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W-2658

November 6, 2014

Town of Grafton Planning Board
Grafton Memorial Municipal Center
30 Providence Road
Grafton, MA 01519

Re: **The Village at Institute Road**
Special Permit Application
Response to 2009 Final Review Comments

Dear Board Members:

In December, 2009, Guerriere & Halnon, Inc. (G&H), on behalf of the Applicant, D&F Afonso Builders, Inc. (D&F), submitted an Application for a Special Permit – Major Residential Development and an Application for Approval of a Preliminary Plan. The Board opened the Public Hearings for these Applications and several meetings were held discussing the project. Graves Engineering, Inc. (Graves) was retained by the Board to review and comment on the plans' conformance with applicable "Rules and Regulations Governing the Subdivision of Land; Grafton, Massachusetts"; "Grafton Zoning By-Law"; and standard engineering practice.

As part of Graves' review, they prepared two Plan Review letters dated January 14, 2010 and March 9, 2010 in which they provided engineering and compliance comments on the two submitted development plans. Based on the comments contained in these two letters; G&H made revisions to the design plans and prepared response letters dated February 18, 2010 and May 17, 2010. At this time, the question regarding the status of Institute Road (public or private) became the controlling factor on the project. It was evident that until this issue was clarified, the project would not be proceeding.

Graves prepared a third and final comment letter dated August 12, 2010 to address the last submission to the Board. As the Public Hearing was in an extended continuance to address the status of Institute Road, G&H did not respond to this letter.

In January 2011, with no decision having been reached regarding the status of Institute Road, the Applicant requested to withdraw the Applications without prejudice.

On November 4, 2013 the Worcester County Superior Court issued a judgment that the Town had acquired Institute Road by prescription, confirming its status as a public road.

We are aware that the current application is completely separate from previous application and that a complete Engineering review will be performed as part of this submission. That being stated, we feel it prudent to provide responses to the final comments so that the Board will have a full appreciation of what has previously occurred and where the design currently stands in comparison to the previous submission.

This letter is to address the final review comments contained in the letter from Graves Engineering, Inc. dated August 12, 2010. Graves' comments are shown in *italics* followed by our responses in **bold**.

Zoning By-Law

Both Conventional and Flexible Plans

1. *(1/14/10) We are concerned about pedestrian traffic outside the project limits, specifically along Institute Road. Currently there are no sidewalks along Institute Road. One particular area of concern is approximately 280 feet south of the northern project entrance where there is a horizontal curve and vertical curve in Institute Road with an embankment on the west side of the road. This area does not accommodate pedestrian traffic. Currently there is little development in the area that generates significant pedestrian traffic. The project proposes approximately 50 dwelling units, which is likely to increase pedestrian traffic along Institute Road. The plans propose sidewalks along the project roads; with the proposed sidewalks terminating at Institute Road.*

Consideration should be given to creating a "looped" sidewalk/walking path system. Ideally, connecting the sidewalks at northern and southern entrances by way of a sidewalk along Institute Road might be preferable. However, the vernal pool on the west side of Institute Road would add complexity to sidewalk design and permitting. An alternative may be to connect the sidewalk at the cul-de-sac of Road C (on both the conventional and flexible plans) to Institute Road north of the vernal pool via the existing gravel road (with any necessary improvements to the gravel road) and constructing a sidewalk on the western side of Institute Road from the gravel road to the northern entrance. Either alternative would provide a sidewalk on Institute Road at the horizontal curve located approximately 280 feet south of the northern entrance. The Planning Board, DPW or other Town departments may have opinions relative to a sidewalk system; therefore we defer further discussion to the Town. (s5.3.13.j & SR&R§4.1.2.1.c)

(2/18/10) For both the Conventional and Flexible plans, a walking path has been added from the end of the sidewalk of the internal cul-de-sac through the woods to the north of the Vernal Pool to Institute road. A sidewalk has been added along the west side of Institute Road from the end of the path to the sidewalk at the northern entrance.

(3/9/10) The plans were revised to provide a walking path from the end of the sidewalk at the cul-de-sac through the woods, across the existing gravel road and connecting to a new sidewalk on the west side of Institute Road. A new sidewalk on Institute Road would be constructed from the walking path to the northern project entrance. As proposed, the walking path would connect to the Institute Road sidewalk approximately 150 feet (conventional plan) to 190 feet (flexible plan) north of where the gravel road intersects Institute Road. In either case the walking trail passes over a hill and will have a significant downgradient slope toward Institute Road - 3 horizontal : 1 vertical (or 33%). A slope this steep must be avoided, especially near Institute Road. Sections 4.10 and 5.6 of the "Rules and Regulations Governing the Subdivision of Land" have specific requirements for trails, bikeways and walkways, including maximum slope. As an alternative, it appears the walking trail could be routed south of the hill along or near the gravel road, thereby eliminating a steep down-slope at the approach to Institute Road. Again, we defer further discussion to the Town.

(3/17/10) The grade of all walking trails has been revised to comply with the regulations. The walking trail was not relocated to the existing gravel road based on concerns raised by the Board on the close proximity of the gravel road to the existing vernal pool.

(8/12/10) The proponent has re-graded the walking path near Institute Road, providing a slope of 8%±. However, this option requires relatively extensive clearing/grading. Approximately 50 feet west of Institute Road the earth cut will be up to eight feet deep and the clearing width will vary between 22 feet and 45 feet. Again, we defer further discussion to the Town.

In order to provide the walking trail as requested, avoid the vernal pool, and comply with the walking trail design regulations, the submitted trail design was required.

Conventional Plans

2. (1/14/10) *Several of the zoning yard setbacks need to be revised because they are not offset the proper distances and/or are not parallel with the property line. This is apparent at Lots 22 & 23, 32 & 33, and 35 & 36. (s3.2.3.2)*

(2/18/10) The zoning setback lines have been revised

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

Flexible Plans

3. (1/14/10) *The proponent should specify which Design Guidelines are being addressed for the bonus provision (i.e. increase from 46 conventional lots to 51 flexible lots). (s5.3.5.2)*

(2/18/10) The following Design Guidelines have been incorporated into the design of the project to attain the 15% bonus provision:

- **§5.3.13.b – 100' vegetated buffer to surface waters and wetlands.**
- **§5.3.13.f – Protection of natural elements**
- **§5.3.13.h – Landscaping screens of low visual interest**
- **§5.3.13.j – Pedestrian circulation system**
- **§5.3.13.k – Contiguous open space**
- **§5.3.13.l – Access to common land**

(3/9/10) The design engineer cited specific sections of the Design Guidelines for which the bonus provision was applied. As noted in comment #1 above, we are concerned about the slope of the walkway near the intersection of Institute Road and therefore question whether the bonus provision of 35.3.13.j would apply. We understand the Planning Board will consider any applicability and/or approval of the bonus provision.

(3/17/10) As noted above, the grade of all walking trails has been revised to comply with the regulations.

(8/12/10) Acknowledged. The proponent has re-graded the walking path near Institute Road, providing a slope of 8%±. However, this option requires relatively extensive clearing/grading. Preservation of the existing hill and vegetation may be preferable.

As noted hereinbefore, in order to provide the walking trail as requested, avoid the vernal pool, and comply with the walking trail design regulations, the submitted trail design was required

Subdivision Rules & Regulations

Both Conventional and Flexible Plans

4. (1/14/10) *The locus does not have a north arrow. (s3.2.3.1)*

(2/18/10) North arrows have been added to the locus plans

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

5. (1/14/10) *We are concerned about turning movements at the intersection of Institute Road and the proposed streets. GEI superimposed vehicle turning templates on the plans. For a single-unit vehicle (e.g. parcel delivery truck) exiting the site and turning right, the vehicle will encroach upon opposing traffic in Institute Road by approximately four feet at both intersections. The plans currently show 40-foot radius curbing at the intersections which we believe was intended to minimize any conflict in turning movements. However, curbing radii are typically no greater than 30 feet; larger radii can result in vehicles "cutting corners" and conflicting with opposing vehicles. Also, a semi-trailer exiting the southern entrance by turning right will*

have difficulty maneuvering within the paved portion of the roads. Institute Road should be widened at least at the project entrances and/or pavement transition lanes should be added, and the curb radii should be reduced to no greater than 30 feet. (§4.1.2.2.b)

(2/18/10) The width of Institute Road has been increased to 26 feet at both entrances. A 15 to 1 (per MHD design guidelines) or 75 foot minimum transition has been proposed to from the existing road width to the proposed road width.

Curb radius has been reduced to 30 feet.

(3/9/10) Acknowledged. The plans were revised to widen Institute road to 26 feet at the project entrances and to provide transitions, and to show 30-foot curb radii at the intersections.

(3/17/10) No additional comment.

6. *(1/14/10) Based upon measurements made during our site visit, in the vicinity of the project Institute Road generally has a paved width of approximately 21 feet; the width varied between 20.5 feet and 22 feet. Although the Traffic Impact and Access Study presented "future build" traffic estimates in vehicles per hour during peak times, it did not present a "future build" estimate for vehicles per day (vpd). Using the Study's estimated background growth of 5.6% over five years and the estimated project generated traffic of 560 vpd (75% northbound and 25% southbound), we estimated that under "future build" conditions traffic flow along Institute Road would be approximately 1,700 vpd north of the project and approximately 1,400 vpd south of the project. Grafton Subdivision Rules and Regulations identify certain road design parameters (e.g. road width) based in part upon traffic flow. The existing width of Institute Road doesn't meet the minimum requirement for any of the street widths specified in the Rules and Regulations. In short, the existing width of Institute Road is less than current Town standards and the project would result in increased traffic and turning movements on Institute Road. Therefore, we defer to the Town if improving (e.g. widening) Institute Road should be considered beyond the intersections at the new project entrances.*

(2/18/10) We are continuing to review the status and condition of Institute Road. We have initiated conversations with various departments and agencies within the Town and are attempting to contact the State to obtain additional information. GPI, the traffic engineer for the project, has reviewed the roadway for its adequacy to carry the predicted traffic volumes. Please refer to the attached letter from GPI that addresses the adequacy of Institute Road and the site roadway separation. Any additional information that we obtain will be forwarded to the Board.

(3/9/10) No further comment.

(3/17/10) Information was previously submitted to the Board and Town Counsel regarding the clarification of the status of Institute Road. With respect to proposed improvements along Institute Road, Sheet 20 has been added to both the Conventional and Flexible plans. A proposed cross section for Institute Road has been added. Based on discussions with the Board, the cross section depicts a 2-foot wide graded shoulder being added along both sides of Institute Road from the southern extent of the project (south property line) north to Westboro Road. The cross section also depicts a grass strip and concrete sidewalk where it is noted to be installed from the northern entrance southward to the walking trail.

Sheet 20 also depicts the proposed revision to the road profile of Institute Road. The existing crest vertical curve at the high point just north of the vernal pool does not provide the required sight distance for the posted speed limit. The proposed road profile has been designed to comply with the Mass Highway's design requirements for a 30 MPH crest curve, the posted speed for the roadway. The revision will require the existing high point of the roadway to be lowered by approximately 2.5 feet. The lowering of the roadway, along with the additional clearing required in this area for the shoulder and sidewalk, will greatly increase the sight distances in this area and thus the safety of the roadway.

(8/12/10) No further comment.

The status of Institute Road has been clarified by the Worcester Superior Court, in their Judgment dated November 4, 2013. In that judgment, the Judge found that the Town has acquired Institute Road by prescription.

Additional information is provided under Comment 20 below.

Conventional Plans

7. *(1/14/10) There are several isolated areas within the rights-of-way where the proposed cut is greater than 6'. These areas include Road A between STA 1+58± & STA 2+05± (left side only) and between STA 6+25± & STA 8+25±, Road B between STA 15+50± & STA 15+85± (right side only), and Road C between STA 2+35± & STA 3+20±. (§4.1.2.1 .b)*

(2/18/10) The site layout was selected to minimize, as much as possible, the cuts and fills on the site. Due to site topography, and in order to comply with the road grade requirements noted in the Rules and Regulations, cuts and fills in excess of 6 feet were required.

(3/9/10) No further comment - the areas were listed above to aid the Planning Board in identifying the areas where cuts exceed 6 feet. We defer any further consideration of this issue to the Planning Board.

(3/17/10) Refer to response above

(8/12/10) No further comment – the areas were listed above to aid the Planning Board in identifying the areas where cuts exceed 6 feet. We defer any further consideration of this issue to the Planning Board.

The roadway profiles and grading were reviewed and revised so that all areas within the rights-of-way comply with the maximum cut or fill of six (6) feet.

8. *(1/14/10) There are abutting properties to the west of the project owned by the Town of Grafton. The conventional plans do not provide any type of access from the proposed roads to the Town's parcels, whether for vehicular or pedestrian access. We defer to the Town of Grafton what type of access, if any, is needed. As part of the access, consideration should be given to maintaining or re-routing the path on Lot 7 so it can connect to Road B. (§4.1.2.1 .d & §4.1.2.1 .e; GZBL §5.3.13.i)*

(2/18/10) It may be possible to relocate the path across Lot 7 so that it runs between Lots 6 and 7, but this would require permission from the Town to perform work on their property so that the path could be relocated.

(3/9/10) The plans were revised to show a path along the property line of Lots 6 and 7. Sections 4.10 and 5.6 of the "Rules and Regulations Governing the Subdivision of Land" have specific requirements for trails, bikeways and walkways. These requirements must be incorporated into the plans during definitive plan design. This new path would also require relocating a portion of the path on the Town-owned property. We understand the issue of connecting the subdivision sidewalk/trail system to the abutting land will be further addressed by the Town.

(3/17/10) As noted above, the grade of all walking trails has been revised to comply with the regulations.

(8/10/10) The plans were revised to show a path along the property line of Lots 6 and 7. Sections 4.10 and 5.6 of the "Rules and Regulations Governing the Subdivision of Land" have specific requirements for trails, bikeways and walkways. These requirements must be incorporated into the plans during definitive plan design. This new path would also require relocating a portion of the path on the Town-owned property. We understand the issue of connecting the subdivision sidewalk/trail system to the abutting land will be further addressed by the Town.

As noted above, the grades of all walking trails will comply with the regulations.

Flexible Plans

9. (1/14/10) *There is no water main on Road A between stations 0+00 and 7+00. It appears that this was a drafting error; the water main will have to be provided on the definitive plans. (§3.2.4.1 .f)*

(2/18/10) The water main in this area has been added to the plans.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

10. (1/14/10) *There are abutting properties to the west of the project owned by the Town of Grafton. The flexible development plans propose open space contiguous to the abutting land, but Lot FL-8 is proposed over an existing path. Consideration should be given to re-routing the path so it connects to Road A. (§4.1.2.1 .d & §4.1.2.1 .e; GZBL §5.3.1 3.i)*

(2/18/10) The path can be relocated to the west of Lot 8 and connect to Road A.

(3/9/10) The plans were revised to provide a walkway or trail west of Lot 8. Sections 4.10 and 5.6 of the "Rules and Regulations Governing the Subdivision of Land" have specific requirements for trails, bikeways and walkways. These requirements must be incorporated into the plans during definitive plan design.

(3/17/10) As noted above, the grade of all walking trails has been revised to comply with the regulations.

(3/9/10) The plans were revised to provide a walkway or trail west of Lot 8. Sections 4.10 and 5.6 of the "Rules and Regulations Governing the Subdivision of Land" have specific requirements for trails, bikeways and walkways. These requirements must be incorporated into the plans during definitive plan design.

As noted above, the grades of all walking trails will comply with the regulations.

11. (1/14/10) *There are several isolated areas within the rights-of-way where the proposed cut or fill is greater than 6'. There are excessive cuts along Road A between STA 0+47± & STA 2+07±, 12+05± & STA 13+20± (left side), and STA 15+18± & STA 16+75. There is an excessive fill on Road A between STA 13+38± & STA 14+45±. There is an excessive cut on Road C between STA 0+07 & STA 3+80. (§4.1.2.1.b)*

(2/18/10) The site layout was selected to minimize, as much as possible, the cuts and fills on the site. Due to site topography, and in order to comply with the road grade requirements noted in the Rules and Regulations, cuts and fills in excess of 6 feet were required.

(3/9/10) No further comment -the areas were listed above to aid the Planning Board in identifying the areas where cuts or fills exceed 6 feet. We defer any further consideration of this issue to the Planning Board.

(3/17/10) Refer to Response Above

(8/10/10) No further comment -the areas were listed above to aid the Planning Board in identifying the areas where cuts or fills exceed 6 feet. We defer any further consideration of this issue to the Planning Board.

The roadway profiles and grading were reviewed and revised in an attempt to comply with the maximum cut or fill of six (6) feet. The revised Flexible Development plans comply with this requirement is all locations except one. That location is a fill on the right side of Road A between Sta 13+19 and Sta 14+86. We were unable to make this area comply based on the required roadway grades and existing site topography.

General Engineering Comments

Both Conventional and Flexible Plans

12. (1/14/10) *Based upon our site visit (driver's eye being 15 feet from the major road edge-of-pavement and 3.5 feet above the proposed minor road) and information on the grading plans, there are sight distance obstructions looking south from the northern project entrance. The shoulder of Institute Road south of the northern project entrance will likely have to be excavated and re-graded to provide adequate sight distance. Removal of vegetation may also be required. Based upon Table 3 of the Traffic Impact and Access Study, the sight distance should be suitable for a design speed of at least 40 mph.*

(2/18/10) As noted in our response to Question 1 above, the plans have been revised to include a sidewalk along the west side of Institute Road from the northern entrance heading south. The grading and clearing required and depicted for sidewalk provide the required sight distance.

(3/9/10) Acknowledged. The plans were revised to show re-grading along the road shoulder for sidewalk construction and sight distance improvement.

(3/17/10) In addition to than noted above, Sheet 20 has been added to both sets of drawings. This sheet depicts a proposed road cross section and road profile modification for Institute Road.

13. (1/14/10) *The intersection curb radii within the project should be no greater than 30 feet. Curb radii of 40 feet were proposed.*

(2/18/10) Curb radius has been reduced to 30 feet.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

Conventional Plans

14. (1/14/10) *The vertical curve between STA 0+02.24 and STA 4+82.24 on Road B is too long. The K-value of 120 indicates that there will be approximately 192 feet (of the 480 foot vertical curve) where the tangent slope is less than the minimum 0.8%. This could be a potential drainage issue and an area subject to excessive debris/sand accumulation. At a vertical curve such as this tangent slopes less than 0.8% are inevitable, but should be not excessively long. For comparison, a vertical curve with a K-value of 40 (160 foot long vertical curve) would have approximately 64 feet where the tangent slope is less than 0.8%. The vertical curve should be revised.*

(2/18/10) The vertical crest curve has been redesigned with a K-value of 40 (160 foot vertical curve). As noted, this will result in a total curve length of 64 feet with a grade less than 0.8%.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

15. (1/14/10) *On the definitive plans, the Road "C" curb transition at the cul-de-sac entrance (station 4+75+1-left) should be smoothed.*

(2/18/10) The curb transition has been revised.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

Flexible Plans

16. (1/14/10) *On the definitive plans, the Road "C" curb transition at the cul-de-sac entrance (station 4+20+/- right) should be smoothed.*

(2/18/10) The curb transition has been revised.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

General Comments

17. (1/14/10) *The existing grade profiles of the left and right sides of the rights-of-way on the profiles are were not labeled.*

(2/18/10) The profiles have been labeled.

(3/9/10) Labels were added to Flexible Development Plans but not to the Conventional Development Plans. If the Conventional Plans are to be revised for other reasons, then labels should be added to the profile sheets; otherwise the revisions should be made on the definitive plans if conventional development is chosen.

(3/17/10) Labels have been added to the plans.

(8/10/10) Acknowledged. Labels have been added to the profile for the Conventional Development Plans.

No additional comment.

18. (1/14/10) *Datum elevations must be provided on each profile. For example, the profiles on Sheets 15 through Sheet 19 of the Preliminary Flexible Development Plan are missing elevations.*

(2/18/10) Datum or grid elevations have been added to all sheets.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

19. (1/14/10) *Tangent slopes must be clearly defined on the profile sheets. For example, there are not any slopes on the first portion of the profile on Sheet 15 of the Preliminary Flexible Development Plan.*

(2/18/10) The profiles have been revised so that slopes are visible.

(3/9/10) Acknowledged. The plans were revised.

(3/17/10) No additional comment.

Additional Comments

20. (8/10/10) *Both the Flexible and Conventional Development Plans were revised to include vertical alignment revisions on Institute Road. Changes to the vertical alignment are proposed between station 9+32.90 and station 12+09.05. The existing grades in this area are proposed to be lowered approximately 2.4' Vertical road re-alignment would require lowering the existing water main accordingly. The k-values for the two vertical curves in this area correspond to design speeds of 30 MPH (k=19 for crest and k=37 for sag vertical curves per Exhibits 4-26 and 4-27 in MassHighway Project Development & Design Guide, 2006 Edition). The proposed revisions are certainly an improvement compared to existing conditions.*

However, consideration should be given to designing for a speed greater than 30 MPH. Per Table 3 of the Traffic Impact Report, the 85th percentile observed travel speeds were 40 MPH and 37 MPH in the southbound and northbound lanes, respectively. In a conceptual manner, we evaluated the potential for utilizing crest vertical curves for 35 MPH (Alternate 1) and 40 MPH (Alternate 2) design speeds. For comparison, the following table shows pertinent information associated with existing conditions, the proposed alterations and potential options for vertical re-alignment.

Table 1 – Institute Road Vertical Curve Data

Design Option	Crest Vertical Curve “k”	Design Speed, MPH*	Approximate Length of New Vertical Curve, Feet	Approximate Depth of Deepest Earth Cut, Feet	Approximate Length of Water Main Alterations, Feet
Existing	7.8+/-	21 to 22	NA	NA	NA
Proposed	19	30	226	2.5	160
Alternate 1	29	35	365	4.0	300
Alternate 2	44	40	524	7.5	470

* Per MassHighway Project Development & Design Guide, 2006 Edition

In evaluating Alternate 1, it appears feasible to revise the crest vertical curve to achieve a “k” of 29. Please note, a “k” of 28 is required for Minor Streets per Grafton Subdivision Rules and Regulations §4.1.5.3. By our estimate, the vertical curve would extend from station 8+38+/- to station 12+04+/- . This alternate would require an earth cut of up to approximately 4 feet and re-laying approximately 300 feet of the existing water main in order to maintain minimum cover requirements.

The feasibility of constructing Alternate 2 is more questionable than Alternate 1. The vertical curve would extend from station 7+39+/- to station 12+63+/- (almost to the culvert from the vernal pool). Depending upon findings during final design, runoff from the road near the vernal pool area may be directed farther north instead of to its current discharge point near the culvert. Finally, earth excavation would be deep – approximately 7.5 feet - and approximately 470 feet of water main alterations would be required.

In summary, the design engineer has proposed improvements to the vertical alignment of Institute Road. The proposed work is an improvement compared to existing conditions, but meets a design speed which is less than observed 85th percentile speeds. To understand the feasibility of constructing improvements to meet a greater design speed, we evaluated two alternatives to the proposed vertical alignment. The construction of Alternate 1 appears to be feasible and would accommodate a design speed of 35 MPH. The feasibility of constructing Alternate 2 appears to be questionable primarily because of the extent of earth excavation. We defer further consideration of this comment to the Planning Board and would be glad to answer any questions you may have relative to our evaluation.

Sheet 20 of both plan sets have been revised to depict a 35 MPH crest vertical curve with a design “k” value of 29. The new curve length is 345.77 feet and results in a maximum cut at the peak of the hill of 4.7 feet. The revised profile also requires approximately 350 lf of water main to be replaced as a lower elevation.

In summary, we have attempted to comply with every comment that was raised by Graves. The only comment that we could not comply with is Item 11, where there is approximately 170 feet of the right side of a road where the fill depth is greater than six (6) feet. Other than this, and our request to use sloped granite curbing, we feel that the project is full compliance with the Board’s regulations. If you have any questions with respect to the information contained herein, please call me at 508-234-6834

Sincerely
Guerriere & Halnon, Inc.



Michael Y. Weaver, P.E.
 Project Manager