

***Main Street (Route 9)/
Pleasant St (Route 31)
Roadway Improvement Project
(Project No. 606207)***

Spencer,
Massachusetts

Prepared for **Massachusetts Department of Transportation**

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Report Narrative

The Federal Highway Administration (FHWA) has established 13 controlling criteria as defined in 23 CFR 625, which must be adhered to when designing a roadway improvement project. The Massachusetts Department of Transportation – Highway Division (MassDOT) has adopted this policy and applies the requirements of 23 CFR 625 to all projects regardless of funding source. If any one of these criteria is not met, a design exception report is prepared requesting approval of the design.

This Design Exception Report is written in conformance with Chapter 2 of the MassDOT Project Development and Design Guide (2006).

Executive Summary

The intersection improvement project consists of the following two intersections:

1. Main Street at Maple Street; and
2. Main Street at Pleasant Street and Wall Street.

Figure 1 illustrates the project area intersections on a USGS map showing the location of the project in the Town of Spencer.

Main Street (Route 9), Maple Street and Pleasant Street (Route 31) are major corridors that provide access to downtown Spencer and surrounding towns. Route 9 is part of the National Highway System (NHS) network and is classified as a Principal Arterial; it provides east-west access through the Town of Spencer. Route 31 provides north-south access and is classified as an Urban Minor Arterial. The side streets are classified as local roadways. The roadways within the project limits are all under the jurisdiction of the Town of Spencer.

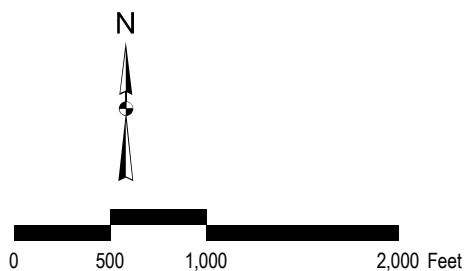
Land use in the vicinity of the project is a mix of retail, restaurant and residential uses. Downtown Spencer is located within a historic district. Several buildings and parking lots abut the back of sidewalk along both sides of the corridor.

The following summarizes the approximate daily traffic volumes for the project area:

- Main Street (Route 9): approximately 14,764 vehicle per day (vpd);
- Pleasant Street (Route 31): approximately 5,657 vpd.



Source: USGS 1982-1985



VHB Vanasse Hangen Brustlin, Inc.

Figure 1
USGS Locus Map

July 2013

Main Street (Route 9)
Transportation Improvements
Spencer, Massachusetts

Pavement conditions within the project limits reveal surface wear/ raveling, patched potholes, and block, transverse and longitudinal cracking. Pavement rutting and shoving is localized and minor indicating that pavement structure appears to not be performing adequately for the given traffic load. Pavement markings are faded and difficult to see in many areas. In addition, on-street parking and shoulder widths are not striped. Sidewalks are cracking and heaving and have been patched with hot mix asphalt in places.

In January, 2013 a Road Safety Audit (RSA) was prepared by MassDOT for Main Street (Route 9) from Elm Street to Maple Street. Based on the RSA, this intersection has averaged 14 incidents over the last three years (2009-2012), the prevalent crash type was rear-end crashes, comprising nearly half of all crashes. In addition, five of the 43 crashes happened between pedestrians and vehicles, the majority of which occurred at the unsignalized midblock crosswalk west of Mechanic Street. The RSA identified failure to yield, solar glare and “courtesy crashes” as the most common cited causes. Poor visibility for drivers departing the intersection of Main Street at Maple Street, exacerbated by the roadway alignment and downhill grade, are also likely contributing factors to these incidents.

The goal of the project is to improve traffic and roadway operations at both intersections and at driveways and intersections between these two locations while maintaining access to abutting businesses. In addition, improvements are proposed for pedestrian and bicycle accommodations and on-street parking. The following summarizes some of the improvements proposed for this project:

- Geometric modifications to improve large vehicle turning movements. This includes the realignment and reconstruction of Pleasant Street to the west to better align with Wall Street.
- Sidewalk reconstruction with improved wheelchair ramps and crosswalks for pedestrian accessibility;
- Pavement rehabilitation (mill and overlay) and minor full depth reconstruction for minor roadway widening along Main Street;
- Addition of landscape and streetscape improvements; and
- Reconstruction of two existing signalized intersections and modification of signal timings to provide a coordinated traffic control system.

The 13 controlling criteria were reviewed for the existing and proposed conditions within the project limits. Following this review, it was determined that this design exception request is for the following: (i.) lane width and shoulder width, (ii.) horizontal alignment, (iii.) vertical alignment and grade, (iv.) cross slope.

Project Location and Limits

The corridor reviewed for this design exception request extends along Main Street (Route 9) from just west of Elm Street to just east of Maple Street for a distance of approximately 1,725 feet. Figure 2 is an aerial photo that illustrates the project area intersections and the immediate surrounding area.

Existing Conditions

The existing conditions for Main Street, Pleasant Street and Maple Street within the project limits are summarized in Table 1 below.

Table 1a - Existing Conditions

	Main Street
Posted Speed	30 mph
Design Speed	25 mph
ADT (2011)*	14,764 vpd
ADT (2031)*	15,909 vpd
Existing Travel Lane Width	12-17 feet
Number of Lanes	3 (1 travel lane in each direction; 1 turning lane)
Existing Usable Shoulder Width	Not striped and on-street parking exists

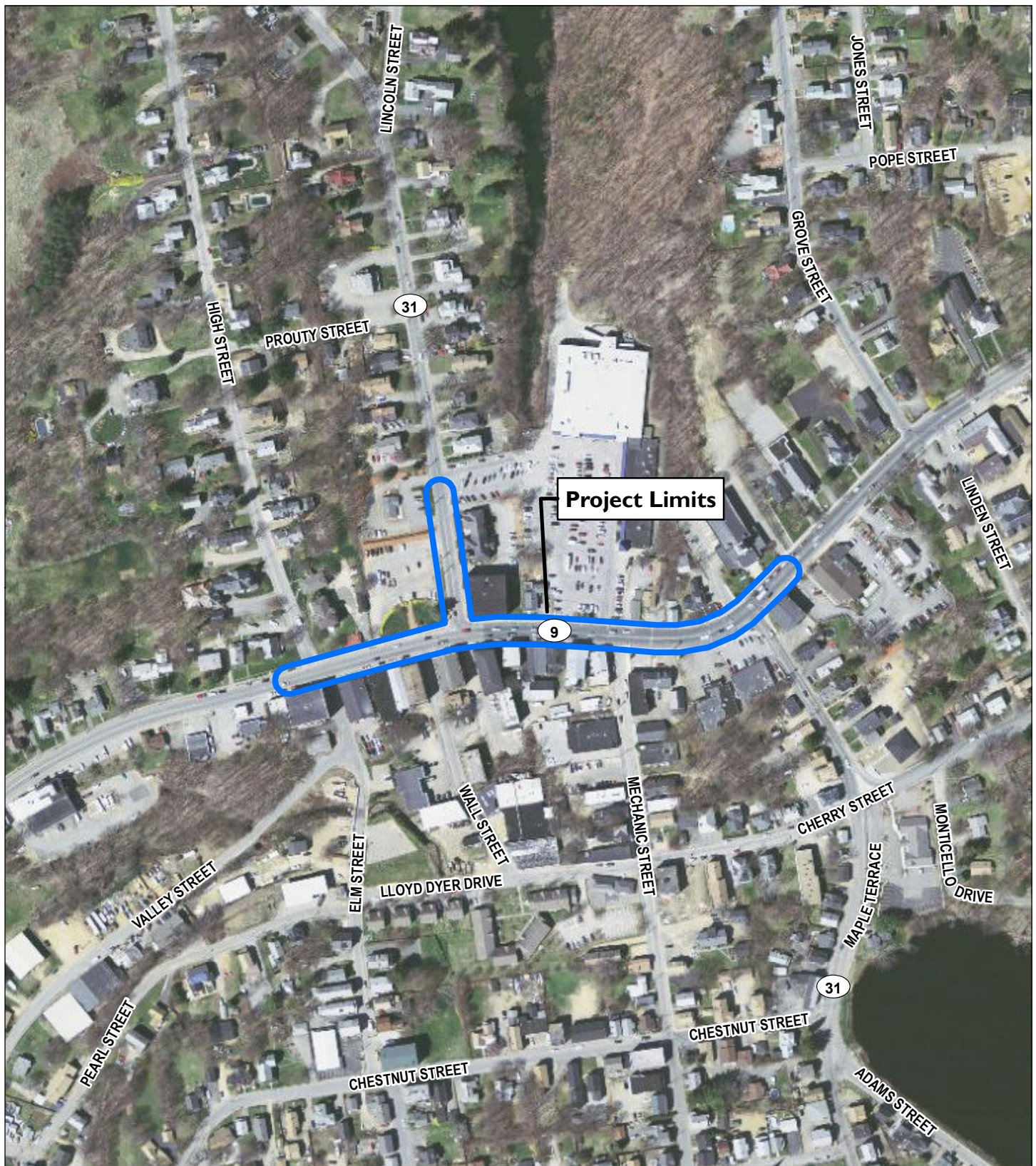
Table 1b - Existing Conditions

	Pleasant Street
Posted Speed	30 mph
Design Speed	30 mph
ADT (2011)*	5,657 vpd
ADT (2031)*	6,096 vpd
Existing Travel Lane Width	14-16 feet
Number of Lanes	2 (1 travel lane in each direction)
Existing Usable Shoulder Width	Not striped

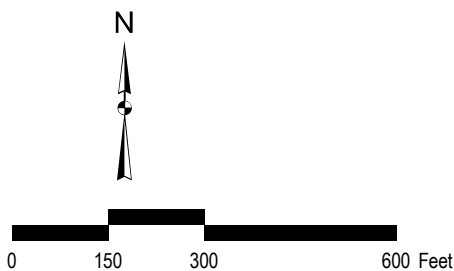
Table 1c - Existing Conditions

	Maple Street
Posted Speed	25 mph
Design Speed	30 mph
ADT (2011)*	N/A
ADT (2031)*	N/A
Existing Travel Lane Width	12 feet
Number of Lanes	2 (1 travel lane in each direction)
Existing Usable Shoulder Width	Not striped

* ADT based on Traffic Data collected by Innovative Data, LLC April 2011



Source: USGS 2009



VHB Vanasse Hangen Brustlin, Inc.

Figure 2
Aerial Locus Map

July 2013

Main Street (Route 9)
Transportation Improvements
Spencer, Massachusetts



Main Street (Route 9) at Maple Street (Route 31)

The intersection of Main Street and Maple Street currently form a four-way signalized intersection, including Municipal Drive. The current configuration results in an offset intersection between Municipal Drive and Maple Street. There are sidewalks located on both sides of Main Street and Maple Street. There are crosswalks at all four legs of the intersection. Main Street, a three lane roadway east of Maple Street, is two travel lanes and a left turn lane onto Maple Street. The travel lane widths range from approximately 12-feet to 18-feet, with the eastbound travel lane being the widest. This eastbound lane on-street parking is prohibited to accommodate a bus stop. The cross-section of Main Street west of Maple Street consists of two travel lanes and a right turn lane onto Maple Street. The lane widths range from approximately 12-feet to 24-feet, with the westbound travel lane being the widest. On-street parking is prohibited in this area as well.

A field visit was conducted to inventory existing traffic signal equipment. It was determined that the loops are no longer functioning properly, as a result the traffic signal operates in a pre-timed manner. Vehicle signal heads are a combination of post-top mounted and overhead with 12" circular L.E.D. indications. Pedestrian signal heads are outline style. Pedestrian push buttons are present but only one of four conforms to the latest ADA/AAB requirements. The traffic signal equipment is antiquated. Signal heads have back plates, but are not louvered and can be difficult to see when traveling westbound in the evening.



Main Street at Pleasant Street /Wall Street

At this location, Main Street is intersected by Pleasant Street (Route 31) from the north, Wall Street from the south and a commercial driveway from the south forming a 5-leg offset intersection. Wall Street intersects Main Street from the south and is offset from Pleasant Street by approximately 60-feet. Pleasant Street (Route 31) is an Urban Minor Arterial, while Wall Street is classified as a local roadway. The intersection is currently signalized.

The Main Street eastbound approach begins as a single wide lane before transitioning to a short two-lane segment with a dedicated left-turn lane between Wall Street and Pleasant Street. The Main Street westbound approach consists of a shared left-turn and through lane with an exclusive right-turn lane. The Pleasant Street southbound approach consists of a single general purpose travel lane. Wall Street consists of a single lane with movements restricted to left turns only. The northbound commercial driveway approach consists of a single lane restricted to right-out only. Wall Street and the commercial driveway are marked with stop bars but otherwise have no other pavement markings.

This intersection was also part of the same RSA conducted by MassDOT.

The following lists some of the observations that were made during the RSA:

- Signal Visibility: a number of safety issues relating to signal equipment and visibility were reviewed, including: back plates are not present and there are no louvers
- Alignment: Pleasant Street and Wall Street have a poor alignment from each other.
- Emergency Pre-emption: emergency pre-emption is not present at this location.
- Bicycle Accommodations: existing shoulder widths are not striped and are insufficient for bicycle travel on all roadways.

The traffic signal operates in a pre-timed manner since the loops are no longer operating. Pedestrian signal heads are outline style. Pedestrian push buttons are present and do conform to the latest ADA/AAB requirements. The traffic signal equipment is antiquated.

Additionally, several alternatives were originally considered for improving operations and safety at this intersection. Through working sessions with the Town of Spencer and MassDOT District 3 personnel, the option of retaining the current geometry was eliminated due to the extensive crash history and poor operations at the traffic signal. A roundabout would have required more than one circulating lane to achieve an acceptable level of service, and was hence eliminated due to the lack of available Right-of-Way, the presence of buildings on three of the four corners and a major grade change on the fourth corner.



Functional Classification

MassDOT classifies Main Street as a Principal Arterial. Maple Street and Pleasant Street are Urban Minor Arterials. Mechanic Street, Wall Street, Elm Street and High Street are local roadways. Main Street is further classified in the National Highway System (NHS) as an "NHS-Other Route". All roadways within the project limits are owned and maintained by the Town of Spencer.



Roadway Character and Transportation Demands

Main Street is an east/west roadway and Maple Street and Pleasant Street are both north/south roadways. In addition to the two signalized intersections, there are three side streets that intersect the study area corridor, including: High Street, Elm Street, and Mechanic Street. There are also seven driveways located on Pleasant Street and 18 driveways that

intersect Main Street within the project area, and all of these driveways serve businesses or residences that are adjacent to the corridor. The following Table 2 provides a summary of the traffic volumes observed within the project area. Observed traffic volumes are reported by direction.

Table 2 - Observed Variations of Traffic Volumes

Location	Direction	Daily ¹	Commuter Hours ³	
		Weekday	AM Peak	PM Peak
Main Street, east of Mechanic St	Eastbound	7,275	675	370
Main Street, east of Mechanic St	Westbound	7,400	380	565
Maple Street, south of Main St	Northbound	2,350	265	245
Maple St, south of Main St	Southbound	2,250	145	200
Mechanic St, south of Main St	Southbound	16,685	60	95
Pleasant St, north of Main St	Northbound	2,890	135	310
Pleasant St, north of Main St	Southbound	2,775	255	245
Wall St, south of Main St	Northbound	370	35	45
Wall St, south of Main St	Southbound	170	15	20

Source: Hourly traffic volumes for Main Street, Pleasant Street and Wall Street were obtained from Automatic Traffic Recorder (ATR) Counts conducted in April 2011. Commuter hour traffic volumes were obtained from Turning Movement Counts (TMCs) conducted in April 2011. All data was collected by Innovative Data, LLC for VHB and was rounded using the basic hourly report summaries from the traffic data.

Notes: Peak hour volumes reported in the table above may not coincide with the turning movement peak hours that are reported in this FDR.

1 average daily traffic volume expressed in vehicles per day

2 volumes expressed in vehicles per hour and report low, high and average hourly traffic volumes (by direction) between 7:00 AM and 7:00 PM.

3 volumes expressed in vehicles per hour and report commuter peak hour traffic between 7:00 AM – 9:00 AM (AM Peak) and between 4:00 PM – 6:00 PM (PM Peak).

Existing Lane and Shoulder Width

The following summarizes the roadway characteristics of the project area:

Main Street:

- Pavement Width: varies between 38 and 52-feet; and
- Cross Section: varies but typically consists of 12-foot travel lanes, 12-foot turning lanes, and a wider travel lane/parking lane/unstriped shoulder.

Maple Street:

- Pavement Width: approximately 24-feet; and
- Cross Section: two 12-foot travel lanes, no shoulders or on-street parking.

Pleasant Street:

- Pavement Width: varies between 28 and 32-feet; and
- Cross Section: one 14-foot travel lane and one 14 to 18-foot travel lane, no shoulders or on-street parking.



Description of Surrounding Area

Land use in the project area is primarily retail, commercial and residential. Many of the businesses along Main Street are located at the back of sidewalk. In some cases the sidewalk is level with the entrances to the buildings, however many businesses have stairs or a second tier of granite curb and sidewalk. There are a several businesses located on Main Street within the project area, including a few restaurants, Price Chopper and Whitco. The public library is located on Pleasant Street approximately 200-feet from the intersection of Main Street. The Town Hall is located at 157 Main Street which is within the easterly project limits. This portion of Main Street is a Historic District.



Speeds

ATRs collected on Main Street and Pleasant Street included speed information. According to the ATR data, the 85th percentile speed on Main Street east of Mechanic Street is 28 mph eastbound and 28 mph westbound. The posted speed limit for this section of Main Street corridor is 30 mph. On Pleasant Street, the 85th percentile speed, north of the Price Chopper driveway is 37 mph northbound and 35 mph southbound. The posted speed limit for Pleasant Street is 30 mph in both directions.

While speed data was not collected on Maple Street, the posted speed is 25 mph in both directions. The short section of this roadway that is included as part of the project limits, has been designed to meet existing conditions.



Right-of-Way

The following summarizes the roadway characteristics of the project area:

Main Street:

- Right-of-Way: varies between 54 and 76-feet

Pleasant Street:

- Right-of-Way: varies between 41 and 46-feet

Maple Street:

- Right-of-Way: approximately 33-feet



Crash data

To identify crash trends, VHB reviewed the most current crash data for the project area intersections utilizing data obtained from the Spencer Police Department for the years 2009 through 2012.

Table 3 summarizes the reported crashes for the two intersections.

A collision diagram was prepared for MassDOT as part of the Road Safety Audit. A copy of the collision diagram has been included in Attachment C.

Table 3 - Project Area Intersection Crash Summary

	Main Street at Maple Street	Main Street at Pleasant Street
Year		
2009 ^a	1	0
2010	6	2
2011	5	5
<u>2012^b</u>	<u>1</u>	<u>3</u>
Total	13	10
Annual Average	3.25	2.5
Collision Type		
Angle	2	3
Rear-end	8	7
Sideswipe, same direction	1	0
<u>Single vehicle crash</u>	<u>2</u>	<u>0</u>
Total	13	10
Crash Severity		
Non-fatal injury	2	0
<u>Property damage only (none injured)</u>	<u>11</u>	<u>10</u>
Total	13	10
Time of Day		
Weekday, 7:00 AM - 9:00 AM	2	1
Weekday, 4:00 PM - 6:00 PM	4	2
Saturday, 11:00 AM - 2:00 PM	0	0
Weekday, other time	5	2
<u>Weekend, other time</u>	<u>2</u>	<u>5</u>
Total	13	10
Pavement Conditions		
Dry	10	10
<u>Wet</u>	<u>3</u>	<u>0</u>
Total	13	10
Non Motorist (Bike, Pedestrian)		
Total	1	0
MassDOT Crash Rate	0.65	0.37

Source: Town of Spencer Police Department.

a data reflects crashes recorded from June 15, 2009 to December 31, 2009

b data reflects crashes recorded from January 1, 2012 and June 15, 2012

The 2013 official statewide crash rate is 0.80 for signalized intersections. The Town of Spencer is located within District 3 and the 2010 crash rate for District 3 is 0.89 for signalized intersections.

Using standard MassDOT formulas, Table 4 summarizes the crash rates, in the unit of crashes per million entering vehicles, calculated for the project area intersections.

The Main Street at Pleasant Street and Wall Street calculation uses the 10 crash incidents as reported by the Spencer Police Department over a four year period and results in a crash rate below the statewide and District rate. The Main Street and Maple Street calculation uses the 13 crash incidents from 2009 through 2012; the resulting crash rate is slightly lower than both the State and District average.

Table 4 - Intersection Crash Rates

Intersection	Crash Rate ¹
Main Street at Pleasant Street/Wall Street	0.37
Main Street at Maple Street	0.65

Source: MassDOT and City crash data

1 The MassDOT Crash Rate Worksheets are included in the Appendices



Environmental Factors

There are no regulated resource areas within the immediate vicinity of the project that will require any environmental permitting. No floodplain, endangered species, wetlands, critical stormwater areas, or areas of critical environmental concern have been identified within the project area.

Transportation improvement projects where proposed widening of the road is less than a single lane are considered redevelopment projects. As a result, DEP Stormwater Management Guidelines must be met to the extent practicable. Deep sump catch basins are proposed, which will provide some treatment for stormwater runoff.



Cultural Resources

The segment of Main Street located within the project limits is an Historic District. Four historic markers have been identified within the project limits, and will be removed and reset as part of this project. Two of the monument locations shall be slightly adjusted due to the proposed realignment of Pleasant Street.



Accessibility

There are currently sidewalks on both sides of the Main Street and on the east side of Pleasant Street. Wheelchair ramps and crosswalks are provided; however, not all are compliant with the current ADA/AAB regulations. Bicycle accommodations are not provided. The existing roadway cross section consists of one wide travel lane in each direction; the parking lane and shoulders are not striped.



Need

In order to meet minimum requirements for NHS designated roadways, and to accommodate bicycles and on-street parking on one side of the street, a minimum roadway width of 47-feet is required for each direction on Main Street; not including turning lanes near intersections which increases the necessary width to 59-feet. This includes two 12-foot travel lanes, and two 8-foot shoulders and a 7-foot parking lane. An additional 12-foot turning lane would be necessary at intersections.

In addition, existing vertical alignment on Main Street does not currently meet 30 MPH design speed requirements for minimum stopping sight distance. While vertical realignment is necessary to meet these requirements, the proposed design attempts to maintain or improve existing conditions. It is noted that the vertical geometry which is not met is at a signalized intersection. Therefore, it is anticipated that vehicles will be arriving at a slower rate of speed since they will be entering a conflict area, or intersection. Moreover, new mast arms and signage are proposed to improve visibility for the motorist.

Proposed Improvements



Main Street (Route 9) at Maple Street (Route 31)

Proposed geometric improvements at this intersection are as follows:

- Widen the Main Street westbound leg to provide 5 foot shoulders on both the approach and departure lanes.
- Widen the Main Street eastbound leg to provide a 5 foot eastbound bicycle lane and a 5 foot shoulder in the westbound direction.
- Provide new sidewalks and wheelchair ramps to meet current ADA/AAB access standards at the intersection.
- Proposed milling and pavement overlay along with full-depth widening at the intersection.

Improvements to traffic control will be necessary due to the proposed geometric changes and to accommodate future traffic volumes, and to provide safe and efficient traffic operation at this intersection. These traffic control improvements are as follows:

- Fully-reconstruct the traffic signal system and provide timing for peak hour volume requirements to control all movements at this intersection.
- Provide split phasing for Maple Street and the Municipal driveway.
- Provide an eastbound right-turn overlap during the Maple Street northbound movement.
- Provide time of day coordination with the intersection of Main Street at Pleasant Street/ Wall Street.
- Provide concurrent pedestrian phasing via push-button actuation.
- Provide emergency vehicle pre-emption on all approaches.
- Upgrade signage and pavement markings to meet with the proposed design.

Through the implementation of protected phasing for the northbound left-turn movement, with the associated eastbound right-turn overlap phasing, vehicle queues will be reduced when compared to the existing condition. The reduced queues, as well as the presence of an eastbound bicycle lane and 5 foot shoulders will improve bicycle mobility.

Horizontally and vertically, the Main Street alignment will be modified to meet 30 MPH design speed requirements, except for design exceptions requested herein.

Impacts to abutters and adjacent businesses will be minimized and the roadway will remain within the existing layout. The typical section for Main Street will have two 11-foot lanes, a 5-foot shoulder, and a 7-foot parking lane. In addition, a 6-10 foot sidewalk and/ or grass belt is included. While 8-foot shoulders are required since Main Street is part of the NHS network, the Town wants to maintain on-street parking for adjacent businesses.

The project also includes full depth pavement construction in widened areas, mill and overlay, roadway realignment, granite curbing, minor drainage system improvements, pavement markings, signage, minor landscaping and other incidental items. Right of way impacts are limited to temporary construction, utility easements and permanent easements that will need to be secured by the Town of Spencer.

Main Street at Pleasant Street/Wall Street

Proposed geometric improvements at this intersection are as follows:

- Realign Pleasant Street such that it intersects Main Street opposite Wall Street to form a more traditional intersection.
- Provide one exclusive left-turn lane and one shared through-right lane on Pleasant Street.
- Provide a channelized right-turn island for vehicles making the westbound right-turn movement from Main Street onto Pleasant Street.
- Provide a better defined exclusive left-turn lane using pavement markings on Main Street eastbound.
- Provide new sidewalks and wheelchair ramps to meet current ADA/ AAB access standards at the intersection.
- Proposed milling and pavement overlay along with full-depth widening at this intersection.

Improvements to traffic control will be necessary to accommodate future traffic volumes, and to provide efficient traffic operation at this intersection. These traffic control improvements are as follows:

- Reconstruct the existing signalized intersection with appropriate timing and phasing for peak hour volume requirements to control all movements at this intersection.
- Provide coordination with the proposed traffic signal at Main Street and Maple Street.
- Provide protected-permissive left turn phase for the Main Street eastbound approach.
- Install pedestrian crosswalks across the Main Street westbound, Pleasant Street and Wall Street approaches and provide concurrent pedestrian phasing.
- Upgrade existing signs and pavement markings to meet with the proposed design.
- Provide emergency vehicle pre-emption on all approaches.

Currently right-turn movements are restricted at Wall Street, so vehicles seeking to turn right onto Main Street must navigate through the commercial driveway currently located across from Pleasant Street. With the realignment of Pleasant Street with Wall Street the turning movements from Wall Street are no longer restricted and the commercial driveway is no longer included as part of the signalized intersection. This realignment provides a safer means of access to/ from the residential neighborhood to the south.

The typical section for Pleasant Street will have four foot shoulders and 11-foot travel lanes. Near the intersection of Main Street, an additional 11-foot left turning lane will be provided for the eastbound direction. In addition, a 6-foot sidewalk has been included on the easterly side of Pleasant Street.

Main Street east of Pleasant Street will have a two foot shoulder adjacent to the 11-foot right turn lane, two 11-foot travel lanes, a 5-foot shoulder, and a 7-foot parking lane or bus lane. In addition, a 6-11 foot sidewalk and/ or grass belt is included on both sides.

Main Street west of Pleasant Street will have a two foot shoulder, two 11-foot travel lanes, a 10-foot turning lane, and a 11-foot eastbound travel lane with a 5-foot shoulder, and a 7-foot parking lane. In addition, a 6 foot sidewalk is included on both sides.

A significant Right-of-Way alteration is required to accommodate the realigned geometry of Pleasant Street. In addition, minor Right-of-Way alterations will be required on each corner of the intersection and along Main Street to accommodate the proposed traffic signal equipment, sidewalks and wheelchair ramps.

Discussion of Design Exception



Shoulder Width and Lane width

Proposed

Within the NHS portion of the Project, Main Street (Route 9) shall provide a minimum of 5-foot wide shoulders wherever possible. Two foot shoulders and sharrows are proposed where tying into existing at the westerly project limits and at the right turn lane onto Pleasant Street. Eleven foot travel lanes and ten foot turning lanes are provided along Main Street. Figures 3-1, 3-2, and 3-3 illustrate the preferred design.

Desirable and Minimum Standards

The minimum requirements for shoulder and lane widths for non-3R roadways within the National Highway System are 12-foot wide travel lanes and 8-foot wide shoulders. Also, the minimum shoulder and lane width for Arterials in non-NHS areas are 11-foot lanes and 4-foot shoulders (to meet bicycle accommodation).

Justification For Change

On-street parking currently exists within the limits of this project area, and mostly located on the southerly side of the corridor and between westerly project limits and Mechanic Street. The commercial buildings in this area abut the back of the sidewalk. This limits the space for widening to accommodate eight foot shoulders and on-street parking. These businesses rely on the on-street parking for their patrons, and one of the Town's goals for this project is to maintain and enhance on-street parking along with pedestrian access. Eliminating the parking would cause abutters and the public to oppose the project. It is also important to note that this is a historic district, so there eliminating or altering existing structures would have cultural and historic impact.

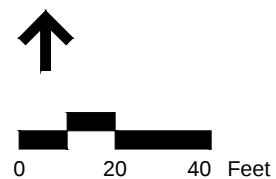
Providing 8-foot shoulders and maintaining on-street parking, while improving traffic flow, safety and access along the corridor, would require the project to remove buildings between Wall Street and Mechanic Street. Purchasing and demolishing these buildings would force the businesses occupying these structures to move, which would have a negative impact on the downtown area and the economy of Spencer. Eliminating the parking and providing eight foot shoulders alone would likely result in illegal on-street parking or create opportunities for vehicles to bypass queued vehicles during peak periods, which in return would create unsafe conditions along this corridor and at each of the project area intersections. Since relocating businesses would have significant social and financial impacts to the community, providing eight foot shoulders is not practicable for this project.

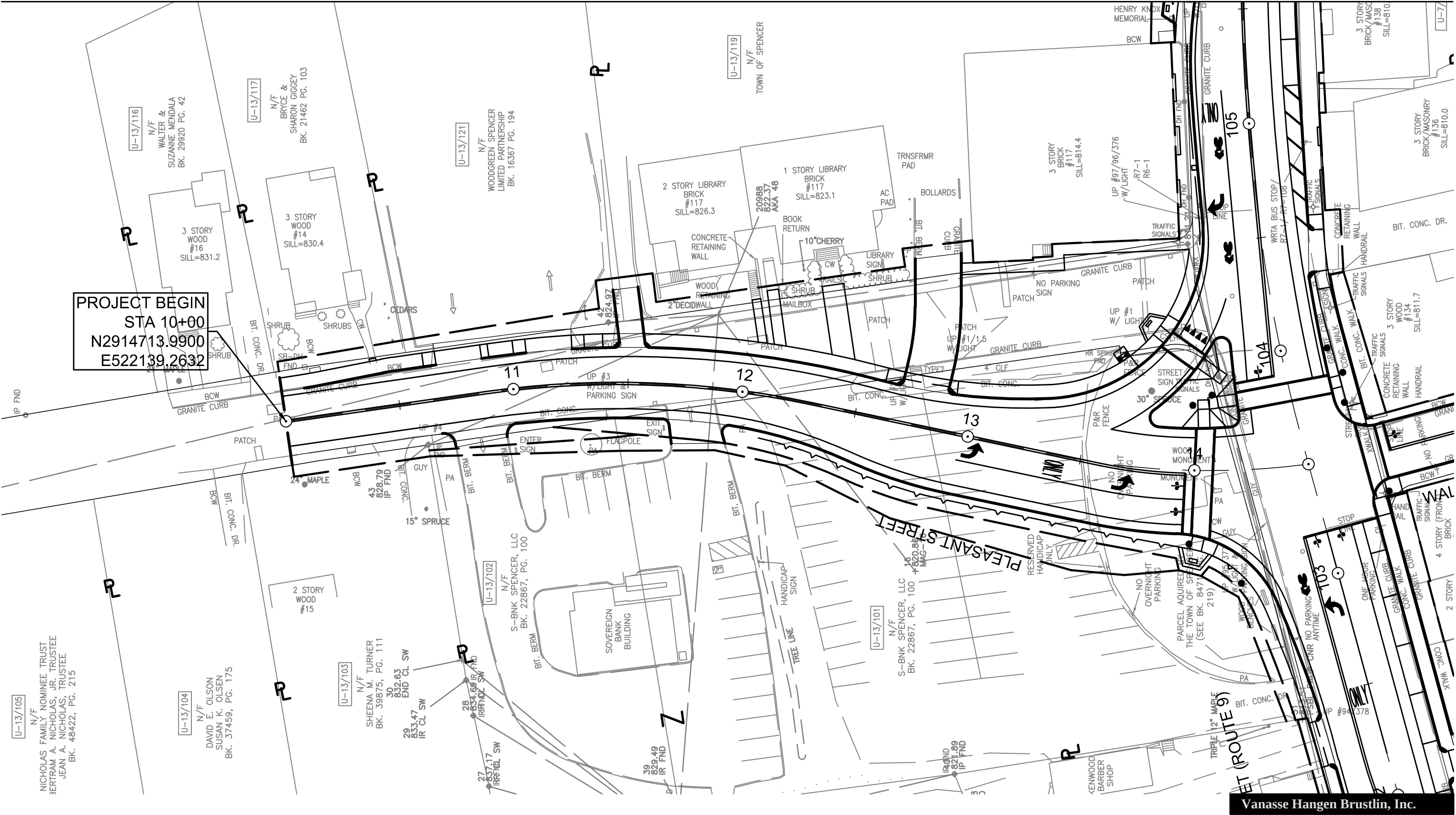
A concept providing 8-foot shoulders and on-street parking has been prepared and is illustrated in Figures 4-1 and 4-2. Providing both on-street parking and eight foot

shoulders would require eliminating abutting buildings. Due to right of way acquisitions, building demolition and full depth reconstruction, the project cost would increase to approximately \$6,860,000. The monetary cost does not reflect the cultural and historic issues created by removing these buildings. Nor does it address economic concerns resulting from displacing the businesses currently occupying these structures.

A concept illustrating 8-foot shoulders and no on-street parking has been prepared and is shown in Figures 5-1 and 5-2. The inclusion of eight foot shoulders and twelve foot travel lanes to meet NHS guidelines but not provide on-street parking would result serious impacts to the adjacent businesses and potentially prevent the project from moving forward.

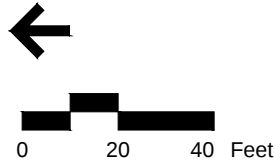
Figure 3-1
Spencer
Main Street (Route 9)
Proposed Design

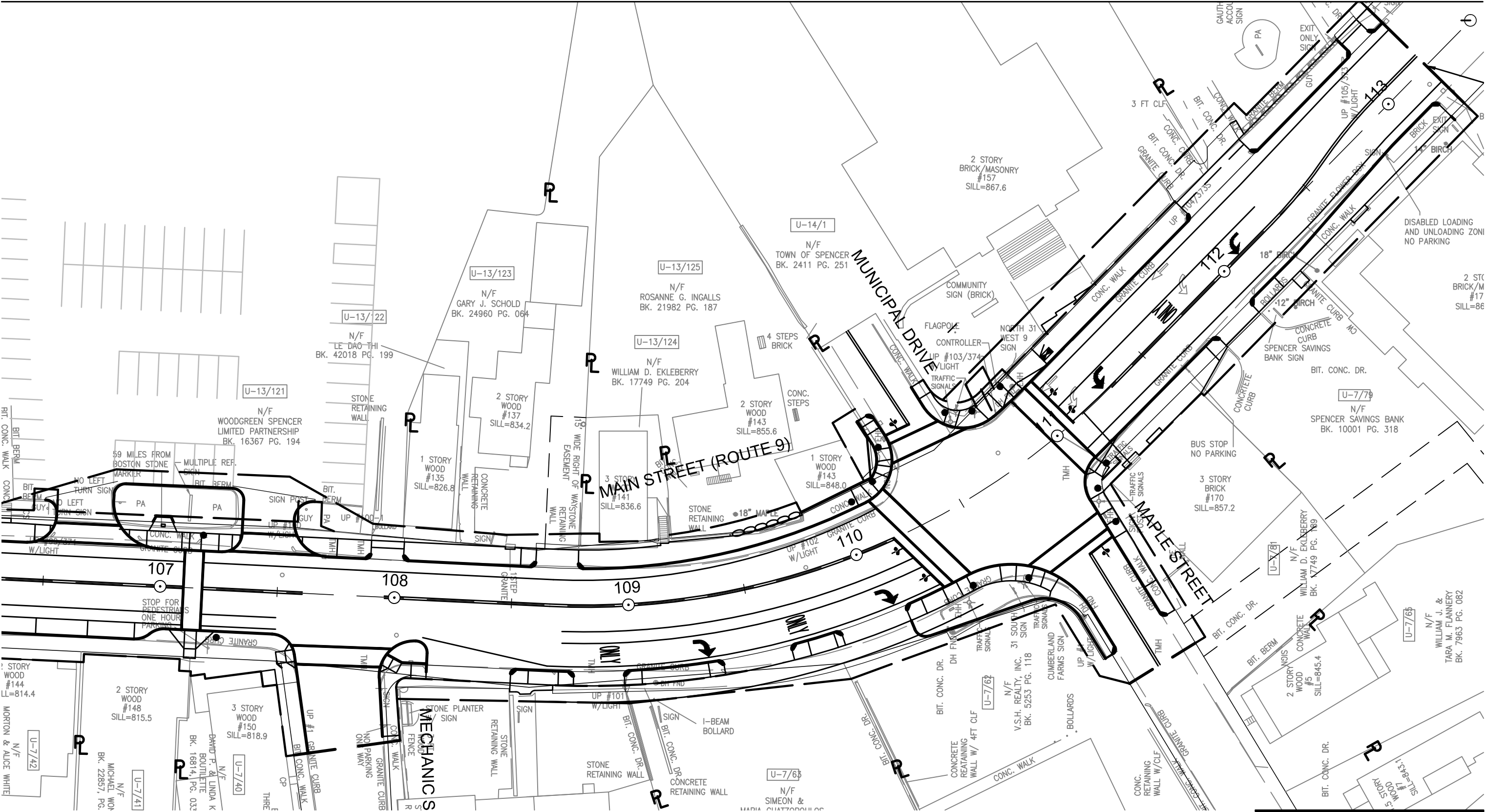




Vanasse Hangen Brustlin, Inc.

Figure 3-2
Spencer
Main Street (Route 9)
Proposed Design

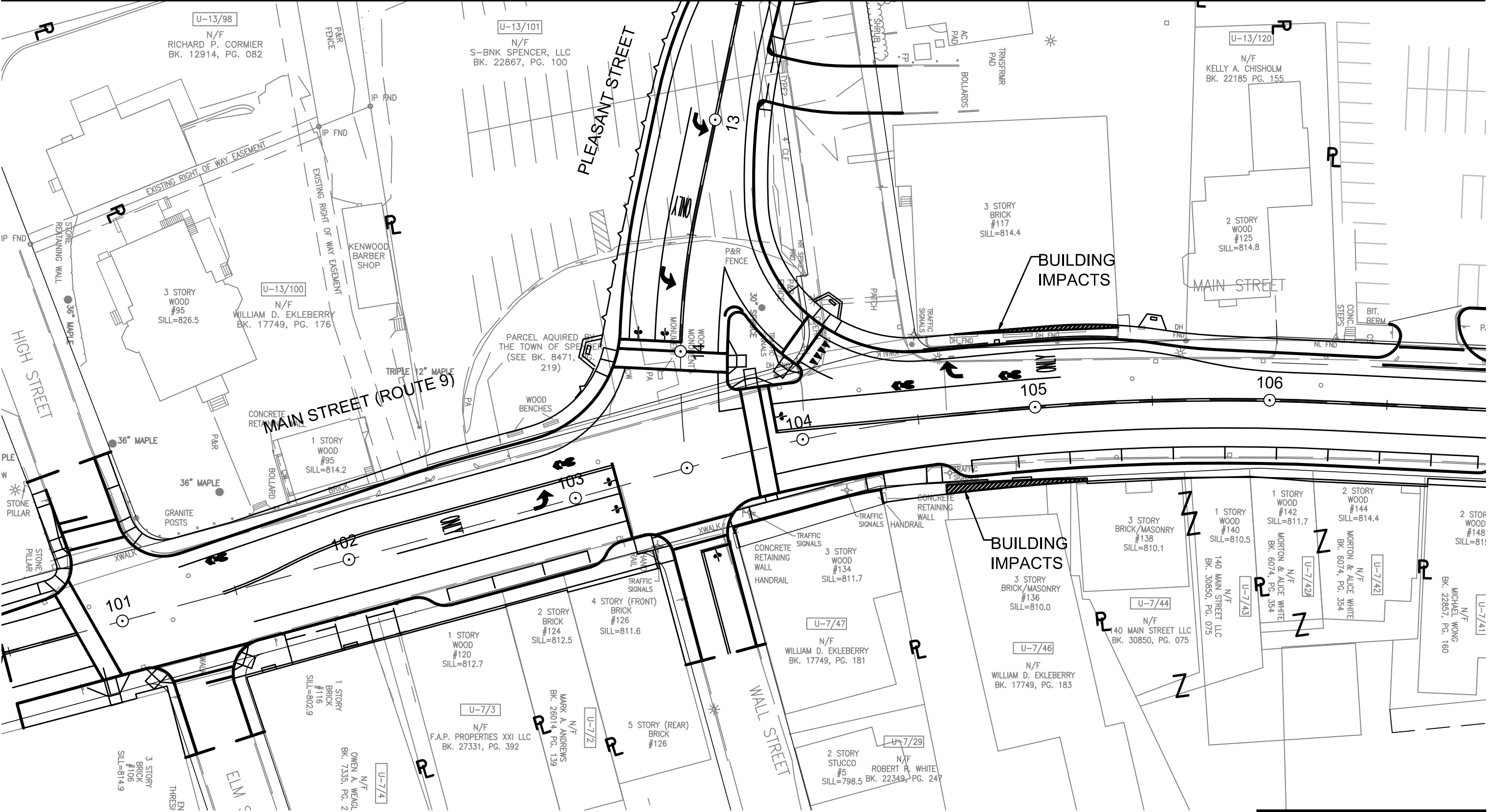




Vanasse Hangen Brustlin, Inc.

Figure 3-3
Spencer
Main Street (Route 9)
Proposed Design

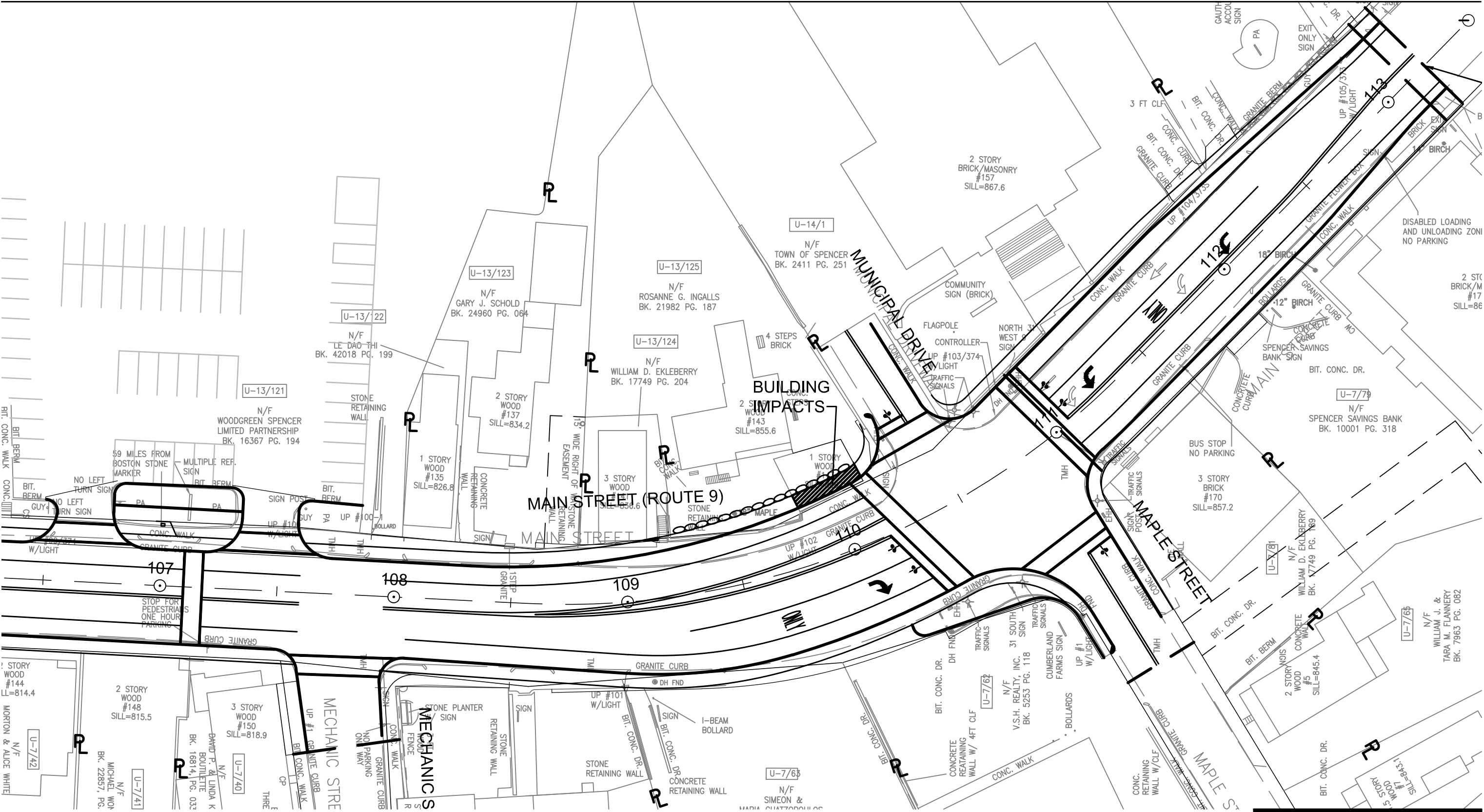
October 2013



Vanasse Hangen Brustlin, Inc.

Figure 4-1 October 2013

Spencer
Main Street (Route 9)
NHS Concept
Alternative - On-Street Parking



Vanasse Hangen Brustlin, Inc.

Figure 5-2 October 2013

Spencer
Main Street (Route 9)
NHS Concept
Minimum



Horizontal Alignment

Proposed

A Design Exception is also being requested for the horizontal curve length for the curves summarized in Table 5.

Table 5 - Horizontal Curve Length

Station	Vicinity of Curve	Radius	Length
103+59.16	Main Street (at Wall Street)	700-feet	103.44
104+62.60	Main Street (at Pleasant Street)	1000-feet	165.58
108+66+44	Main Street (east of Mechanic Street)	315-feet	265.64
10+86.94	Pleasant Street (north of Main Street)	410-feet	143.55
13+37.00	Pleasant Street (at Main Street)	335-feet	112.78

Desirable and Minimum Standards

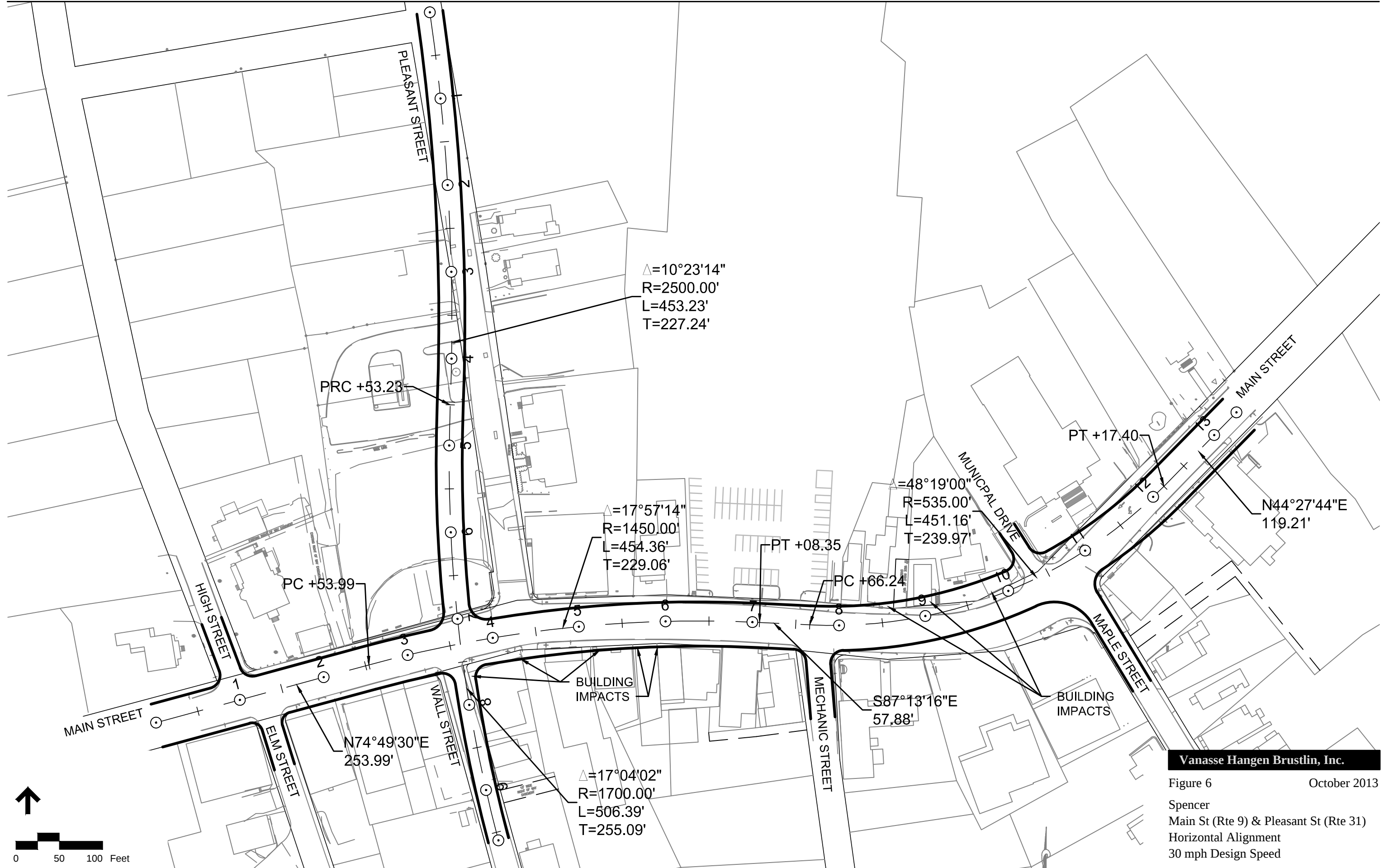
The minimum curve length requirement is $15V$ where V is the design speed. The design speed is 30 MPH; therefore, the minimum curve length is 450-feet and the minimum curve radius is 335-feet.

Justification For Change

Figure 6 illustrates a centerline alignment that would be needed to meet the desirable curve length ($L=450'$). As it can be seen, increasing the length and radius of this curve will have significant impact to adjacent properties and would require the Town to acquire and demolish at least seven buildings.

Improving this alignment would increase the cost of the project significantly due to property impacts, building demolition and full depth reconstruction. Those Right of way and demolition costs would be borne by the Town of Spencer. The total project cost would be approximately \$6.57 million.

As previously stated, the project is located within an historic district, so in addition to the increased Right of Way and construction costs, impacts would raise historic and cultural issues.



Vanasse Hangen Brustlin, Inc.

Figure 6
October 2013
Spencer
Main St (Rte 9) & Pleasant St (Rte 31)
Horizontal Alignment
30 mph Design Speed



Vertical Alignment

Proposed

A Design Exceptions is also being requested for the vertical profile on Main Street (Route 9) corridor. The preferred design follows the existing profile which does not meet the standard for the minimum and maximum grades or the minimum K value for sag curves. Figure 7 shows the preferred option.

Desirable and Minimum Standards

Table 6 summarizes MassDOT's recommended grades and K values versus the proposed design. This table represent a range of the cross slopes within the project area that does not meet the MassDOT recommendations.

Table 6 - Vertical Alignment

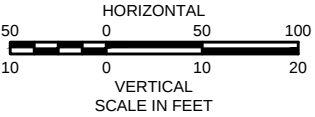
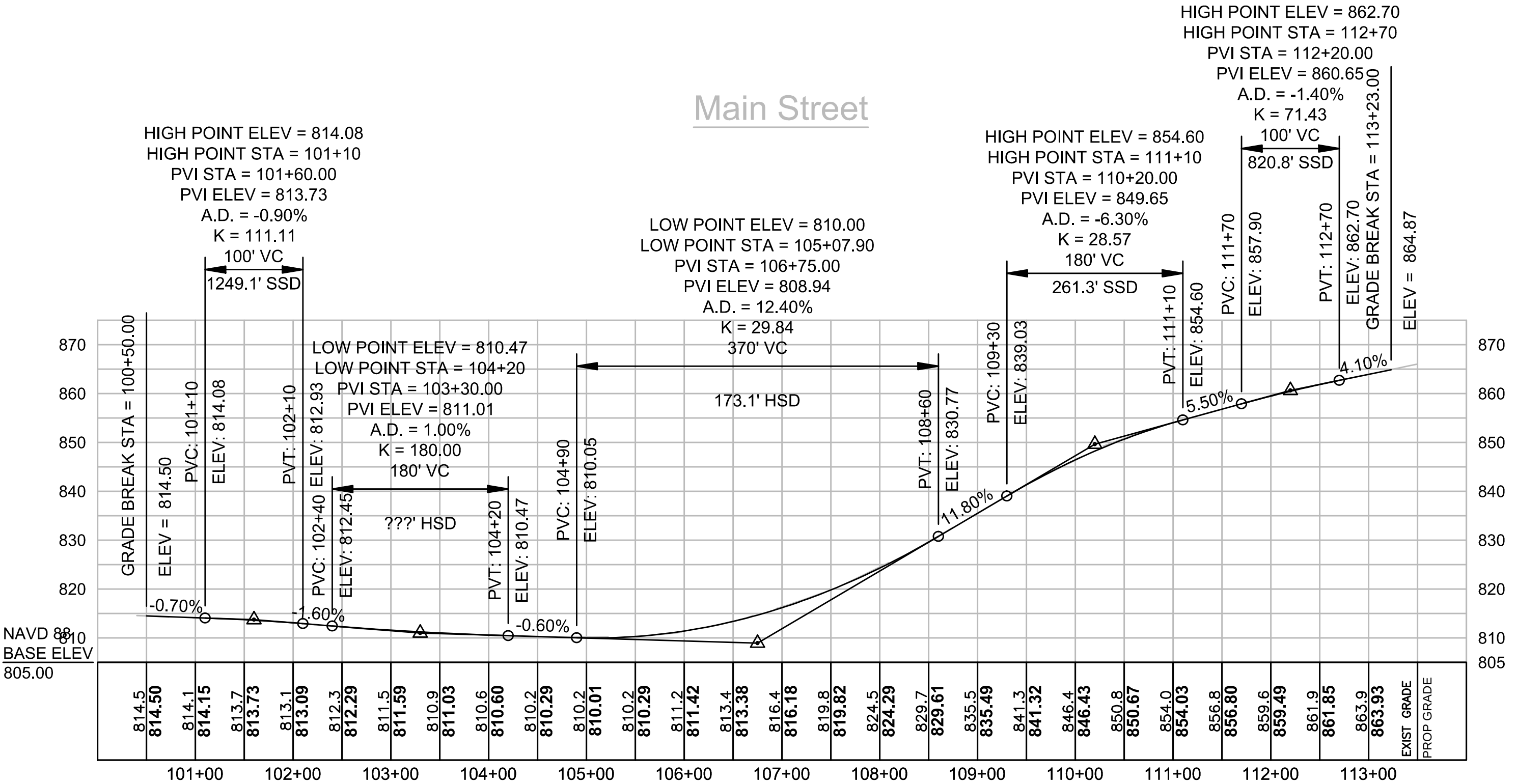
MassDOT's Recommended Design	Proposed Design
Maximum Grade – 9%	Maximum Grade – 11.8%
Minimum Grade – 0.6%	Minimum Grade – 0.6%
K Sag Curve – 37 (for 30mph design speed)	K Sag Curve – 29.85

Justification For Change

The work on Main Street (Route 9) consists of pavement milling and overlay with minimal full-depth widening. The proposed design attempts to maintain the roadway profile within the limit of work. The area where maximum grade is exceeded is located near the signalized intersection of Maple Street and Main Street. The minimum grade is located at the existing signalized intersection of Pleasant Street and Main Street. The deficient sag curve connects these two tangents. The proposed sag curve K value does meet minimum criteria for a 25 mph design speed. The observed speeds in the area of concern are less than 30 mph. In order to provide a proposed profile that meets the design criteria for a 30 mph design speed significant changes in profile elevation are required, refer to Figure 8. The significant cuts and fills (maximum of 1.6 feet of cut and 3 feet of fill) results in approximately 60% of Main Street needing full-depth reconstruction. Moreover, it is imperative to maintain access to the businesses located in the buildings abutting Main Street. The significant changes in grade at the back of walk would require interior renovations since there is insufficient space to provide stairs and an ADA compliant sidewalk on the exterior the impacted buildings. Determining the feasibility and costs of renovating these buildings is not possible at this time. If access cannot be maintained to the businesses occupying the structures, these buildings are rendered essentially useless. In the event renovations are not feasible, the seven impacted buildings must be acquired and demolished. The proposed project currently has an estimated

construction cost (without ROW) of approximately \$3.7 million. Including additional full-depth reconstruction on Main Street and the demolition of the affected buildings the resulting project construction cost would be approximately \$5.08 million. ROW acquisition would cost an additional \$3.27 million.

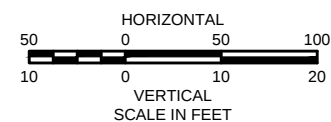
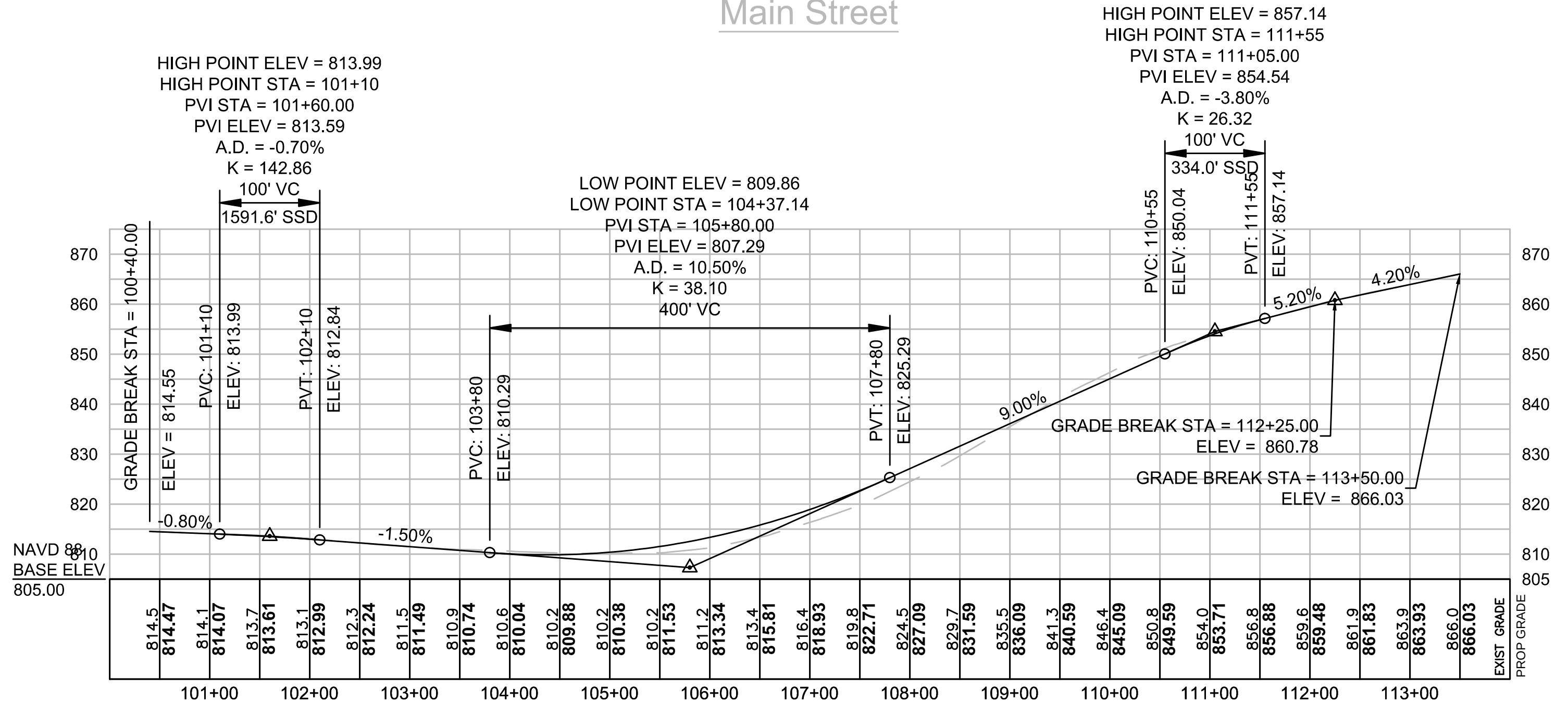
Main Street



Vanasse Hangen Brustlin, Inc.

Figure 7
October 2013
Spencer
Main Street (Route 9)
Profile - 25 mph Design Speed
Preferred Design

Main Street



Vanasse Hangen Brustlin, Inc.

Figure 8

October 2013

Spencer

1
Main Street (Route 9)

Profile - 30 mph Design Speed

Minimum Design



Cross Slope

Proposed

Additional Design Exceptions are being requested for cross slopes within the Main Street (Route 9) corridor. There are numerous areas where the existing cross slope exceeds the maximum cross slope of 2%. Figures 10-1, 10-2 and 10-3 illustrate critical sections within the project limits which indicate the non-compliant cross slopes.

Desirable and Minimum Standards

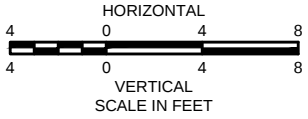
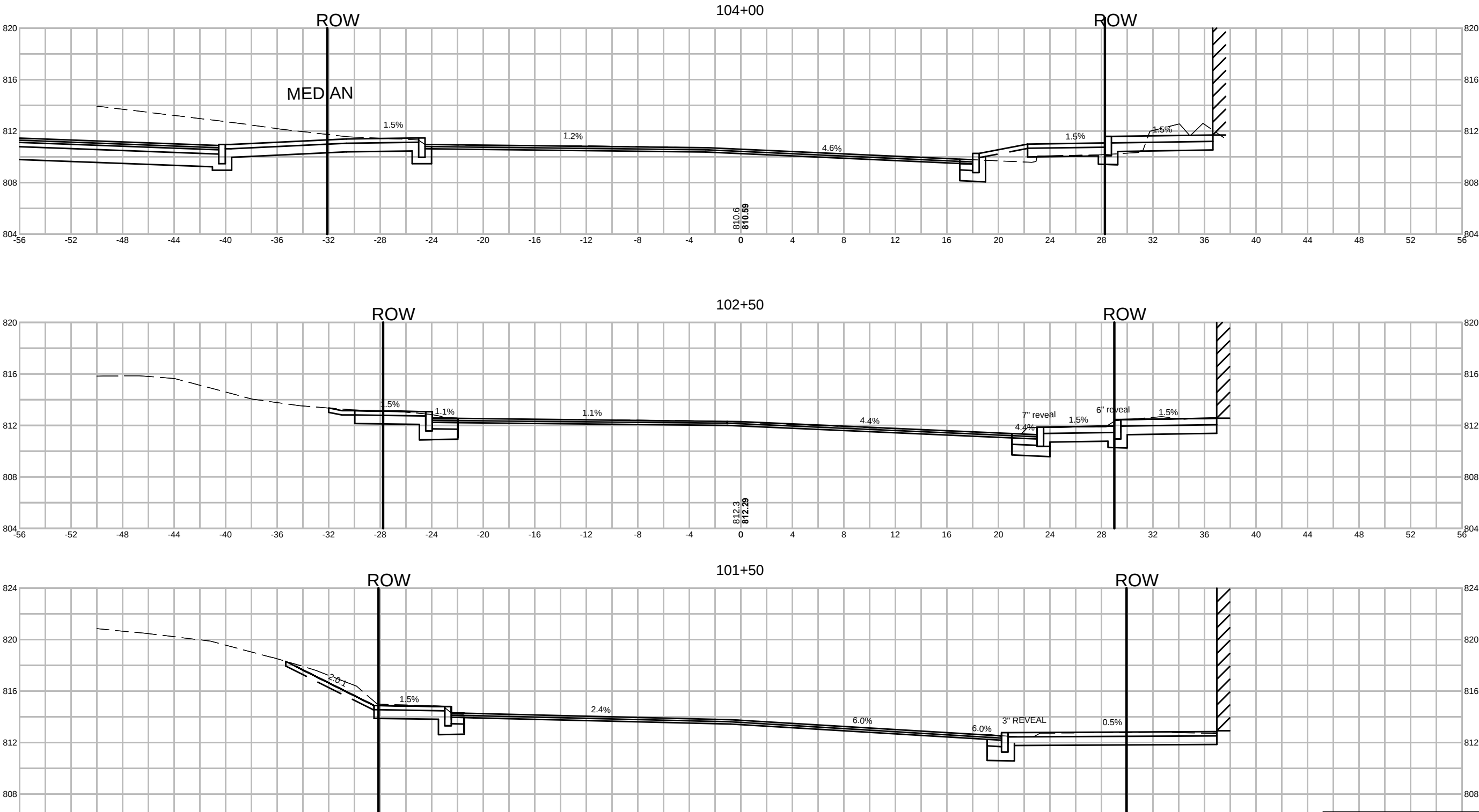
Table 7 summarizes MassDOT's recommended cross slope versus the proposed design. This table represents a range of the cross slopes within the project area that do not meet the MassDOT recommendations.

Table 7 - Cross Slope

MassDOT's Recommended Cross Slope	Proposed Design
Maximum Cross slope 2% (HMA Surface)	0.2% to 6.7%

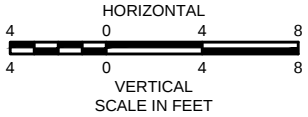
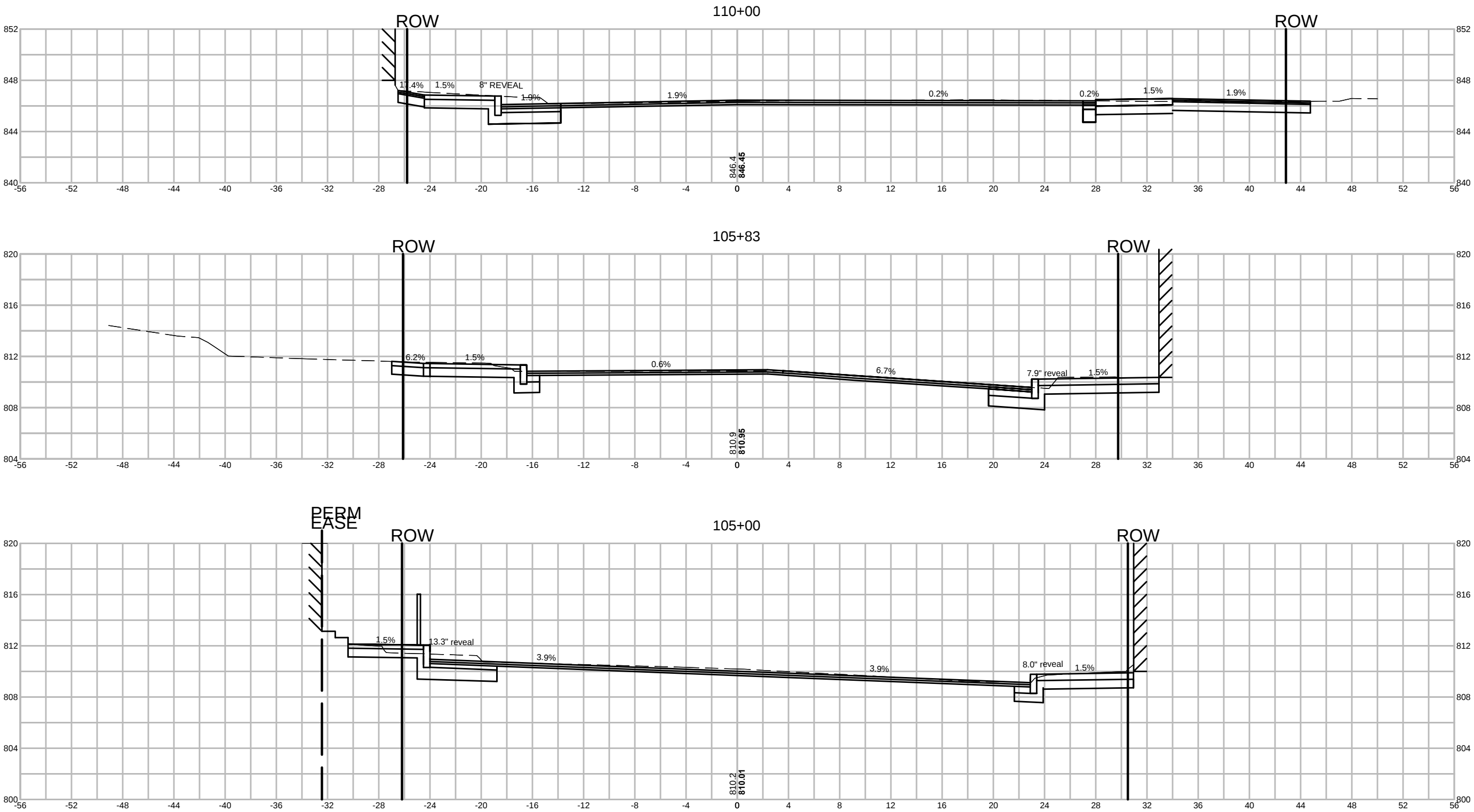
Justification For Change

The work on Main Street consists of the reconstruction of the existing pavement width with minimal full-depth widening. The proposed design attempts to maintain the roadway cross slopes within the limit of work. The topography of the project area results in higher elevations on the northerly side of Main Street. As a result, much of Main Street is superelevated. The rate superelevation was not designed per MassDOT Guidebook, rather to meet existing conditions. In order to provide a normal crowned section with a 2% cross slope, the entire length of Main Street would need to be full-depth reconstruction. Moreover in several locations it would not be possible to maintain the existing grades at the back of sidewalk. Significant changes to grade would be very problematic, since there are several buildings and entrances located at the immediate back of sidewalk. It is necessary to maintain access to the businesses occupying these buildings. Significantly lowering or raising the grade may undermine the existing building foundations; moreover changes in grade at the back of walk may require alterations to the building to maintain access. Eight buildings would be significantly impacted and would have to be renovated or acquired and demolished. The proposed project currently has an estimated construction cost (excluding ROW) of approximately \$3.7 million. It is not possible to quantify the costs of renovations with the information available. With the inclusion of full-depth reconstruction for the length of Main Street to meet the recommended 2% as well as the demolition of the impacted buildings, the project construction costs are expected to increase by approximately \$1.4 million. The ROW costs would also increase by \$3.27 million resulting in a total project cost of \$8.37 million.



Vanasse Hangen Brustlin, Inc.

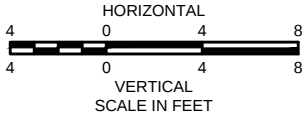
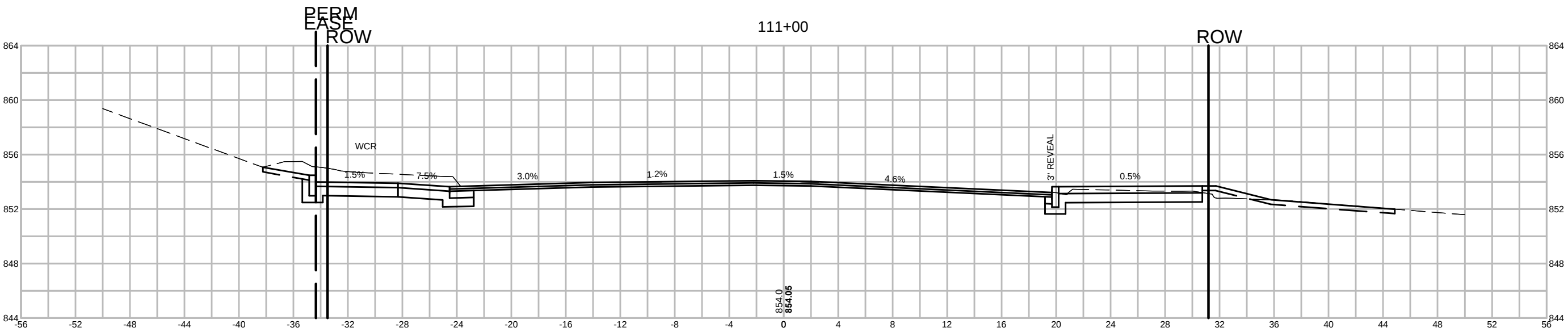
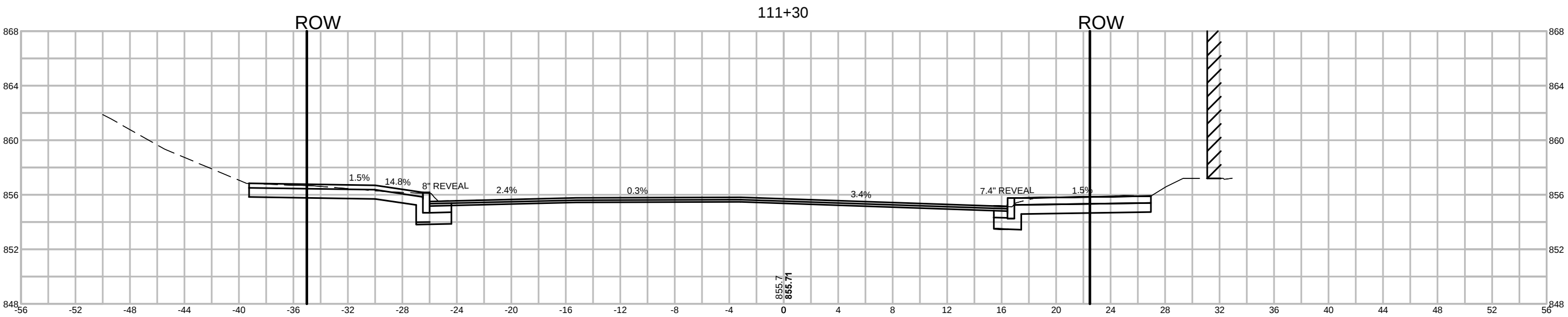
Figure 9-1
Spencer
Main Street (Route 9)
Cross-sections - Existing Cross Slopes
Proposed Design - Existing Profile
October 2013



Vanasse Hangen Brustlin, Inc.

Figure 9-2
Spencer
Main Street (Route 9)
Cross-sections - Existing Cross Slopes
Proposed Design - Existing Profile

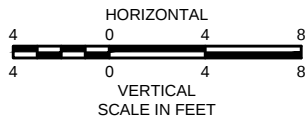
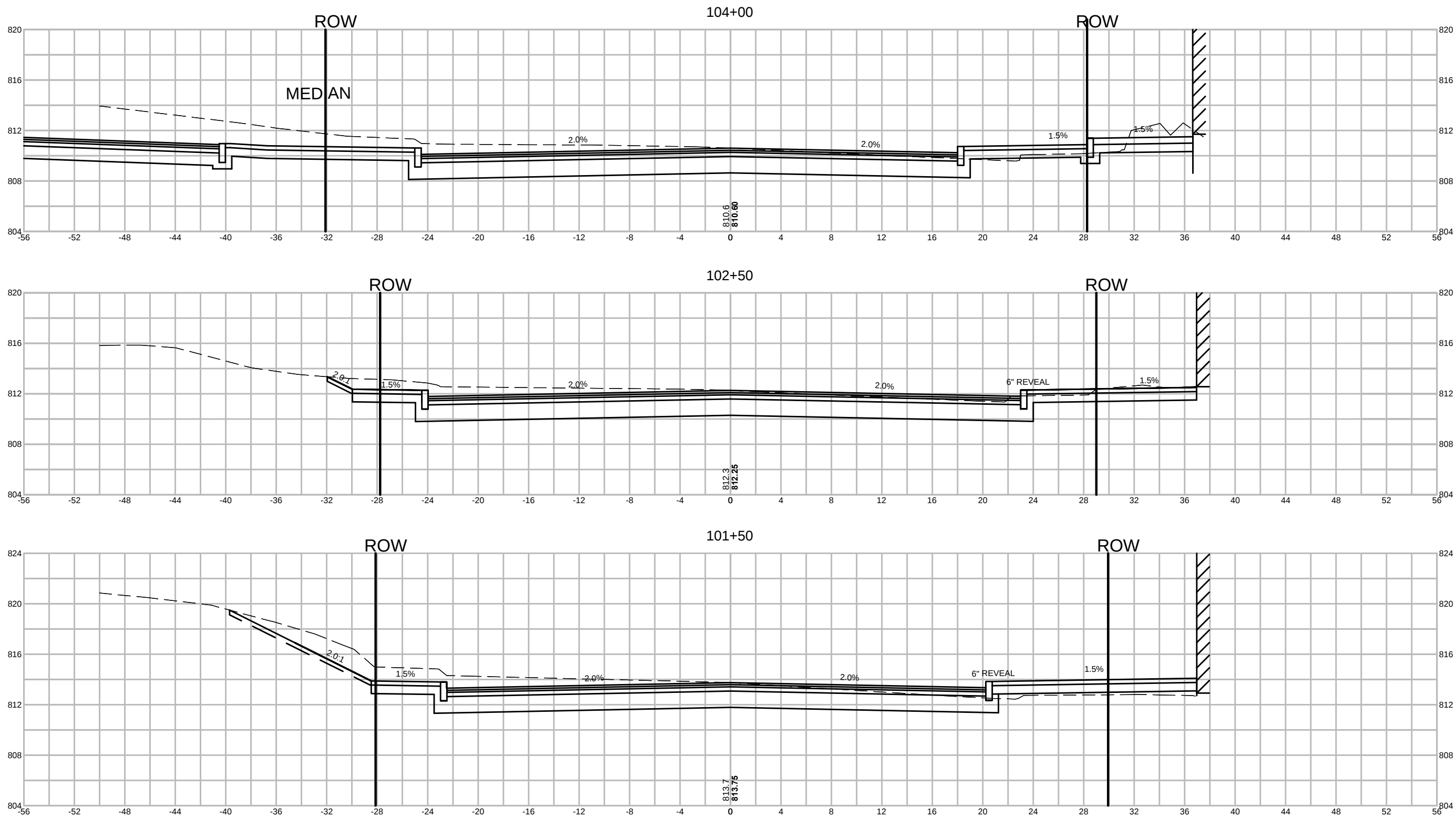
October 2013



Vanasse Hangen Brustlin, Inc.

Figure 9-3
Spencer
Main Street (Route 9)
Cross-sections - Existing Cross Slopes
Proposed Design - Existing Profile

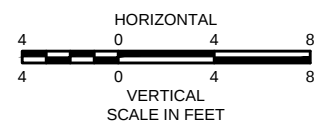
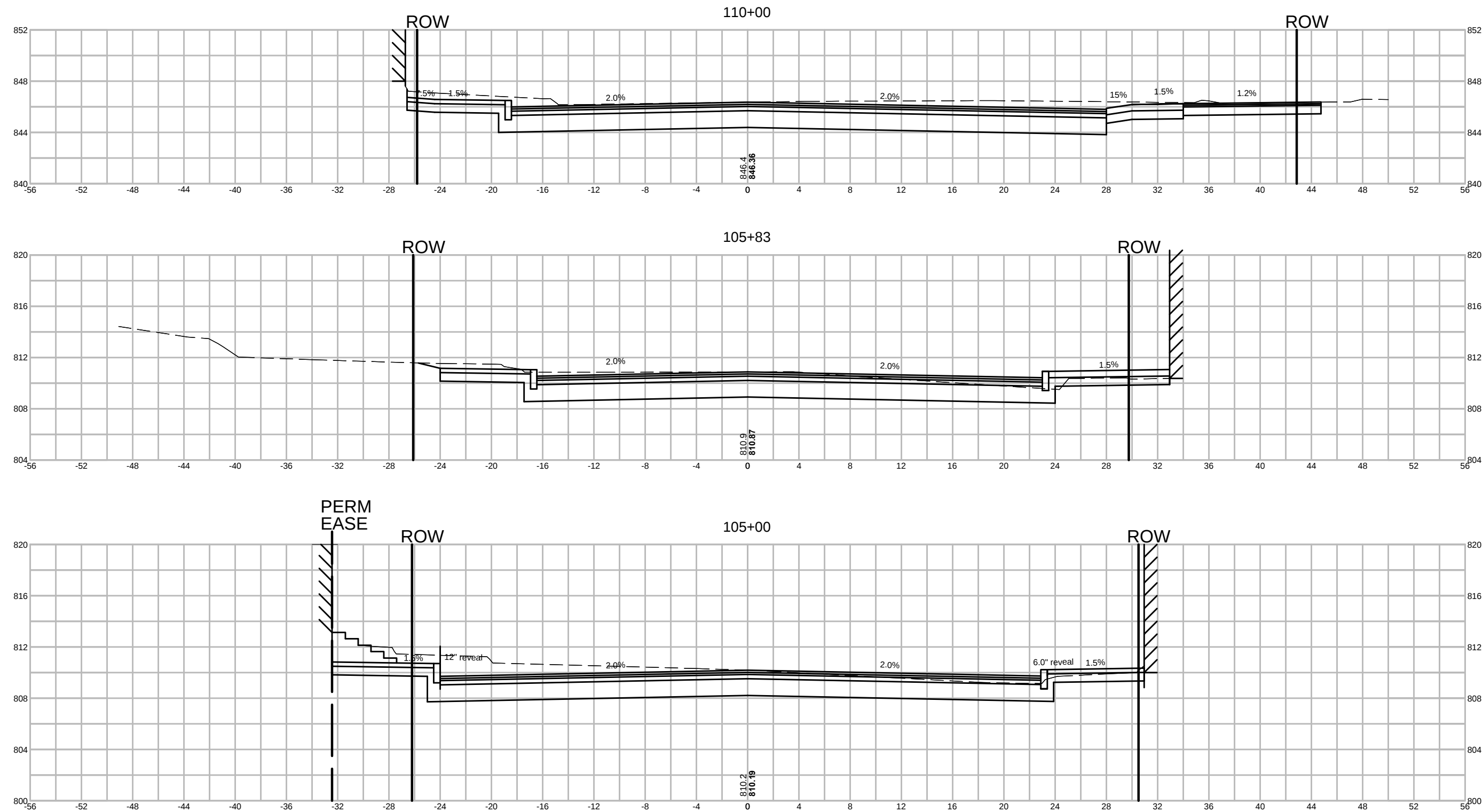
October 2013



Vanasse Hangen Brustlin, Inc.

Figure 10-1 October 2013

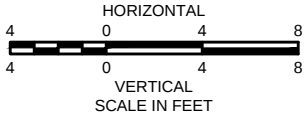
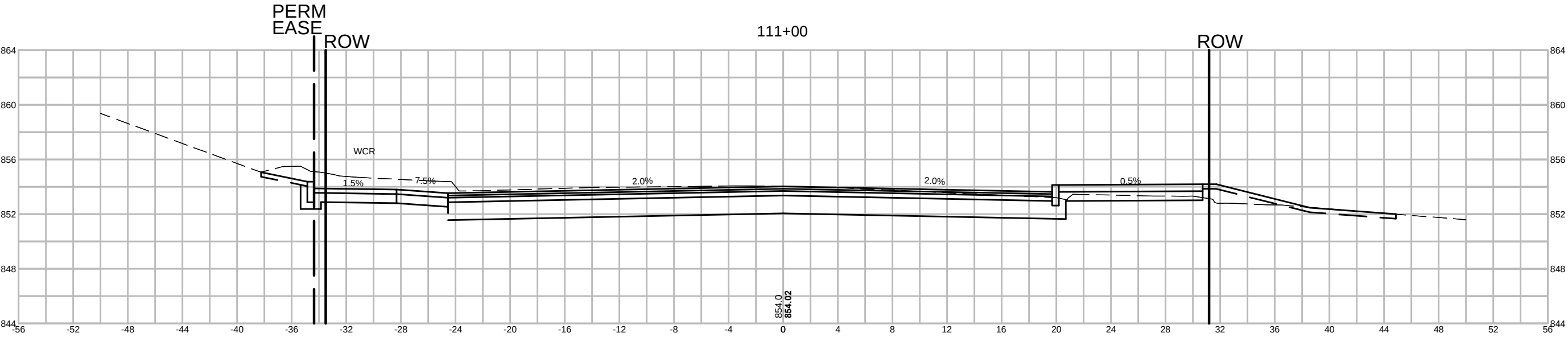
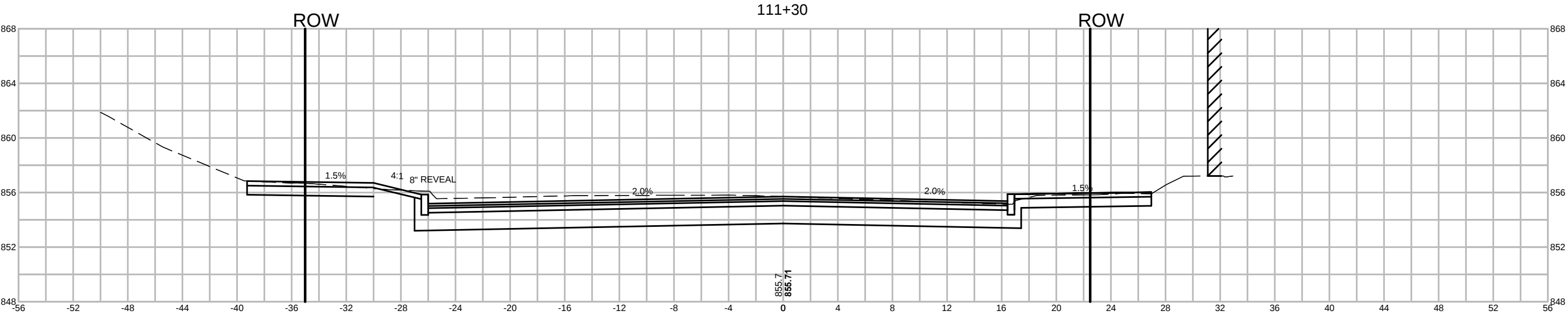
Spencer
Main Street (Route 9)
Cross-sections - 2% Cross Slopes
Minimum 30 mph Profile



Vanasse Hangen Brustlin, Inc.

Figure 10-2 October 2013

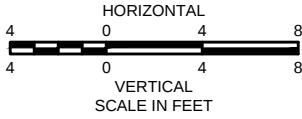
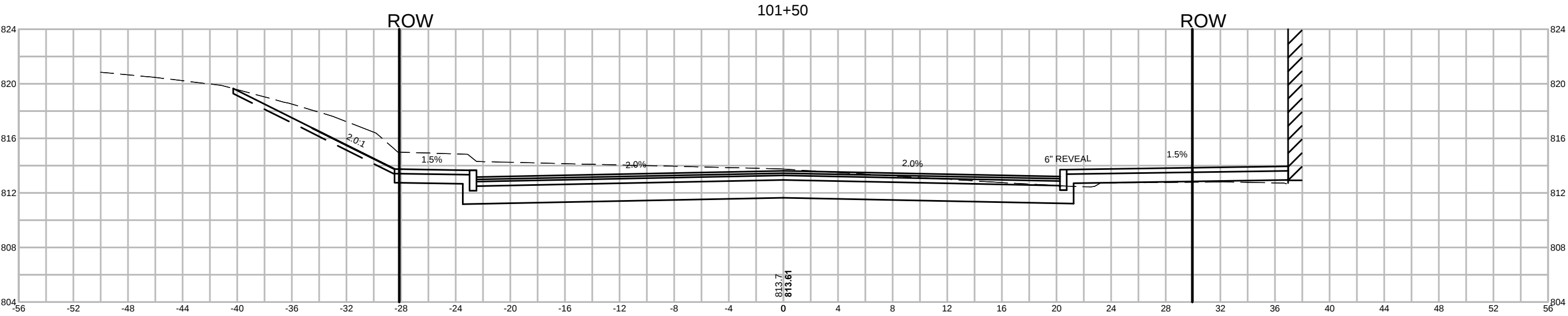
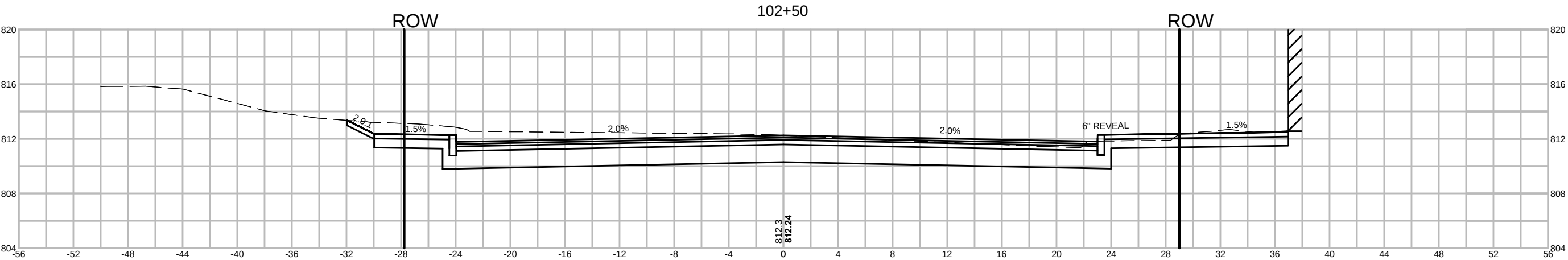
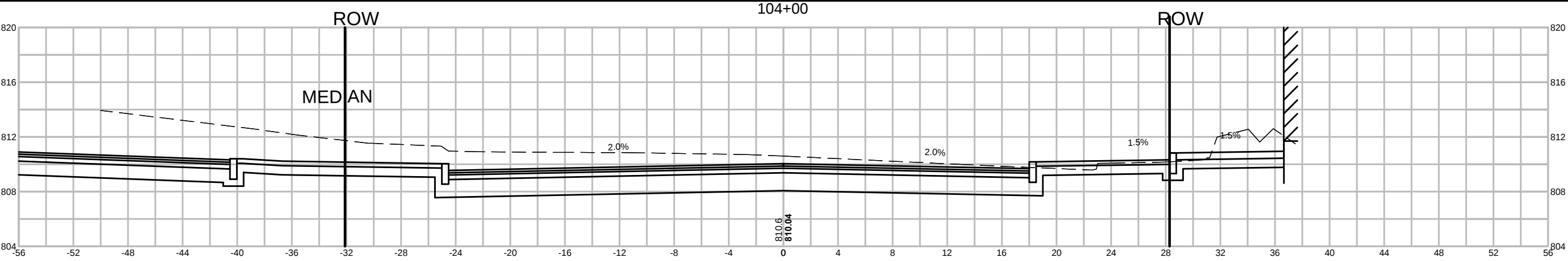
Spencer
Main Street (Route 9)
Cross-sections - 2% Cross Slopes
Minimum 30 mph Profile



Vanasse Hangen Brustlin, Inc.

Figure 10-3 October 2013

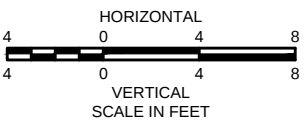
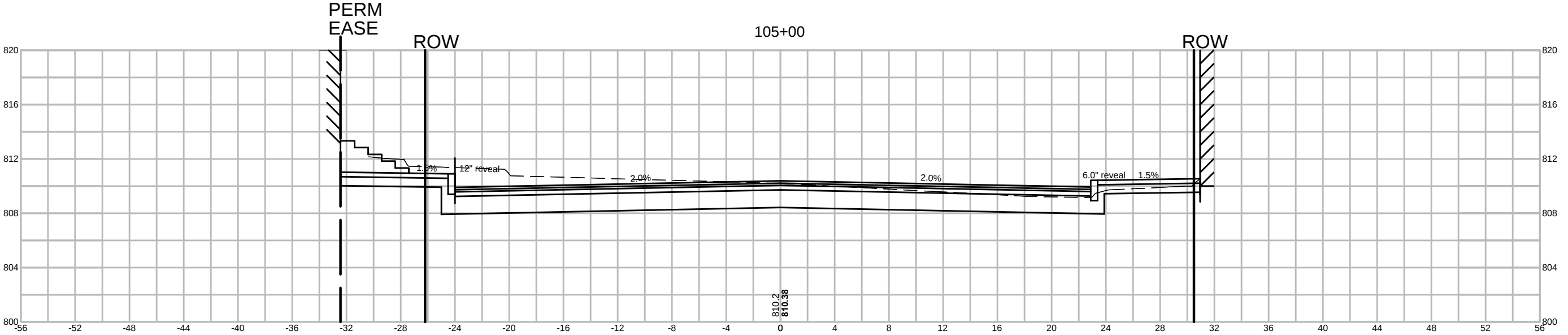
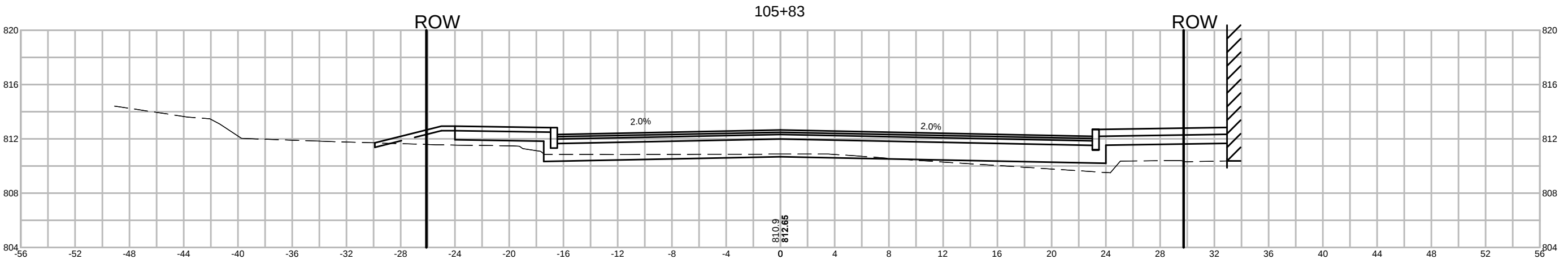
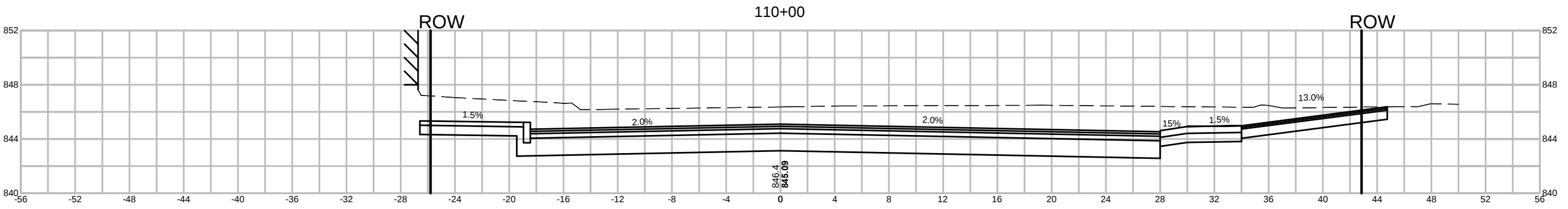
Spencer
Main Street (Route 9)
Cross-sections 2% Normal Crown
Minimum 30 mph Profile



Vanasse Hangen Brustlin, Inc.

Figure 11-1
Spencer
Main Street (Route 9)
Cross-sections - 2% Cross Slopes
Alternative 1 - Existing Profile

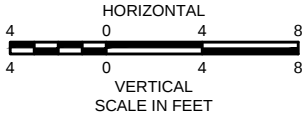
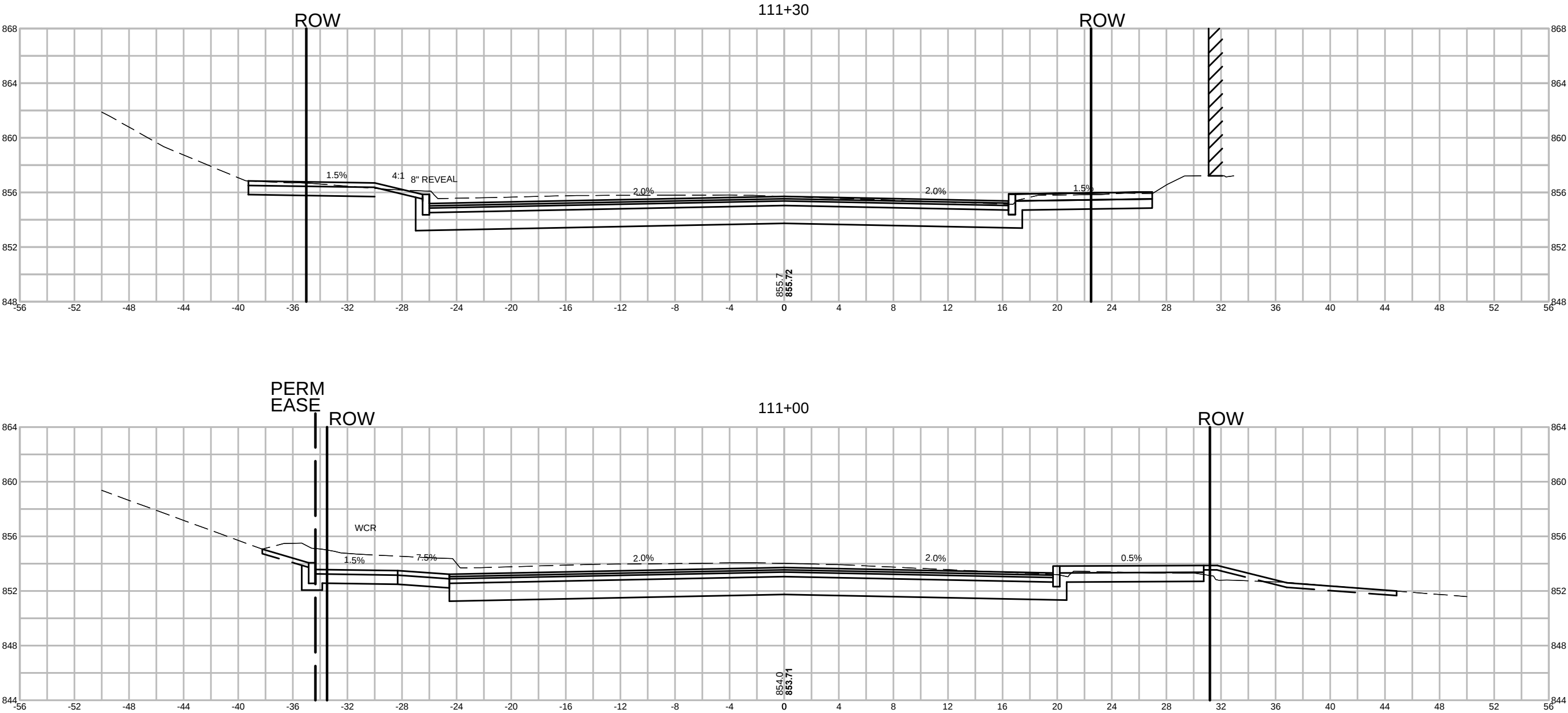
October 2013



Vanasse Hangen Brustlin, Inc.

Figure 11-2 October 2013

Spencer
Main Street (Route 9)
Cross-sections - 2% Cross Slopes
Alternative 1 - Existing Profile



Vanasse Hangen Brustlin, Inc.

Figure 11-3 October 2013

Spencer
Main Street (Route 9)
Cross-sections 2% Cross Slopes
Alternative 1 - Existing Profile



Summary

As previously discussed, of the 13 controlling criteria, five criteria associated with the proposed improvements have not been met in some areas of the project primarily on Main Street. A design exception is being requested for the following:

- Shoulder and Lane Width: On Main Street, which is an NHS roadway, the preferred design is not providing 8-foot shoulder widths, however the design provides 5-foot shoulders, except for adjacent to turning lanes where a 2-foot shoulder and 5-foot bike lane are provided. In order to provide an 8-foot shoulder on street parking and bus turnout would have to be eliminated and several buildings would have to be acquired and demolished.
- Horizontal Alignment: Increasing the length and radius of deficient curves will have significant impact to adjacent commercial properties, which would require the Town of Spencer to acquire at least seven commercial properties demolish the buildings.
- Vertical Alignment: Changing the proposed maximum and minimum grades and increasing the vertical curve length to meet necessary K values results in significant cuts and fills. This results in increasing the cost of constructing the roadway by approximately \$1.38 million. These cost increases do not even consider the additional cost of acquiring the impacted properties.
- Cross Slope: The proposed cross slopes for this project vary to meet the existing cross slopes. Full depth pavement would be required for the entire length of Main Street in order to achieve a consistent 2% cross slope. Moreover, stairs or retaining walls would be required to provide ADA compliant sidewalks and maintain access to the businesses located at the back of sidewalk.

Beyond the monetary costs required to meet these controlling criteria, the necessary design would have significant cultural, historic, and economic impacts.

Design Exception Report Checklist

DESIGN EXCEPTION REPORT CHECKLIST

City/Town: Spencer **Project File No.:** 606207
Facility: Route 9/Main Street **Fed. Aid Proj. No.:** _____

I. Project Description

A. Type of Work Proposed

- | | |
|--|--|
| ☐ Full Depth Reconstruction | ☒ Resurfacing/Box Widening |
| ☐ Reclamation | ☐ NHS Bridge Replacement/Rehabilitation |
| ☐ New Construction | ☐ Other _____ |

B. Purpose of Project

- | | |
|--|--------------------------------------|
| ☒ Safety Improvement | ☐ Maintenance |
| ☐ Additional Capacity | ☐ Other _____ |
| ☐ Describe if Other: _____ | |

C. Footprint Road Project? ☐ YES ☒ NO

II. Indicate Controlling Criteria, as defined by Project Development and Design Guide, requiring a Design Exception. (See worksheet ATTACHMENT A).

A. Roadway and Bridge Criteria

- | | |
|--|--|
| ☐ Design Speed | ☒ Grades |
| ☒ Lane Width | ☐ Stopping Sight Distance |
| ☒ Shoulder Width | ☒ Cross Slope |
| ☒ Horizontal Alignment | ☒ Superelevation |
| ☒ Vertical Alignment | ☐ Horizontal Clearance |

B. Bridge Only Criteria

- | | |
|--|---|
| ☐ Width | ☐ Vertical Clearance |
| ☐ Structural Capacity | |

III. Description of Facility

A. Functional Classification

- | | |
|--|--|
| ☐ Urban Freeway | ☐ Rural Freeway |
| ☒ Urban Arterial | ☐ Rural Arterial |
| ☐ Urban Collector | ☐ Rural Collector |
| ☐ Urban Local | ☐ Rural Local |

DESIGN EXCEPTION REPORT CHECKLIST

City/Town: Spencer

Project File No.: 606207

(Description of Facility cont'd)

B. NHS

☒ Yes

☐ No

C. General Description of Project Area

☐ Undeveloped

☒ Residential

☒ Commercial

☐ Industrial

☐ Scenic

☒ Historic

☐ Describe if Other: _____

D. Traffic Volume

ADT (Current)	<u>14,764 VPD</u>	T (Peak Hour)	<u>1.7%</u>
ADT (Design Year)	<u>15,909 VPD</u>	T (Avg. Day)	<u>1.5%</u>
K	<u>0.06</u>	DHV	<u>1,019 VPH</u>
D	<u>59.40%</u>	DDHV	<u>606 VPH</u>

E. Speed

Posted	<u>30 MPH</u>	85th Percentile	<u>28 MPH</u>
Observed	<u>23 to 28 MPH</u>	Existing Design Speed	<u>25 MPH</u>

F. Lane and Shoulder Width

Existing

Lane Width 17'-19' Right Shoulder N/A* Left Shoulder N/A*

* There are no striped shoulders or parking spots within the project limits.

Attach a Typical Section (8 1/2" x 11") depicting existing dimensions and proposed cross-sections. Include R.O.W lines.

G. Right of Way

☐ State Highway

☐ County

☒ City/Town

Average Width 58'

DESIGN EXCEPTION REPORT CHECKLIST

City/Town: Spencer

Project File No.: 606207

(Description of Facility cont'd)

H. Crash Data

The crash rate shall be calculated based on the latest three years of crash data available. Crash rates should be calculated for roadway segments based on Hundred Million Vehicle Miles traveled (HMVM) as follows:

$$\text{HMVM} = (A \times 100,000,000) / (\text{ADT} \times D \times L)$$

A = number of total crashes at the study location during a given period

ADT = Average Daily Traffic

D = number of days in the study period

L = length of study location in miles

Attach additional tables and diagrams as necessary to accurately communicate the crash history within the project limits.

Provide a detailed narrative that summarizes available data and draws a conclusion as to the expected effectiveness of any proposed improvements.

I. Environmental Factors

Attach a brief discussion of the natural, cultural, historic or other environmental constraints associated with the proposed project. All of the following must be addressed: wetland/floodplain, trees, parkland, endangered species, cultural, historic, archaeological, etc.

V. Summary of Impacts

Complete the attached spreadsheet titled Summary of Impacts (ATTACHMENT B). A separate spreadsheet is required for each of the controlling criteria for which a design exception is requested.

Attach photographs that illustrate existing features important to the proposed design.

VI. Recommendation

By drawing from all of the above information, attach a narrative documenting that reasonable engineering judgement was used to justify the proposed design.

**DESIGN EXCEPTION REPORT
CHECKLIST**

City/Town: Spencer

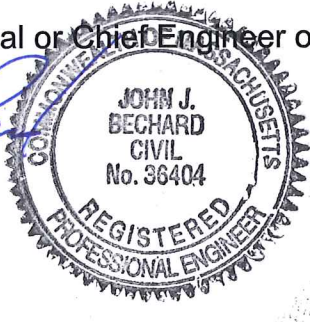
Project File No.: 606207

VII. Certification of Design Exception Report (Engineering Directive E-99-002)

I have reviewed this document as it relates to the proposed design and have determined the design to be safe for public health and welfare in conformity with accepted engineering standards.

Signature and P.E. Stamp of Principal or Chief Engineer of firm preparing report:

John J. Bechard
Name
Sr. Principal
Title
11/22/13
Date



DESIGN EXCEPTION REPORT CHECKLIST

City/Town: Spencer

Project File No.: 606207

Facility: Route 31/Pleasant Street

Fed. Aid Proj. No.: _____

I. Project Description

A. Type of Work Proposed

- | | |
|---|--|
| ☒ Full Depth Reconstruction | ☒ Resurfacing/Box Widening |
| ☐ Reclamation | ☐ NHS Bridge Replacement/Rehabilitation |
| ☐ New Construction | ☐ Other _____ |

B. Purpose of Project

- | | |
|--|--------------------------------------|
| ☒ Safety Improvement | ☐ Maintenance |
| ☐ Additional Capacity | ☐ Other _____ |
| ☐ Describe if Other: _____ | |

C. Footprint Road Project? ☐ YES ☒ NO

II. Indicate Controlling Criteria, as defined by Project Development and Design Guide, requiring a Design Exception. (See worksheet ATTACHMENT A).

A. Roadway and Bridge Criteria

- | | |
|--|--|
| ☐ Design Speed | ☐ Grades |
| ☐ Lane Width | ☐ Stopping Sight Distance |
| ☐ Shoulder Width | ☐ Cross Slope |
| ☒ Horizontal Alignment | ☐ Superelevation |
| ☐ Vertical Alignment | ☐ Horizontal Clearance |

B. Bridge Only Criteria

- | | |
|--|---|
| ☐ Width | ☐ Vertical Clearance |
| ☐ Structural Capacity | |

III. Description of Facility

A. Functional Classification

- | | |
|---|--|
| ☐ Urban Freeway | ☐ Rural Freeway |
| ☐ Urban Arterial | ☐ Rural Arterial |
| ☒ Urban Collector | ☐ Rural Collector |
| ☐ Urban Local | ☐ Rural Local |

DESIGN EXCEPTION REPORT CHECKLIST

City/Town: Spencer

Project File No.: 606207

(Description of Facility cont'd)

B. NHS

☐ Yes

☒ No

C. General Description of Project Area

☐ Undeveloped

☒ Residential

☒ Commercial

☐ Industrial

☐ Scenic

☒ Historic

☐ Describe if Other: _____

D. Traffic Volume

ADT (Current) 5,657 VPD

T (Peak Hour) 1.3%

ADT (Design Year) 6,096 VPD

T (Avg. Day) 1.3%

K 0.1

DHV 595 VPH

D 55.60%

DDHV 331 VPH

E. Speed

Posted 30 MPH 85th Percentile 37 MPH (NB)

Observed 35-37 MPH Existing Design Speed 35 MPH (SB)

F. Lane and Shoulder Width

Existing

Lane Width 14'-15' Right Shoulder N/A* Left Shoulder N/A*

* There are no striped shoulders within the project limits.

Attach a Typical Section (8 1/2" x 11") depicting existing dimensions and proposed cross-sections. Include R.O.W lines.

G. Right of Way

☐ State Highway

☐ County

☒ City/Town

Average Width 41.25'

DESIGN EXCEPTION REPORT CHECKLIST

City/Town: Spencer

Project File No.: 606207

(Description of Facility cont'd)

H. Crash Data

The crash rate shall be calculated based on the latest three years of crash data available. Crash rates should be calculated for roadway segments based on Hundred Million Vehicle Miles traveled (HMVM) as follows:

$$\text{HMVM} = (A \times 100,000,000) / (\text{ADT} \times D \times L)$$

A = number of total crashes at the study location during a given period

ADT = Average Daily Traffic

D = number of days in the study period

L = length of study location in miles

Attach additional tables and diagrams as necessary to accurately communicate the crash history within the project limits.

Provide a detailed narrative that summarizes available data and draws a conclusion as to the expected effectiveness of any proposed improvements.

I. Environmental Factors

Attach a brief discussion of the natural, cultural, historic or other environmental constraints associated with the proposed project. All of the following must be addressed: wetland/floodplain, trees, parkland, endangered species, cultural, historic, archaeological, etc.

V. Summary of Impacts

Complete the attached spreadsheet titled Summary of Impacts (ATTACHMENT B). A separate spreadsheet is required for each of the controlling criteria for which a design exception is requested.

Attach photographs that illustrate existing features important to the proposed design.

VI. Recommendation

By drawing from all of the above information, attach a narrative documenting that reasonable engineering judgement was used to justify the proposed design.

**DESIGN EXCEPTION REPORT
CHECKLIST**

City/Town: Spencer

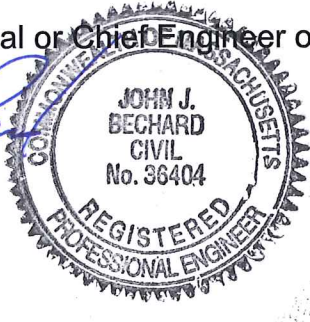
Project File No.: 606207

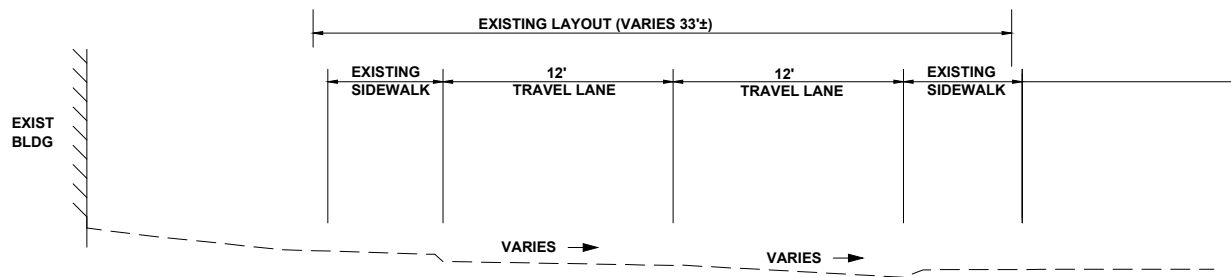
VII. Certification of Design Exception Report (Engineering Directive E-99-002)

I have reviewed this document as it relates to the proposed design and have determined the design to be safe for public health and welfare in conformity with accepted engineering standards.

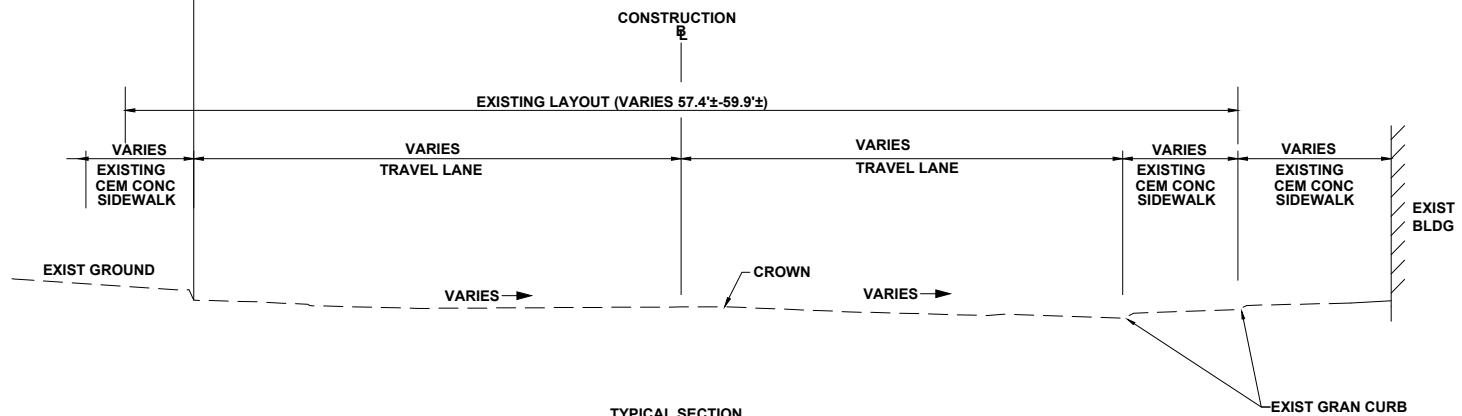
Signature and P.E. Stamp of Principal or Chief Engineer of firm preparing report:

John J. Bechard
Name
Sr. Principal
Title
11/22/13
Date

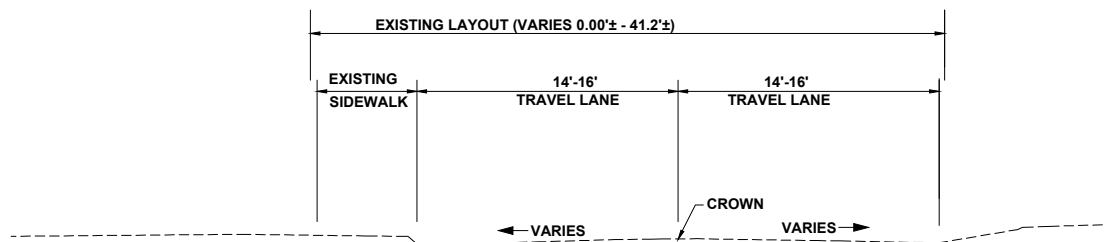




TYPICAL SECTION
MAPLE STREET (ROUTE 31)



TYPICAL SECTION
MAIN STREET (ROUTE 9)



TYPICAL SECTION
PLEASANT ST

Photographs



Existing Offset Intersection of Pleasant Street and Wall Street at Main Street



Pleasant Street at Main Street– looking east on Main Street
Building and entrances located at the back of sidewalk



Pleasant Street – looking south



Intersection of Main Street and Maple Street – looking south on Maple Street



Main Street – Existing Steep Grade



Business located at back of sidewalk – Also showcases existing steep grade of Main Street



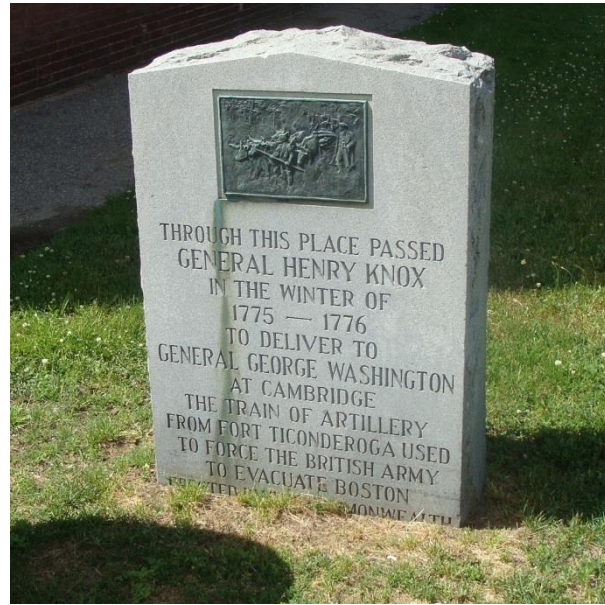
Building and Entrances located at the back of sidewalk on Main Street



Stone Masonry Retaining wall with historic horse hitches at #143 Main Street



Historic Marker - Boston Post Road



Monument – General Henry Knox



Landmark Sign – Massasoit Hotel

Attachment A (Controlling Criteria)

DESIGN EXCEPTION REPORT
ATTACHMENT A
CONTROLLING CRITERIA

City/Town: Spencer Project File No.: 606207

Design Speed

Refer to Guidebook, Exhibit 3-7

Desirable	<u>30 MPH</u>
Minimum	<u>25 MPH</u>
Posted	<u>30 MPH</u>
Proposed	<u>30 MPH *</u>

☐ Design Exception Required.

* 30 MPH design speed was assumed

Lane Width

Refer to Guidebook, Exhibit 5-14

Desirable	<u>12'</u>
Minimum	<u>12'</u>
Proposed	<u>11'</u>

☐ Design Exception Required.

Shoulder Width

Refer to Guidebook, Exhibit 5-12 (see note 3)

	Right
Desirable	<u>12'</u>
Minimum	<u>8' (NHS)</u>
Proposed	<u>2'-5'</u>

☒ Design Exception Required.

	Left
Desirable	<u>2'</u>
Minimum	<u>2'</u>
Proposed	<u>2'</u>

☐ Design Exception Required.

Horizontal Alignment

Refer to Guidebook, Exhibit 4-8 and 4-9

Minimum	<u>335'</u>
Proposed	<u>315'</u>
PI Sta.	<u>108+66.44</u>
Radius	<u>315</u>

☒ Design Exception Required.

PI Sta.	<u> </u>	PI Sta.	<u> </u>
Radius	<u> </u>	Radius	<u> </u>

Refer to Guidebook, Chapter 4, Section 4.2 (Compound Curves).

Check all compound curves. The radius of the tighter curve should be no less than 50 percent of the flatter curve.

☐ Design Exception Required.

DESIGN EXCEPTION REPORT
ATTACHMENT A
CONTROLLING CRITERIA

City/Town: Spencer **Project File No.:** 606207

(Horizontal Alignment cont'd)

Length of Curve.

Lmin = 30 V (freeways)

Lmin = 15 V (other major highways)

V = Design Speed

☒ Design Exception Required.

Vertical Alignment

For Crest Vertical Curves, refer to Guidebook, Exhibit 4-26

Minimum 19

Proposed 28.57

PVI Sta. _____ PVI Sta. _____ PVI Sta. _____ PVI Sta. _____

K _____ K _____ K _____ K _____

☐ Design Exception Required.

For sag curves, refer to Guidebook, Exhibit 4-27

Minimum 37

Proposed 29.85

PVI Sta. _____ PVI Sta. _____ PVI Sta. _____ PVI Sta. _____

K _____ K _____ K _____ K _____

☒ Design Exception Required.

Grades

Refer to Guidebook, Exhibit 4-21

Maximum 9%

Proposed 11.8%

☐ Design Exception Required.

Stopping Sight Distance

Refer to Guidebook, Exhibit 3-8

Minimum 200

Desirable 227@9%

Proposed 261.3

☐ Design Exception Required.

DESIGN EXCEPTION REPORT
ATTACHMENT A
CONTROLLING CRITERIA

City/Town: Spencer **Project File No.:** 606207

(Stopping Sight Distance cont'd)

Refer to Guidebook Section 3.7 and Exhibit 4-5 (SSD Middle Ordinate)

Minimum 18.9

Desirable 19

☐ Design Exception Required.

Cross Slope

Refer to Guidebook, Section 5.5.2

Bit Conc. 0.020

Cem Conc. 0.016

Proposed 0.067 Maximum

☒ Design Exception Required.

Superelevation

Refer to Guidebook Section 4.2. Check required values for superelevation rates, transitioning, runoff, banking, etc. for all lanes and shoulders.

☒ Design Exception Required.

Horizontal Clearance

Refer to AASHTO A Policy on Geometric Design of Highways and Streets.

Minimum 18 inches beyond face of curb.

☐ Design Exception Required.

Bridge Only Criteria

Lane and Shoulder Width

Refer to AASHTO A Policy on Geometric Design of Highways and Streets.

☐ Design Exception Required.

Structural Capacity

Refer to Chapter 3 of MassHighway Bridge Manual.

☐ Design Exception Required.

Vertical Clearance

Refer to Guidebook, Exhibit 4-28

Minimum

Proposed

☐ Design Exception Required.

Attachment B

(Summary of Impacts)

ATTACHMENT B **DESIGN EXCEPTION REPORT** **SUMMARY OF IMPACTS**

Provide a summary of the incremental impacts associated with the Desirable, Minimum and Proposed design. Include impacts of

A separate Summary of Impacts sheet shall be prepared for each controlling criteria element that does not meet the minimum specified.

CONTROLLING CRITERIA: LANE WIDTH/SHOULDER WIDTH

SUMMARY OF IMPACTS

INSERT VALUE IN THIS COLUMN	WETLANDS (SF)	TREES (EA)	PARKLANDS (SF)	STONE WALLS (LF)	SALT MARSH (SF)	ROW (\$)	CONST. COST (\$)	TOTAL COST (\$)
DESIRABLE	n/a	n/a	n/a	n/a	n/a			
MINIMUM 12' LANE;8-SHLDR* no on-street parking	n/a	n/a	n/a	n/a	n/a	\$2.75 M	\$4.11 m	\$6.86 M
ALTERNATIVE 1 12' LANE; 8' SHLDR w/ on-street parking	n/a	n/a	n/a	n/a	n/a	Not Feasible	Not Feasible	Not Feasible
ALTERNATIVE 2	n/a	n/a	n/a	n/a	n/a			
RECOMMENDED 11' LANE; 5' SHLDR w/ on-street parking	n/a	n/a	n/a	n/a	n/a	N/A	\$3.7 M	\$3.7 m

* 8-foot shoulders eliminate the ability to provide on-street parking.

NOTE: Attach a narrative detailing the impacts of each alternative.

NOTE: Columns and rows may need to be added to address additional incremental designs or impacts

ATTACHMENT B **DESIGN EXCEPTION REPORT** **SUMMARY OF IMPACTS**

Provide a summary of the incremental impacts associated with the Desirable, Minimum and Proposed design. Include impacts of incremental designs.

A separate Summary of Impacts sheet shall be prepared for each controlling criteria element that does not meet the minimum specified.

CONTROLLING CRITERIA: MINIMUM HORIZONTAL CURVE LENGTHS

SUMMARY OF IMPACTS

INSERT VALUE IN THIS COLUMN	WETLANDS (SF)	TREES (EA)	PARKLANDS (SF)	STONE WALLS (LF)	SALT MARSH (SF)	ROW (\$)	CONST. COST (\$)	TOTAL COST (\$)
DESIRABLE	n/a	n/a	n/a	n/a	n/a			
MINIMUM 15V = 450'	n/a	n/a	n/a	n/a	n/a	\$2.41 M	\$4.16 M	\$6.57 M
ALTERNATIVE 1	n/a	n/a	n/a	n/a	n/a			
ALTERNATIVE 2	n/a	n/a	n/a	n/a	n/a			
RECOMMENDED Preferred Design	n/a	n/a	n/a	n/a	n/a	n/a	\$3.7 M	\$3.7 M

NOTE: Attach a narrative detailing the impacts of each alternative.

NOTE: Columns and rows may need to be added to address additional incremental designs or impacts

ATTACHMENT B **DESIGN EXCEPTION REPORT** **SUMMARY OF IMPACTS**

Provide a summary of the incremental impacts associated with the Desirable, Minimum and Proposed design. Include impacts of incremental designs.

A separate Summary of Impacts sheet shall be prepared for each controlling criteria element that does not meet the minimum specified.

CONTROLLING CRITERIA: VERTICAL ALIGNMENT

SUMMARY OF IMPACTS

INSERT VALUE IN THIS COLUMN	WETLANDS (SF)	TREES (EA)	PARKLANDS (SF)	STONE WALLS (LF)	SALT MARSH (SF)	ROW (\$)	CONST. COST (\$)	TOTAL COST (\$)
DESIRABLE	n/a	n/a	n/a	n/a	n/a			
MINIMUM 30 MPH Profile Bal. Cut & Fill; N.C.	n/a	n/a	n/a	n/a	n/a	\$4.18 M	\$4.17 M	\$8.35 M
ALTERNATIVE 1	n/a	n/a	n/a	n/a	n/a			
ALTERNATIVE 2	n/a	n/a	n/a	n/a	n/a			
RECOMMENDED 25 MPH Profile Existing Cross-slopes	n/a	n/a	n/a	n/a	n/a	n/a	\$3.7 M	\$3.7 M

* 8-foot shoulders eliminate the ability to provide on-street parking.

NOTE: Attach a narrative detailing the impacts of each alternative.

NOTE: Columns and rows may need to be added to address additional incremental designs or impacts

**ATTACHMENT B
DESIGN EXCEPTION REPORT
SUMMARY OF IMPACTS**

Provide a summary of the incremental impacts associated with the Desirable, Minimum and Proposed design. Include impacts of incremental designs.

A separate Summary of Impacts sheet shall be prepared for each controlling criteria element that does not meet the minimum specified.

CONTROLLING CRITERIA: CROSS SLOPE

SUMMARY OF IMPACTS

INSERT VALUE IN THIS COLUMN	WETLANDS (SF)	TREES (EA)	PARKLANDS (SF)	STONE WALLS (LF)	SALT MARSH (SF)	ROW (\$)	CONST. COST (\$)	TOTAL COST (\$)
DESIRABLE 2% N.C.	n/a	n/a	n/a	n/a	n/a	\$4.18 M	\$4.19 M	\$8.37 M
MINIMUM 2% N.C. Existing Profile	n/a	n/a	n/a	n/a	n/a	\$4.18 M	\$3.99 M	\$8.17 M
ALTERNATIVE 1	n/a	n/a	n/a	n/a	n/a			
ALTERNATIVE 2	n/a	n/a	n/a	n/a	n/a			
RECOMMENDED Preferred Design	n/a	n/a	n/a	n/a	n/a	n/a	\$3.7 M	\$3.7 M

NOTE: Attach a narrative detailing the impacts of each alternative.

NOTE: Columns and rows may need to be added to address additional incremental designs or impacts

Attachment C (Collision Diagram)



COLLISION DIAGRAM

CITY/TOWN: SPENCER DATE PREPARED: 8/27/12
REGION: CMRPC PREPARED BY: CO
ROADWAY NAMES: MAIN ST (RT 9) BETWEEN ELM ST & MAPLE ST
TIME PERIOD ANALYZED: 7/15/2009 - 7/15/2012
SOURCE OF CRASH REPORTS: SPENCER POLICE DEPARTMENT

SYMBOLS		TYPES OF CRASH		SEVERITY
	Moving Vehicle		Head On	
	Backing Vehicle		Angle	
	Non-Involved Vehicle		Turning Move	
	Pedestrian		Rear End	
	Parked Vehicle		Sideswipe	
	Fixed Object		Out of Control	
	Bicycle			
	Animal			

