

Ref: 7943

July 27, 2018

Mr. Fred Hamwey, P.E.
Principal
Hamwey Engineering Inc.
46 Austin Street
Leominster, MA 01453

Re: Traffic Engineering Peer Review
Goodridge Brook Estates – Sterling Road
Lancaster, Massachusetts

Dear Fred:

Vanasse & Associates, Inc. (VAI) has completed a review of the materials submitted on behalf of Crescent Builders, Inc. (the “Applicant”) in support of the proposed Goodridge Brook Estates residential development to be located off Sterling Road in Lancaster, Massachusetts (hereafter referred to as the “Project”). The Project has been submitted to the Town for consideration of the issuance of a Comprehensive Permit under the provisions Massachusetts General Laws, Chapter 40B, Sections 20-23, as amended (Chapter 40B). Our review focused on the following specific areas as they relate to the Project: i) vehicle and pedestrian access and circulation; ii) Massachusetts Department of Transportation (MassDOT) design standards; iii) Town Zoning requirements as they relate to access, parking and circulation; and iv) accepted Traffic Engineering and Transportation Planning practices.

In support the Project, the Applicant submitted the following materials which are the subject of this review:

1. *Site Development Plan of Land*, Goodridge Brook Estates, Multi Unit & Single Family Subdivision Layout, Lancaster, Massachusetts; GLM Engineering Consultants, Inc.; February 8, 2018, last revised July 5, 2018; and
2. *Traffic Impact and Access Study*, Proposed Goodridge Brook Estates, Sterling Road, Lancaster, Massachusetts; Green International Affiliates, Inc.; June 2018.

In addition, VAI reviewed the site locus in order to validate the existing conditions context of the Project and the study area that was assessed in the June 2018 *Traffic Impact and Access Study* (the “June 2018 TIAS”), and to observe factors that could impact the design and location of the access to the Project site and potential off-site improvements.

Based on our review of the June 2018 TIAS and the accompanying *Site Development Plan of Land*, we have determined that the materials were prepared in a professional manner and following the applicable standards of care. That being said, we have requested that the study area that was assessed in the June 2018 TIAS be expanded to include the intersections of Sterling Hill Road at George Hill Road and Sterling Street (Route 62) at Chase Hill Road, and that the Applicant’s engineer: i) confirm that there are no roadway improvement projects planned in the area; ii) refine the trip distribution pattern for the

Project; and ii) define the limits of vegetation trimming/removal that are required to provide the necessary sight lines at the Project site roadways/driveway. In addition, we have requested that the Applicant's engineer review and revise specific elements of the Site Plans with regard to internal circulation, plan notations, and parking for the multi-family component of the Project.

The following summarizes our review of the materials submitted in support of the Project. Our comments are indicated in *italicized* text, with those requiring responses or additional information ***bolded***.

PROJECT DESCRIPTION

The Project will entail the construction of a 200-unit residential community that will be comprised of 64 single-family homes and 136 multi-family units to be collectively known as Goodridge Brook Estates and located off Sterling Road in Lancaster, Massachusetts. The Project site encompasses 45.42 ± acres of land that is bounded by Sterling Road to the north; residential and agricultural properties to the south and east; and a commercial property to the west. At present the Project site consists of areas of open and wooded space and low-lying wetland areas.

Access to the Project will be provided by way of two (2) roadways and one driveway defined as follows: Road "A" will intersect the south side of Sterling Road approximately 1,300 feet west of Deershorn Road and will provide access to 53 single-family homes; Road "C" will intersect the south side of Sterling Road approximately 400 feet west of Road "A" and will provide access to seven (7) single-family homes; and a driveway that will intersect the south side of Sterling Road approximately 1,300 feet west of Road "A" and will provide access to the multi-family residential buildings (136 units total). Four (4) of the proposed single-family homes will front along Sterling Road will have individual driveways that will provide direct access to Sterling Road.

The Applicant has proposed to construct 180 parking spaces to serve the multi-family residential development, or a parking ratio of 1.32 spaces per dwelling unit, with reserve areas to increase the total number of parking spaces to 204, or a parking ratio of 1.5 spaces per dwelling unit. Parking for the single-family homes will be provided in individual driveways and garages that will accommodate a minimum of two (2) vehicles per home.

JUNE 2018 TRAFFIC IMPACT AND ACCESS STUDY

General

Comment: The June 2018 TIAS was prepared in a professional manner and following the applicable standards of care; however, the study was not stamped and signed by the Professional Engineer in responsible charge for the preparation of the document as required pursuant to Massachusetts General Law. ***A letter should be provided by the Professional Engineer attesting to their oversight in preparing the document and providing their Massachusetts Professional Engineer Registration number and discipline.***

Existing Conditions

Study Area

The study area that was assessed in the June 2018 TIAS consisted of Sterling Road, Sterling Street/Clinton Road (Route 62) and Deershorn Road, and the following specific intersections:

- Sterling Road/Flagg Road/Route 62
- Sterling Road/Deershorn Road/George Hill Road

Comment: *This study area is generally sufficient to evaluate the potential impact of the Project on the transportation infrastructure based on the expected trip-distribution pattern for the Project, and encompasses the major intersections located proximate to the Project site where the Project is expected to result in an increase in peak-hour traffic volumes by: i) five (5) percent or more; or ii) by more than 100 vehicles per hour.*

Given the expected trip distribution pattern for the Project, the study area should be expanded to include the intersection of Sterling Street (Route 62) at Chase Hill Road. In addition, a discussion of the impact of the Project at the Sterling Hill Road/George Hill Road intersection should be provided given its proximity to the Sterling Road/Deershorn Road intersections.

Traffic Volumes and Data Collection

Traffic volume data was collected at the study area intersections by means of: i) manual turning movement counts (TMCs) and vehicle classification counts conducted on Wednesday, April 11, 2018 during the morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak periods; and ii) automatic traffic recorder (ATR) counts conducted on Tuesday, April 10, 2018 through Wednesday, April 11, 2018, inclusive, on Sterling Hill Road in the vicinity of the Project site. The ATR counts included the collection of vehicle travel speed data. A review of seasonal adjustment data available from MassDOT indicated that traffic volume conditions during the month of April are slightly below average conditions and, as such, the raw traffic count data were adjusted upward accordingly to average-month conditions.

Comment: *The data collection effort (traffic counts and vehicle travel speed measurements) and establishment of the seasonal adjustment were completed in accordance with standard Traffic Engineering and Transportation Planning practices, and we are in general agreement that the resulting data provides a reasonable basis from which to assess the potential impact of the Project on the transportation infrastructure.*

Pedestrian and Bicycle Facilities

A description of existing pedestrian accommodations within the study area was included as a part of the intersection descriptions.

Comment: *Sidewalks are not provided along Sterling Road in the vicinity of the Project site. The Applicant's engineer identified that a sidewalk is provided along the north side of Sterling Road from George Hill Road and continuing easterly thereafter to Main Street.*

A description of existing and planned future bicycle accommodations within the study area and their relationship to the Project site should be provided.

Public Transportation

A review of existing public transportation services that are available within the study area was provided as a part of the June 2018 TIAS. Based on this review, at this time there are no regularly scheduled public transportation services within the study area.

Comment: *We note that the Montachusett Regional Transit Authority (MART) provides Council-On-Aging (COA) transportation services for elderly (age 60+) and disabled residents within the Town of Lancaster that is coordinated through the COA.*

Motor Vehicle Crash Summary

Motor vehicle crash information was obtained for the study area intersections from MassDOT for the three-year period 2013 through 2015, inclusive. Based on a review of this information, six (6) motor vehicle crashes were reported to have occurred at the Sterling Road/Flagg Road/Route 62 intersection over the three-year review period, with one (1) crash reported at the Sterling Road/Deershorn Road intersection. The majority of the crashes were reported to have occurred during daylight; on dry pavement; and involved single-vehicle or sideswipe collisions that resulted in property damage only. All of the study area intersections were found to have a motor vehicle crash rate (average number of motor vehicle crashes reported per year per million vehicles traveling through an intersection) that was below the MassDOT average motor vehicle crash rates for similar intersections.

Comment: *The motor vehicle crash analysis was completed in accordance with MassDOT standards and following standard Traffic Engineering and Transportation Planning practices, and we are in agreement with the findings of the analysis.*

A review of the MassDOT statewide High Crash Location List indicated that there are no designated locations within or immediately proximate to the study area that are included in MassDOT's Highway Safety Improvement Program (HSIP) database as high crash cluster locations.

Future Conditions

No-Build Conditions

Traffic volumes within the study area were projected to 2025, which represents a 7-year planning horizon from the existing conditions base year (2018) that was presented in the June 2018 TIAS. The future condition traffic volume projections were developed by: i) applying a background traffic growth rate to the 2018 Existing traffic volumes; and ii) adding traffic associated with specific development projects by others that may increase traffic volumes within the study area beyond that accounted for by the background traffic growth rate.



The Applicant's engineer consulted with the Town of Lancaster Community Development and Planning Department in order to determine if there were any specific development projects by others that would result in an increase in traffic volumes within the study area that would exceed the background traffic growth rate. Based on this consultation, the Applicant's engineer incorporated traffic volumes associated with the construction of the Jones Crossing residential development (36 single-family homes) into the future condition traffic volume projections.

Based on a comparison of traffic count data obtained from historic counts conducted by MassDOT along Sterling Road, the Applicant's engineer determined that use of a 0.5 percent per year compounded annual background traffic growth rate would reflect the expected growth in traffic that will occur within the 7-year time horizon of the June 2018 TIAS.

Comment: *We are in agreement with the methodology that was used to develop the future No-Build condition traffic volume projections for the Project and consider the resulting traffic volumes to represent a reasonable future planning condition from which to assess the impact of the Project on the transportation infrastructure.*

The Applicant's engineer should consult with MassDOT and the Town in order to determine if there are any planned roadway improvement projects within the study area that would impact traffic volumes, trip patterns or operating conditions.

Build Conditions

Future Build condition (with the Project) traffic volume projections were developed by the Applicant's engineer using trip-generation statistics published by the Institute of Transportation Engineers (ITE)¹ for similar land uses as those proposed (single-family homes and multifamily residential). The following table summarizes the trip-generation calculations for the Project as presented in the June 2018 TIAS using the ITE data.

¹*Trip Generation*, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2017.

GOODRIDGE BROOK ESTATES TRIP-GENERATION SUMMARY

Time Period/Direction	Vehicle Trips		
	(A) Single-Family Homes (64 Units)	(B) Multi-Family Housing (136 Units)	(C = A + B) Total
<i>Average Weekday Daily:</i>			
Entering	345	494	839
<u>Exiting</u>	<u>345</u>	<u>494</u>	<u>839</u>
Total	690	988	1,678
<i>Weekday Morning Peak Hour:</i>			
Entering	13	15	28
<u>Exiting</u>	<u>38</u>	<u>49</u>	<u>87</u>
Total	51	64	115
<i>Weekday Evening Peak Hour:</i>			
Entering	42	49	91
<u>Exiting</u>	<u>24</u>	<u>29</u>	<u>53</u>
Total	66	78	144

Traffic volumes associated with the Project were assigned onto the study area roadway network based on a review of existing travel patterns within the study area and Journey-to-Work data for residents of the Town of Lancaster obtained from the 2010 U.S. Census. Based on this approach, the following trip assignments were developed by the Applicant's engineer for the Project:

TRIP-DISTRIBUTION SUMMARY

Roadway	Direction To/From	Trip Assignment (Percent)
Route 62	Northwest	35
Sterling Road	Northeast	30
Deershorn Road	Southwest	<u>35</u>
TOTAL		100

Comment: We are in general agreement with the methodology that was used to develop the anticipated traffic characteristics of the Project and the trip distribution pattern (existing traffic patterns and U.S. Census data).

We note that the Applicant's engineer should have used trip-generation data for ITE Land Use Code 221, Multifamily Housing (Mid-Rise), as it is our understanding that the multi-

family residential buildings will be four-stories; however, the use of this data (mid-rise vs. low-rise) would have resulted in lower traffic volumes for this component of the Project and, as such, the trip projections and the associated analyses that are presented in the June 2018 TIAS provide a conservative (high) assessment of the potential impact of the Project on the transportation infrastructure.

With regard to the trip distribution, we are in general agreement with the orientation of trips; however, we would suggest that a portion of the trips assigned to Deershorn Road (35 percent) should be distributed to Route 62 south of Sterling Road (Sterling Street) as residents of the Project may choose direct access to Route 62.

Traffic Operations Analysis

In order to assess the potential impact of the Project on the transportation infrastructure, a detailed traffic operations analysis was performed for the study intersections under 2018 Existing, 2025 No-Build (without the Project) and 2025 Build (with the Project) conditions. In brief, traffic operations are described by six “levels of service” which are defined by letter grades from “A” through “F”, with a level-of-service (LOS) “A” representing the best operating conditions (average motorist delays of less than 10 seconds and little or no apparent vehicle queuing) and a LOS “F” representing constrained operating conditions (average motorist delays of 50 to 80 seconds or more and often with apparent vehicle queuing). A LOS of “E” is representative of an intersection or traffic movement that is operating at its design capacity, with a LOS of “D” typically representing the limit of acceptable traffic operations.

Comment: *The traffic operations analysis was completed using the appropriate methodologies and we are in general agreement with the reported results and the identified impact of the Project on operating conditions at the study area intersections. The Project is expected to have a minimal impact on operating conditions at the study area intersections, with all movements predicted to operate at LOS C or better. Project-related impacts were defined as a potential increase in average motorist delay of up to 2.0 seconds and in vehicle queuing of up to one (1) vehicle.*

Sight Distance

The Applicant’s engineer provided sight distance measurements for the Project site roadways/driveway intersections with Sterling Road. Both stopping sight distance and intersection sight distance measurements were performed following American Association of State Highway and Transportation Officials (AASHTO)² standards and using a 45 mph approach speed along Sterling Road, which is consistent with the 85th percentile vehicle travel speed that was measured along the roadway (44 to 45 mph). These measurements indicate that the available lines of sight at the subject intersections exceed the required minimum sight distance to function in a safe manner based on a 45 mph approach speed with the selective clearing of vegetation along Sterling Road.

²A Policy on Geometric Design of Highway and Streets, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2011.

Comment: *The sight distance measurements were performed following the appropriate standards and we are in agreement that the recommended minimum lines of sight for safe operation based on a 45 mph approach speed along Sterling Road can be attained with the selective trimming and removal of trees and vegetation located along the south (Project) side of Sterling Road.*

In order to ascertain the extent of the tree/vegetation trimming and removal, the sight triangle areas for the Project site roadways/driveway should be added to the Site Plans (discussion follows).

Recommendations

The following recommendations and commitments to mitigation were presented as a part of the June 2018 TIAS:

- Provide STOP-signs and marked STOP-lines for vehicles exiting the Project site to Sterling Road.
- All STOP-signs to be installed shall be consistent with current *Manual on Uniform Traffic Control Devices* (MUTCD)³ standards and guidelines.
- Any grading, landscaping, and signing proposed at the site drive intersections with Sterling Road should be designed and maintained so as not to obscure sight lines.
- A marked STOP-line should be provided on the Sterling Road westbound approach to Route 62 with a “Stop Sign Ahead” warning sign (graphic symbol) provided on Sterling Road approximately 300 feet east of the intersection.

In addition, the Applicant’s engineer suggested that, independent of the Project, safety and traffic flow improvements should be completed at the Sterling Road/Deershorn Road intersection.

Comment: *We are in agreement with the recommendations that were provided in the June 2018 TIAS and would recommend that the Applicant commit to implementing the suggested measures. In addition, we would suggest that the Applicant consider the following additional mitigation commitments as a part of the Project:*

- 1. Design and construct a sidewalk along the Project site frontage on Sterling Road or provide monies to the Town to be used for sidewalk construction along the roadway;***
- 2. Prepare a Functional Design Report (FDR) and associated MassDOT 25 Percent Design Plans for the implementation of the suggested traffic flow and safety improvements at the Sterling Road/Deershorn Road intersection. This information (FDR and 25 Percent Design Plans) can be used by the Town to apply for State funding for the construction of improvements at the intersection; and***

³Manual on Uniform Traffic Control Devices (MUTCD); Federal Highway Administration; Washington, DC; 2009.

3. *Traffic control devices associated with the at-grade railroad crossing of Sterling Road (i.e., signs, pavement markings and warning lights/gates) should be reviewed and upgraded as may be necessary to meet the current requirements of the MUTCD.*

SITE PLANS

The following comments are offered with respect to our review of the *Site Development Plan of Land* prepared by A GLM Engineering Consultants, Inc. and dated February 8, 2018, last revised July 5, 2018 (hereafter referred to as the “Site Plans”).

1. *A truck turning analysis should be provided for the Lancaster Fire Department design vehicle, a school bus (to the extent that a school bus will be accessing the Project) and a single-unit (SU) truck (representative of a moving/delivery truck, trash/refuse truck or similar). The turning analysis should demonstrate that the subject vehicles can access and circulate within the Project in an unimpeded manner.*
2. *Internal to the Project site, circulating roads and drive aisles should be a minimum of 22-feet in width for two-way travel and 23-feet where adjacent to perpendicular parking, or as required to accommodate truck access and fire truck turning maneuvers.*
3. *Fire lanes and/or emergency access drives, where provided, should be a minimum of 20-feet in width pursuant to the requirements of NFPA® 1.⁴*
4. *Unless otherwise approved by the Fire Department, a secondary means of access for emergency vehicles should be provided to the multi-family residential development given the number of units that are proposed (136 units) and the length of the access roadway.*
5. *To the extent that the Town may wish to develop an access to the property along the north side of Sterling Road opposite the Project site, Road “C” should be shifted to the west to align with the Town right-of-way that has been reserved for such access.*
6. *The Applicant should provide a turn-around area at the end of each of the drive aisles for the multi-family residential buildings pursuant to the requirements of NFPA® 1 or provide a letter from the Fire Department indicating their acceptance of the access given that the current design requires a backing maneuver for emergency vehicles that exceeds 150-feet.*
7. *Circulation around the traffic circle at the front of the southern multi-family residential buildings should be directed in a one-way counterclockwise direction, with appropriate signs and pavement markings provided to regulate the one-way circulation pattern.*
8. *A sign and pavement marking plan should be developed for the Project and included as a part of the Site Plans.*

⁴National Fire Protection Association (NFPA)® 1, *Fire Code*, Seventh Edition; NFPA; Quincy, Massachusetts; 2015; as amended per 527 CMR.

9. *A sidewalk has been provided along one side of Road "A", Road "B" and the driveway to the multi-family development that extend to Sterling Road. A sidewalk should also be provided along Road "C" that extends to Sterling Road. In addition, pedestrian crossings should be provided at appropriate locations within the Project that should include marked crosswalks with Americans with Disabilities Act (ADA) compliant wheelchair ramps. These crossings should be shown on the Site Plans.*
10. *Consideration should be given to providing a sidewalk along the Project site frontage on Sterling Road between the multi-family driveway and Road "A" as discussed previously.*
11. *The sight triangle areas for the Project site roadways/driveway intersections should be shown on the Site Plans along with a note to indicate: "Signs, landscaping and other features located within sight triangle areas shall be designed, installed and maintained so as not to exceed 2.5-feet in height. Snow windrows located within sight triangle areas that exceed 3.5-feet in height or that would otherwise inhibit sight lines shall be promptly removed."*
12. *A note should be added to the Site Plans stating: "All Signs and pavement markings to be installed within the Project site shall conform to the applicable specifications of the Manual on Uniform Traffic Control Devices (MUTCD)."⁵*
13. *Where provided, double-yellow centerline pavement markings should consist of two parallel double-yellow lines.*
14. *A narrative should be provided indicating how tenant moves for the multi-family component of the Project will be managed. The location of the moving vehicle staging area should be reflected in the truck turning analysis and include the required maneuvers for the subject vehicle to enter and exit the Project site.*
15. *A narrative should be provided indicating how trash/recycling will be managed for the multi-family component of the Project, including the location where these items will be picked-up. The pick-up location should be reflected in the truck turning analysis.*
16. *Secure bicycle parking should be provided for the multi-family component of the Project consisting of exterior bicycle racks for each building and weather protected bicycle storage.*
17. *The Applicant should consult with the Lancaster School Department to define the location of the school bus waiting areas for the Project.*
18. *Consideration should be given to accommodating electric vehicle (EV) charging stations within the multi-family component of the Project.*

⁵Ibid 3.

PARKING

Section 220-23, *Minimum number of spaces*, of Chapter 200, *Zoning*, of the Town of Lancaster Bylaws does not have specific parking requirements for residential uses other than for a seasonal cottage. As currently proposed, the Site Plans indicate that 180 parking spaces will be constructed to serve the multi-family residential development, or a parking ratio of 1.32 spaces per dwelling unit, with reserve areas to increase the total number of parking spaces to 204, or a parking ratio of 1.5 spaces per dwelling unit. Parking for the single-family homes will be provided in individual driveways and garages that will accommodate a minimum of two (2) vehicles per home.

Comments: *Given that parking requirements for residential uses are not cited in the Zoning Bylaw, a review of parking demand data published by the ITE⁶ for residential uses located in a suburban setting was undertaken. This data indicates that the average parking demand for an apartment community is approximately 1.23 vehicles per dwelling unit and the 85th percentile peak parking demand is approximately 1.94 vehicles per dwelling unit.⁷ For single-family homes, the average peak parking demand is 1.83 vehicles per dwelling unit and the 85th percentile peak parking demand is 2.14 vehicles per dwelling unit.*

*Based on this guidance, the parking ratio that is proposed for single-family home component of the Project (2.0+ spaces per dwelling unit) is appropriate. **For the multi-family component, we recommend that the Site Plans be revised to accommodate a minimum parking ratio of 1.5 spaces per dwelling unit, with additional parking spaces provided to accommodate visitors, staff and prospective tenants.***

SUMMARY

VAI has completed a review of the materials submitted on behalf of Crescent Builders, Inc. in support of the proposed Goodridge Brook Estates residential development to be located off Sterling Road in Lancaster, Massachusetts. Our review focused on the following areas as they relate to the Project: i) vehicle and pedestrian access and circulation; ii) MassDOT design standards; iii) Town Zoning requirements as they relate to access, parking and circulation; and iv) accepted Traffic Engineering and Transportation Planning practices.

Based on our review of the June 2018 TIAS and the accompanying *Site Development Plan of Land*, we have determined that the materials were prepared in a professional manner and following the applicable standards of care. That being said, we have requested that the study area that was assessed in the June 2018 TIAS be expanded to include the intersections of Sterling Hill Road at George Hill Road and Sterling Street (Route 62) at Chase Hill Road, and that the Applicant's engineer: i) confirm that there are no roadway improvement projects planned in the area; ii) refine the trip distribution pattern for the Project; and ii) define the limits of vegetation trimming/removal that are required to provide the necessary sight lines at the Project site roadways/driveway. In addition, we have requested that the Applicant's

⁶*Parking Generation*, 4th Edition; Institute of Transportation Engineers; Washington, D.C.; 2010.

⁷The 85th percentile parking demand is defined as the observed parking demand that was found to be exceeded at 15 percent of the observation sites (or 15 percent of the observed values exceeded the 85th percentile parking demand). The 85th percentile parking demand can be considered a reasonable design value from which to assess potential parking demands for a project.

Mr. Fred Hamwey, P.E.

July 27, 2018

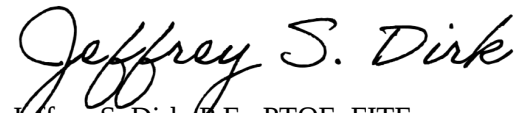
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engineer review and revise specific elements of the Site Plans with regard to internal circulation, plan notations, and parking for the multi-family component of the Project. Written responses to our comments should be provided so that we may continue our review of the Project on behalf of the Town.

This concludes our review of the materials that have been submitted to date in support of the Project. If you should have any questions regarding our review, please feel free to contact me.

Sincerely,

VANASSE & ASSOCIATES, INC.

A handwritten signature in black ink that reads "Jeffrey S. Dirk". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Jeffrey S. Dirk, P.E., PTOE, FITE
Principal

Professional Engineer in CT, MA, ME, NH, RI and VA

JSD/jsd

cc: File