

Concept Plan for

***Modification of Alternative 4
US Route 460
Windsor, Virginia***

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INTRODUCTION AND SUMMARY

The 2014 Draft Supplemental Environmental Impact Statement (hereinafter “DSEIS”) for the US Route 460 project evaluated five options for improvements to the 55-mile segment of that route from Petersburg to Suffolk. Options included building limited-access highways on new alignment, combinations of rebuilding segments of the existing US Route 460 plus limited-access bypasses around towns, and completely rebuilding US Route 460 in its present alignment.

Responding to the difficulty of obtaining required permits for the significant wetlands impacts that would result from building the entire 55-mile project, an early 2015 technical memorandum examined improvement projects for the easternmost 17-mile segment, which includes the Town of Windsor.¹ Options included “Alternative 4,” a holdover from the DSEIS Alternative 4 calling for the complete rebuilding of US Route 460 in its present alignment. Other options, “Hybrid B” (selected as VDOT’s preferred alternative) and “Hybrid X,” would combine segments of a rebuilt US Route 460 with segments of limited-access highway bypassing the Town of Windsor.

The DSEIS’s Alternative 4 calls for “Typical Section C” (reproduced as Figure 2 in this report),² a divided four-lane highway with 16-foot median, enclosed (curb and gutter) drainage, and sidewalks in a 105-foot right of way. This cross section, an inappropriate design for the built-up area of Windsor, would take a large number of properties, require substantial acreage in the Town’s historical district, and restrict access to the Town’s businesses.

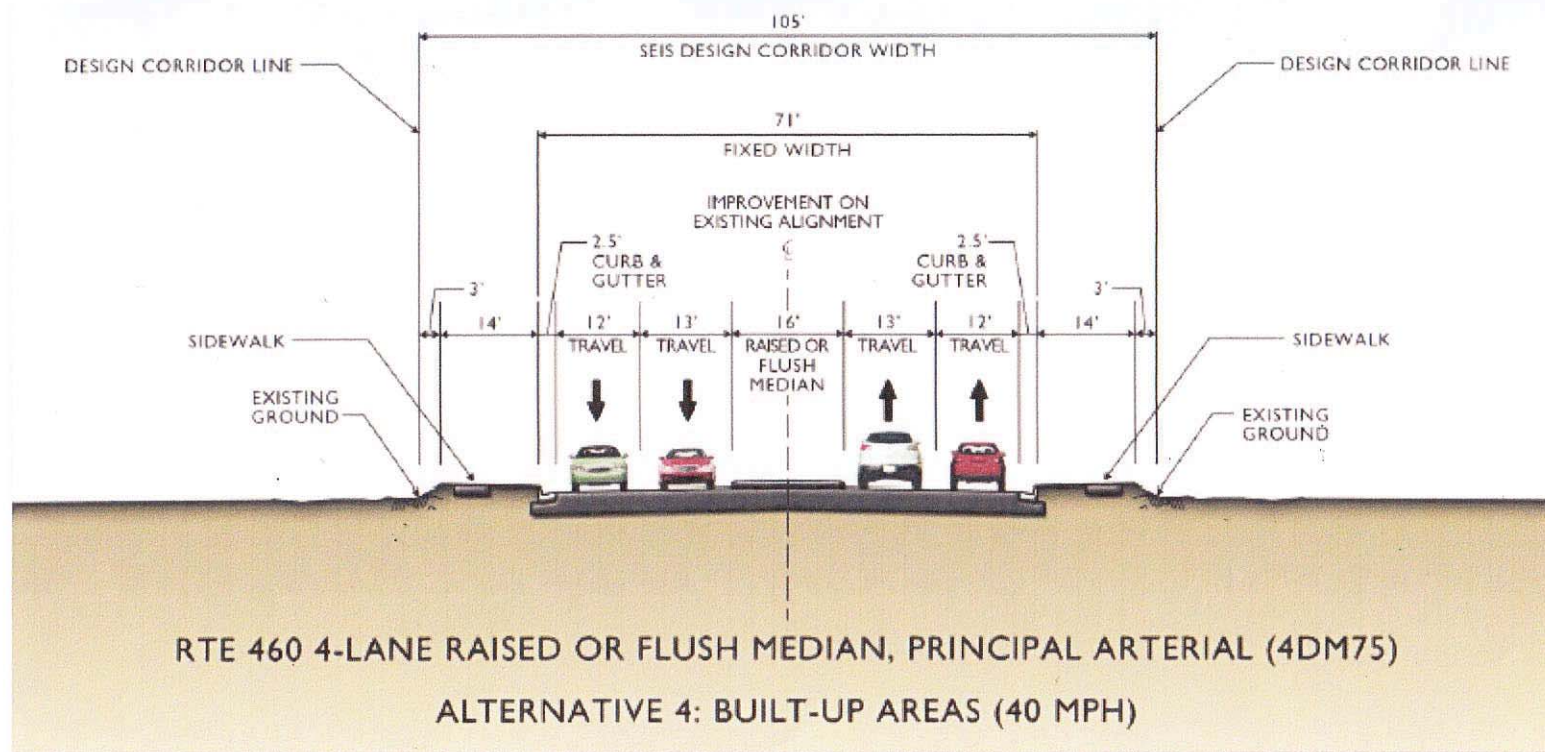
The DSEIS Alternative 4 is far more destructive than necessary and ignores alternatives to significantly improve existing Route 460 with minimal adverse impacts. This report proposes a “Modified Alternative 4,” which would replace Typical Section C within Windsor with a five-lane cross section (hereinafter “Town Cross Section”) adapted to the built-up area of Windsor. This Modified Alternative 4, incorporating the Town Cross Section, would require substantial taking or replacement of structures on four (three occupied and one vacant) commercial properties, and take none of the Town’s historical district or properties. It would also provide opportunities for numerous access management actions along US Route 460, and would be compatible with a potential reconfiguration of the problematic six-leg intersection in the center of Windsor.

Modified Alternative 4 would equal or surpass DSEIS Alternative 4 in accomplishment of all the objectives given in the 2014 DSEIS for improvement of the US Route 460 Corridor. Modified Alternative 4 through Windsor would cost substantially less than the DSEIS Alternative 4, because of differences in right of way and construction cost. The Modified Alternative 4 could provide options and funding for access management measures and the reconfiguration of the problematical six-leg intersection in the Windsor town center. In the important quality-of-life measure of business district modernization, which was not addressed in the DSEIS, Modified Alternative 4 would be a vast improvement over the DSEIS Alternative 4.

These conclusions are summarized in the following sections of this report.

¹ See HDR & WRA, Technical Memorandum, “Hybrid Comparison Analysis West of Zuni to Route 58” (Jan. 2, 2015).

² DSEIS at Figure 2.3-7.



SOURCE: 2014 DSEIS, Figure 2.3-7

Figure 2. Typical Section C, DSEIS Design Corridor Alternative 4

ISSUES WITH TYPICAL SECTION C, DSEIS ALTERNATIVE 4

Typical Section C of the DSEIS Alternative 4 (Figure 2), while an appropriate road design for an area with few businesses fronting on the road, is problematical for the built-up area of Windsor. This area, characterized by businesses, homes, and institutions with direct driveway access to US Route 460, extends 3.7 miles from Stave Mill Road (SR 646) to Old Suffolk Road (SR 636). Within this segment of US Route 460, there are around 90 business or institutional destinations (hereinafter “commercial” destinations) fronting on and having direct access from US Route 460.

The 16-foot raised median called for in Typical Section C limits vehicular access for all commercial driveways to “right turn in/right turn out” (RI/RO) movements. Left turns both into and out of commercial driveways are prevented by the raised median in Typical Section C. The 2014 DSEIS Alternative 4 compensates for the inability to make left turns into or out of driveways by accommodating U-turns at median openings and intersections. Typical Section C’s restricting of turning movements to RI/RO and accommodating U-turns is intended to both “manage” (improve safety and convenience of) access to commercial sites and improve traffic flow for “through” traffic (passing through Windsor but with neither origin nor destination within it).

However, in areas throughout the US similar to the 3.7-mile built-up area of Windsor (characterized by small, slow-growing single-business commercial sites and historic town centers), reliance on RI/RO and U-turns for commercial site access has proven to be problematical. The combination of RI/RO and compensating U-turns creates more turning movements on roads with RI/RO restriction than would otherwise occur on the same roads but with left turns permitted into and out of driveways. U-turns concentrate left turns at intersections rather than diffusing them to numerous midblock locations. This concentration of U-turns causes intersection delay, is a contributing factor in angle collisions, can result in demands for unwarranted signals, and can impose additional phases (protected left turns) on existing traffic signals thereby decreasing their capacity. The turning radius of even the smallest of vehicles routinely used for commercial delivery (the “single unit” local delivery truck) exceeds the available space in Typical Section C for such turns, and would necessitate widening, at intersections, beyond the pavement width provided in Typical Section C.

Typical Section C could be built with a “flush” median (Figure 2) at some locations or even throughout the Town, presumably permitting left turns directly into/out of fronting driveways. This configuration of Typical Section C would resemble a five-lane cross section, with four through lanes and a continuous two-way left turn lane (TWLTL). Properly sized, this would be an appropriate cross section for US Route 460 through Windsor. However, the dimensions of all of the components in Typical Section C render it inappropriate, even as a five-lane design, for the Windsor town center: the 16-foot “flush” median width, while needed for automobile U-turns with a raised median, exceeds the 13-foot width required for a TWLTL; the through lane widths (12 to 13 feet) in the Typical Section C exceed the desirable 11-foot widths allowable, for town centers, in the *VDOT Road Design Manual*; and the 14-foot “sidewalk” areas should be considered a desirable target to be balanced against required property takings, and not as a fixed requirement.

By its very size, Typical Section C is fundamentally unresponsive to its surroundings. It imposes a 105-foot right of way and access restriction on a town center area that has grown up around a 70 to 80 foot right of way, with unrestricted access to commercial sites. The 2014 DSEIS Alternative 4 with its Typical Section C does not adapt to this reality.

MODIFIED ALTERNATIVE 4 WITH “TOWN CROSS SECTION”

The Modified Alternative 4 proposed in this report replaces Typical Section C within Windsor with a five-lane cross section (hereinafter “Town Cross Section”), a widely-accepted design for areas such as this. Key elements of this Town Cross Section (Figure 3) are summarized in the following sections.

Continuous two-way left-turn lane (TWLTL) – This is the most widely accepted design approach in Virginia and throughout the US for: (1) improving traffic capacity and safety on town or urban roads with closely spaced commercial driveways; and (2) preserving the economic viability of businesses fronting the road. The *VDOT Road Design Manual* recommends that a TWLTL “should be considered on low-speed arterial highways (25 to 45 MPH) with no heavy concentrations [e.g., school, shopping mall] of left-turn traffic” and further suggests that they “also may be used where an arterial or major route must pass through a developed area having numerous street intersections and entrances, and where it is impractical to limit left turns.”³ This is a precise description of US Route 460 through the Windsor town center.

Design speed and speed limit – Design speed (dictated largely by a road’s sight distance and curvature) should be 5 to 10 mph greater than the posted speed limit of the road. Thus, a 40 mph design speed (same as recommended for Typical Section C) would accommodate the 30 to 35 mph posted speed limit that would be appropriate for a rebuilt US Route 460 through Windsor. Greater than a 40 mph design speed is already provided by conditions (long sight distance and gently curving alignment) along US Route 460 through Windsor.

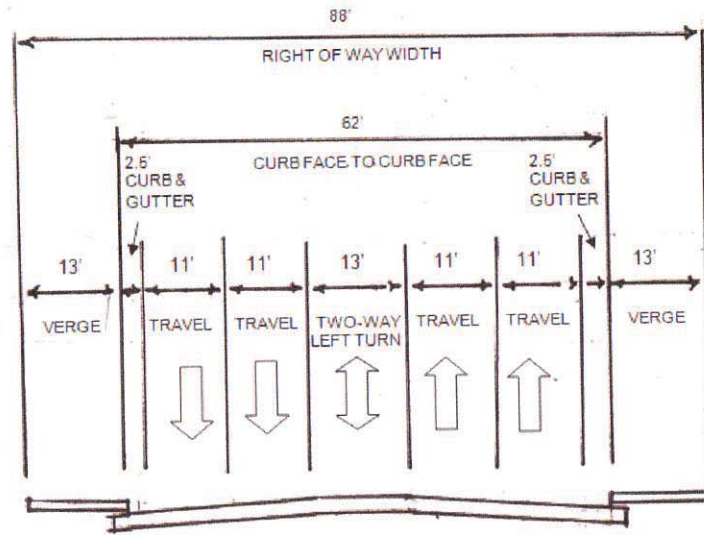
Right of way widths – The Town Cross Section calls for an 88-foot right of way (Figure 3A) through most of the 3.7-mile segment for which it is proposed. For a 1,600-foot (0.3-mile) segment in the Town of Windsor, a reduction in right of way width to 80 feet (Figure 3B) is needed to avoid impacts to closely fronting properties.

Through lane widths – For both versions of the Town Cross Section (Figure 3), four 11-foot through lanes are recommended. This width is allowed, for a design speed of 40 mph, by the *VDOT Road Design Manual*.⁴ This width (11 feet) is further supported by AASHTO’s *A Policy on Geometric Design of Highways and Streets* (the AASHTO “Green Book”), the underlying basis for the *VDOT Road Design Manual*. The 11-foot lane width enables a compact right of way that balances the need for traffic service with community needs such as managing access to commercial properties, accommodating pedestrians, and providing planting space for street trees.

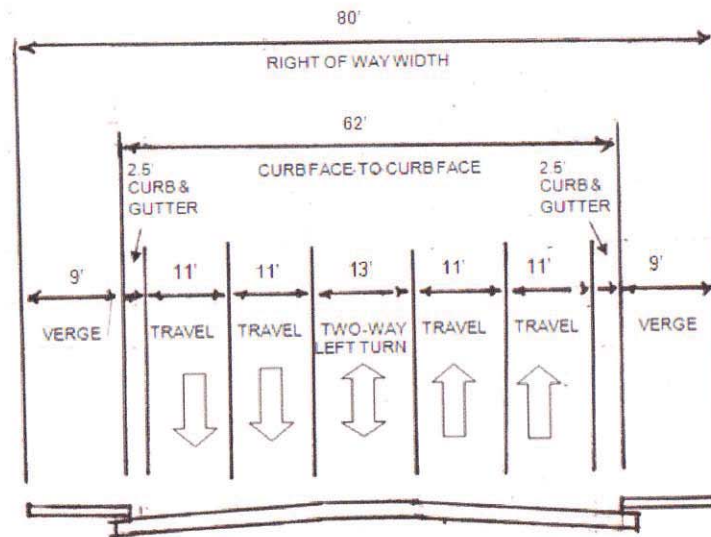
Even though 11-foot lanes are permitted by the *VDOT Road Design Manual*, VDOT might maintain that the objectives of a rebuilt US Route 460 segment in Windsor (for example,

³ *VDOT Road Design Manual*, Appendix F at F-89.

⁴ *Id.* at Figure A-1-5 (“Geometric Design Standards for Urban Principal Arterial System (GS-5)”).



A. Five-Lane, TWLTL, 88-Foot Right of Way



B. Five-Lane, TWLTL, 80-Foot Right of Way

Figure 3. Cross Sections, US Route 460, Modified Alternative

accommodating a large volume of heavy trucks, design consistency with future rebuilding of US Route 460 beyond Windsor, etc.) require lane widths greater than 11 feet. However, historical preservation and minimizing impact on local business provide strong justification for 11 foot lanes in Windsor.

The need for design exceptions (or for otherwise having to make the case) for lanes widths of 11 feet may soon become a non-issue. Under a proposed update of their design standards for the National Highway System (of which US Route 460 is a part), the FHWA is proposing that on “low-speed NHS roadways” of design speed less than 50 mph, deviations from lane width guidelines would no longer require design exceptions, and that there should be “the flexibility to choose lanes widths as narrow as 10 feet on some facilities.”⁵

Sidewalks and planting area – One of the features of Typical Section C that would be appropriate for Windsor is the generous (14-foot) area identified in the DSEIS as usable for sidewalks and plantings. For all but 0.3 miles, the Town Cross Section has a 13-foot area (almost the same as the Typical Section C’s 14 feet) on both sides of the roadway, containing a landscape buffer of at least 6 feet (permitting tree planting) as specified the *VDOT Road Design Manual*,⁶ plus sidewalk of at least 5 feet in width.

For a 0.3-mile segment through the center of Windsor, this area would be reduced to 9 feet in width. This width would still accommodate sidewalks and the planting of street trees on both sides of the street.

This roadside verge containing sidewalk and landscaping area is essential to: (1) provide safe and attractive pedestrian routes; (2) organize the currently unsafe access to commercial properties; (3) make access to fronting properties more convenient; and (4) impart a “town center” character to Windsor, through sidewalk continuity, design and narrowing of driveway openings, tree plantings, and other landscaping.

Access management measures – Modified Alternative 4 could readily support three types of access management actions: (1) replacement of wide unorganized driveways with driveways conforming to guidelines in the *VDOT Road Design Manual*⁷; (2) cross-access easements that would permit more commercial properties to connect to side streets, thereby minimizing the use of US Route 460 by local drivers; and (3) replacement of some driveways serving small commercial sites with jointly used driveways serving more than a single parcel.

Side street improvements – There are strong reasons for setting the limit of work for the Modified Alternative 4 to include side streets out to a distance of at least 200 feet from the edge of the US Route 460 right of way:

- Assuring proper side-street approach to US Route 460, with left-turn lanes on side streets where needed;
- Providing the first stage of sidewalks on side streets in commercial areas;

⁵ See FHWA, “Revision of Thirteen Controlling Criteria for Design; Notice and Request for Comment,” 80 Fed. Reg. 60732-01 (Oct. 7, 2015).

⁶ *VDOT Road Design Manual*, Appendix A at A-121.

⁷ *Id.* at Appendix F.

- Complementing the main street (i.e., US Route 460) access management actions, particularly the provision of cross access to side streets;
- Replacing frayed infrastructure (street pavement, driveway connections, drainage, lighting, etc); and
- Aesthetics – streetscape, plantings, lighting, etc.

All of the above measures would be accommodated within the existing right of way of the side streets.

CONCEPT PLAN OF THE MODIFIED ALTERNATIVE 4

The Modified Alternative 4 plan incorporates a combination of two cross sections within the segment identified as “Typical Section C, Windsor” in the DSEIS’s Figure 2.3-6:

- West of Route 646 (Stave Mill Road) and east of Route 636 (Old Suffolk Road), Modified Alternative 4 adopts the DSEIS “Typical Section C” (Figure 2 in this report), a four-lane road with 16-foot raised median, and curb and gutter drainage, in a 105-foot right of way.
- Between Route 646 (Stave Mill Road) and Route 636 (Old Suffolk Road), a distance of 3.7 miles, the recommended cross section is four lanes plus one continuous TWLTL, in the following two variations: (1) between Route 646 (Stave Mill Road) and B Avenue (a distance of 1.2 miles), and also between a point 300 feet east of Joyner Avenue and Route 636 (Old Suffolk Road), a distance of 2.2 miles, a cross section (Figure 3A) of 88 feet of right of way with four 11-foot lanes, a 13-foot TWLTL, curb and gutter drainage, and 13-foot verge on either side; and (2) between B Avenue and a point 300 feet east of Joyner Avenue in Windsor (a distance of 0.3 miles), a typical cross section (Figure 3B) of 80 feet, with four 11-foot lanes, a 13-foot TWLTL, curb and gutter drainage, and 9-foot verge. For a short (700-foot) segment centered on the six-leg intersection, some adjustment in the verge width might be required to minimize property acquisitions.

The concept plan for Modified Alternative 4 incorporating the Town Cross Section is shown, for the central area of Windsor, on Figures 4 through 12. These figures focus on the segment between the US Route 460/US Route 258 intersection and the US Route 460/Hidden Acres Circle intersection (a distance of 1.3 miles). This segment of US Route 460 encompasses the areas where there are closely fronting commercial, institutional or historical properties, and where therefore the property taking impacts of the concept could be an issue.

Outside the 1.3-mile central area of Windsor (i.e., west of the US Route 460/US Route 258 intersection and east of the US 460/Hidden Acres Circle intersection) there are no commercial or residential structures or parking areas closely fronting the 88-foot right of way proposed for the Town Cross Section. The property takings (minor “partial takes”) needed for the Town Cross Section are not likely to be an issue.

PROPERTY ACQUISITION IMPACT OF MODIFIED ALTERNATIVE 4

The existing right of way of US Route 460 through the Town of Windsor is typically 80 feet to the west of the six-leg intersection and 70 feet (with some segments 66 feet) to the east.

Figure 4: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section

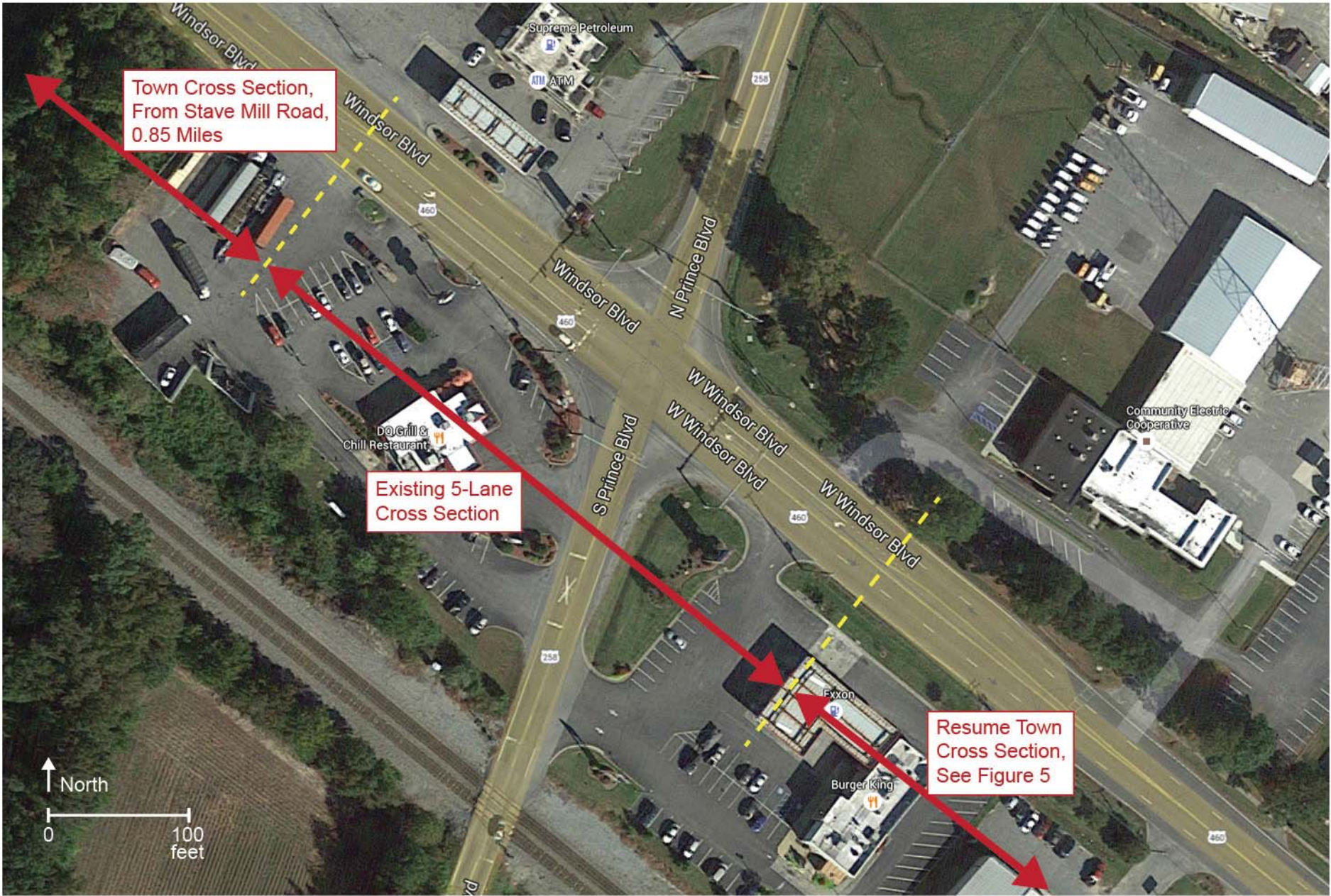


Figure 5: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section



Figure 6: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section



Figure 7: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section

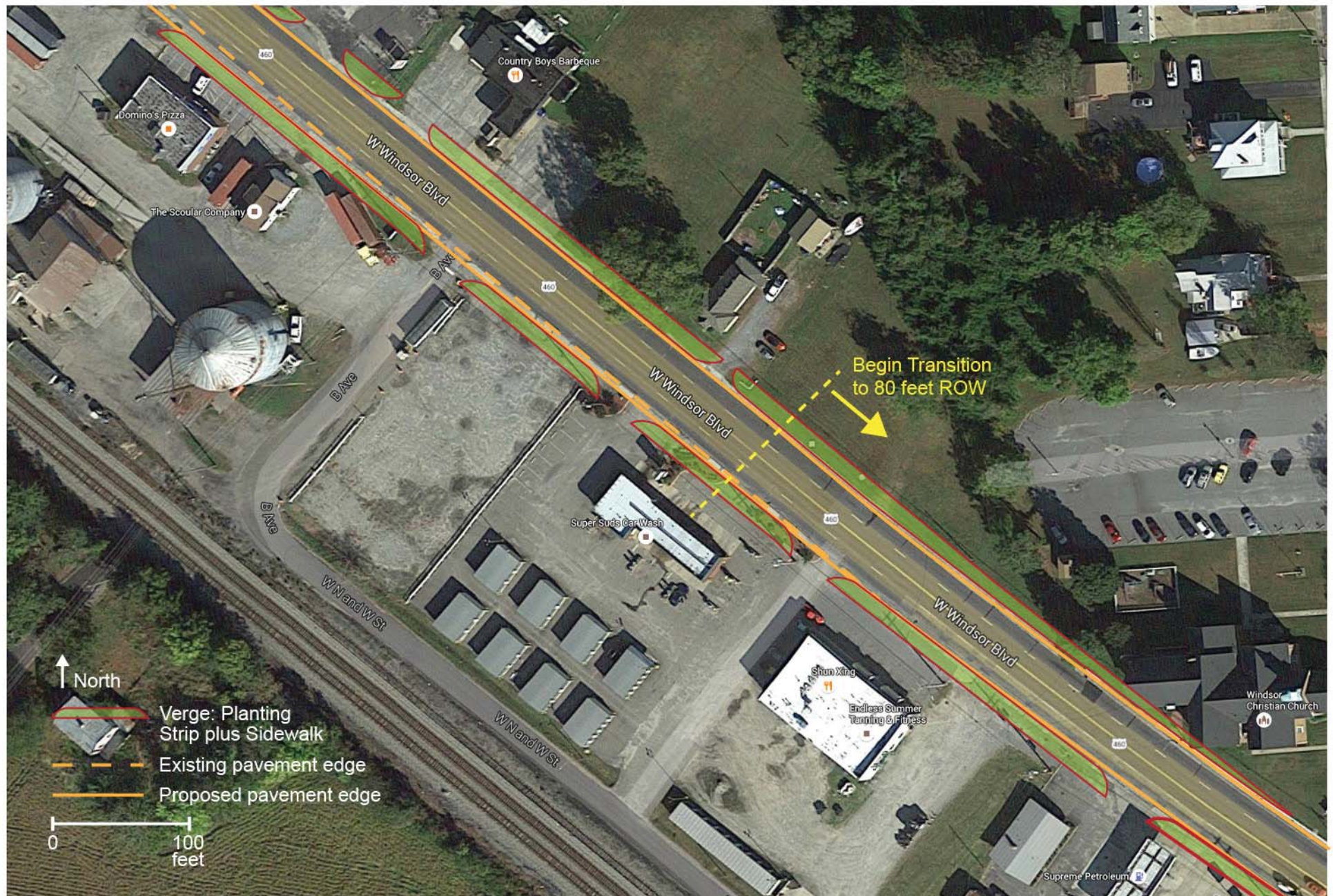


Figure 8: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section



Figure 9: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section



Figure 10: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section



Figure 11: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section

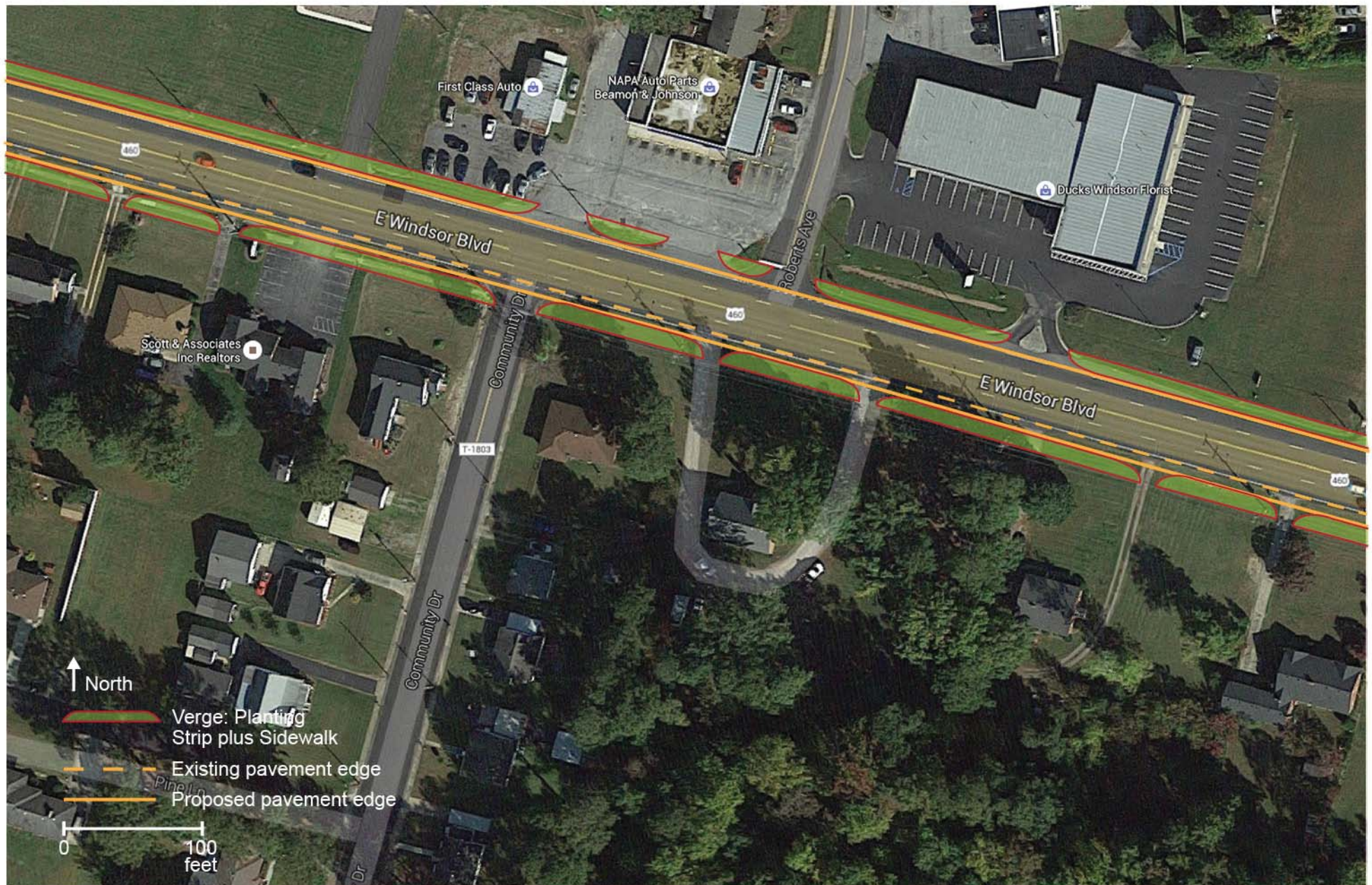


Figure 12: US Route 460, Modified Alternative 4 Concept Plan with “Town” Cross Section



The right of way needed for the Town Cross Section in Modified Alternative 4 is either 88 feet (Figure 3A) or 80 feet (Figure 3B). The Modified Alternative 4, therefore, would require additional right of way (beyond the typical existing 70 – 80 feet) ranging from 8 feet to 18 feet.

The increment of right of way needed for the Modified Alternative 4 through the 3.7 mile segment for which the Town Cross Section is proposed is around 7 acres. This increment of right of way is around one-half of the 15 acres that would be required over the same 3.7-mile segment for the 2014 DSEIS Alternative 4 with its 105-foot right of way.

With the exception of one segment (around 700 feet in length centered on the six-leg intersection) the increment of right of way needed for the Town Cross Section can be obtained with only minor “partial takes” without the need for building demolition, major modification of a structure, or taking of a complete property. Further, the additional right of way needed for the Town Cross Section would not deprive any property of an adequate number of on-site parking spaces, although some reconfiguration of parking would be needed at some locations.

The 700-foot “tight spot” centered on the six-leg intersection is due to an existing right of way of only 70 feet, bordered closely by several buildings. The proposed 80-foot right of way (Figure 3B) could, at most, require substantial taking or modification of buildings on four properties: (1) the Supreme Petroleum fuel pump and mini-mart building at 5 West Windsor Boulevard (i.e., US Route 460); (2) the vacant lot just to the west of the six-leg intersection at 5 Bank Street; (3) the fuel pump area at the Southern Food Store, at 9 East Windsor Boulevard; and (4) Aerus Electrolux at 11 East Windsor Boulevard. As a first step in reducing the right of way impact on these parcels, the verge can be reduced to six feet (sidewalk only) through and near the six-leg intersection. Two additional options could further minimize the right of way impacts on these four parcels: (1) elimination of the sidewalk on the north side of US Route 460 through the six-leg intersection; and (2) obtaining a design exception for reduced lane width through the six-leg intersection area.

The Modified Alternative 4 does not require any taking of right-of-way from historical properties, neither National Register of Historic Places (NRHP) listed/eligible nor contributing properties within the Windsor Historical District.⁸ This absence of takings of historical properties contrasts sharply with the 2014 DSEIS Alternative 4, which requires right-of-way takings from: (1) at least 14 contributing properties in the Windsor Historical District; and (2) at least two NRHP eligible or listed properties.

IMPACT OF MODIFIED ALTERNATIVE 4 ON WETLANDS

The Modified Alternative 4, requiring only 7 acres of new right of way, could be expected to have less impact on wetlands than 2014 DSEIS Alternative 4 with its need for 15 acres of new right of way. Given the small wetlands impact of the 2014 DSEIS Alternative 4 (only two acres in “area 3” which encompasses Windsor) and further, that the Modified Alternative 4 requires less than half that needed for the 2014 DSEIS Alternative 4, it is likely that the wetland impact of Modified Alternative 4 is minimal.

⁸ See DSEIS, Appendix A, *Draft Section 4(f) Evaluation* at Figures 3-2e and 4-17.

POSSIBLE ACCESS MANAGEMENT MEASURES

Table 1 summarizes the access management actions that could be readily incorporated with the design of the Modified Alternative 4. These actions would be voluntary on the part of property owners, would not require property taking other than that needed for the Town Cross Section, would not eliminate direct access to/from US Route 460 for any property, and would not require any administrative action by the Town.

A more aggressive approach to access management—for example, mandating joint use driveways, requiring cross access with all adjacent properties, or including cross-access drive lanes in the Modified Alternative 4 construction plans—would yield a substantially greater number of access management actions than those summarized in Table 1.

Table 1
Summary of Possible Access Management Actions
Modified Alternative 4
3.7-mile Segment of US Route 460, Windsor, VA

Type of Access Management Measure	Extent of Access Management Measure
Reduce width and reconfigure currently undefined driveways	<ul style="list-style-type: none">• 21 locations• Currently 1,600 feet in aggregate width Reduce to aggregate of 620 feet
Close driveways	<ul style="list-style-type: none">• 8 locations• Access through remaining property access or adjacent joint-use driveway
Cross-access easement	<ul style="list-style-type: none">• 4 locations• Total of 10 properties connected
Driveway geometric design conforming to VDOT access management guidelines	<ul style="list-style-type: none">• All driveways on Modified Alternative 4• Curb and gutter cross section at all driveways

RECONFIGURATION OF THE SIX-LEG INTERSECTION

Traffic issues at the six-leg intersection – The six-leg intersection of US Route 460 with Court Street, Church Street, and Bank Street in the center of Windsor is rightly regarded as a problem by drivers and VDOT. Among its traffic issues are:

- Numerous conflicting movements. While these are manageable given the low traffic volumes on the side streets, they are disconcerting to drivers, who see them as a safety problem.
- Geometry of intersecting streets, with a number of acute angles of intersecting streets. Further, the geometry creates large areas of pavement which do not sufficiently confine movements.
- Capacity on US Route 460 – because of the absence of left turn lanes on US Route 460, turning movements into the side streets at the six-leg intersection can block through traffic on US Route 460.

Opportunities for reconfiguring the six-leg intersection – The large amount of space occupied by streets and parking in the Windsor town center area (for a block or so in all directions from the six-leg intersection) while a detriment to the appearance and character of the Town, is on the other hand an opportunity for reconfiguring the circulation of the six-leg intersection. Much of the area needed for reconfiguring the intersection already exists as street pavement, parking area, or vacant land.

Objectives of reconfiguring the six-leg intersection –

- Organize and simplify turning movements
- Preserve connections between the side streets
- Improve traffic flow on US Route 460
- Improve appearance of the town center
- Reduce amount of pavement in the town center

Approaches to reconfiguring the six-leg intersection – Typically, approaches to simplifying complex intersections such as the six-leg intersection in the Windsor town center involve some combination of: (a) realigning streets to meet in two or more four-way intersections; (b) merging side streets so that only a single combined street intersects with the “main” street; (c) limiting some street segments to one-way flows; and (d) rotary flow (roundabout or “courthouse square”) to disperse the intersections.

One feasible reconfiguration (Figure 13) of the Windsor six-leg intersection would incorporate three elements of the typical approach identified above; specifically:

- Separating the streets now forming the six-leg intersection into two conventional 4-way intersections on US Route 460, the western one at the current location of the six-leg intersection and the eastern one 140 feet to the east.
- Shifting the northern end of South Court Street eastward some 140 feet, intersecting US Route 460 at its reconfigured eastern intersection and thereby leaving a single street intersecting US Route 460 from the south at the western 4-way intersection (current six-leg intersection location).
- Bending the southern end of Church Street slightly to the east, to meet the reconfigured eastern intersection.
- Inserting a segment of east-west street, with one-way traffic eastbound, around 130 feet to the south of US Route 460. This segment of street functions as a “partial roundabout.”
- Restricting traffic movements on the northern end of the relocated South Court Street (i.e., between the new east-west street segment (above) and US Route 460), a distance of around 100 feet, to one-way movement northbound.

The land use impacts of the reconfigured intersection would be:

- Creation of a highly visible town center park square adjacent to US Route 460.
- “Partial take” and rebuilding of the property (Southern Food Store and gas station) on the southeast corner of US Route 460/South Court Street (relocated). This location would continue as a high-value location.

Figure 13: Reconfigured Six-Leg Intersection, Windsor, VA



Traffic operations at a reconfigured six-leg intersection – The two 4-way intersections would be signalized as a single intersection. The distance between stop bars, around 220 feet, is similar to the distance between stop bars at the existing six-leg intersection, so signal clearance time would need not increase over that existing. Given the low turning volumes and the availability of left-turn storage, it is likely that simple two-phase signal cycles (i.e., with “permitted” but not “protected” left turns) would suffice. Two-phase operation would yield the maximum possible signal capacity for through traffic on US 460.

Detailed traffic capacity analysis based on turning movement counts may indicate a possible future need for a “protected” left turn phase, to facilitate turning movements from US Route 460 into Church Street and Court Street. The addition of a protected left turn phase could add slightly to the traffic signal delay for through traffic on US Route 460. The capacity of the signalized intersections, even with left turn phase included, would be adequate for the projected year 2040 peak hour traffic volumes (see following section, “Traffic Operations”).

Street continuity and connectivity – Under the proposed plan for reconfiguring the six-leg intersection, three movements, all of them low-volume, would require a “dog leg” segment of travel on US Route 460 between the two intersections: (1) from South Court Street northbound to North Court Street; (2) from Church Street southbound to Banks Street; and (3) from Church Street southbound to South Court Street. All other movements (21 in number) are accomplished without “dog leg” travel on US Route 460.

TRAFFIC OPERATIONS

Traffic Safety – Both the Modified Alternative 4 and the 2014 DSEIS Alternative 4 correct the geometric design deficiencies of US Route 460, thereby improving safety for all users. In addition, the TWLTL in Modified Alternative 4 eliminates several factors that would contribute to crashes in DSEIS Alternative 4: U-turns at intersections, increased vehicle miles of travel due to restriction of left turns into/from driveways, and lane changing on US Route 460 before/after U-turns.

Existing traffic volumes and capacity – The Hampton Roads Transportation Planning Organization (HRTPO) reports, for the highest-volume segment of US Route 460 in Windsor (between US Route 258 and the six-leg intersection)⁹:

- Most recent (year 2014) weekday average daily traffic (ADT) volume of 14,326
- A “moderate” level of congestion
- A growth rate of 0.6% over the three-year period from 2011 to 2014

Applying generalized guidelines from the 2010 Highway Capacity Manual (HCM) confirms that only moderate peak-hour congestion would be present on a Modified Alternative 4 under existing traffic volumes. At the critical location for capacity (the signalized intersection of US Route 460 with US Route 258), the year 2014 peak hour volumes (around 10% of ADT) are using around 45% of its capacity. At the other three signalized locations, there is more spare capacity than at the US Route 460/US Route 258 intersection. For all road segments with

⁹ HRTPO, *Volumes, Speeds, and Congestion on Major Roadways in Hampton Roads* (Oct. 2015).

“uninterrupted flow” (i.e., more than 1/4-mile upstream from a traffic signal), the capacity of the five-lane Town Cross Section (57,000 ADT) far exceeds the year 2014 ADT of 14,320.

Year 2040 traffic and capacity – The projected year 2040 ADT on the 2014 DSEIS Alternative 4 through Windsor is 27,500 ADT.¹⁰ Presumably, the critical location for traffic capacity would continue to be the US Route 460/US Route 258 intersection. Generalized guidelines from the 2010 HCM show that the peak hour traffic (around 10% of ADT) would use 86% of the capacity of the signalized intersection. Capacity could be increased by routine traffic engineering measures such as dual left turn lanes. At the other three signalized locations, there would be more spare capacity than at the US Route 460/US 258 intersection. For all road segments with “uninterrupted flow,” the capacity of the Town Cross Section (57,000 ADT) would far exceed the year 2040 ADT of 27,500.

Travel Time and Delay – Travel time and delay on US Route 460 through Windsor are determined largely by: (1) signalized intersection elements (number of approach lanes, type of signal equipment, and signal phasing); and (2) traffic volumes approaching the signals. The signalized intersection elements would be identical for the Modified Alternative 4 and 2014 DSEIS Alternative 4. However, the traffic volumes approaching the intersections would be slightly higher for the 2014 DEIS Alternative 4, reflecting the U-turns needed for local property access. Consequently, the signal delay and travel time would be slightly higher under the 2014 DSEIS Alternative 4.

Actual versus projected traffic growth – Traffic volumes on US Route 460 through Windsor are not growing at the rate projected in the DSEIS. Based on traffic counts from the HRTPO, the annual growth rate (compounded) in ADT through Windsor for the three-year period from 2011 to 2014 was 0.6% (slightly over one-half of one percent).

The annual growth rate (compounded) for the increase in ADT from the most recently reported HRTPO data (14,326 ADT in the year 2014) and the year 2040 projection for the 2014 DSEIS Alternative 4 (27,500 ADT) is 2.5%. The annual growth rate of 0.6% observed over the 2011 to 2014 period is therefore one-fourth of the 2.5% annual growth projected for the 2014 to 2040 period. This large difference between observed and projected growth rates suggests that the year 2040 forecast might not be realized, further suggesting that the spare capacity of US Route 460 through Windsor is likely to be even more ample in the year 2040 than indicated by the above calculations.

ACCOMPLISHMENT OF PROJECT PURPOSE AND NEED

US Route 460 with the Town Cross Section in place of Typical Section C addresses all of the objectives of the *Purpose and Needs Elements* section of the DSEIS as follows (Table 2)¹¹:

¹⁰ DSEIS, *Traffic and Transportation Technical Report* at Table 5-16.

¹¹ See DSEIS at § 1-3.

Table 2
Accomplishment of Project Purpose and Need
Modified Alternative 4

Purpose and Need Element	Accomplishment of Project Purpose and Need Objectives	
	By Modified Alternative 4	Compared to 2014 DSEIS Alternative 4
Address roadway geometric design deficiencies	<ul style="list-style-type: none"> Brings roadway design into conformity with the <i>VDOT Road Design Manual</i> 	Same as 2014 DSEIS Alternative 4
Improve safety	<ul style="list-style-type: none"> Removes left-turn vehicles from through lanes Eliminates lane changing due to through-lane blockage by left-turning vehicles Provides opportunity to reduce number of driveways Provides proper driveway configurations Provides sidewalks Minimizes crosswalk distances at intersections 	Better than 2014 DSEIS Alternative 4
Accommodate increasing freight shipments	<ul style="list-style-type: none"> Removes vehicles waiting to make left turns from truck traffic in through lanes Reduces lane changing conflicts 	Better than 2014 DEIS Alternative 4
Reduce travel delay	<ul style="list-style-type: none"> Eliminates delay due to blockage of through lanes by left-turning vehicles Direct access to fronting driveways 	Better than 2014 DSEIS Alternative 4
Emergency evacuation capability	<ul style="list-style-type: none"> Undivided through lanes road (no median) are more easily converted than divided lanes to imbalanced flow (three lanes in major direction) in emergencies. Further, TWLTL provides a FOURTH outbound evacuation lane. Drainage and road flooding problems eliminated 	Better than 2014 DSEIS Alternative 4
Improve strategic military connectivity	<ul style="list-style-type: none"> Meets the Strategic Military Connectivity need to “advance infrastructure improvements that enhance the military’s readiness capability”¹² 	Same as 2014 DSEIS Alternative 4
Address local economic development goals	<ul style="list-style-type: none"> Direct and improved access to local businesses Upgraded US Route 460 improves traffic flow 	Better than 2014 DSEIS Alternative 4

¹² *Id.* at §1.3.6.

Further indication of the extent to which the Modified Alternative 4 meets the project purpose and need is provided in the VDOT *Road Design Manual* listing of the advantages of roads with a TWLTL¹³:

- *Reduced travel time*
- *Improved capacity*
- *Flexibility of using as temporary detour*
- *Does not control or limit the number of left turns*
- *Separates opposing traffic flows by one full lane*
- *Public preference*
- *Reduced accident frequency, particularly rear-end collisions*

CONCLUSION

The Modified Alternative 4 as described in this report is superior to the 2014 DSEIS Alternative 4 with respect to all the evaluation measures identified for the US Route 460 Corridor project:

- ***Purpose and need attainment*** – The Modified Alternative 4 surpasses the 2014 DEIS Alternative 4 in five of the seven purpose and need objectives for the US Route 460 project, and equals the performance of the 2014 DSEIS Alternative 4 for the other two objectives (Table 2 above).
- ***Environmental impacts*** – The Modified Alternative 4 requires only one-half the additional right of way and a fraction of the property takings needed by the 2014 DSEIS Alternative 4. The Modified Alternative 4 does not require any taking of property from historical properties. The Modified Alternative would have even less wetland impact than the already minimal impact of 2014 DSEIS Alternative 4.
- ***Project cost*** – The Modified Alternative 4 would cost significantly less than the 2014 DSEIS Alternative 4, due to lower property acquisition and construction costs.

The 2014 DSEIS Alternative 4 is a cost effective and, except for its historical property impact, the most environmentally sensitive of the alternatives considered for the US Route 460 corridor project. The Modified Alternative 4 presented in this report overcomes the most serious shortcomings of the 2014 DSEIS Alternative 4—its right of way takings and impact on historical properties—and thus will meet the project purpose and need with far less impacts than other alternatives considered not only in the 2014 DSEIS but also for the 17-mile segment of US Route 460 through or around the Town of Windsor.

¹³ VDOT *Road Design Manual*, Appendix F at F-89.

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Traffic Engineer

EDUCATION

Graduate Studies, Civil Engineering
(Transportation Planning) Northwestern
University, Evanston, Illinois

Master of Business Administration, University
of North Carolina, Chapel Hill, North Carolina

Bachelor of Science, Industrial Engineering,
North Carolina State University, Raleigh, North
Carolina

EXPERIENCE

Public-interest traffic engineering consultant,
2007 – present

Principal, Senior Transportation Planner,
Glatting Jackson Kercher Anglin, Inc., Orlando,
Florida (1987 - 2007)

Senior Transportation Planner, Post, Buckley,
Schuh & Jernigan, Inc., Orlando, Florida (1984
- 1987)

Senior Associate, Alan Voorhees & Associates,
McLean, Virginia (1971 to 1984)

REGISTRATION

Professional Engineer, Florida, #45920
and Alabama #31910.

MAJOR AREAS OF EXPERTISE

Over 40 years of experience in traffic engineering. Since the 1990's, focused on bringing balance to the design of roads, improving not just their vehicular traffic capacity but also their accommodation of non-motorized travel, and their value for local businesses and as focal points of civic pride and enthusiasm. Has applied this approach, "context sensitive" design, to roads in new communities, in "retro-fits" of damaged areas such as blighted commercial strips and early-

generation shopping malls, and the rebuilding of major arterial highways.

Roadway Planning: Applied traffic forecast modeling and capacity analysis for concept plan for Shelby Farms Parkway in Memphis; "86/64" plan for replacing riverfront freeway in Louisville; Riverfront Parkway conversion from freeway in Chattanooga; Route 202 greenway/parkway in Bucks County, PA.; Martin Luther King Parkway through the University Circle area in Cleveland; Route 19 riverfront conversion from freeway in Trenton; Fort Washington Way (I-71) in Cincinnati; I-20/59 in downtown Birmingham; Alaskan Way freeway conversion in Seattle.

Highway Alternatives Analysis: Conversion of Columbus Boulevard to waterfront centerpiece, Philadelphia; downsizing of Cumberland Avenue, Knoxville; prototype designs for strip reclamation, Savannah GA, La Crosse, WI and Kansas City; reclamation of Route 51, Pittsburgh; transition to urban boulevard on Brambleton Avenue, Norfolk; "town and country" concept on Maybank Highway, Charleston SC; removing ramps and restoring urban street features on Mercury Boulevard in Hampton, VA; lane reduction and transition to urban avenue on South Orange Avenue, Orlando; transition to urban boulevard on Johnny Dodd Boulevard, Mount Pleasant, SC.

Traffic Capacity Analysis: Responsible charge for application of Highway Capacity Manual procedures and proprietary applications software (HCS and Synchro) for projects throughout the US, including traffic impact analysis for private developments, comparison of road improvement alternatives, review of proposed road designs and environmental impact analysis.

Environmental Document Review: Reviewed traffic and transportation elements of environmental documents for major highway projects in Tennessee, California, Georgia, Florida, New York and Pennsylvania. Focus of reviews included traffic capacity analysis, traffic modeling and safety analysis.

Residential street design: Street designs for numerous communities, including Bluffton, South Carolina; Centerville, Ohio; Liberty, California; Suffolk, Virginia.

Town Center Streets: New urbanist street and block layouts in numerous communities.

Policy Advice on “Smart Growth” traffic planning: PennDOT, New Jersey DOT, Delaware Valley RPC.

Testimony: Accepted as expert for court testimony in Pennsylvania, New York, Georgia and Ohio. Numerous appearances at hearings for record.

PUBLICATIONS

Residential Streets, Third Edition, 2001, Urban Land Institute, (Principal Author).

Time Saver Standards for Urban Design, 2003, McGraw Hill Companies, Traffic Calming, Section 7.2.

Can't Get There from Here – Or Can We, Forum for Applied Research and Public Policy, Summer, 2001

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Massachusetts Highway Design Manual (Intersection, Traffic Calming Chapters), 2005.