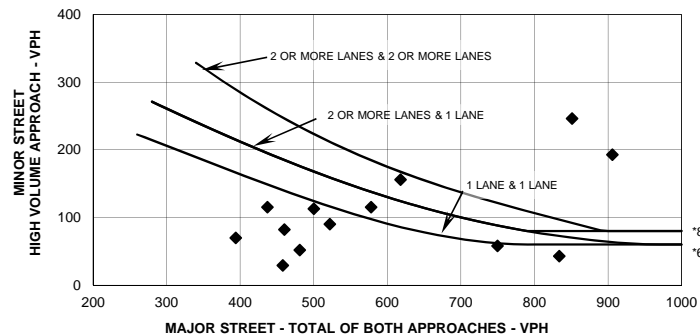
Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	458	29
7-8 am	834	43
8-9 am	750	58
9-10am	481	52
10-11am	394	70
11-12pm	437	115
12-1pm	500	113
1-2pm	460	82
2-3pm	578	115
3-4pm	618	156
4-5pm	851	246
5-6pm	906	193
6-7pm	522	90

Plot four volume combinations on the applicable figure below.



**FIGURE 4C-2: Criteria for "70%" Volume Level**  
(Community Less than 10,000 population or above 40mph (70 km/hr ) on Major Street)



Source: USMUTCD, 2009

### WARRANT 3 - PEAK HOUR VEHICULAR VOLUME

The Peak Hour Volume signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

#### CONDITION A

##### Criteria

##### 1. Total Stopped Time Delay on Minor Approach

Average Delay per vehicle (sec):	AM	20.1	PM	68.9
Peak Hour Volume:		60		249
Total 1-hour stopped delay (veh-hrs):		0.3		4.8
Volume Criteria		5		5

Criteria: 4 veh-hrs for 1-lane approach; or  
5 veh-hrs for 2-lane approach

##### 2. Minor-Street Approach Volume

Minor Street Volume:	249
Number of Approach Lanes:	2
Volume Criteria:	150

Criteria: 100 vph for 1 lane; 150 vph for 2 lanes

##### 3. Intersection Peak-Hour Volume

Total Entering Volume:	1,155
Number of Approaches:	3
Volume Criteria:	650

Criteria: 650 vph for 3 approaches; or  
800 vph for 4 or more approaches

Criteria 1 Satisfied? Yes ☒ No  
Criteria 2 Satisfied? ☒ Yes No  
Criteria 3 Satisfied? ☒ Yes No

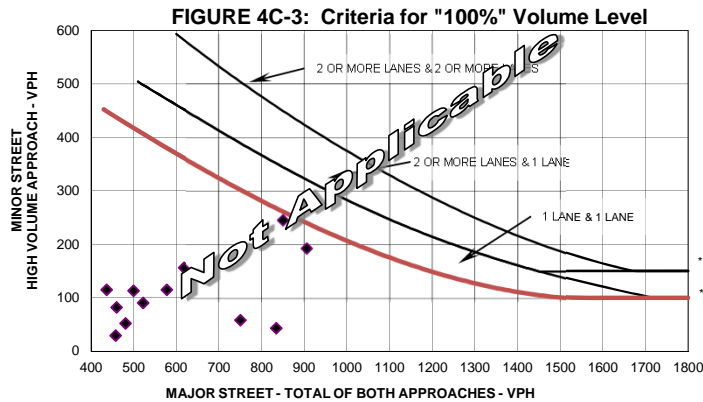
Note: All 3 criteria need to be satisfied for Condition A to be met

#### CONDITION B

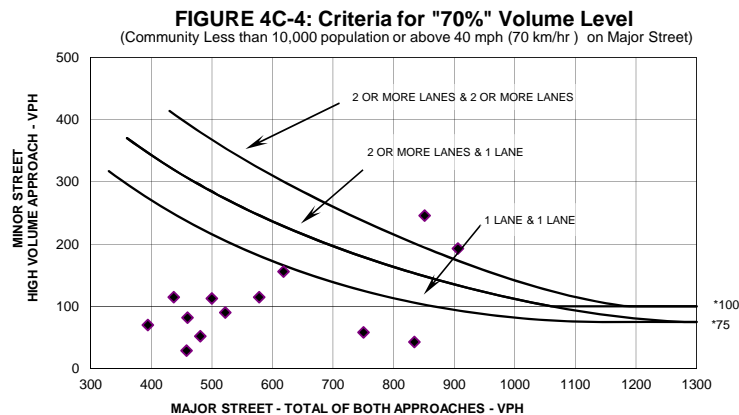
Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	458	29
7-8 am	834	43
8-9 am	750	58
9-10am	481	52
10-11am	394	70
11-12pm	437	115
12-1pm	500	113
1-2pm	460	82
2-3pm	578	115
3-4pm	618	156
4-5pm	851	246
5-6pm	906	193
6-7pm	522	90

Plot volume combination on the applicable figure below.



\* Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume threshold for a minor street approach with one lane.



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

Source: USMUTCD, 2009



# TRAFFIC SIGNAL WARRANT SUMMARY

Project : **Regeneron**  
 Location: **Tempel & NY Route 151**  
**East Greenbush, NY**

Analyst: **SEB**  
 Date: **January 23, 2018**  
 Checked By:   
 CHA Project No. **33295**

Intersection: **Tempel Lane & Red Mill Road (NY Route 151)**

Major Street: **Red Mill Road (NY Route 151)**  
 Minor Street: **Tempel Lane**

Number of Approach Lanes: **1**  
 Number of Approach Lanes: **2**

Critical Approach Speed: **45** mph  
 Posted Speed Limit: **45** mph

Number of Intersection Approaches: **3**

## Volume Level Criteria

1. Is the critical speed of major street traffic > 40 mph ? ☒ Yes ☐ No
2. Is the intersection in a built-up area of isolated community of <10,000 population? ☐ Yes ☒ No

Population: **16,500**

If Question 1 or 2 above is answered "Yes", then use "70%" volume level Use: **70** %

## Traffic Volume Input

Analysis Condition: **Build Sensitivity Analysis**

Data Source: **ATR Data & Trip Gen**

	Hourly Volumes												
	6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	414	886	701	472	387	429	491	452	568	607	836	890	512
Minor Street (Highest Approach)	33	48	68	59	75	125	124	89	127	173	281	214	98
Pedestrian Volume Crossing Major Street (Total of all crossings)													

Notes:

This worksheet includes the Extension of Tempel Lane (Alt 2)

## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME

Applicable: ☒ Yes ☐ No

Satisfied: ☐ Yes ☒ No

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied. Should be applied only after adequate trial of other alternatives that would cause less delay and inconvenience to traffic has failed to solve the traffic problem.

### Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1 .....	1 .....	500	400	350	280	150	120	105	84
2 or more	1 .....	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1 .....	2 or more	500	400	350	280	200	160	140	112

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	350	414	886	701	472	387	429	491	452	568	607	836	890	512
Minor Street (Highest Approach)	140	33	48	68	59	75	125	124	89	127	173	281	214	98

satisfied?

☒

☒

☒

Warrant Criteria Satisfied for Condition A ? NO

Number of Hours Satisfied: 3

### Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1 .....	1 .....	750	600	525	420	75	60	53	42
2 or more	1 .....	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1 .....	2 or more	750	600	525	420	100	80	70	56

source: Table 4C-1, USMUTCD, 2009

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	525	414	886	701	472	387	429	491	452	568	607	836	890	512
Minor Street (Highest Approach)	70	33	48	68	59	75	125	124	89	127	173	281	214	98

satisfied?

☒

☒

☒

☒

Warrant Criteria Satisfied for Condition B ? NO

Number of Hours Satisfied: 4

## WARRANT 1- EIGHT-HOUR VEHICULAR VOLUME (Con't)

### Combination of Conditions A & B

#### Condition A

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	280	414	886	701	472	387	429	491	452	568	607	836	890	512
Minor Street (Highest Approach)	112	33	48	68	59	75	125	124	89	127	173	281	214	98
satisfied?							☑	☑		☑	☑	☑	☑	

satisfied?

☒

☒

☒

☒

☒

☒

Warrant Criteria 80% Satisfied for Condition A ? **NO**

Number of Hours Satisfied: **6**

#### Condition B

	Minimum Volume Requirements  <i>(based on input criteria)</i>	Hourly Volumes												
		6-7 am	7-8 am	8-9 am	9-10am	10-11am	11-12pm	12-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm
Major Street (Both Approaches)	420	414	886	701	472	387	429	491	452	568	607	836	890	512
Minor Street (Highest Approach)	56	33	48	68	59	75	125	124	89	127	173	281	214	98

satisfied?

☒

☒

☒

☒

☒

☒

☒

☒

☒

☒

Warrant Criteria 80% Satisfied for Condition B ? **YES**

Number of Hours Satisfied: **10**

Warrant Criteria 80% Satisfied for Conditions A and B ? **NO**

Number of Hours Satisfied: **6**

## WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

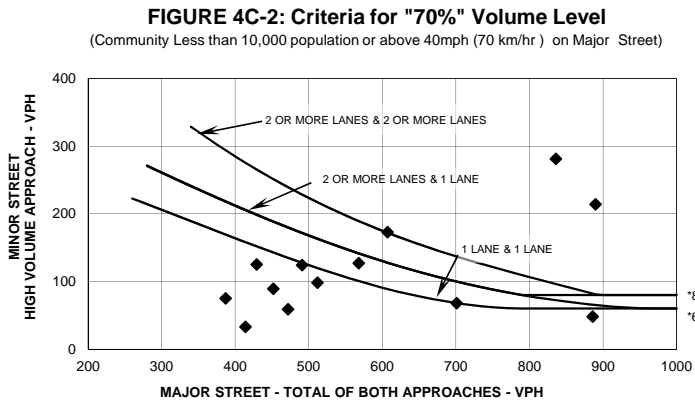
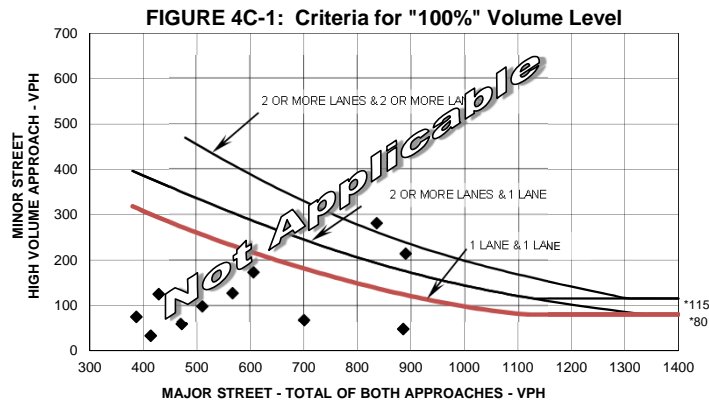
If all four points lie above the appropriate line, then the warrant is satisfied.

Applicable: ☒ Yes ☐ No  
Satisfied: ☐ Yes ☒ No

Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	414	33
7-8 am	886	48
8-9 am	701	68
9-10am	472	59
10-11am	387	75
11-12pm	429	125
12-1pm	491	124
1-2pm	452	89
2-3pm	568	127
3-4pm	607	173
4-5pm	836	281
5-6pm	890	214
6-7pm	512	98

Plot four volume combinations on the applicable figure below.



Source: USMUTCD, 2009

### WARRANT 3 - PEAK HOUR VEHICULAR VOLUME

The Peak Hour Volume signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

#### CONDITION A

##### Criteria

##### 1. Total Stopped Time Delay on Minor Approach

Average Delay per vehicle (sec):	AM	23.3	PM	96.1
Peak Hour Volume:		70		284
Total 1-hour stopped delay (veh-hrs):		0.5		7.6
Volume Criteria		5		5
Criteria: 4 veh-hrs for 1-lane approach; or 5 veh-hrs for 2-lane approach				

##### 2. Minor-Street Approach Volume

Minor Street Volume:	284
Number of Approach Lanes:	2
Volume Criteria:	150

Criteria: 100 vph for 1 lane; 150 vph for 2 lanes

##### 3. Intersection Peak-Hour Volume

Total Entering Volume:	1,174
Number of Approaches:	3
Volume Criteria:	650

Criteria: 650 vph for 3 approaches; or  
800 vph for 4 or more approaches

Criteria 1 Satisfied?	<input checked="" type="checkbox"/> Yes	No
Criteria 2 Satisfied?	<input checked="" type="checkbox"/> Yes	No
Criteria 3 Satisfied?	<input checked="" type="checkbox"/> Yes	No

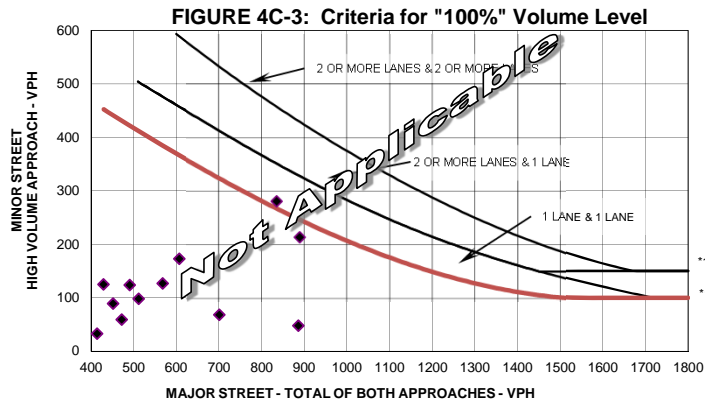
Note: All 3 criteria need to be satisfied for Condition A to be met

#### CONDITION B

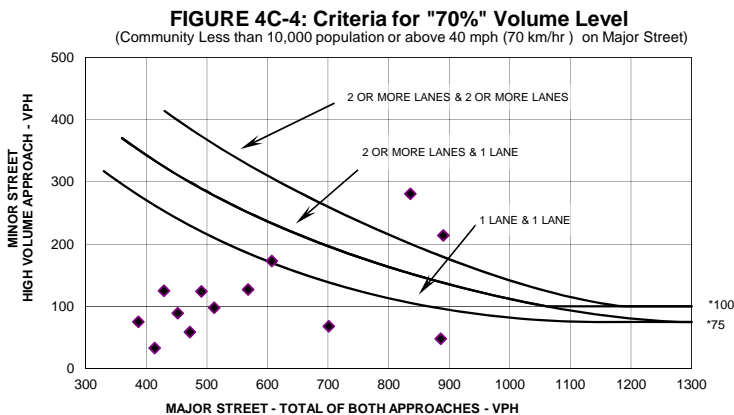
Speed on mainline is above 40 mph or community less than 10,000 - use criteria for 70% volume level

Volumes		
Hour	Major Street	Minor Street
6-7 am	414	33
7-8 am	886	48
8-9 am	701	68
9-10am	472	59
10-11am	387	75
11-12pm	429	125
12-1pm	491	124
1-2pm	452	89
2-3pm	568	127
3-4pm	607	173
4-5pm	836	281
5-6pm	890	214
6-7pm	512	98

Plot volume combination on the applicable figure below.



\* Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume threshold for a minor street approach with one lane.



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

Source: USMUTCD, 2009