





December 1, 2015

Joel T. Faxon, Esq., Chairman  
Police Commission  
Newtown Police Department  
3 Main Street  
Newtown, Connecticut 06470

Dear Mr. Faxon:

As requested, we have completed this Traffic Study for the intersection of Main Street at Church Hill Road and West Street to determine if intersection improvements can mitigate existing traffic congestion and safety concerns due to the placement of the Flag Pole in the center of the intersection. It is understood that with any modifications to this intersection the Flag Pole will remain. This has been taken into account in the Study and each of the alternatives developed to address the traffic and safety concerns at this intersection.

The results of the analyses for and recommendations take into account existing and future traffic conditions, other development, pedestrian activity and the significant number of accidents identified at this intersection into account to develop recommendations for this intersection. The findings of this analysis indicate that to protect motorists from the Flag Pole and to address traffic congestion and overall safety a raised center median is recommended on the southbound approach on Main Street and the shifting of the Church Hill Road approach to the south so that the alignment for left turn movements from Church Hill Road to southbound Main Street will no longer need to turn around the pole in a clockwise format. Further, the closure of the northerly leg of West Street (West Street #1) will further mitigate turning movement conflicts and overall safety concerns.

The results of the analysis indicate that with these geometric modifications, with or without traffic signal control, this intersection will operate at an improved level of safety and minimize congestion. The intersection meets the criteria followed by the Connecticut Department of Transportation (ConnDOT) for installation of a traffic signal. Further, if it was determined

Mr. Joel T. Faxon, Esq., Chairman

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that the signal installation is not appropriate for a variety of reasons, these recommended geometric modifications are still appropriate.

The geometric modifications will impact on-street parking generally located along the westerly side of Main Street in the immediate vicinity of the Church Hill Road intersection. This Concept Plan incorporates recommendations to modify this parking, which is to essentially eliminate certain perpendicular parking located at the intersection.

Sincerely,

**DRAFT**

Michael A. Galante  
Executive Vice President

Enclosure

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## SUMMARY

This Intersection Improvement Study was prepared to provide the Town of Newtown with a recommended Concept Plan to improve the overall safety and operational characteristics of the existing STOP controlled intersections of Main Street at Church Hill Road/West Street #2 (one-way westbound) and Main Street at West Street #1(one-way eastbound) (collectively and commonly referred to as the Flag Pole intersection). There has been a concern regarding the overall safety and operations of this intersection; therefore, this Study has been completed to assist the Town to develop a recommendation to modify the intersection layout, traffic control devices, lane arrangements and pedestrian facilities to enhanced safety. In the past, the Town has had discussions with the Connecticut Department of Transportation (ConnDOT) and it is clearly understood that an intersection improvements will maintain the existing Flag Pole in the center of this intersection.

The Study addresses traffic conditions for the 2015 and 2018 future traffic volumes during the weekday morning, weekday midday, weekday afternoon and Saturday midday peak hours of the adjacent street system. Manual turning movement counts were collected specifically for this Study at the intersections of Main Street at Church Hill Road/West Street #2 and Main Street at West Street #1 during the weekday from 7:00 A.M. to 9:00 P.M. and during the Saturday and Sunday midday peak periods. The most recent ConnDOT ATR data was obtained to adjust and balance the manual turning movement count data. Historical ConnDOT ATR data is also provided for comparisons purposes only.

The 2018 future traffic volumes employed a one percent annual growth rate and included all other developments planned or approved in the vicinity of the Study Area intersections. The annual growth rate is consistent with the Town of Newtown and ConnDOT data.

Based on the future traffic volume data for Main Street, Church Hill Road and West Street #1 and #2, one recommended intersection improvement plan was conceptualized for both TWO-WAY STOP control and a fully-actuated traffic signal for the Town's consideration to improve the overall safety and operational characteristics of the Study Area intersection. The traffic signal warrant analysis indicates that a traffic signal is warranted at this location.

A network micro-simulation study was undertaken as a supplement to the industry standard capacity analysis, as per the Highway Capacity Manual (HCM) 2010, Chapter 6 "Alternative tools." The SimTraffic 9 simulation model was utilized to assess the traffic impacts associated with the recommended intersection improvement plan.

Results of the micro-simulation for the Study Area for the existing conditions with 2015 traffic volumes indicate that the existing roadway network does experience significant traffic congestion during all Study peak hours. The Study Area will continue to experience significant congestion in the future (2018) if improvements are not provided. Results of the micro-simulation for the Study Area intersections show that the network traffic operation will recover quickly from congestion given the proposed geometric improvements and recommended traffic signal control (if a signal was installed). The SimTraffic 9 procedures predicted realistic moderate traffic operation conditions that last throughout the Study Area peak periods of the adjacent street system and vehicle queues that do not overflow the available storage space during peak hours. The recommended intersection improvement plan will improve Study Area traffic operations along Study Area roadways and at their intersections for both 2015 and future 2018 traffic volumes.

## INTRODUCTION

This Intersection Improvement Study was prepared to provide the Town of Newtown with a detailed set of alternatives and recommended action to improve the overall safety and operational characteristics of the Study Area intersections. There is a concern regarding the overall safety and operations of the noted intersection. Any improvement plan considered for the Flag Pole intersection must maintain the existing Flag Pole in the center of this intersection.

### **Project Description**

As it exists, the intersection of Main Street, Church Hill Road and West Street #1 and #2 presents an on-going safety concern for the Town of Newtown. The 100-foot high Flag Pole currently stands in the center of the subject intersection unprotected from motorists passing by on the busy State roadways. The accident history for this location reveals an unusually high rate incidence for traffic volumes on the adjacent roadways.

The purpose of preparing the subsequent Intersection Improvement Plans for the intersection is to offer alternatives for consideration to improve the overall safety and operational characteristics while preserving the historical character of the subject intersection and surrounding area.

## EXISTING CONDITIONS

This section of the report provides a description of the existing roadway network serving the subject intersection. Traffic data included in this section was obtained through recent turning movement counts conducted specifically for this Study as well as historical traffic volume data obtained from ConnDOT for machine count locations located within the Study Area. Field observations are also included in this section of the report in addition to accident data, provided by the Newtown Police Department, for the intersection.

### Roadways

The following is a description of roadways serving the “Flag Pole” intersection which are part of the subsequent analyses:

1. *Main Street (U.S. Route 6/State Route 25)* – This is a two-lane, State-maintained roadway which begins to the east of Johnnie Cake Lane (West Junction), and continues southeast to the signalized intersection of Sugar Street (State Route 302) and Glover Avenue. Land use along Main Street is a mix of commercial and residential and includes many driveways to individual single-family homes.

The TWO-WAY STOP controlled intersections of Church Hill Road/West Street #2 and West Street #1 are slightly off-set and located within the Downtown/Historical section of Main Street. The existing northbound approach lane is approximately 14 feet in width; and, the existing southbound approach lane is approximately 11 feet in width. The roadway provides a double yellow centerline and white striped shoulder lines for its entire length in the Study Area. The northbound approach shoulder is approximately 5 feet in width and the southbound approach shoulder is approximately 11 feet in width. Asphalt curbs and sidewalks are located along both sides of the roadway in the immediate vicinity of the Church Hill Road and West Street intersections. The posted speed limit on Main Street is 30 miles per hour, with

the nearest posted sign (southbound) located just to the south of West Street #1. Parking is generally not permitted along westerly side of Main Street adjacent to the intersections of Church Hill Road/West Street #2 and West Street #1; with the exception of, on-street perpendicular parking provided along the 33 Main Street property frontage and the Newtown Meeting House frontage. There are no posted parking regulations on easterly side of Main Street in the immediate vicinity of the Church Hill Road/West Street #2 and West Street #1 intersections. Parking is generally permitted subject to restrictions on both sides of Main Street north of the Newtown Savings Bank and south of the Cyrenius H. Booth Library. Crosswalks are provided on Main Street immediately north and south of Church Hill Road.

2. *Church Hill Road* – This is generally a two-lane, east-west, State maintained roadway, which is also designated as U.S. Route 6. The segment designated as U.S. Route 6 begins at the TWO-WAY STOP controlled intersection with Main Street and continues east to Interstate 84 (I-84) Interchange 10. Land use along Church Hill Road is a mix of commercial and residential and includes many driveways to individual single-family homes.

The existing single westbound approach lane to Main Street is approximately 16 feet in width; and, the existing pavement width at this location is approximately 39.5 feet. In the vicinity of Main Street, the roadway provides a double yellow centerline and white striped shoulder lines. The westbound approach shoulder to Main Street is approximately 3 feet in width and the eastbound receiving lane's shoulder at this location is approximately 3 feet in width as well. The roadway provides a concrete curb and sidewalk along the northerly side; however, it only provides an asphalt curb on the southerly side. Further east sidewalks are provided along both sides of the roadway. The posted speed limit on Church Hill Road is 35 miles per hour, with the nearest posted sign (eastbound) located just to the east of Main Street. Parking is generally not permitted along Church Hill Road.

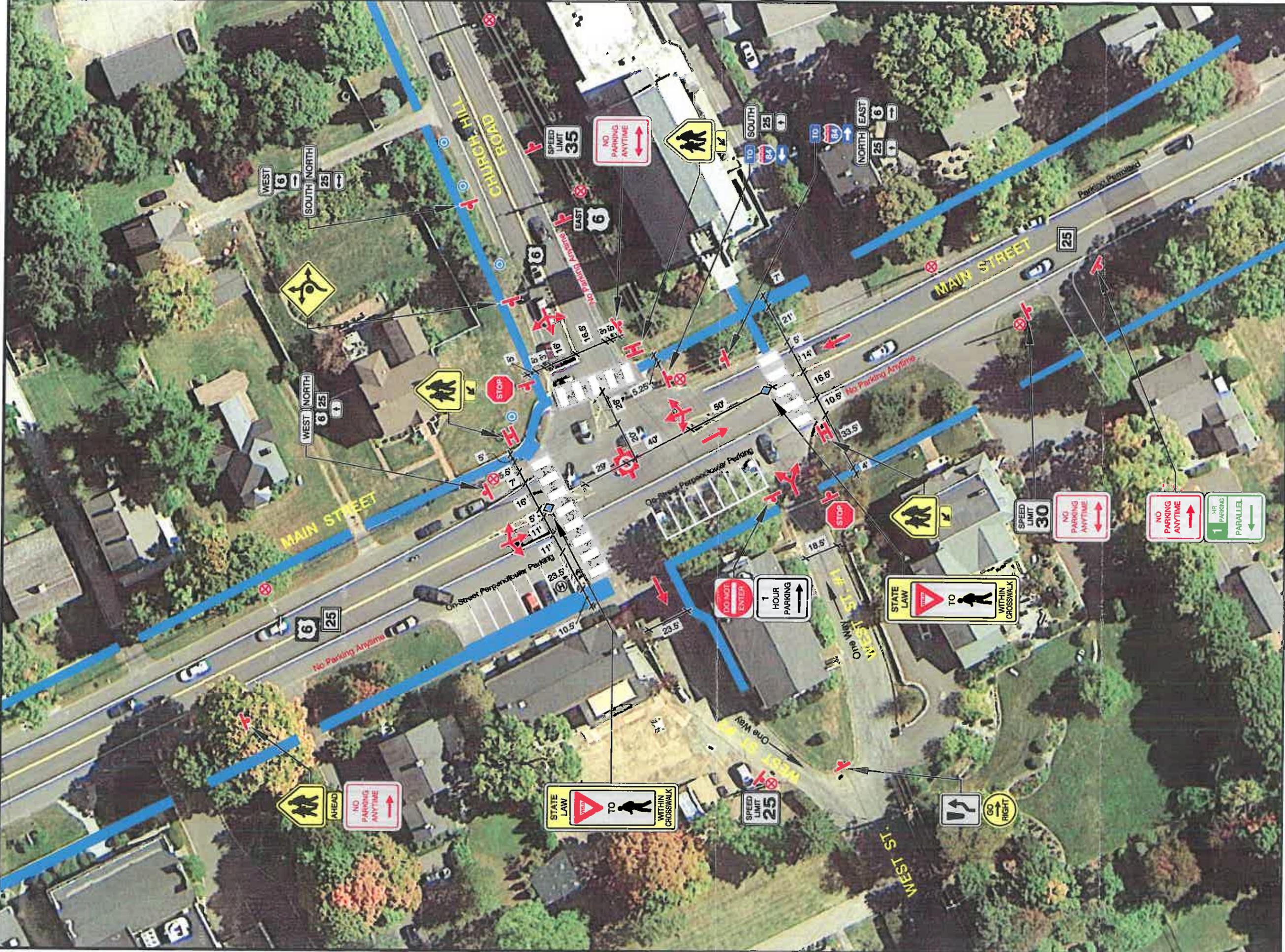
3. *West Street (including #1 and #2)* – This is generally a two-lane, Town-maintained roadway which begins to the northeast at the rear of the Historical Newtown Meeting House and continues southwest to connect with Sugar Street. Land use along West Street is primarily single-family residential, although there are Town buildings and a Church located on the roadway.

West Street branches into two, one-way, road segments at the intersection of Main Street and Church Hill Road. West Street #2, originates at Main Street, directly opposite Church Hill Road and is designated one-way westbound. West Street #1, which also originates at Main Street, is offset to the south of Church Hill Road and is designated as one-way eastbound. The Main Street approach is STOP controlled. West Street #1 and #2 are separated by the Newtown Meeting House. West Street #1 and #2 intersect immediately west of the Newtown Meeting House property where they merge and become simply West Street.

The West Street #1 approach lane to Main Street is approximately 18.5 feet in width; and, the West Street #2 receiving lane from the Main Street/Church Hill Road intersection is approximately 23.5 feet in width. Neither, West Street #1 or #2 provide pavement markings of any kind. Both roadways are bordered by asphalt curves on both sides. The posted speed limit is designated as 25 miles per hour on the West Street #2 approach to West Street. There are one-way signs located along both roadways. At the location West Street diverges there is signage indicating the roadway is divided and that driver's should "Go Right."

Figure 1 provides a graphic illustration of the area roadways described above. Figure 2 provides a graphic illustration of current street system characteristics. It includes a detailed inventory of the posted signage adjacent to the Study Area. Photographs of the current street system are provided in Appendix of this report.





**CURRENT STREET SYSTEM CHARACTERISTICS**

**INTERSECTION**  
**IMPROVEMENT STUDY**  
 Main Street / Church Hill Road /  
 West Street Intersection - Newtown, CT

FREDERICK P. CLARK ASSOCIATES, INC.  
 PLANNING, TRANSPORTATION, ENVIRONMENT AND DEVELOPMENT  
 RYE, NEW YORK      FAIRFIELD, CONNECTICUT

Scale in Feet  
 0 30 50

2  
 10/27/15

**LEGEND**

- Traffic Lane
- Yield to Pedestrians Buoy
- Traffic Sign
- Street Lighting Pole
- Sidewalk
- Utility Pole
- Pedestrian Crosswalk
- Handicapped Van Accessible
- Flagpole

## Traffic Volumes

To develop baseline traffic volumes for the Study intersections of Main Street at Church Hill Road/West Street #2 and Main Street at West Street #1, manual traffic turning movement counts were conducted on the following dates and times:

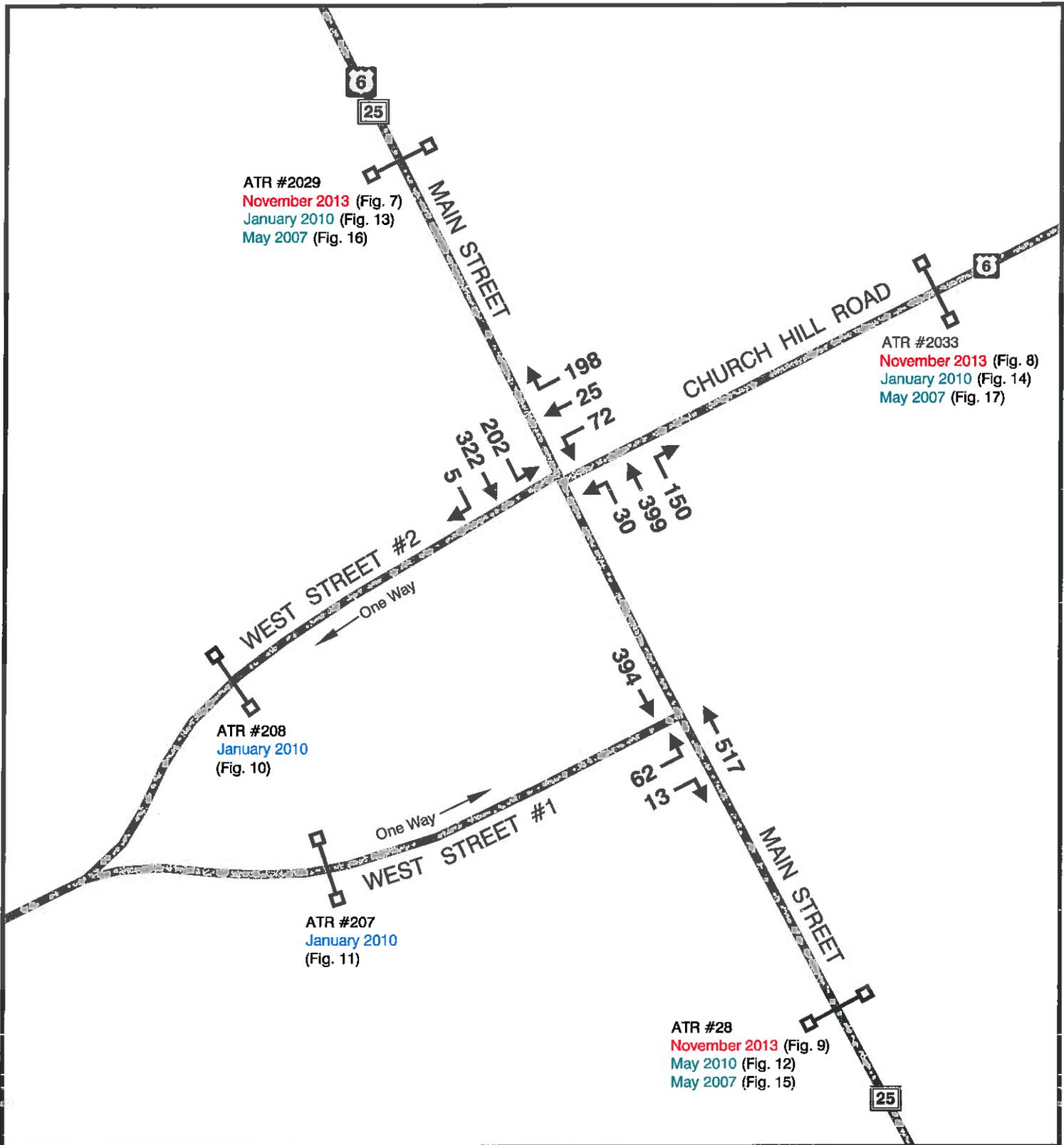
- Thursday, September 17<sup>th</sup> from 7:00 A.M. to 9:00 P.M.;
- Saturday, September 19<sup>th</sup> from 10:00 A.M. to 2:00 P.M.; and,
- Sunday, September 20<sup>th</sup> from 9:00 A.M. to 12:00 Noon.

The traffic counts were conducted when Schools were in session and during ideal weather conditions. The traffic counting program included vehicle classification by passenger vehicle, School buses, and trucks. Pedestrian activity across all roadway approaches was also collected. Based on the results of the traffic counting program, the following peak hours were identified on Main Street:

- Weekday morning – 8:00 to 9:00 A.M.;
- Weekday midday – 12:15 to 1:15 P.M.;
- Weekday afternoon – 5:00 to 6:00 P.M.;
- Saturday midday – 11:30 A.M. to 12:30 P.M.; and,
- Sunday midday – 11:00 A.M. to 12:00 P.M.

Figures 3, 4 and 5 graphically illustrate the 2015 existing traffic volumes for the weekday morning, weekday midday and weekday afternoon peak hours, respectively. Figure 6 graphically illustrates the 2015 existing traffic volumes for the Saturday midday peak hour. The 2015 existing traffic volumes for the Sunday midday peak hour were not graphically illustrated or included as a part of the analysis since the Saturday midday peak hour traffic volumes were found to be significantly higher. The raw and summarized turning movement count data collected for the Study peak hours can be found in Appendix of this report.





**LEGEND**

□—□ ConnDOT ATR Count Locations

**NOTES:**

1. Manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Thursday, September 17, 2015 from 7:00 A.M. to 9:00 P.M.
2. The 2015 existing traffic volumes were adjusted and balanced to the most recent Connecticut Department of Transportation (ConnDOT) Automatic Traffic Recorder (ATR) data collected within the study area.

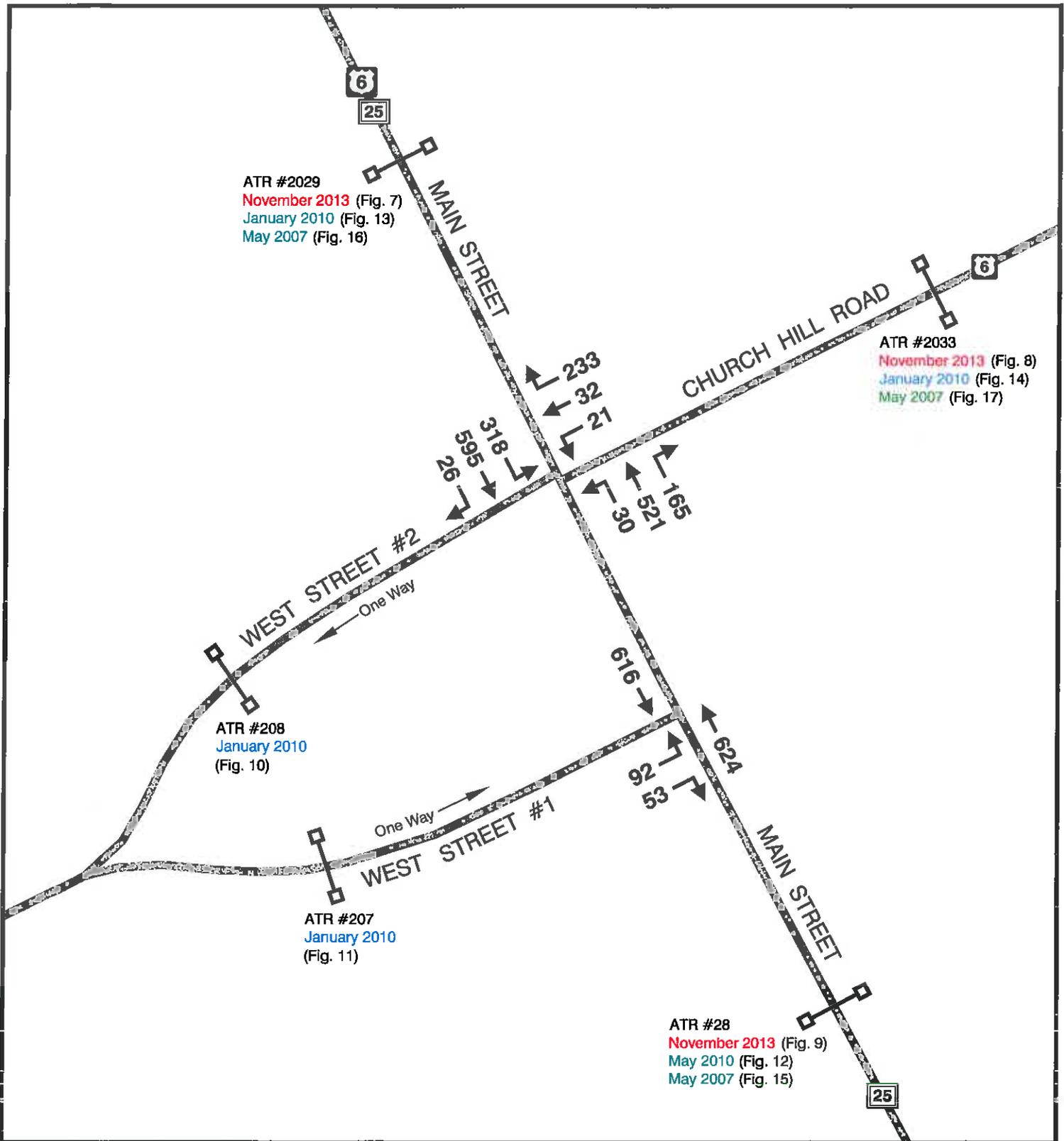
**2015 TRAFFIC VOLUMES  
EXISTING ROADWAY NETWORK  
WEEKDAY MIDDAY PEAK HOUR  
(12:15 to 1:15 P.M.)**

**INTERSECTION  
IMPROVEMENT STUDY  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT**

**FREDERICK P. CLARK ASSOCIATES, INC.**  
PLANNING, TRANSPORTATION, ENVIRONMENT AND DEVELOPMENT  
RYE, NEW YORK      FAIRFIELD, CONNECTICUT



Not to Scale



**LEGEND**

□—□ ConnDOT ATR Count Locations

**NOTES:**

- Manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Thursday, September 17, 2015 from 7:00 A.M. to 9:00 P.M.
- The 2015 existing traffic volumes were adjusted and balanced to the most recent Connecticut Department of Transportation (ConnDOT) Automatic Traffic Recorder (ATR) data collected within the study area.

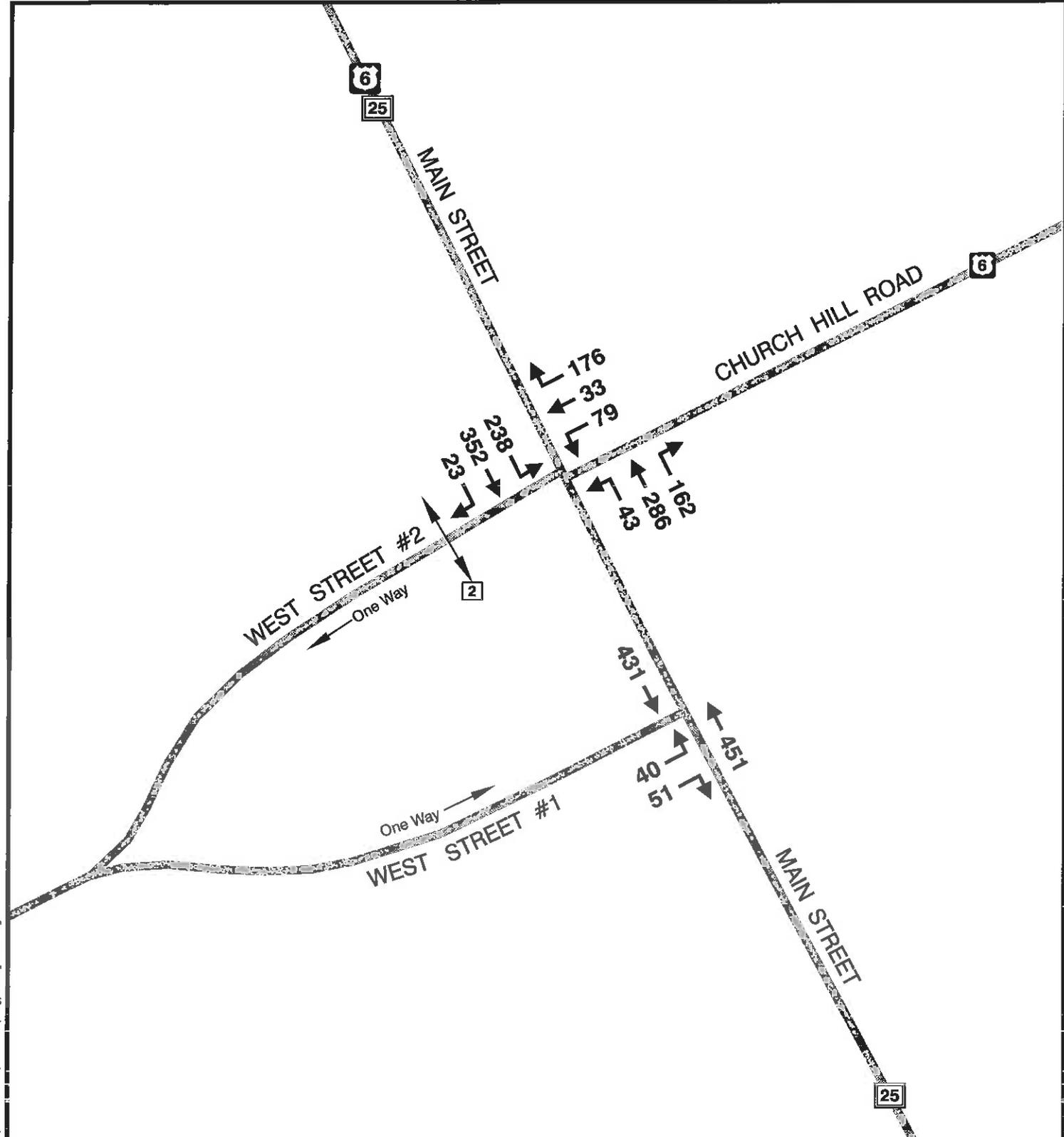
**2015 TRAFFIC VOLUMES  
EXISTING ROADWAY NETWORK  
WEEKDAY AFTERNOON PEAK HOUR  
(5:00 to 6:00 P.M.)**

**INTERSECTION  
IMPROVEMENT STUDY  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT**



**FREDERICK P. CLARK ASSOCIATES, INC.**  
PLANNING, TRANSPORTATION, ENVIRONMENT AND DEVELOPMENT  
RYE, NEW YORK      FAIRFIELD, CONNECTICUT

File: G:\752.006 Modifications to Main Street (Flag Pole), Newtown\Autocad\Fig\Map\Figures.dwg



**LEGEND**

← [2] Pedestrians (by approach)

**NOTES:**

1. Manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Saturday September 19, 2015 from 10:00 A.M. to 2:00 P.M.
2. The Saturday midday peak hour was utilized since the volumes are significantly higher than the Sunday peak hour.

**2015 TRAFFIC VOLUMES  
EXISTING ROADWAY NETWORK  
SATURDAY MIDDAY PEAK HOUR  
(11:30 A.M. to 12:30 P.M.)**

**INTERSECTION  
IMPROVEMENT STUDY  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT**



FREDERICK P. CLARK ASSOCIATES, INC.  
PLANNING, TRANSPORTATION, ENVIRONMENT AND DEVELOPMENT  
RYE, NEW YORK FAIRFIELD, CONNECTICUT

6

Not to Scale

11/16/15

As part of the inventory steps of data collection, Automatic Traffic Recorder (ATR) data was obtained from ConnDOT for all machine count locations within the vicinity of the Main Street intersection with Church Hill Road/West Street #2 and West Street #1. A summary of available Traffic data and figures graphically illustrating the State traffic counting program are provided in Appendix of this report.

Table 1 provides a comparison of the two-way traffic volumes obtained from ConnDOT machine counts for the latest three count periods available. The data indicates that the two-way traffic volumes on Main Street, northwest of Church Hill Road/West Street #2 decreased between 2007 and 2013 during the weekday morning peak hour and increased slightly during the weekday afternoon peak hour. Overall the total daily traffic volumes on Main Street have decreased slightly between 2007 and 2013. It was found that two-way traffic volumes on Main Street, southeast of Church Hill Road, decreased between 2007 and 2013 during both the weekday morning and weekday afternoon peak hours and over the course of the day as well. The data indicates that the two-way traffic volumes on Church Hill Road, east of Main Street decreased between 2007 and 2013 during the weekday morning peak hour; however, increased during the weekday afternoon peak hour. Overall the total daily traffic volumes decreased on Church Hill Road between 2007 and 2013. State machine count data for West Street #1 and #2 was found to only be available for 2010; therefore, no comparisons could be made. The raw and summarized ConnDOT ATR data for 2007, 2010 and 2013 can also be found in the Appendix of this report.

Based on the results of the traffic counting programs conducted by Frederick P. Clark Associates and ConnDOT, Main Street, north of Church Hill Road/West Street #2, had a recorded two-way volume of 1,553, 1,126, 1,693 and 1,075 vehicles during the weekday morning, weekday midday, weekday afternoon and Saturday midday peak hours, respectively. South of the Church Hill Road/West Street #2 intersection, Main Street had a recorded two-way volume of 1,553, 973, 1,332 and 922 vehicles during the four peak hours, respectively. Church Hill Road, east of the Main Street intersection had a recorded two-way

Table 1  
**CONNDOT TRAFFIC VOLUME COMPARISON – PEAK HOURS**  
 Intersection Improvement Study  
 Main Street/Church Hill Road/West Street Intersection  
 Newtown, Connecticut

| LOCATION   | VEHICLES                     |       |       |       |       |                                |        |        |        |      |                    |      |
|--|------------------------------|-------|-------|-------|-------|--------------------------------|--------|--------|--------|------|--------------------|------|
|  | Weekday Morning <sup>1</sup> |       |       |       |       | Weekday Afternoon <sup>2</sup> |        |        |        |      | Daily <sup>3</sup> |      |
|  | 2013                         | 2010  | 2007  | 2013  | 2010  | 2007                           | 2013   | 2010   | 2007   | 2013 | 2010               | 2007 |
| Main Street (U.S. Route 6/State Route 25),<br>Northwest of Church Hill Road (U.S. Route 6)/ West Street #2 | 1,457                        | 1,239 | 1,808 | 1,865 | 1,400 | 1,786                          | 20,324 | 16,178 | 20,580 |      |                    |      |
| Main Street (State Route 25),<br>Southeast of Church Hill Road   | 1,232                        | 688   | 1,351 | 1,250 | 711   | 1,343                          | 15,530 | 8,231  | 15,740 |      |                    |      |
| Church Hill Road,<br>East of Main Street (State Route 25)  | 1,119                        | 589   | 1,126 | 1,169 | 775   | 948                            | 11,149 | 8,768  | 11,964 |      |                    |      |
| West Street #2 (1W WB), West of Main Street  | N/A                          | 91    | N/A   | N/A   | 95    | N/A                            | N/A    | 1,191  | N/A    |      |                    |      |
| West Street #1 (1W EB), West of Main Street  | N/A                          | 118   | N/A   | N/A   | 116   | N/A                            | N/A    | 1,201  | N/A    |      |                    |      |

Source: Automatic Traffic Recorder (ATR) data collected by the Connecticut Department of Transportation (ConnDOT) for Study Area roadways in May 2007, January and May 2010 and November 2013.

Notes:

1. Weekday morning peak hour traffic volumes represent the highest one-hour traffic volumes recorded between 12:00 A.M. and 12:00 Noon.
2. Weekday afternoon peak hour traffic volumes represent the highest one-hour, two-way traffic volumes recorded between 12:00 Noon and 12:00 A.M.
3. Daily traffic volumes represent a one-day period. Dates vary.
4. N/A – Indicates ATR counts were not conducted during the respective year.

Table 2  
**TWO-WAY TRAFFIC VOLUMES – PEAK HOURS**  
 Intersection Improvement Study  
 Main Street/Church Hill Road/West Street Intersection  
 Newtown, Connecticut

| LOCATION   | VEHICLES        |                |                   |                 |                 |
|--|-----------------|----------------|-------------------|-----------------|-----------------|
|  | Weekday Morning | Weekday Midday | Weekday Afternoon | Saturday Midday | Saturday Midday |
| Main Street,<br>North of Church Hill Road/West Street #2 | 1,553           | 1,126          | 1,693             | 1,075           | 1,075           |
| Main Street,<br>South of Church Hill Road/West Street #2 | 1,320           | 973            | 1,332             | 922             | 922             |
| Church Hill Road,<br>East of Main Street                 | 761             | 647            | 769               | 688             | 688             |
| West Street #2 (1W WB),<br>West of Main Street           | 76              | 60             | 88                | 99              | 99              |
| Main Street,<br>South of West Street #1                  | 1,307           | 924            | 1,293             | 933             | 933             |
| West Street #1 (1W EB),<br>West of Main Street           | 97              | 75             | 145               | 91              | 91              |

Source: Manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Thursday, September 17, 2015 from 7:00 A.M. to 9:00 P.M. and Saturday, September 19, 2015 from 10:00 A.M. to 2:00 P.M.

Notes: The 2015 existing traffic volumes were adjusted and balanced to Connecticut Department of Transportation (ConnDOT) Automatic Traffic Recorder (ATR) data collected within the Study Area.

volume of 761, 647, 769 and 688 vehicles during the four peak hours, respectively. West of the Main Street intersection, West Street #2 (one-way westbound) had a recorded volume of 76, 60, 88 and 99 vehicles during the four peak hours, respectively.

The data indicates that Main Street, south of the West Street #1 intersection, had a recorded two-way volume of 1,307, 924, 1,293 and 933 vehicles during the weekday morning, weekday midday, weekday afternoon and Saturday midday peak hours, respectively. West Street #1 (one-way eastbound), west of the Main Street intersection, had a recorded volume of 97, 75, 145 and 91 vehicles during the four peak hours, respectively. Table 2 provides a summary of the two-way traffic volumes (unless otherwise specified) recorded for each of the roadway segments included in the designated Study Area.

### **Traffic Field Observations**

Traffic observations were conducted on Friday, September 11, 2015 between 10 A.M. and 1:00 P.M. The following was observed:

- *Flag Pole Fixed Object* – The Flag Pole is not shielded and; therefore, unprotected from motorists;
- *Heavy Vehicles* – Heavy vehicles traveling westbound on Church Hill Road were observed to ignore the posted signage directing drivers to travel counter-clockwise around the Flag Pole when making a left turn at the center of the intersection. The drivers of heavy vehicles were observed to cut across the intersection instead of traversing around the Flag Pole;
- *Improper Passing* – It was very typical to see, vehicles traveling southbound on Main Street bypass southbound vehicles turning left onto Church Hill Road, using the roadway shoulder. Vehicle traveling northbound on Main Street were also observed using the bypass northbound vehicles turning left onto West Street #2 using the roadway shoulder; and,

- *Unsafe Backing* – Backing out of the Newtown Meeting House perpendicular parking spaces becomes a significant hazard when southbound vehicles utilized the shoulder of Main Street to bypass vehicles turning left onto Church Hill Road.

### **Accident History**

The Flag Pole Traffic Study conducted by the Traffic Unit of the Newtown Department of Police Services was obtained to supplement the accident history analysis. The report indicates that accident data was collected from the Newtown Department of Police Services CAD system and case files from January 1, 2009 through December 31, 2014. Within this time period, there were a total of 94 reported motor vehicle accidents that occurred at the intersection of Main Street and Church Hill Road/West Street #2 (Flag Pole Intersection) and Main Street at West Street #1. The significant findings of the report have been provided below:

- 17 out of 94 accidents (18 percent) reported involved personal injury;
- 18 out of 94 accidents (19 percent) involved collisions with the Flag Pole (fixed object);
- 2 out of 94 accidents (2 percent) involved collisions with pedestrians;
- 25 out of 94 accidents (26 percent) were related to drivers failing to grant the right of way, specifically from a stop sign; and,
- 22 out of 94 accidents (23 percent) were related to drivers failing to drive a reasonable distance apart (following too closely).

Other common contributing factors to accidents provided within the report include:

- Failure to grant the right of way at an intersection;
- Passing on the right (improper passing maneuver);
- Restricted turns (violating traffic control); and,
- Improper turns (improper turning maneuvers).

The findings of the report indicate an unusually high pattern of incidences which warrant mitigation. The Flag Pole Traffic Study can be found in the Appendix of this report.

Accident data was also obtained from ConnDOT for Main Street at the intersections of Church Hill Road/West Street #2 and West Street #1 for a period beginning January 1, 2009 through December 31, 2014. Table 3 provides a detailed summary of the State accident experience which is further discussed below.

The results of the State data analysis indicate that at the two-way STOP controlled intersections of Main Street at Church Hill Road/West Street #2 and West Street #1 there were a total of five reported accidents during the six-year Study analysis period. The data indicates that three of the accidents were limited to property damage only while two resulted in injury. The following collision types were reported: an angled collision, collision with a pedestrian, a rear-end collision, a collision between turning vehicles intersecting paths, and a collision between vehicles turning in opposite directions. The contributing factor to two of the accidents was drivers performing an improper passing maneuver. Other contributing factors included failure to grant the right of way, drivers following one another too closely and the unsafe use of the highway by a pedestrian. The data indicates that 60 percent of the accidents occurred during the daylight and during dry roadway surface and weather conditions.

Table 3  
 ACCIDENT EXPERIENCE SUMMARY – STATE ROUTE 25 AT U.S. ROUTE 6/WEST STREET  
 Intersection Improvement Study  
 Main Street/Church Hill Road/West Street Intersection  
 Newtown, Connecticut

| ACCIDENT CHARACTERISTICS              | STATE ROUTE 25 (MAIN STREET)   |         |
|---------------------------------------|--|---------|
|                                       | At West Street #1 and<br>Route 6 (Church Hill Road)<br><b>(20.15 to 20.16)</b> |         |
|                                       | Total  | Percent |
| <b>Year</b>                           |  |         |
| ▪ 2009                                | 2  | 40      |
| ▪ 2010                                | 1  | 20      |
| ▪ 2011                                | 0  | 0       |
| ▪ 2012                                | 0  | 0       |
| ▪ 2013                                | 1  | 20      |
| ▪ 2014                                | 1  | 20      |
| ▪ Total                               | 5  | 100     |
| <b>Accident Severity</b>              |  |         |
| ▪ Property Damage                     | 3  | 60      |
| ▪ Injury                              | 2  | 40      |
| <b>Collision Type</b>                 |  |         |
| ▪ Angle                               | 1  | 20      |
| ▪ Pedestrian                          | 1  | 20      |
| ▪ Rear-end                            | 1  | 20      |
| ▪ Turning – Intersecting Paths        | 1  | 20      |
| ▪ Turning – Opposite Directions       | 1  | 20      |
| <b>Contributing Factor</b>            |  |         |
| ▪ Failed To Grant Right of Way        | 1  | 20      |
| ▪ Following Too Closely               | 1  | 20      |
| ▪ Improper Passing Maneuver           | 2  | 40      |
| ▪ Unsafe Use of Highway By Pedestrian | 1  | 20      |
| <b>Light Condition</b>                |  |         |
| ▪ Daylight                            | 3  | 60      |
| ▪ Dawn                                | 1  | 20      |
| ▪ Dusk                                | 1  | 20      |
| <b>Surface Condition</b>              |  |         |
| ▪ Dry                                 | 3  | 60      |
| ▪ Wet                                 | 2  | 40      |
| ▪ Snow/Slush                          | 5  | 100     |
| <b>Weather Conditions</b>             |  |         |
| ▪ No Adverse                          | 3  | 60      |
| ▪ Rain                                | 2  | 40      |

Source: Connecticut Department of Transportation

Notes:

1. Latest available three year accident analysis period is from January 1, 2012 to December 31, 2014.
2. Accident data was provided from January 1, 2009 to December 31, 2014 to be with data included in the Flag Pole Traffic Study conducted by the Newtown Department of Police Services Traffic Unit in 2015.
3. State Route 25 Mile Markers indicated in **bold**.

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 10/26/2015

## **FUTURE TRAFFIC IMPACTS**

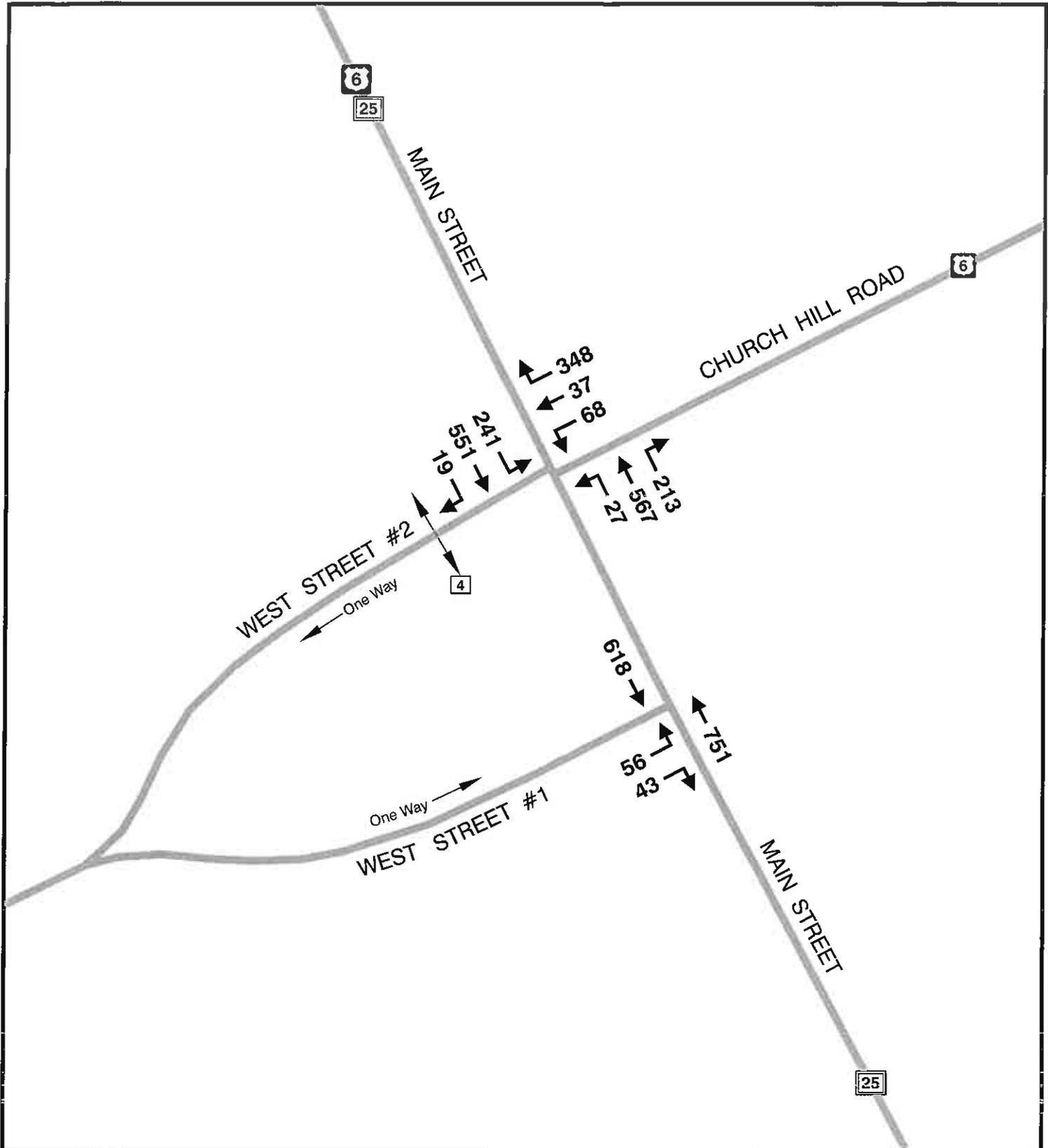
In this section of the report there is a description of the forecasted traffic volumes for a 2018 condition. It includes a description of the alternatives for consideration to improve the operational efficiency and safety of the subject intersections. Capacity analyses are provided for the do nothing alternative and the recommend intersection improvement plan which includes the measures of effectiveness for comparison purposes.

### **2018 Forecasted Traffic Volumes**

To bring the 2015 existing baseline traffic volumes to a 2018 future traffic condition it was first necessary to project all 2015 traffic volumes by employing an annual growth rate of one percent per year. This may be considered very conservative; however, it accounts for any general growth in traffic on Study Area roadways. The 2018 projected traffic volumes are provided in Appendix of this report.

The next step typically includes adding the traffic related to any planned or approved developments in the immediate vicinity of the Study Area, which may impact the Study intersections or roadways by adding vehicle trips. A list of the planned and approved developments included in this analysis is also provided in Appendix E of this report.

The 2018 future traffic volumes were determined by adding the traffic volumes related to the planned and approved developments to the 2018 projected traffic volumes. The 2018 future traffic volumes are graphically illustrated in Figures 7, 8 and 9 for the weekday morning, weekday midday and weekday afternoon peak hours, respectively. The 2018 future traffic volumes for the Saturday midday peak hour are graphically illustrated in Figure 10.



**LEGEND**

← → 4 Pedestrians (by approach)

**NOTE:**

The 2018 Background Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES**  
WEEKDAY MORNING PEAK HOUR

**INTERSECTION**  
**IMPROVEMENT STUDY**  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT



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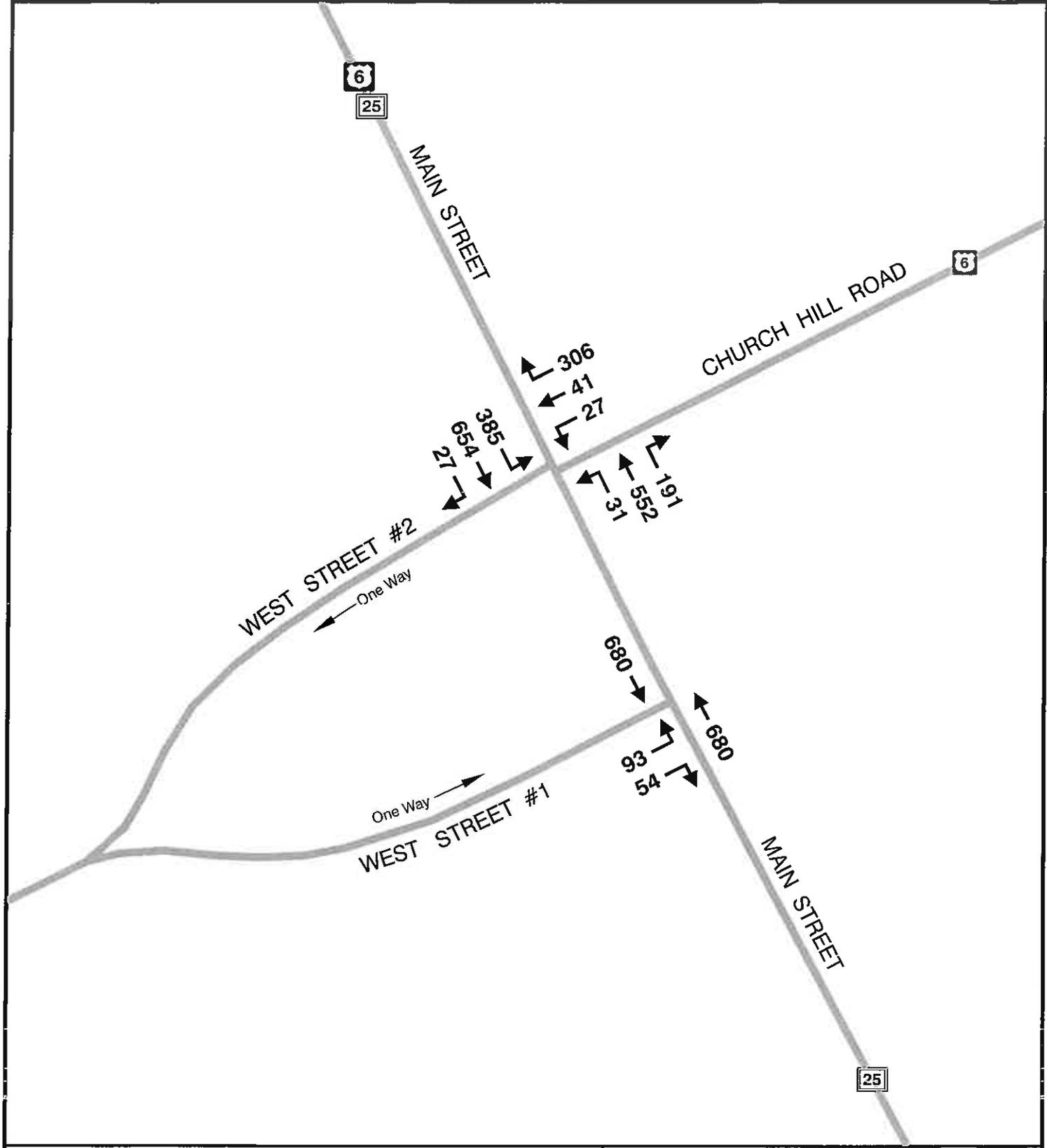
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**NOTE:**  
 The 2018 Background Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES  
 WEEKDAY AFTERNOON PEAK HOUR**

**INTERSECTION  
 IMPROVEMENT STUDY  
 Main Street / Church Hill Road /  
 West Street Intersection - Newtown, CT**

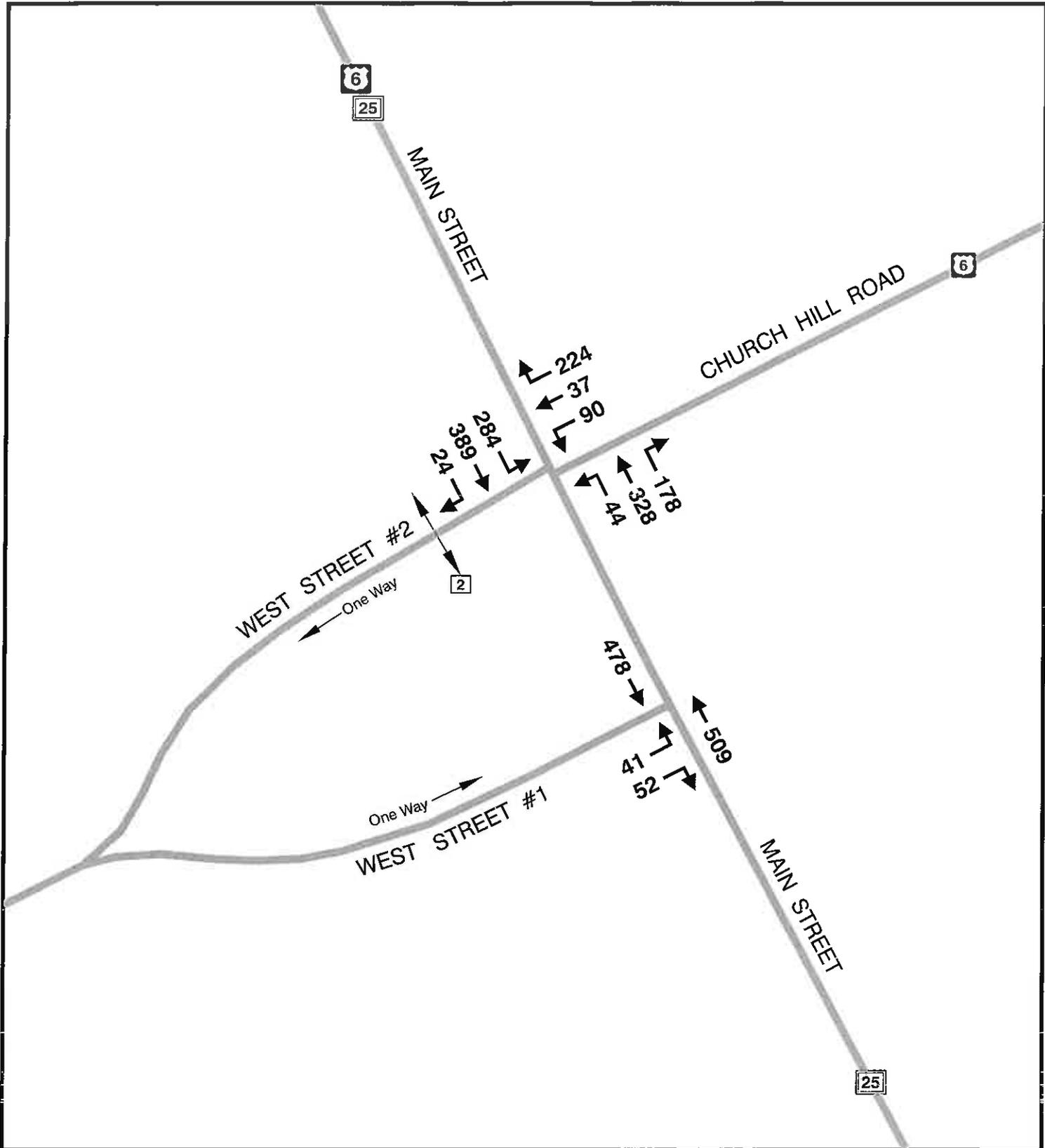


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**LEGEND**

← → 2 Pedestrians (by approach)

**NOTE:**

The 2018 Background Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES**  
**SATURDAY MIDDAY PEAK HOUR**

**INTERSECTION**  
**IMPROVEMENT STUDY**  
**Main Street / Church Hill Road /**  
**West Street Intersection - Newtown, CT**



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## **Alternatives Considered**

The following intersection improvement alternatives were explored in the process of identifying the recommended intersection improvement plan:

- *Do Nothing Alternative:* Maintain Two-Way STOP Control at Church Hill Road and West Street #1 ;
- *Alternative 1:* Modification of Church Hill Road Approach and Pedestrian Safety Enhancement;
- *Alternative 2:* Installation of Fully-Actuated Traffic Signal with Exclusive Pedestrian Phase and Modifications to the Westbound Church Hill Road Approach
- *Alternative 3:* Alternative 2 in Addition to Modifications to the Southbound Main Street Approach;
- *Alternative 4:* Installation of Fully-Actuated Traffic Signal with Exclusive Pedestrian Phase and Modifications to All Intersection Legs; and,
- *Alternative 5:* Installation of a Roundabout, Alterations of Traffic Flow on West Street #2, and Turning Movement Restrictions to West Street #1.

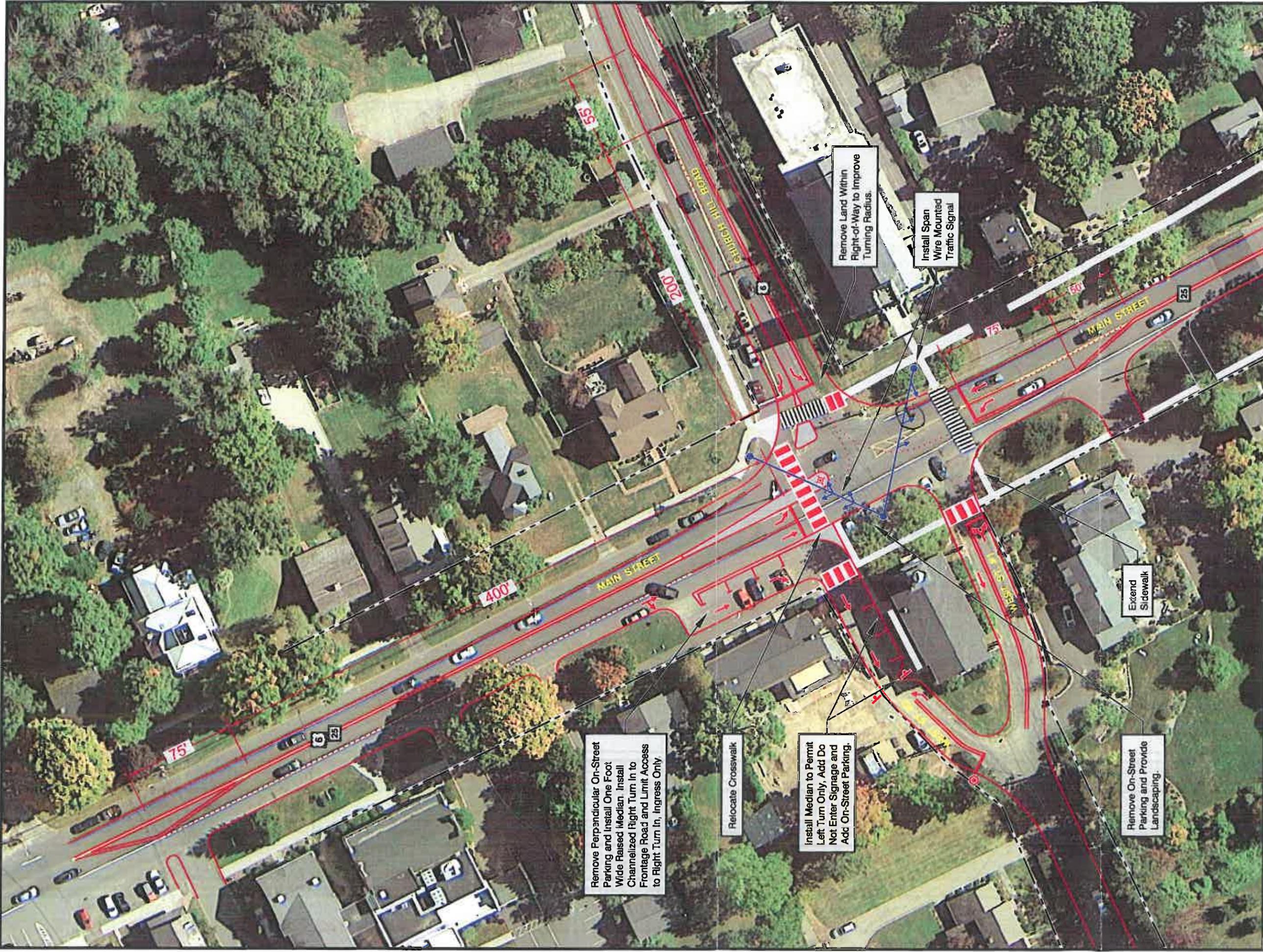
## **Recommended Intersection Improvement Plan**

*Installation of Fully-Actuated Traffic Signal with Exclusive Pedestrian Phase, Modifications to All Intersection Legs and Converting West Street #1 and #2 to Two-Way Traffic Flow* – The recommended alternative includes widening the westbound Church Hill Road approach to Main Street within the State right-of-way to accommodate separate left and right turn only lanes. The alternative also includes shifting the entire Church Hill Road approach south so that left-turning vehicles would no longer have to travel around the Flag Pole to continue traveling southbound on Main Street. The right-turn only lane would be channelized and the Stop Bar would remain in approximately the same location. Access to West Street #2 would be eliminated. A 100-foot raised central island would be installed to protect the Flag Pole and deflect vehicles on the southbound Main Street Approach. West Street #2 would be converted to an access road for local businesses. Only the westerly most

section would be converted to two-way flow. The existing on-street perpendicular parking on the westerly side of Main Street just north of West Street #2 would be relocated so that a one-way (south-westbound) frontage road could be constructed. The frontage road would be separated from the Main Street travel lanes by a two-foot (minimum) wide raised median. A four-foot median is preferred. The on-street perpendicular parking spaces which would be eliminated will be relocated as on-street parallel parking spaces along the easterly side of the frontage road. West Street #1 would be converted to a two-lane roadway within the Town right of way. The eastbound West Street #1 approach would permit full movements. Both the northbound and southbound Main Street approaches would be widened to accommodate separate through and left-turn only lanes. On the northbound Main Street approach a left-turn bay would replace the existing southbound lane and the southbound shoulder would be converted to a southbound travel lane. On the southbound Main Street approach a left-turn bay would replace the existing southbound travel lane and the southbound shoulder would be converted to a through lane. A fully-actuated traffic signal with vehicle detection on all approaches in addition to an exclusive pedestrian phase would be installed. The existing northbound Main Street and westbound Church Hill Road crosswalks would remain incorporated into the final design. The existing southbound Main Street crosswalk would shift slightly to the south to reflect the shift in Church Hill Road. Perpendicular on-street parking in front of the Newtown Meeting House would be eliminated. The area could be landscaped in the future to increase the aesthetic appeal of the final design. Figure 11A graphically illustrates the proposed intersection layout. Figure 11B graphically illustrates only the recommended geometric improvements to the Study Area, maintaining TWO-WAY STOP control.

### **Existing and Future Traffic Volumes with Recommended Geometric Improvements**

The 2015 traffic volumes with the recommended geometric improvements are graphically illustrated for the weekday morning, weekday midday, weekday afternoon and Saturday midday peak hours in Figures 12, 13, 14 and 15, respectively. Similarly, the 2018



Remove Perpendicular On-Street Parking and Install One Foot Wide Raised Median. Install Channelized Right Turn In to Frontage Road and Limit Access to Right Turn In, Ingress Only

Relocate Crosswalk

Install Median to Permit Left Turn Only, Add Do Not Enter Signage and Add On-Street Parking.

Remove On-Street Parking and Provide Landscaping.

Remove Land Within Right-of-Way to Improve Turning Radius.

Install Span Wire Mounted Traffic Signal

Extend Sidewalk

LEGEND

- Traffic Lane
- Proposed Pedestrian Crosswalks
- Flagpole
- Roadway Right of Way
- Proposed Span Wire Mounted Traffic Signal
- Proposed Raised Median
- Proposed Stop Sign

**RECOMMENDED ALTERNATIVE**  
 FULLY ACTUATED TRAFFIC SIGNAL WITH EXCLUSIVE PEDESTRIAN PHASE, MODIFICATIONS TO ALL INTERSECTION LEGS & CONVERTING WEST ST. #1 & #2 TO TWO-WAY FLOW

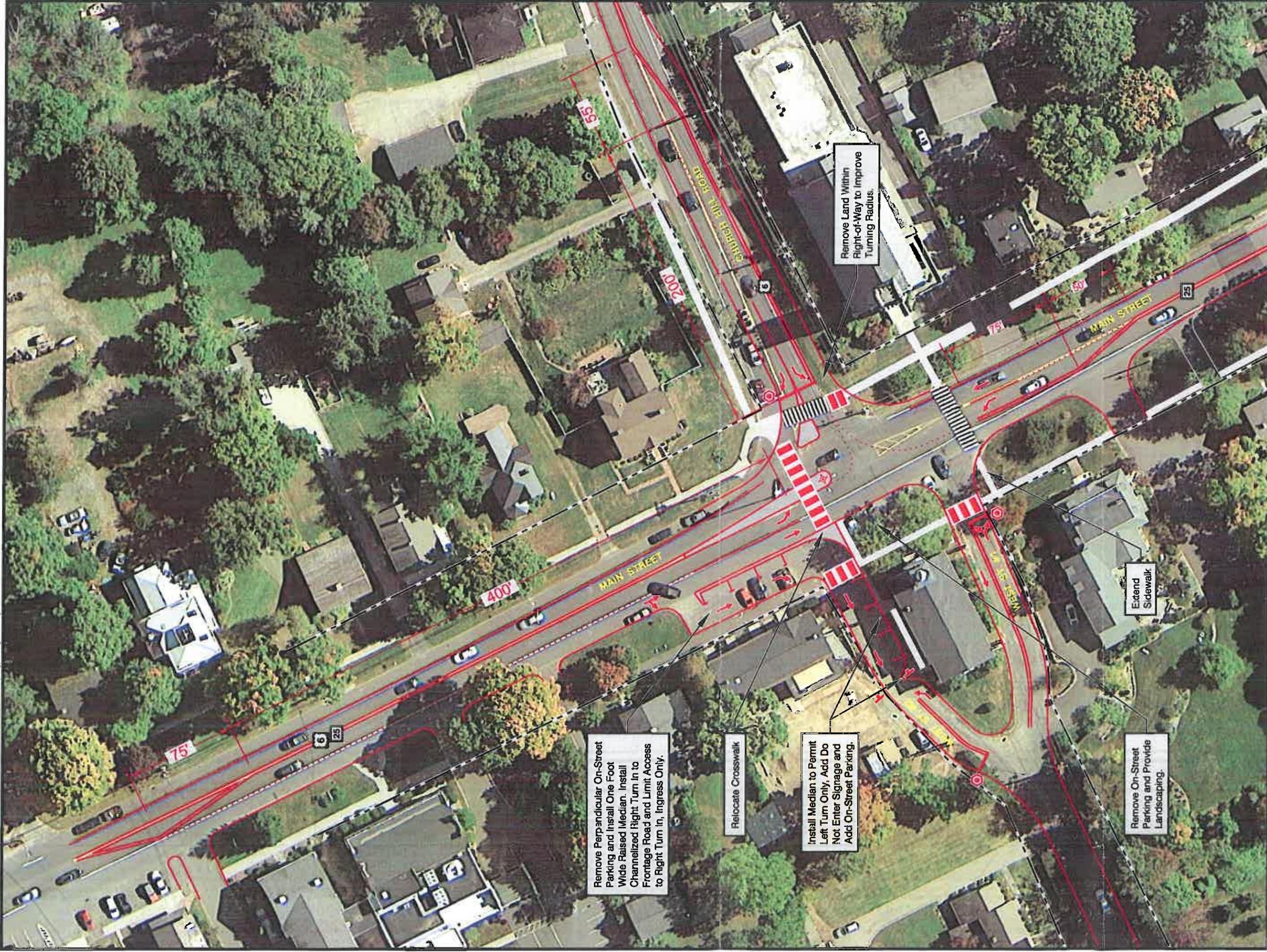
**INTERSECTION**  
**IMPROVEMENT STUDY**  
 Main Street / Church Hill Road /  
 West Street Intersection - Newtown, CT

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11A  
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**LEGEND**

-  Traffic Lane
-  Proposed Pedestrian Crosswalks
-  Flagpole
-  Roadway Right of Way
-  Proposed Raised Median
-  Proposed Stop Sign

**RECOMMENDED ALTERNATIVE**  
 TWO WAY STOP CONTROLLED  
 MODIFICATIONS TO ALL INTERSECTION LEGS AND  
 CONVERTING WEST STREET #1 & #2 TO TWO-WAY FLOW

**INTERSECTION**  
**IMPROVEMENT STUDY**  
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 0 30 60

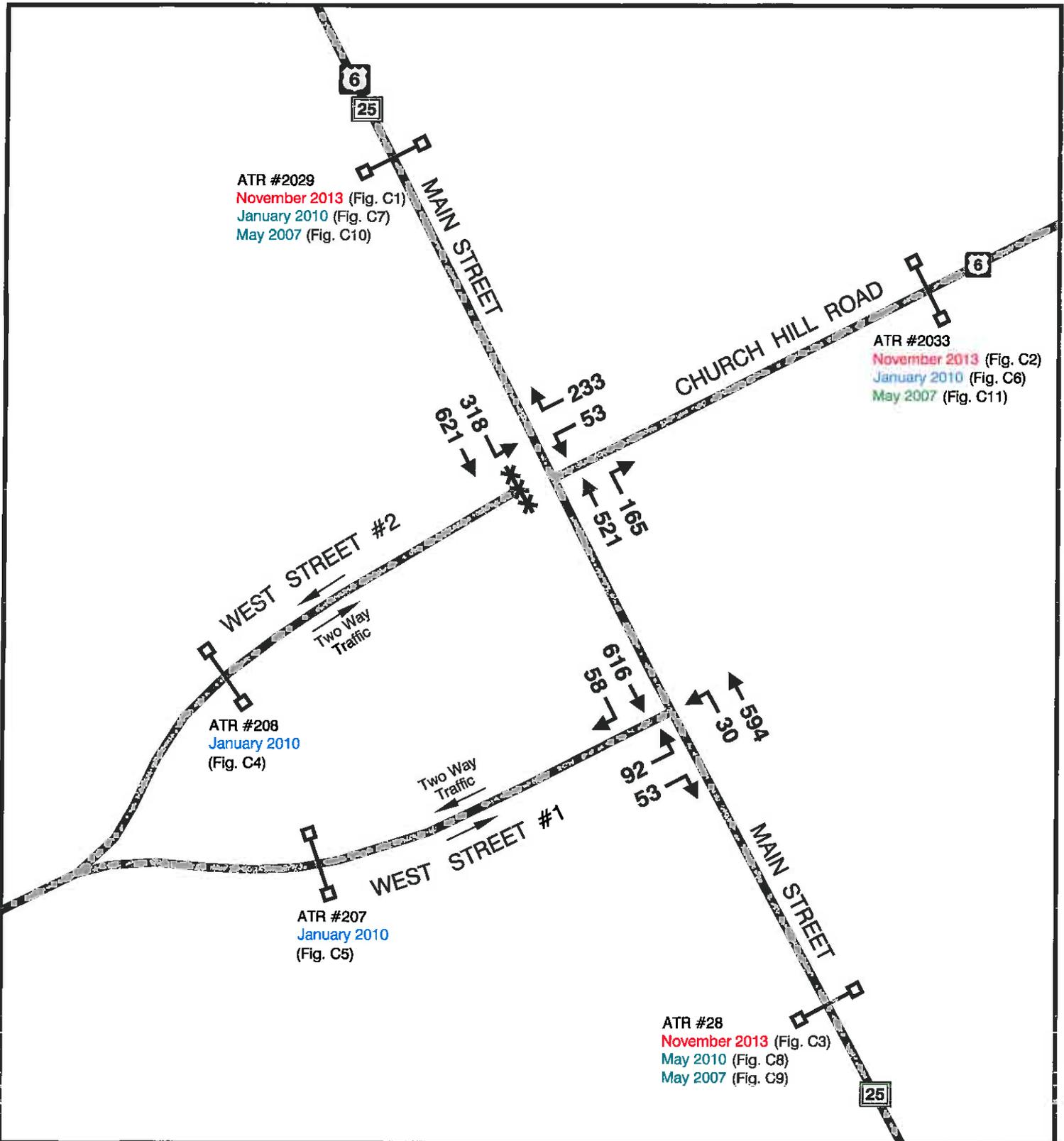


11B

11/18/15







**LEGEND**

- ConnDOT ATR Count Locations
- Closed Roadway - West Street #2

**NOTES:**

1. Manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Thursday, September 17, 2015 from 7:00 A.M. to 9:00 P.M.
2. The 2015 existing traffic volumes were adjusted and balanced to the most recent Connecticut Department of Transportation (ConnDOT) Automatic Traffic Recorder (ATR) data collected within the study area.

**2015 TRAFFIC VOLUMES WITH RECOMMENDED GEOMETRIC IMPROVEMENTS WEEKDAY AFTERNOON PEAK HOUR (5:00 - 6:00 P.M.)**

**INTERSECTION IMPROVEMENT STUDY  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT**

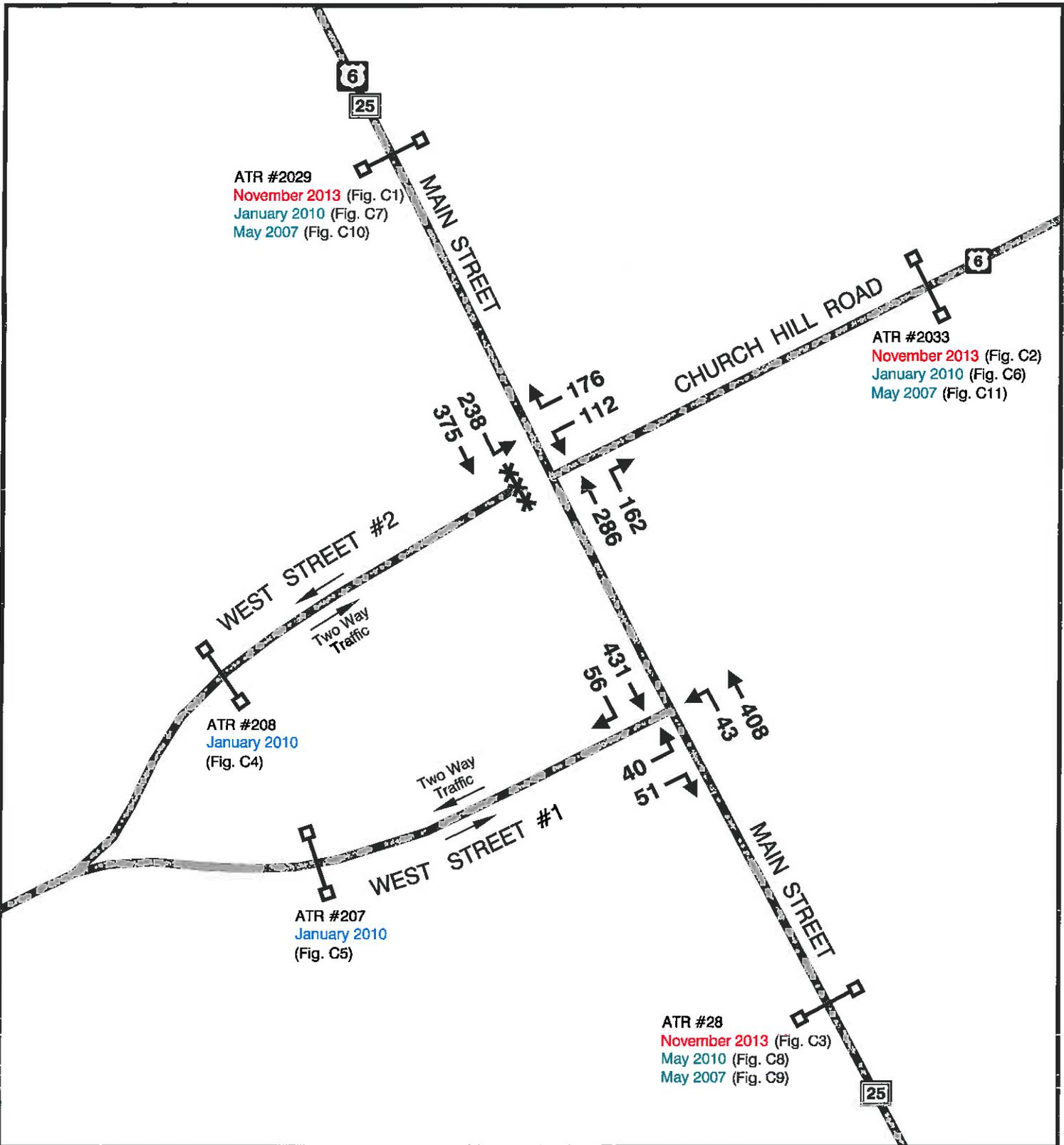
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ATR #2029  
 November 2013 (Fig. C1)  
 January 2010 (Fig. C7)  
 May 2007 (Fig. C10)

ATR #2033  
 November 2013 (Fig. C2)  
 January 2010 (Fig. C6)  
 May 2007 (Fig. C11)

ATR #208  
 January 2010  
 (Fig. C4)

ATR #207  
 January 2010  
 (Fig. C5)

ATR #28  
 November 2013 (Fig. C3)  
 May 2010 (Fig. C8)  
 May 2007 (Fig. C9)

**LEGEND**

- ConnDOT ATR Count Locations
- Closed Roadway - West Street #2

**NOTES:**

1. Manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Saturday, September 19, 2015 from 10:00 A.M. to 2:00 P.M.
2. The Saturday midday peak hour was utilized since the volumes are significantly higher than the Saturday peak hour.

**2015 TRAFFIC VOLUMES WITH RECOMMENDED GEOMETRIC IMPROVEMENTS SATURDAY MIDDAY PEAK HOUR (11:30 A.M. - 12:30 P.M.)**

**INTERSECTION IMPROVEMENT STUDY**  
 Main Street / Church Hill Road /  
 West Street Intersection - Newtown, CT

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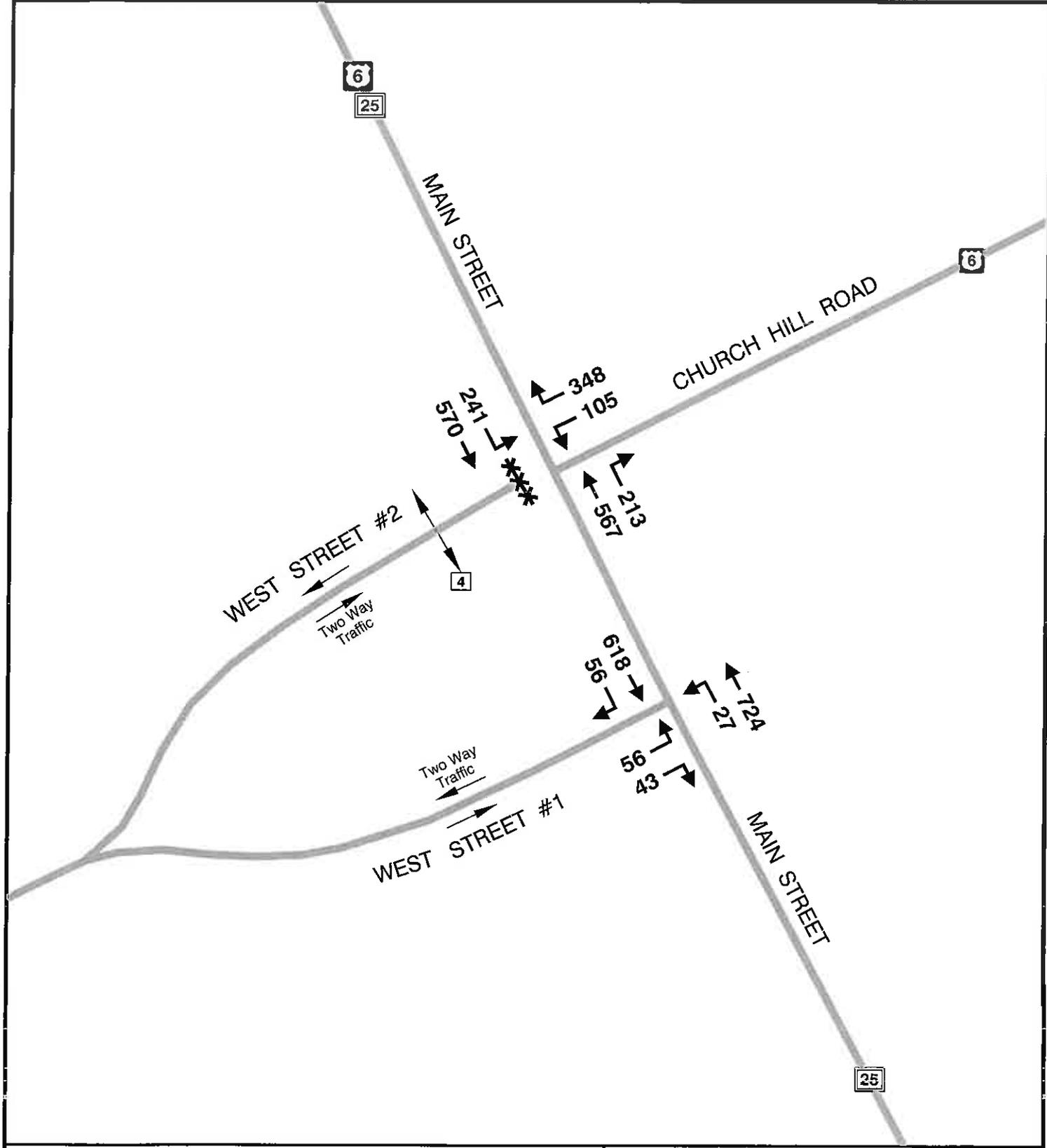
future traffic volumes with the recommended geometric improvements are graphically illustrated for the aforementioned peak hours in Figures 16, 17, 18 and 19, respectively.

### **Alternative Capacity Analysis and Measures of Effectiveness Comparison**

Due to the volume of traffic entering the intersections of Main Street at Church Hill Road/West Street #1 and West Street #2 it was necessary to utilize a microscopic (Micro-Simulation) model to accurately represent 2015 and 2018 conditions. The Highway Capacity Manual (HCM) 2010, Chapter 6 “Performance Measures from Alternative Tools” suggests that in such a circumstance Micro-Simulation should be utilized as it may better calibrate actual traffic conditions as observed in the field.

A Micro-Simulation study was undertaken as a supplement to the industry Macroscopic capacity analysis. The SimTraffic 9.0 Micro-Simulation model was utilized to better assess Study Area traffic conditions. Performance measures such as total delay per vehicle (seconds/vehicle) and storage/95<sup>th</sup> percentile and maximum queue length were identified and quantified that realistically reflect attributes of the study. Results of the Micro-Simulation analysis for Study Area intersections illustrates that the network does experience significant traffic congestion due to the 2015 traffic volumes during all Study peak hours. The Study Area will continue to experience congestion due to the 2018 traffic volumes if nothing is done.

The following is a summary of the results of the analyses for the 2015 traffic volumes and 2018 future traffic volumes. Capacity analyses were completed for the existing roadway network which includes the intersections of Main Street at Church Hill Road/West Street #2 (one-way westbound) and Main Street at West Street #1 (one-way eastbound) for both the 2015 and 2018 traffic volumes. Capacity analyses were also completed for the aforementioned TWO-WAY STOP controlled intersections with recommended geometric improvements for the 2015 and 2018 traffic volumes. Finally, capacity analyses were conducted for the recommended alternative which includes the



**LEGEND**

- Pedestrians (by approach)
- Closed Roadway - West Street #2

**NOTE:**

The 2018 Build Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES WITH RECOMMENDED GEOMETRIC IMPROVEMENTS WEEKDAY MORNING PEAK HOUR**

**INTERSECTION IMPROVEMENT STUDY**  
**Main Street / Church Hill Road / West Street Intersection - Newtown, CT**

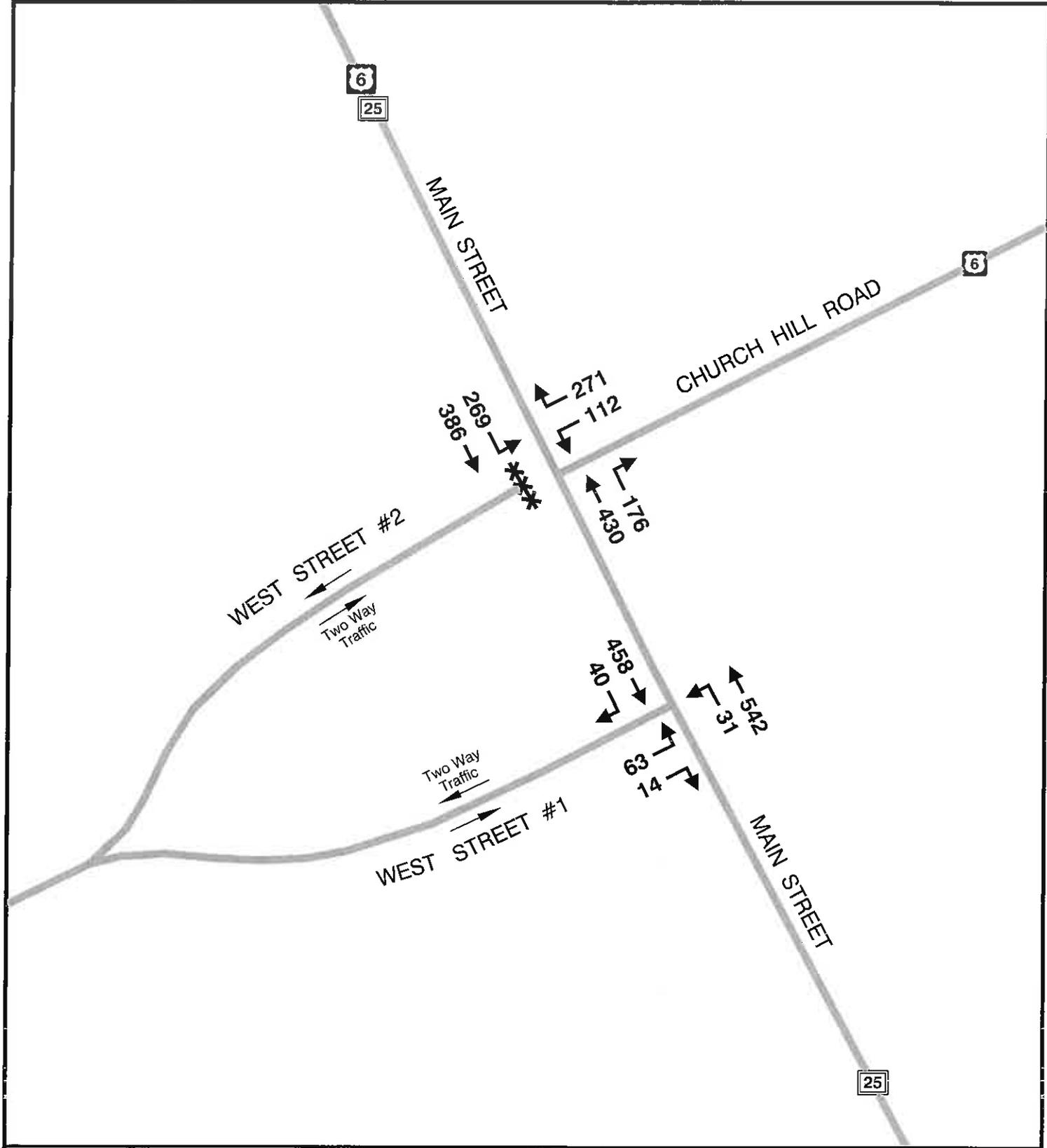


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**LEGEND**

 Closed Roadway - West Street #2

**NOTE:**  
The 2018 Build Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES WITH RECOMMENDED GEOMETRIC IMPROVEMENTS WEEKDAY MIDDAY PEAK HOUR**

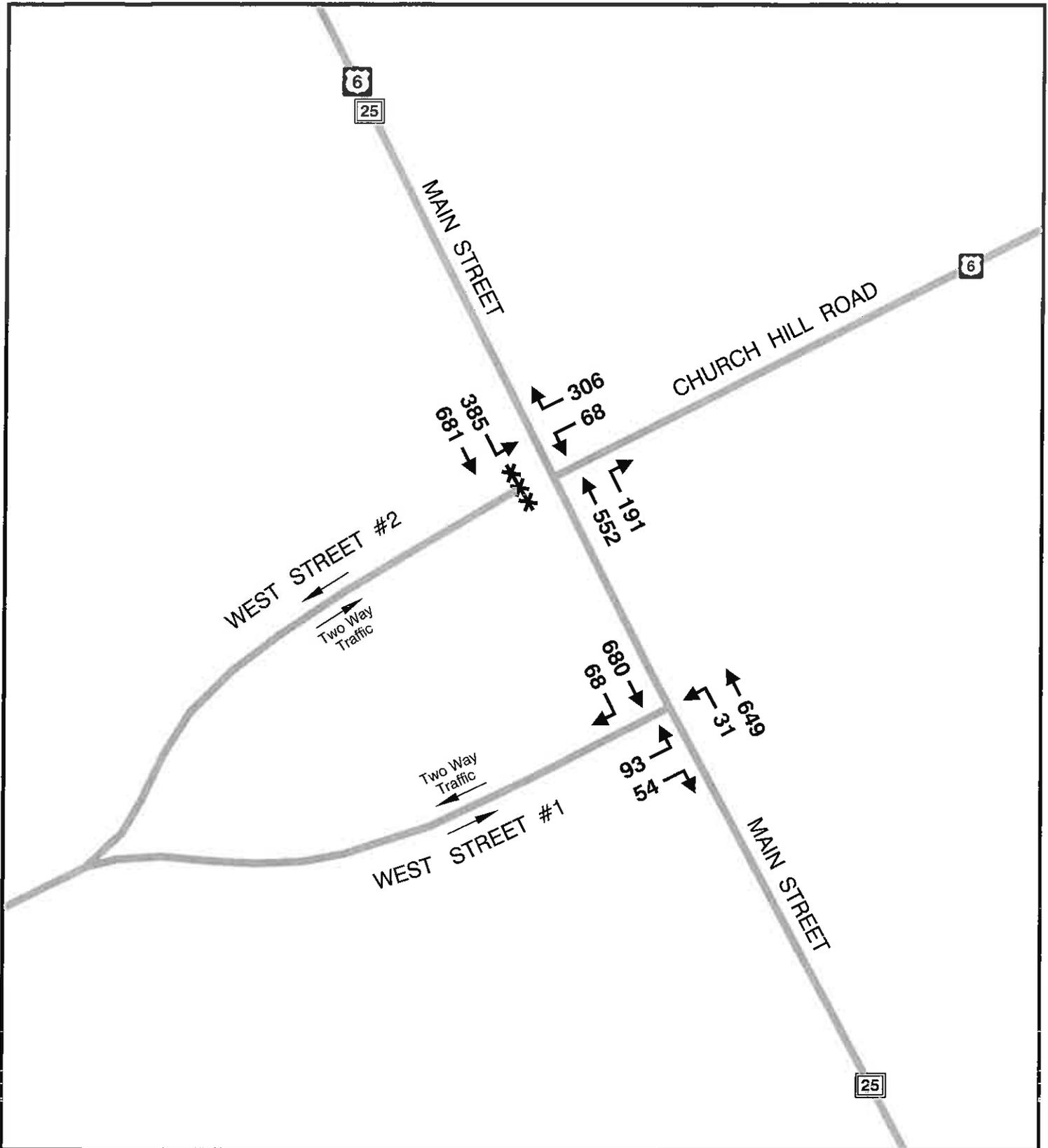
**INTERSECTION IMPROVEMENT STUDY**  
Main Street / Church Hill Road / West Street Intersection - Newtown, CT



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**LEGEND**

 Closed Roadway - West Street #2

**NOTE:**

The 2018 Build Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES WITH RECOMMENDED GEOMETRIC IMPROVEMENTS WEEKDAY AFTERNOON PEAK HOUR**

**INTERSECTION IMPROVEMENT STUDY**  
**Main Street / Church Hill Road /**  
**West Street Intersection - Newtown, CT**

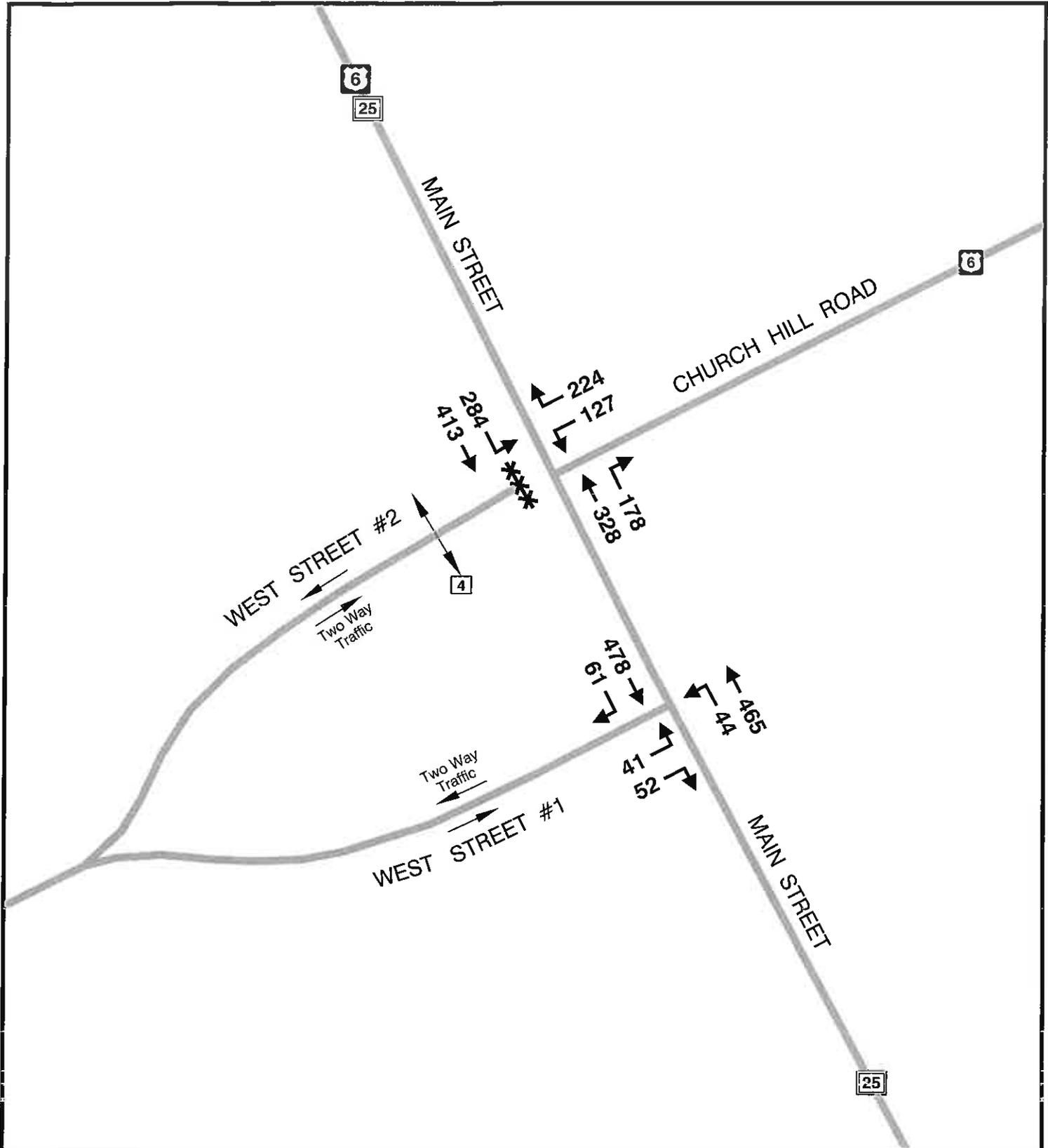


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**LEGEND**

- Pedestrians (by approach)
- Closed Roadway - West Street #2

**NOTE:**

The 2018 Build Traffic Volumes include the 2018 Projected Traffic Volumes and Other Developments Traffic Volumes.

**2018 TRAFFIC VOLUMES WITH RECOMMENDED GEOMETRIC IMPROVEMENTS SATURDAY MIDDAY PEAK HOUR**

**INTERSECTION IMPROVEMENT STUDY**  
**Main Street / Church Hill Road / West Street Intersection - Newtown, CT**



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installation of a fully-actuated traffic signal with an exclusive pedestrian phase, modifications to all intersection legs and converting West Street #1 and #2 to two-way flow for both the 2015 and 2018 traffic volumes.

1. *Main Street at Church Hill Road/West Street #1*

**2015 Traffic Volumes, Existing Roadway Network, Do Nothing Alternative –**

Results of the capacity analysis of this TWO-WAY STOP controlled intersection indicate that the northbound Main Street movements operate with Level of Service “A” during all Study peak hours. The southbound Main Street movements operate with Level of Service “C” or better during the weekday morning, weekday midday and Saturday midday peak hours. However, the southbound Main Street movements operate at Level of Service “F” during the weekday afternoon peak hour. The westbound Church Hill Road movements operate with Level of Service “F” during all weekday peak hours and Level of Service “E” during the Saturday midday peak hour.

**2018 Future Traffic Volumes, Existing Roadway Network, Do Nothing**

**Alternative –** Results of the capacity analysis indicate that the northbound Main Street movements will operate with Level of Service “A” during all Study peak hours. The southbound Main Street movements will operate with Level of Service “C” or better during the weekday midday and Saturday midday peak hours. However, the southbound Main Street movements will operate with Level of Service “E” and “F” during the weekday morning and weekday afternoon peak hour hours, respectively. The westbound Church Hill Road movements will operate with Level of Service “F” during all Study peak hours.

**2015 Traffic Volumes with Recommended Geometric Improvements –**

Results of the capacity analysis of this TWO-WAY STOP controlled intersection indicate that the northbound Main Street movements would operate with Level of Service

“A” during all Study peak hours. The southbound Main Street movements would operate with Level of Service “A” during the weekday midday and Saturday midday peak hours; however, the southbound Main street movements would operate with Level of Service “C” or better during the weekday morning and weekday afternoon peak hours. The westbound Church Hill Road movements would operate with Level of Service “F” during the weekday morning peak hour. The westbound Church Hill Road left-turn movements would operate with Level of Service “F” during the weekday afternoon and Saturday midday peak hours. The Church Hill Road movements would operate with Level of Service “D” or better during the weekday midday peak hour.

**2018 Future Traffic Volumes with Recommended Geometric Improvements–** Results of the capacity analysis of this TWO-WAY STOP controlled intersection indicate that the northbound Main Street movements will operate with Level of Service “A” during all Study peak hours. The southbound Main Street movements will operate with Level of Service “D” or better during the weekday morning, weekday midday and Saturday midday peak hours; however, the southbound Main street movements will operate with Level of Service “E” or better during the weekday afternoon peak hour. The westbound Church Hill Road movements will operate with Level of Service “F” during the weekday morning and weekday afternoon peak hours. The Church Hill Road movements will operate with Level of Service “F” or better during the Saturday midday peak hour. The Church Hill Road movements will operate with Level of Service “A” or better during the weekday midday peak hour.

**2015 Traffic Volumes with Recommended Geometric Changes and Fully-Actuated Traffic Signal –** Results of the analysis of this signalized intersection indicate that it would operate at an overall Level of Service “C” during all weekday peak hours and “B” during the Saturday midday peak hour. All lane groups would

operate with Level of Service “D” or better with the exception of the Church Hill Road left-turn lane group during the weekday morning and weekday afternoon peak hours.

**2018 Future Traffic Volumes with Recommended Geometric Changes and Fully-Actuated Traffic Signal** – Results of the analysis of this signalized intersection indicate that it will operate at an overall Level of Service “D” or better during all Study peak hours. All lane groups will operate with Level of Service “D” or better with the exception of the Church Hill Road left-turn lane group during the weekday morning peak hour and the southbound Main Street left-turn lane group during the weekday afternoon peak hour.

2. *Main Street at West Street #1*

**2015 Traffic Volumes, Existing Roadway Network, Do Nothing Alternative** – Results of the capacity analysis of this STOP controlled intersection indicate that the north and southbound Main Street through movements operate with Level of Service “A” during all Study peak hours. The eastbound West Street #1 movements operate with Level of Service “D” or better during the weekday midday and Saturday midday peak hours; however, the eastbound movements operate with Level of Service “F” during both the weekday morning and weekday afternoon peak hours.

**2018 Future Traffic Volumes, Existing Roadway Network** – Results of the capacity analysis indicate that the north and southbound Main Street through movements will operate with Level of Service “A” during all Study peak hours. The eastbound West Street #1 movements will operate with Level of Service “D” or better during the weekday midday and Saturday midday peak hours; however, the eastbound movements will operate with Level of Service “F” or better during the weekday morning and weekday afternoon peak hours.

**2015 Traffic Volumes, Recommended Geometric Improvements** – Results of the capacity analysis of this STOP controlled intersection indicate that the north and southbound Main Street movements would operate with Level of Service “A” during all Study peak hours. The eastbound West Street #1 movements would operate with Level of Service “D” or better during the weekday midday and Saturday midday peak hours; however, the eastbound movements would operate with Level of Service “F” during both the weekday morning and weekday afternoon peak hours.

**2018 Future Traffic Volumes, Recommended Geometric Improvements** – Results of the capacity analysis of this STOP controlled intersection indicate that the north and southbound Main Street movements will operate with Level of Service “A” during all Study peak hours. The eastbound West Street #1 movements will operate with Level of Service “F” or better during the weekday morning and weekday afternoon peak hours; however, the eastbound movements will operate with Level of Service “E” or better during both the Saturday midday peak hour. The eastbound movements will operate with Level of Service “A” during the weekday midday peak only.

Table 4 provides a more detailed summary of the results of the analysis for the 2015 and 2018 traffic volumes with the existing roadway network and indicates Level of Service, average delay and 95<sup>th</sup> percentile queue length for each movement of the Study Area intersections during all Study time periods. Table 5 provides the results of the analysis for the 2015 and 2018 traffic volumes with the recommend geometric improvements and traffic control during all time periods. SimTraffic 9.0 capacity analysis procedures and worksheets are included in Appendix of this report.

### **Traffic Signal Warrant Analysis**

A traffic signal warrant analysis was conducted for the intersection of Main Street at Church Hill Road/West Street #2 (one-way westbound) and West Street #1 (one-way

Table 4  
DO NOTHING ALTERNATIVE<sup>1</sup>  
CAPACITY ANALYSIS RESULTS – MEASURES OF EFFECTIVENESS (MOE) AND STORAGE/QUEUE ANALYSIS RESULTS – PEAK HOURS  
Intersection Improvement Study  
Main Street/Church Hill Road/West Street Intersection  
Newtown, Connecticut

| INTERSECTION   | CONTROL TYPE     | APPROACH       | STORAGE/<br>LINK LENGTH | PHYSICAL UNITS | 2015 TRAFFIC VOLUMES <sup>2</sup> |                     |                          |                     |                             |                     |                           |                     | 2018 TRAFFIC VOLUMES <sup>3</sup> |                     |                          |                     |                             |                     |                           |                     |
|--|------------------|----------------|-------------------------|----------------|-----------------------------------|---------------------|--------------------------|---------------------|-----------------------------|---------------------|---------------------------|---------------------|-----------------------------------|---------------------|--------------------------|---------------------|-----------------------------|---------------------|---------------------------|---------------------|
|  |                  |                |                         |                | Weekday Morning Peak Hour         |                     | Weekday Midday Peak Hour |                     | Weekday Afternoon Peak Hour |                     | Saturday Midday Peak Hour |                     | Weekday Morning Peak Hour         |                     | Weekday Midday Peak Hour |                     | Weekday Afternoon Peak Hour |                     | Saturday Midday Peak Hour |                     |
|  |                  |                |                         |                | LOS/Delay                         | Queue Length (Feet) | LOS/Delay                | Queue Length (Feet) | LOS/Delay                   | Queue Length (Feet) | LOS/Delay                 | Queue Length (Feet) | LOS/Delay                         | Queue Length (Feet) | LOS/Delay                | Queue Length (Feet) | LOS/Delay                   | Queue Length (Feet) | LOS/Delay                 | Queue Length (Feet) |
| Main Street at Church Hill Road/West Street #2 (One Way-Westbound) | TWSC             | Main Street    | 40                      | NB L           | A/6.6                             | <b>46</b>           | A/2.6                    | <b>46</b>           | A/8.9                       | <b>48</b>           | A/2.8                     | <b>43</b>           | A/6.9                             | <b>43</b>           | A/3.4                    | <b>56</b>           | A/4.7                       | <b>44</b>           | A/2.9                     | <b>46</b>           |
|  |                  |                | 40                      | T              | A/1.2                             | <b>46</b>           | A/0.9                    | <b>46</b>           | A/1.2                       | <b>48</b>           | A/1.0                     | <b>43</b>           | A/1.2                             | <b>43</b>           | A/1.0                    | <b>56</b>           | A/1.2                       | <b>44</b>           | A/1.1                     | <b>46</b>           |
|  |                  |                | 40                      | R              | A/0.5                             | <b>46</b>           | A/0.4                    | <b>46</b>           | A/0.6                       | <b>48</b>           | A/0.3                     | <b>43</b>           | A/0.5                             | <b>43</b>           | A/0.6                    | <b>56</b>           | A/0.7                       | <b>44</b>           | A/0.5                     | <b>46</b>           |
|  | Main Street      | SB             | L                       | C/18.9         | 422                               | B/11.0              | 228                      | F/61.8              | <b>1,025</b>                | A/7.4               | 150                       | E/39.5              | <b>776</b>                        | B/11.5              | 235                      | F/96.4              | <b>960</b>                  | A/9.5               | 216                       |                     |
|  |                  |                | T                       | C/16.1         | 422                               | A/7.5               | 228                      | F/60.3              | <b>1,025</b>                | A/5.2               | 150                       | E/36.5              | <b>776</b>                        | A/19.6              | 235                      | F/92.9              | <b>960</b>                  | A/7.6               | 216                       |                     |
|  |                  |                | R                       | B/12.4         | 422                               | A/1.7               | 228                      | F/53.6              | <b>1,025</b>                | A/3.5               | 150                       | E/35.7              | <b>776</b>                        | A/13.8              | 235                      | F/113.8             | <b>960</b>                  | A/6.3               | 216                       |                     |
|  | Church Hill Road | WB             | L                       | F/329.5        | 379                               | F/123.2             | 476                      | F/1,564.1           | 374                         | E/40.2              | 280                       | F/543.0             | 368                               | F/186.9             | 436                      | F/--                | 363                         | F/215.7             | 401                       |                     |
|  |                  |                | T                       | F/413.2        | 379                               | F/123.2             | 476                      | F/1,710.6           | 374                         | E/43.2              | 280                       | F/489.2             | 368                               | F/144.8             | 436                      | F/2,469.7           | 363                         | F/213.3             | 401                       |                     |
|  |                  |                | R                       | F/273.0        | 379                               | F/109.4             | 476                      | F/1,805.8           | 374                         | E/38.2              | 280                       | F/579.7             | 368                               | F/184.8             | 436                      | F/2,707.2           | 363                         | F/191.3             | 401                       |                     |
| Main Street at West Street #1 (One Way- Eastbound)                 | TWSC             | Main Street    | 1000+                   | NB T           | A/3.6                             | 158                 | A/1.7                    | 45                  | A/4.1                       | 150                 | A/1.8                     | 50                  | A/3.4                             | 117                 | A/2.1                    | 76                  | A/3.2                       | 101                 | A/2.6                     | 81                  |
|  |                  | Main Street    | 35                      | SB T           | A/1.1                             | <b>49</b>           | A/0.8                    | 10                  | A/1.4                       | <b>71</b>           | A/0.8                     | 0                   | A/1.3                             | 13                  | A/0.9                    | 16                  | A/1.5                       | <b>66</b>           | A/0.9                     | 0                   |
|  |                  | West Street #1 | 155                     | EB L           | F/97.7                            | <b>160</b>          | D/30.7                   | 113                 | F/93.3                      | <b>195</b>          | C/16.8                    | 72                  | F/66.4                            | 128                 | D/25.6                   | 89                  | F/81.8                      | <b>183</b>          | D/26.1                    | 87                  |
|  |                  | West Street #1 | 155                     | R              | F/55.6                            | <b>160</b>          | C/21.9                   | 113                 | F/69.3                      | <b>195</b>          | A/6.3                     | 72                  | D/28.8                            | 128                 | C/18.4                   | 89                  | F/63.6                      | <b>183</b>          | A/8.3                     | 87                  |

General Notes:

- The Do Nothing Alternative includes the two-way STOP controlled intersections of Main Street at Church Hill Road/West Street #2 and Main Street at West Street #1 as graphically illustrated in Figure 2: Current Street System Characteristics.
- The 2015 existing traffic volumes are based on manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Thursday, September 17 and Saturday, September 19, 2015 which were adjusted and balanced to Connecticut Department of Transportation (ConnDOT) Automatic Traffic Recorder (ATR) data collected within the Study Area.
- The 2018 background traffic volumes include an annual growth rate of one percent per year applied to the 2015 existing traffic volumes in addition to traffic related to all other developments identified within the Study Area.

Micro-simulation General Notes:

- A Micro-simulation (SimTraffic 9.0) capacity analysis was undertaken in place of the Macroscopic (Synchro 9.0) capacity analysis, as per the Highway Capacity Manual (HCM) 2010, Chapter 6 "Performance Measures from Alternative tools." The SimTraffic 9.0 Micro-simulation model was utilized to assess the year 2015 and 2018 operational performance of roadways within the Study Area. Performance measures such as total delay per vehicle (seconds/vehicle) and storage/95<sup>th</sup> percentile maximum queue length were identified and quantified that realistically reflect attributes of the Study Area.
- Results of the Micro-simulation analysis for Study Area intersections illustrate that the Study Area roadways experience traffic congestion during all Study peak hours and excessive delays and queuing on the Church Hill Road Approach.

SimTraffic 8.0 (Microscopic Model) Detailed Notes:

- SimTraffic 8.0 is used for the microscopic capacity and storage/queue analyses.
- Three minutes seeding time is used to fill the network with traffic. It is long enough for a vehicle to traverse the entire network with stop time included and it is longer than the maximum cycle length used in the network.
- 15 minute recorded intervals followed the 3 minutes seeding time to see how quickly the network recovers from congestion. These intervals are recorded for animation, reports and static graphics.
- The Model was calibrated and validated in order to interpret the results accurately. The 3 minutes seed time was long enough for the number of exiting vehicles per minute to stabilize at a fixed number. The number of entering vehicles did not exceed the number of exiting vehicles and equilibrium was achieved. Performance measures such as total delay per vehicle and storage/95<sup>th</sup> percentile queue length were quantified for the Study Area. Animation files were developed to gain insight into how the network performs which include a graphic side-by-side comparison.
- Main Street (State Route 25) is set to north-south.
- TWSC = Two-Way STOP Control.
- Level of Service determining parameter is called the service measure.
- For TWSC Intersections: Level of Service/Average Control delay per vehicle (seconds/vehicle).
- V/C ratio indicates the amount of congestion for each Movement. Any V/C ratio greater than or equal to one indicates that the Movement is operating at above capacity.
- The Queue Length rows show the 95<sup>th</sup> percentile maximum queue length in feet.
- The Queue Length is for each lane. The total queue length is divided by the number of lanes and the lane utilization factor.
- The 95<sup>th</sup> percentile queue is the maximum back of the queue with the 95<sup>th</sup> percentile traffic volumes.
- Bolded** 95<sup>th</sup> percentile queue exceeds the storage available.
- Physical Units consist of Critical Movement for TWSC Intersections.

NB = Northbound      EB = Eastbound      SB = Southbound      WB = Westbound  
L = Left Turn      T = Through      R = Right Turn      APP. = Approach

Table 5  
**RECOMMENDED IMPROVEMENTS<sup>1</sup>**  
**CAPACITY ANALYSIS RESULTS – MEASURES OF EFFECTIVENESS (MOE) AND STORAGE/QUEUE ANALYSIS RESULTS – PEAK HOURS**  
 Intersection Improvement Study  
 Main Street/Church Hill Road/West Street Intersection  
 Newtown, Connecticut

| A. FULLY ACTUATED TRAFFIC SIGNAL CONTROL WITH EXCLUSIVE PEDESTRIAN PHASE |                   |                     |                            |                   |        |                                   |                           |                             |                           |                                |                           |                              |                           |                                   |                           |                             |                           |                                |                           |                              |                           |
|--|-------------------|---------------------|----------------------------|-------------------|--------|-----------------------------------|---------------------------|-----------------------------|---------------------------|--------------------------------|---------------------------|------------------------------|---------------------------|-----------------------------------|---------------------------|-----------------------------|---------------------------|--------------------------------|---------------------------|------------------------------|---------------------------|
| INTERSECTION   | CONTROL TYPE      | APPROACH            | STORAGE/<br>LINK<br>LENGTH | PHYSICAL<br>UNITS |        | 2015 TRAFFIC VOLUMES <sup>2</sup> |                           |                             |                           |                                |                           |                              |                           | 2018 TRAFFIC VOLUMES <sup>3</sup> |                           |                             |                           |                                |                           |                              |                           |
|  |                   |                     |                            |                   |        | Weekday Morning<br>Peak Hour      |                           | Weekday Midday<br>Peak Hour |                           | Weekday Afternoon<br>Peak Hour |                           | Saturday Midday<br>Peak Hour |                           | Weekday Morning<br>Peak Hour      |                           | Weekday Midday<br>Peak Hour |                           | Weekday Afternoon<br>Peak Hour |                           | Saturday Midday<br>Peak Hour |                           |
|  |                   |                     |                            |                   |        | LOS/<br>Delay                     | Queue<br>Length<br>(Feet) | LOS/<br>Delay               | Queue<br>Length<br>(Feet) | LOS/<br>Delay                  | Queue<br>Length<br>(Feet) | LOS/<br>Delay                | Queue<br>Length<br>(Feet) | LOS/<br>Delay                     | Queue<br>Length<br>(Feet) | LOS/<br>Delay               | Queue<br>Length<br>(Feet) | LOS/<br>Delay                  | Queue<br>Length<br>(Feet) | LOS/<br>Delay                | Queue<br>Length<br>(Feet) |
| Main Street at<br>Church Hill Road/<br>West Street #1                    | Traffic<br>Signal | Main Street         | 75                         | NB                | L      | C/22.0                            | 86                        | B/18.6                      | 72                        | C/25.2                         | 74                        | C/21.2                       | 90                        | B/16.3                            | 70                        | C/22.7                      | 85                        | C/21.0                         | 91                        | B/19.7                       | 59                        |
|  |                   |                     | 1000+                      | T                 | B/18.2 | 240                               | B/19.9                    | 241                         | C/23.9                    | 222                            | B/16.5                    | 215                          | B/16.3                    | 242                               | C/20.9                    | 227                         | C/27.2                    | 235                            | B/17.2                    | 246                          |                           |
|  |                   | Main Street         | 400                        | SB                | L      | D/43.8                            | 221                       | C/27.7                      | 161                       | D/51.8                         | 388                       | C/27.7                       | 192                       | D/49.0                            | 259                       | C/33.5                      | 244                       | E/61.4                         | 426                       | D/41.2                       | 287                       |
|  |                   |                     | 530                        | T                 | A/7.7  | 168                               | A/6.2                     | 89                          | A/10.0                    | 352                            | A/5.6                     | 120                          | A/9.4                     | 183                               | A/5.3                     | 114                         | B/13.9                    | 376                            | A/6.5                     | 150                          |                           |
|  |                   | West Street<br>#1   | 155                        | EB                | L      | D/42.7                            | 94                        | D/42.7                      | 115                       | D/54.2                         | 156                       | C/34.1                       | 90                        | D/55.0                            | 111                       | D/44.6                      | 91                        | D/52.5                         | 175                       | D/41.2                       | 91                        |
|  |                   |                     | 155                        | R                 | B/13.9 | 94                                | C/23.6                    | 115                         | C/32.4                    | 156                            | B/12.7                    | 90                           | C/25.2                    | 111                               | C/28.4                    | 91                          | C/34.8                    | 175                            | B/15.6                    | 91                           |                           |
|  |                   | Church Hill<br>Road | 200                        | WB                | L      | E/57.5                            | 165                       | C/26.3                      | 95                        | E/60.4                         | 101                       | C/31.9                       | 120                       | E/63.8                            | 260                       | D/46.6                      | 143                       | D/51.0                         | 88                        | C/31.8                       | 107                       |
| 725  | R                 |                     | A/9.2                      | 235               | A/3.0  | 86                                | A/8.6                     | 202                         | A/2.6                     | 49                             | C/25.7                    | 383                          | A/5.9                     | 172                               | B/11.7                    | 257                         | A/3.9                     | 99                             |                           |                              |                           |
|  |                   | Overall             |                            |                   |        | C/27.0                            | --                        | C/22.7                      | --                        | C/33.1                         | --                        | B/20.0                       | --                        | D/42.5                            | --                        | C/26.5                      | --                        | D/41.2                         | --                        | C/24.7                       | --                        |

| B. TWO-WAY STOP CONTROL             |              |             |                            |                   |         |                                   |                           |                             |                           |                                |                           |                              |                           |                                   |                           |                             |                           |                                |                           |                              |                           |
|-------------------------------------|--------------|-------------|----------------------------|-------------------|---------|-----------------------------------|---------------------------|-----------------------------|---------------------------|--------------------------------|---------------------------|------------------------------|---------------------------|-----------------------------------|---------------------------|-----------------------------|---------------------------|--------------------------------|---------------------------|------------------------------|---------------------------|
| INTERSECTION                        | CONTROL TYPE | APPROACH    | STORAGE/<br>LINK<br>LENGTH | PHYSICAL<br>UNITS |         | 2015 TRAFFIC VOLUMES <sup>2</sup> |                           |                             |                           |                                |                           |                              |                           | 2018 TRAFFIC VOLUMES <sup>3</sup> |                           |                             |                           |                                |                           |                              |                           |
|                                     |              |             |                            |                   |         | Weekday Morning<br>Peak Hour      |                           | Weekday Midday<br>Peak Hour |                           | Weekday Afternoon<br>Peak Hour |                           | Saturday Midday<br>Peak Hour |                           | Weekday Morning<br>Peak Hour      |                           | Weekday Midday<br>Peak Hour |                           | Weekday Afternoon<br>Peak Hour |                           | Saturday Midday<br>Peak Hour |                           |
|                                     |              |             |                            |                   |         | LOS/<br>Delay                     | Queue<br>Length<br>(Feet) | LOS/<br>Delay               | Queue<br>Length<br>(Feet) | LOS/<br>Delay                  | Queue<br>Length<br>(Feet) | LOS/<br>Delay                | Queue<br>Length<br>(Feet) | LOS/<br>Delay                     | Queue<br>Length<br>(Feet) | LOS/<br>Delay               | Queue<br>Length<br>(Feet) | LOS/<br>Delay                  | Queue<br>Length<br>(Feet) | LOS/<br>Delay                | Queue<br>Length<br>(Feet) |
| Main Street at<br>Church Hill Road/ | TWSC         | Main Street | 40                         | NB                | T       | A/0.9                             | 37                        | A/0.9                       | 31                        | A/1.1                          | 47                        | A/0.7                        | 30                        | A/1.2                             | 40                        | A/0.1                       | 48                        | A/1.0                          | 55                        | A/0.9                        | 37                        |
|                                     |              |             | 40                         | R                 | A/10.3  | 37                                | A/0.3                     | 31                          | A/0.7                     | 47                             | A/0.3                     | 30                           | A/0.4                     | 40                                | A/0.0                     | 48                          | A/1.0                     | 55                             | A/0.4                     | 37                           |                           |
|                                     |              | Main Street | 530                        | SB                | L       | C/15.9                            | 153                       | A/7.1                       | 83                        | C/22.5                         | 232                       | A/6.9                        | 111                       | D/25.1                            | 163                       | A/1.5                       | 205                       | E/43.2                         | 403                       | B/10.7                       | 143                       |
|                                     |              |             | 530                        | T                 | A/1.0   | 0                                 | A/0.6                     | 7                           | A/1.1                     | 6                              | A/0.7                     | 0                            | A/0.8                     | 0                                 | A/0.1                     | 0                           | A/2.5                     | 372                            | A/0.9                     | 7                            |                           |
| Church Hill<br>Road                 | TWSC         | WB          | 200                        | L                 | F/504.4 | 269                               | D/30.6                    | 98                          | F/517.0                   | 294                            | F/87.2                    | 190                          | F/600.5                   | 274                               | A/9.2                     | 307                         | --                        | 284                            | F/204.6                   | 313                          |                           |
|                                     |              |             | 725                        | R                 | F/74.1  | 453                               | A/1.9                     | 63                          | C/23.8                    | 414                            | A/1.5                     | 46                           | F/70.0                    | 394                               | A/1.7                     | 496                         | F/133.9                   | 442                            | C/16.5                    | 452                          |                           |
| Main Street at<br>West Street #1    | TWSC         | Main Street | 75                         | NB                | L       | A/4.7                             | 37                        | A/3.4                       | 44                        | A/5.6                          | 41                        | A/3.9                        | 46                        | A/3.5                             | 26                        | A/0.0                       | 28                        | A/6.7                          | 39                        | A/5.0                        | 51                        |
|                                     |              |             | 1000+                      | T                 | A/1.2   | 0                                 | A/1.0                     | 7                           | A/1.4                     | 45                             | A/1.0                     | 0                            | A/1.7                     | 26                                | A/0.2                     | 39                          | A/1.5                     | 42                             | A/1.4                     | 28                           |                           |
|                                     |              | Main Street | 35                         | SB                | T       | A/0.4                             | 14                        | A/0.4                       | 10                        | A/0.4                          | 15                        | A/0.5                        | 18                        | A/0.4                             | 18                        | A/0.0                       | 9                         | A/0.4                          | 10                        | A/0.5                        | 16                        |
|                                     |              |             | 35                         | R                 | A/0.1   | 14                                | A/0.3                     | 10                          | A/0.1                     | 15                             | A/0.4                     | 18                           | A/0.1                     | 18                                | A/0.0                     | 9                           | A/0.0                     | 10                             | A/0.2                     | 16                           |                           |
| West Street<br>#1                   | TWSC         | EB          | 155                        | L                 | F/106.3 | 179                               | C/17.5                    | 82                          | F/83.5                    | 96                             | D/28.3                    | 75                           | F/75.9                    | 117                               | A/0.7                     | 82                          | F/105.6                   | 89                             | E/36.4                    | 79                           |                           |
|                                     |              |             | 155                        | R                 | F/64.7  | 179                               | A/6.4                     | 82                          | F/53.4                    | 96                             | A/9.8                     | 75                           | E/35.3                    | 117                               | A/0.1                     | 82                          | F/86.4                    | 89                             | B/11.4                    | 79                           |                           |

General Notes:

1. The Recommended Improvements include the installation of a fully actuated traffic signal with an exclusive pedestrian phase, modifications to all intersection legs, and the conversion of West #1 and #2 to two-way flow as graphically illustrated in Figure 36: The Recommended Alternative.
2. The 2015 existing traffic volumes are based on manual turning movement counts conducted by Frederick P. Clark Associates, Inc. on Thursday, September 17 and Saturday, September 19, 2015 which were adjusted and balanced to Connecticut Department of Transportation (ConnDOT) Automatic Traffic Recorder (ATR) data collected within the Study Area.
3. The 2018 background traffic volumes include an annual growth rate of one percent per year applied to the 2015 existing traffic volumes in addition to traffic related to all other developments identified within the Study Area.

Micro-simulation General Notes:

4. A Micro-simulation (SimTraffic 9.0) capacity analysis was undertaken in place of the Macroscopic (Synchro 9.0) capacity analysis, as per the Highway Capacity Manual (HCM) 2010, Chapter 6 "Performance Measures from Alternative tools." The SimTraffic 9.0 Micro-simulation model was utilized to assess the year 2015 and 2018 operational performance of roadways within the Study Area. Performance measures such as total delay per vehicle (seconds/vehicle) and storage/95<sup>th</sup> percentile maximum queue length were identified and quantified that realistically reflect attributes of the Study Area.
5. Results of the Micro-simulation analysis for Study Area intersections illustrate that the Study Area roadways experience moderate delays and queuing on the Church Hill Road Approach for the two-way STOP control alternative.

Table 5 Cont'd

SimTraffic 8.0 (Microscopic Model) Detailed Notes:

6. SimTraffic 8.0 is used for the microscopic capacity and storage/queue analyses.
7. Three minutes seeding time is used to fill the network with traffic. It is long enough for a vehicle to traverse the entire network with stop time included and it is longer than the maximum cycle length used in the network.
8. 15 minute recorded intervals followed the 3 minutes seeding time to see how quickly the network recovers from congestion. These intervals are recorded for animation, reports and static graphics.
9. The Model was calibrated and validated in order to interpret the results accurately. The 3 minutes seed time was long enough for the number of exiting vehicles per minute to stabilize at a fixed number. The number of entering vehicles did not exceed the number of exiting vehicles and equilibrium was achieved. Performance measures such as total delay per vehicle and storage/95<sup>th</sup> percentile queue length were quantified for the Study Area. Animation files were developed to gain insight into how the network performs which include a graphic side-by-side comparison.
10. Main Street (State Route 25) is set to north-south.
11. TWSC = Two-Way STOP Control.
12. Level of Service determining parameter is called the service measure.
13. For Signalized Intersections: Level of Service/Average Total delay per vehicle (seconds/vehicle).
14. For TWSC Intersections: Level of Service/Average Control delay per vehicle (seconds/vehicle).
15. ITE publication for Traffic Access and Impact Studies for site development "A Recommended Practice" indicated that overall Level of Service ratings of A to D are normally considered acceptable for signalized intersections (Level C or better are considered desirable). Levels of Service E and F are normally undesirable.
16. V/C ratio indicates the amount of congestion for each Lane Group or movement. Any V/C ratio greater than or equal to one indicates that the Lane Group or Movement is operating at above capacity.
17. The Queue Length rows show the 95<sup>th</sup> percentile maximum queue length in feet.
18. The Queue Length is for each lane. The total queue length is divided by the number of lanes and the lane utilization factor.
19. The 95<sup>th</sup> percentile queue is the maximum back of the queue with the 95<sup>th</sup> percentile traffic volumes.
20. **Bolded** 95<sup>th</sup> percentile queue exceeds the storage available.
21. Physical Units consist of :
  - a. Lane Group, Approach and Intersection Overall for Traffic Signal Controlled Intersections; and,
  - b. Critical Movement for TWSC Intersections.

NB = Northbound      EB = Eastbound      SB = Southbound      WB = Westbound  
L = Left Turn      T = Through      R = Right Turn      APP. = Approach

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eastbound) using the SYNCHRO Warrant 9 computer model. This computer model follows the methodology provided in the Manual of Uniform Traffic Control Devices (MUTCD), published in 2009. The results of the analysis for Warrant 1, “Eight-Hour Vehicular Volume,” indicate that this intersection satisfies the warrant for both Condition A “Minimum Vehicular Volume” and Condition B “Interruption of Continuous Traffic” for the 2015 traffic volumes.

The results of the analysis for Warrant 2, “Four-Hour Vehicular Volume,” state that this intersection satisfies the warrant based on the 2015 intersecting traffic volumes. The results of the analysis for Warrant 3, “Peak Hour,” indicate that this intersection satisfies the warrant for Condition B based on the 2015 major and minor street traffic volumes. The results of the analysis for Warrant 4, “Pedestrian Volume,” indicate that this intersection does NOT satisfy the warrant for the 2015 pedestrian volumes. Warrant 5, “School Crossing,” does NOT satisfy the warrant conditions as there is not a significant number of school children crossing the roadway at the Study Area intersection. Warrant 6, “Coordinated Signal System,” does not satisfy the warrant conditions as progressive movement is NOT a significant concern within the Study Corridor. The results of the analysis for Warrant 7, “Crash Experience,” indicate that this intersection satisfies the warrant for the accident experience based on the severity and frequency of crashes; however, does not satisfy the warrant based on 2015 pedestrian volumes. The results of the analysis for Warrant 8, “Roadway Network,” indicate that this intersection satisfies the warrant based on the 2015 traffic volumes entering the Study Area intersection. Warrant 9, “Intersection Near a Grade Crossing” is not relevant to the Study Area intersection as there are no proposed railroad lines in the immediate vicinity. Finally, the results of the analysis for the ALL-WAY STOP CONTROL Warrant, “Multiway Stop Application” indicate that this intersection satisfies the warrant for ALL-WAY STOP control based on the vehicular volumes entering the intersection from major road approaches. The detailed summary of the warrant analysis is provided in Appendix of this report.

## **Findings**

This Intersection Improvement Study was prepared to provide the Town of Newtown with a recommended Concept Plan to improve the overall safety and operational characteristics of the existing STOP controlled intersections of Main Street at Church Hill Road/West Street #2 (one-way westbound) and Main Street at West Street #1(one-way eastbound) (collectively and commonly referred to as the Flag Pole intersection). There has been a concern regarding the overall safety and operations of this intersection; therefore, this Study has been completed to assist the Town to develop a recommendation to modify the intersection layout, traffic control devices, lane arrangements and pedestrian facilities to enhanced safety. In the past, the Town has had discussions with the Connecticut Department of Transportation (ConnDOT) and it is clearly understood that an intersection improvements will maintain the existing Flag Pole in the center of this intersection.

The Study addresses traffic conditions for the 2015 and 2018 future traffic volumes during the weekday morning, weekday midday, weekday afternoon and Saturday midday peak hours of the adjacent street system. Manual turning movement counts were collected specifically for this Study at the intersections of Main Street at Church Hill Road/West Street #2 and Main Street at West Street #1 during the weekday from 7:00 A.M. to 9:00 P.M. and during the Saturday and Sunday midday peak periods. The most recent ConnDOT ATR data was obtained to adjust and balance the manual turning movement count data. Historical ConnDOT ATR data is also provided for comparisons purposes only.

The 2018 future traffic volumes employed a one percent annual growth rate and included all other developments planned or approved in the vicinity of the Study Area intersections. The annual growth rate is consistent with the Town of Newtown and ConnDOT data.

Based on the future traffic volume data for Main Street, Church Hill Road and West Street #1 and #2, one recommended intersection improvement plan was conceptualized for

both TWO-WAY STOP control and a fully-actuated traffic signal for the Town's consideration to improve the overall safety and operational characteristics of the Study Area intersection. The traffic signal warrant analysis indicates that a traffic signal is warranted at this location.

A network micro-simulation study was undertaken as a supplement to the industry standard capacity analysis, as per the Highway Capacity Manual (HCM) 2010, Chapter 6 "Alternative tools." The SimTraffic 9 simulation model was utilized to assess the traffic impacts associated with the recommended intersection improvement plan.

Results of the micro-simulation for the Study Area for the existing conditions with 2015 traffic volumes indicate that the existing roadway network does experience significant traffic congestion during all Study peak hours. The Study Area will continue to experience significant congestion in the future (2018) if improvements are not provided. Results of the micro-simulation for the Study Area intersections show that the network traffic operation will recover quickly from congestion given the proposed geometric improvements and recommended traffic signal control (if a signal was installed). The SimTraffic 9 procedures predicted realistic moderate traffic operation conditions that last throughout the Study Area peak periods of the adjacent street system and vehicle queues that do not overflow the available storage space during peak hours. The recommended intersection improvement plan will improve Study Area traffic operations along Study Area roadways and at their intersections for both 2015 and future 2018 traffic volumes.

## ALTERNATIVES

## INTERSECTION IMPROVEMENT ALTERNATIVES

The following provides a detailed explanation of each of the alternatives considered as part of this Study:

*Do Nothing Alternative: Maintain Two-Way STOP Control at Church Hill Road and West Street #1* – The Do Nothing Alternative is provided for comparison purposes. Figure G1 graphically illustrates the Do Nothing Alternative/Existing Conditions.

*Alternative 1: Modification of Church Hill Road Approach and Pedestrian Safety Enhancement* - The first alternative proposes the widening of the STOP controlled westbound Church Hill Road approach to Main Street within the State right of way to accommodate separate through-right and left-turn only lanes. To accommodate the addition of a turning lane, the eastbound receiving lane on Church Hill Road would be shifted slightly to the south. The STOP control would be maintained on both the Church Hill Road and West Street #1 approaches in the future. Alternative 1 could include the installation of a stand-alone pedestrian alarm system with Rectangular Rapid Flashing Beacon (RRFB) Technology on the Main Street and Church Hill Road approaches to alert motorists of pedestrian crossing activity. It also includes enhanced pedestrian features such as an extension of the sidewalk within State right of way and south of West Street #1, to connect with the existing crosswalk on the Main Street northbound approach. All Alternatives feature the installation of a raised island to protect the historical flagpole at the center of the intersection and deflect encroaching vehicles. Figure G2 graphically illustrates this alternative 1 and depicts the location of the proposed RRFBs.

*Alternative 2: Installation of Full Actuated Traffic Signal with Exclusive Pedestrian Phase and Modifications to the Westbound Church Hill Road Approach* – The second alternative also considers the widening of the STOP controlled westbound Church Hill Road approach to Main Street within the State right of way to accommodate separate through-right and left-

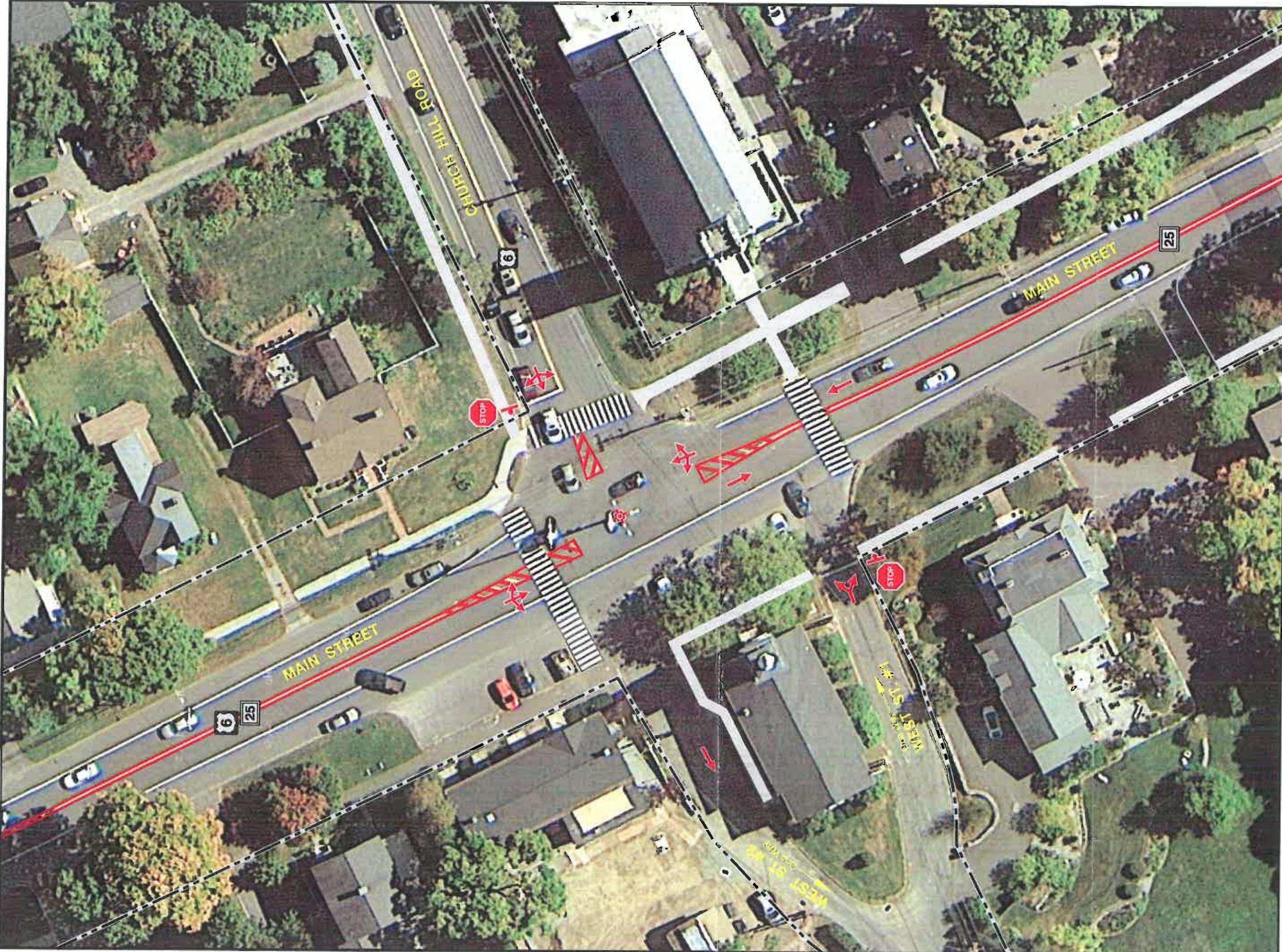
turn only lanes. To accommodate the addition of a turning lane, the eastbound receiving lane on Church Hill Road would be shifted slightly to the south. However, this alternative includes the installation of a fully- actuated traffic signal with detection on all approaches in addition to an exclusive pedestrian phase. To accommodate the fully-actuated traffic signal and limit the size of the intersection “box” for both aesthetics and operational efficiency, would include the existing crosswalk on the northbound approach be shifted north towards Church Hill Road. A sidewalk extension is needed to connect the relocated crosswalk with the sidewalk on the frontage of the Newtown Meeting House. To accommodate this, the two perpendicular parking spaces along the frontage of the Newtown Meeting House would be eliminated. Furthermore, on the West Street #1 approach only right-turn movements would be permitted. Figure G3 graphically illustrates this alternative and depicts the location of the proposed mast arm mounted traffic signal heads.

*Alternative 3: Alternative 2 in addition to modifications to the Southbound Main Street Approach* – The third alternative includes all of the suggested improvements of the second alternative in addition to the widening of the southbound Main Street approach within the State right of way to accommodate separate through-right and left-turn only lanes. To accommodate the addition of a turning lane, the southbound shoulder will be converted to a through-right lane. The Stop Bar for the southbound Main Street approach will remain north of the crosswalk. Figure G4 graphically illustrates this alternative and depicts the proposed improvements to southbound Main Street.

*Alternative 4: Installation of Fully-Actuated Traffic Signal with Exclusive Pedestrian Phase and Modifications to All Intersection Legs* – The fourth alternative also considers the widening of the westbound Church Hill Road approach to Main Street within the State right- of- way; however, to accommodate separate left and right turn lanes only. The right-turn only lane would be channelized and the Stop Bar would be moved west towards the intersection. Access to West Street #2 would be eliminated. The raised central island would span from the southbound Main Street crosswalk to the Flagpole. West Street #2

would be converted to a cul-de-sac and serve as an access road for local businesses. West Street #1 would be converted to a two-lane roadway within the Town right of way. The eastbound West Street #1 approach would permit full movements. Both the northbound and southbound Main Street approaches would be widened to accommodate separate through-right and left-turn only lanes. On the northbound Main Street approach the left-turn bay would replace the existing southbound lane and the southbound shoulder would be converted to a southbound travel lane. A fully-actuated traffic signal with detection on all approaches in addition to an exclusive pedestrian phase would be installed. The existing crosswalks would remain. Perpendicular parking in front of the Newtown Meeting House would be eliminated. Figure G5 graphically illustrates the proposed intersection layout.

*Alternative 5: Installation of a Roundabout, Alterations of Traffic Flow on West Street #2, and Turning Movement Restrictions to West Street #1* – The fifth alternative proposes a roundabout centered around the Flag pole with four one lane yield controlled approaches. To accommodate this, West Street #2 would be converted to a two-lane roadway and serve as the fourth leg to the roundabout. West Street #1 would continue to be STOP controlled; however, restricted to right-turn movements only. Crosswalks would be related as necessary; however, the overall crossing distance would be significantly reduced across all approaches and pedestrians would be able to queue on a central median. The central raised island would be mountable allowing trucks to perform turning maneuvers. Figure G6 graphically illustrates the layout of a roundabout and truck turning templates on State roads.



- LEGEND**
-  Traffic Lane
  -  Traffic Sign
  -  Flagpole
  -  Roadway Right of Way

**EXISTING CONDITIONS**  
DO NOTHING ALTERNATIVE  
(Two Way Stop Controlled Intersection)

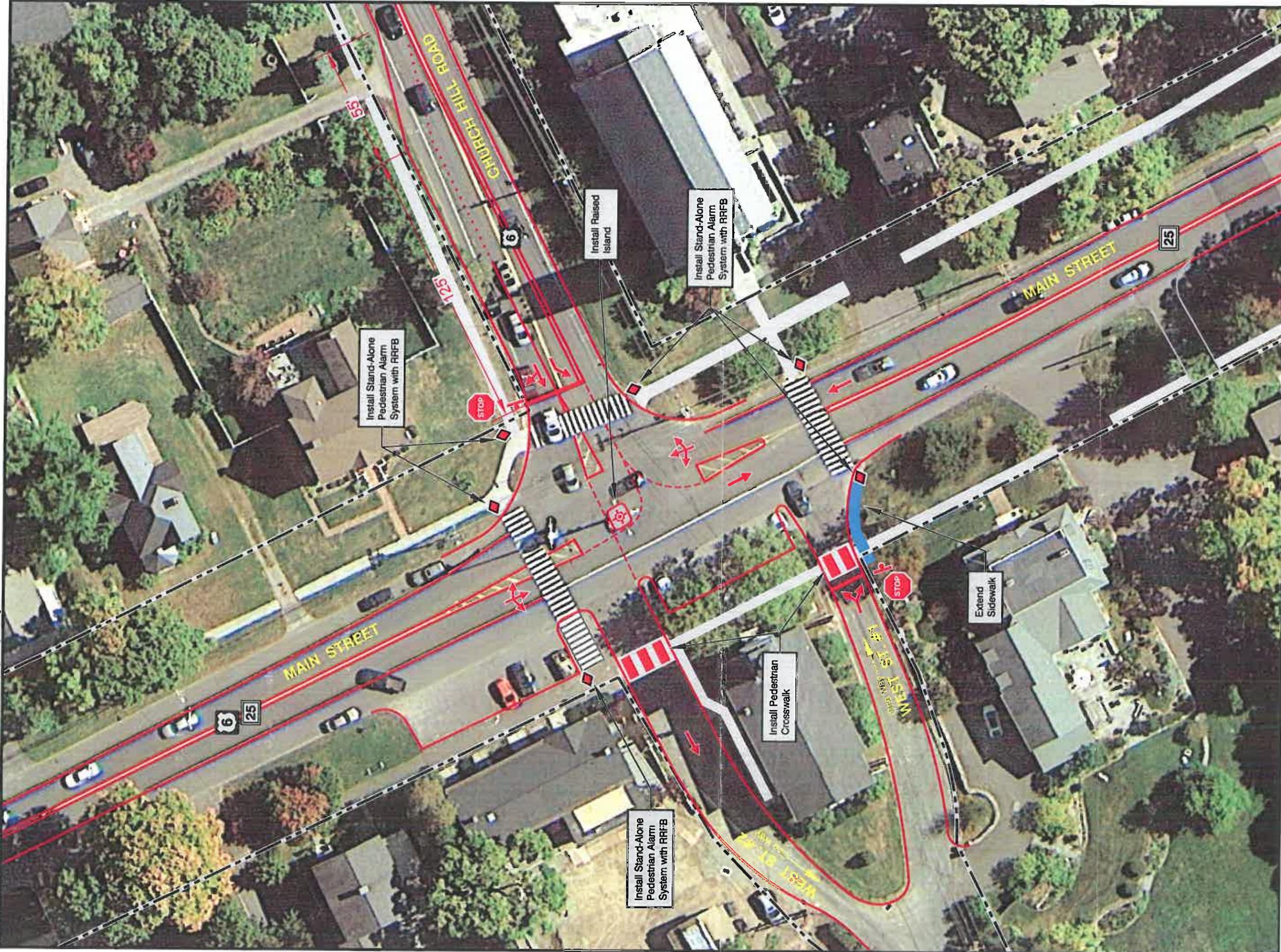
**INTERSECTION IMPROVEMENT STUDY**  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT

FREDERICK P. CLARK ASSOCIATES, INC.  
PLANNING, TRANSPORTATION, ENVIRONMENT AND DEVELOPMENT  
RYE, NEW YORK



**G1**  
11/18/15





LEGEND

- Traffic Lane
- Traffic Sign
- Proposed Pedestrian Crosswalks
- Flagpole
- Roadway Right of Way
- Pedestrian Alarm System with Rectangular Rapid Flashing Beacon (RRFB) Technology

ALTERNATIVE 1 - MODIFICATION OF CHURCH HILL ROAD APPROACH (Two Way Stop Controlled Intersection)

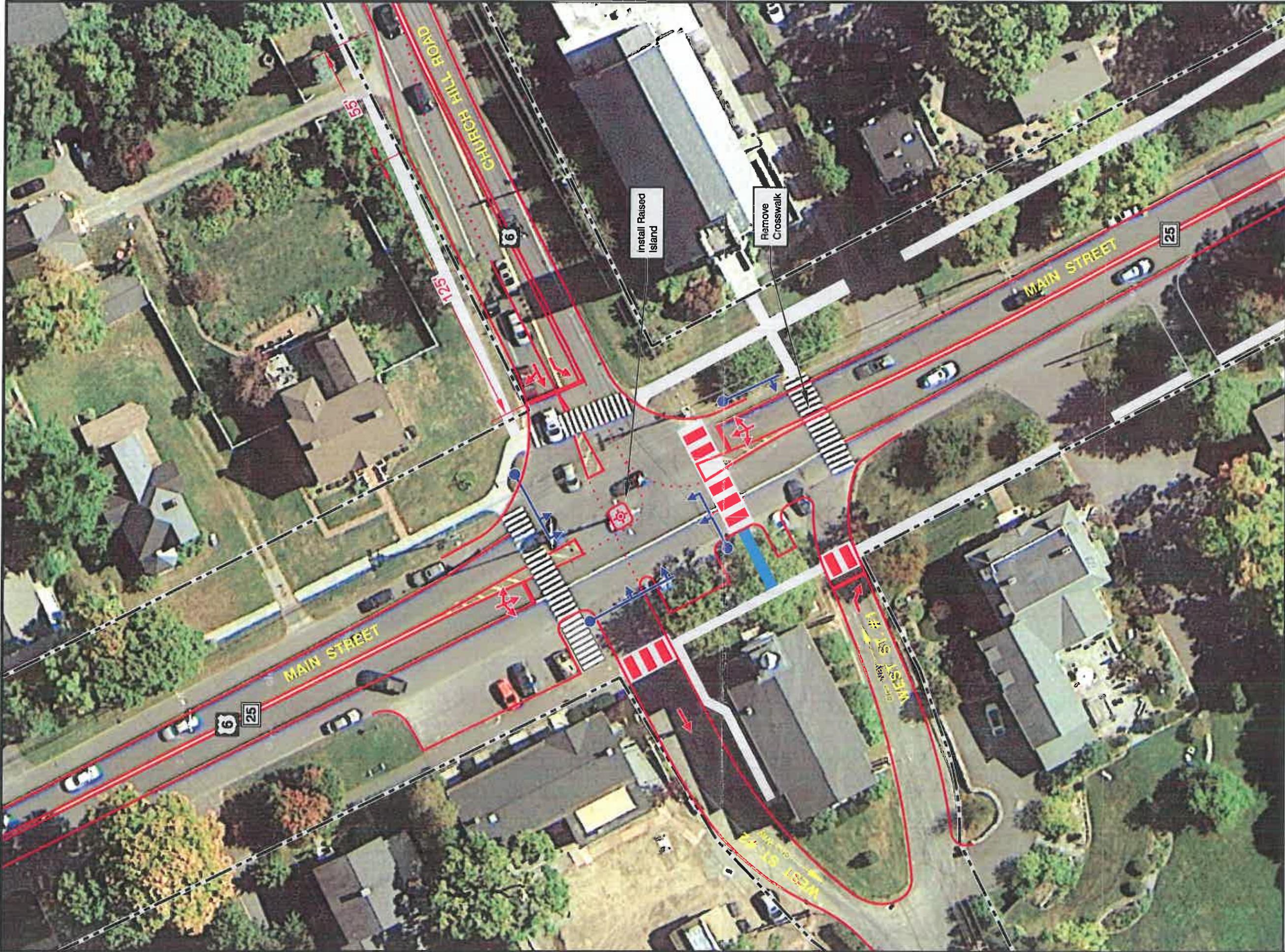
INTERSECTION IMPROVEMENT STUDY  
Main Street / Church Hill Road / West Street Intersection - Newtown, CT

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Scale in Feet  
0 10 20 30 40



G2  
11/18/15



**LEGEND**

-  Traffic Lane
-  Traffic Sign
-  Proposed Pedestrian Crosswalks
-  Flagpole
-  Roadway Right of Way
-  Proposed Mast Arm Mounted Traffic Signal

**NOTES:**

1. As per section 4D.11 of the Manual of Uniform Traffic Control Devices (MUTCD) "Number of Signal Faces on an Approach", locating primary signal faces on the far side of the intersection has been shown to provide safer operation.
2. As per section 4D.14 of the Manual of Uniform Traffic Control Devices (MUTCD) "Longitudinal Positioning of Signal Faces", the proposed signal faces on each approach are located no more than 180 feet beyond the stop line. The signal indications should be 12 inch in diameter.

**ALTERNATIVE 2 - FULLY ACTUATED TRAFFIC SIGNAL WITH EXCLUSIVE PEDESTRIAN PHASE AND MODIFICATION TO CHURCH HILL ROAD**

**INTERSECTION**

**IMPROVEMENT STUDY**  
Main Street / Church Hill Road /  
West Street Intersection - Newtown, CT

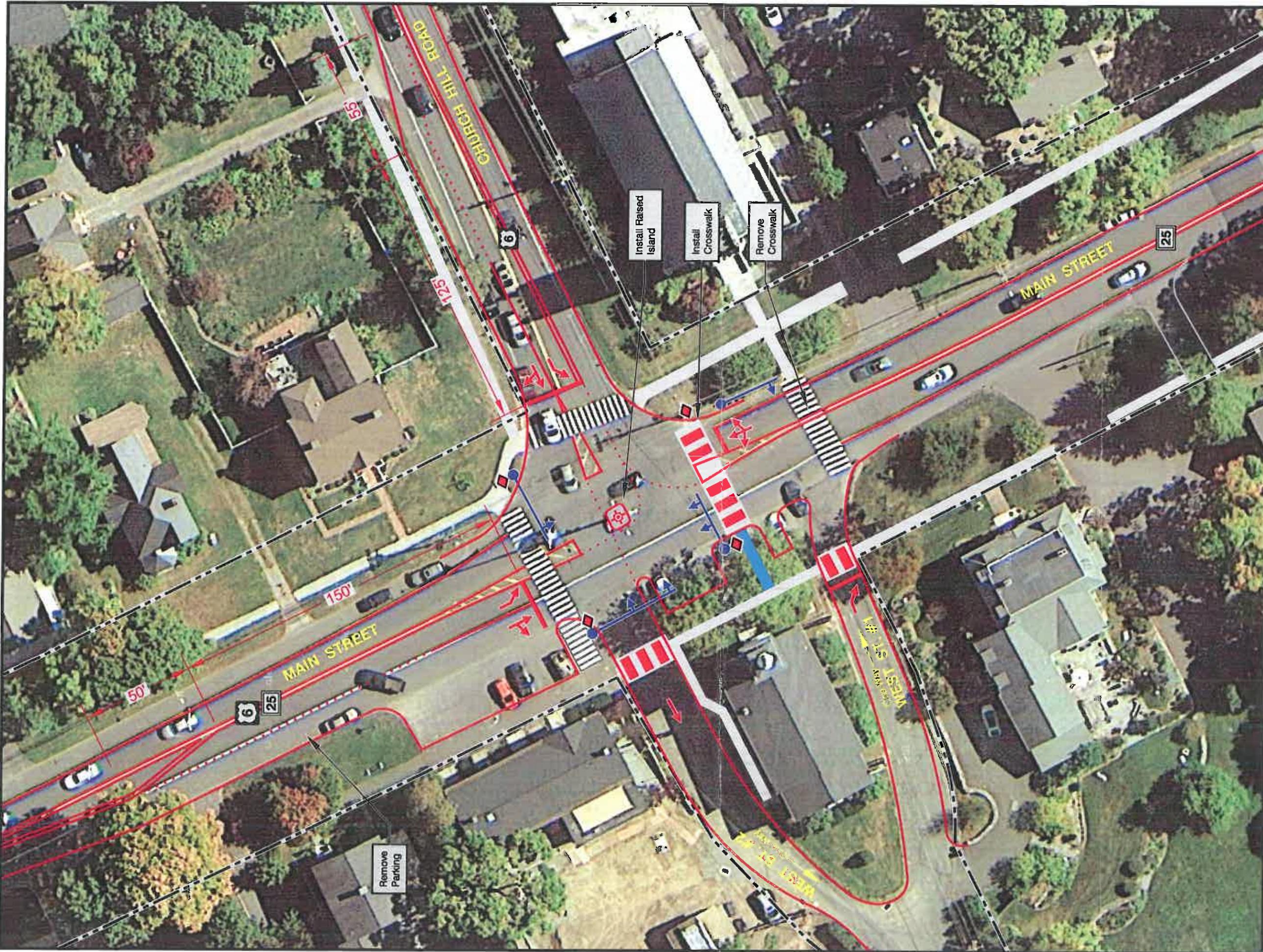
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FAIRFIELD, CONNECTICUT



**G3**

11/18/15





**ALTERNATIVE 3 - FULLY ACTUATED TRAFFIC SIGNAL WITH EXCLUSIVE PEDESTRIAN PHASE AND MODIFICATIONS TO WESTBOUND AND SOUTHBOUND APPROACHES**

**INTERSECTION**  
**IMPROVEMENT STUDY**  
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 West Street Intersection - Newtown, CT

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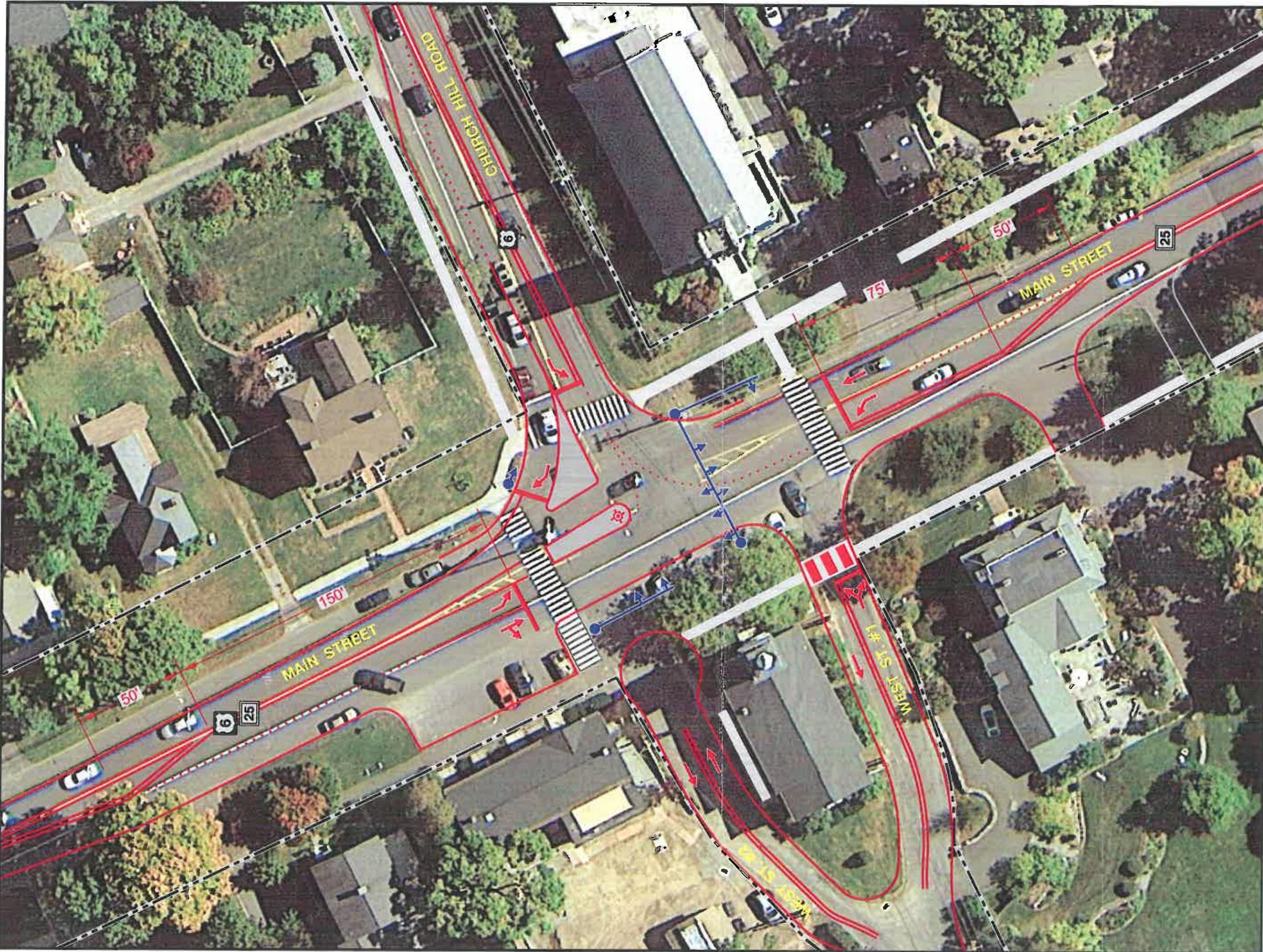
**G4**  
 11/18/15

Scale in Feet  
 0 10 20 30 40

- NOTES:**
- As per section 4D.11 of the Manual of Uniform Traffic Control Devices (MUTCD) "Number of Signal Faces on an Approach", locating primary signal faces on the far side of the intersection has been shown to provide safer operation.
  - As per section 4D.14 of the Manual of Uniform Traffic Control Devices (MUTCD) "Longitudinal Positioning of Signal Faces", the proposed signal faces on each approach are located no more than 180 feet beyond the stop line. The signal indications should be 12 inch in diameter.

**LEGEND**

- Traffic Lane
- Traffic Sign
- Proposed Pedestrian Crosswalks
- Flagpole
- Roadway Right of Way
- Proposed Mast Arm Mounted Traffic Signal



**ALTERNATIVE 4 - FULLY ACTUATED TRAFFIC SIGNAL WITH EXCLUSIVE PEDESTRIAN PHASE AND MODIFICATIONS TO WESTBOUND NORTHBOUND & SOUTHBOUND APPROACHES**

**INTERSECTION**  
**IMPROVEMENT STUDY**  
 Main Street / Church Hill Road /  
 West Street Intersection - Newtown, CT

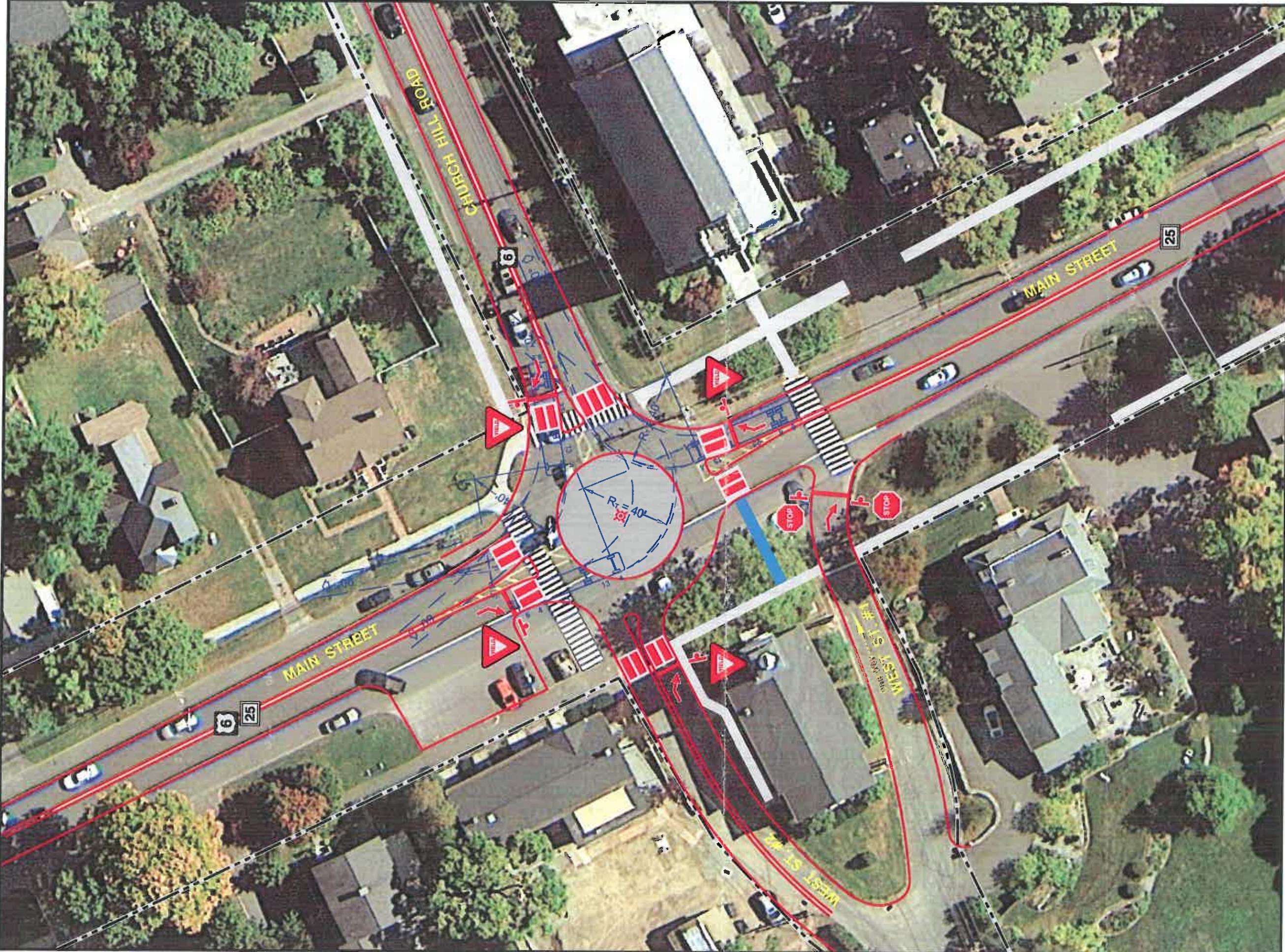
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**G5**  
 11/18/15

Scale in Feet  
 0 10 20 30 40

**LEGEND**

- Traffic Lane
- Traffic Sign
- Proposed Pedestrian Crosswalks
- Flagpole
- Roadway Right of Way
- Proposed Mast Arm Mounted Traffic Signal



**ALTERNATIVE 5 - ROUNDABOUT WITH ALTERATIONS OF TRAFFIC FLOW ON WEST STREET #2**

**INTERSECTION IMPROVEMENT STUDY**  
Main Street / Church Hill Road / West Street Intersection - Newtown, CT

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**G6**  
11/18/15

Scale in Feet  
0 10 20 30 40

- LEGEND**
- Traffic Lane
  - Traffic Sign
  - Flagpole
  - Roadway Right of Way
  - Proposed Pedestrian Crosswalks

**APPENDIX NOT INCLUDED IN THIS DRAFT**