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July 26, 2017

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PLANNING BOARD
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**Subject: The Village at Institute Road
Wetlands Bylaw Regulations and Stormwater Regulations Review**

Dear Maria:

We received the following documents in our office on July 13, 2017:

- Correspondence from Guerriere & Halnon, Inc. to Grafton Planning Board dated July 12, 2017 re: The Village at Institute Road, response to Definitive Plan Review.
- Plans entitled The Village at Institute Road a Conventional Subdivision in Grafton, Massachusetts dated September 16, 2016 and last revised June 26, 2017 (except that Sheets 2 – 9 were last revised June 27, 2017), prepared by Guerriere & Halnon, Inc. for D&F Afonso Builders, Inc. (34 sheets)
- Document entitled Stormwater Report "The Village At Institute Road" Grafton, MA dated September 13, 2016 and last revised June 26, 2017, prepared by Guerriere & Halnon, Inc. for D & F Afonso Builder Corp.

Graves Engineering, Inc. (GEI) has been requested to review and comment on the plans' and supporting documents' conformance with applicable Town of Grafton "Regulations for the Administration of the Wetlands Bylaw", Town of Grafton "Regulations Governing Stormwater Management", MassDEP Stormwater Handbook and standard engineering practices.

GEI also reviewed the plans and supporting documents on behalf of the Grafton Planning Board and issued a separate series of peer review letters. Comments in our letter to the Planning Board that are also germane to this review have been incorporated herein (e.g. compliance with MassDEP Stormwater Handbook).

This letter is a follow-up to our previous review letters dated November 8, 2016, March 21, 2017 and June 15, 2017. For clarity, comments from our previous letters are *italicized* and our latest comments to the design engineer's responses are depicted in **bold**. For brevity, comments previously addressed by the design engineer and acknowledged by GEI have been omitted. Previous comment numbering has been maintained.

Our comments follow:

Regulations for the Administration of the Wetlands Bylaw

4. *The Engineer must provide a site-specific phasing plan for the project. (§V.B.5.f)*

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March 21, 2017

The Engineer provided a phasing plan for the project on Sheet 26. The phasing plan addresses general project phasing but doesn't go into the detail typically presented to a conservation commission (e.g. sequencing of erosion controls installation, tree clearing and grubbing). We don't have an issue with the general project phasing. We defer to the Conservation Commission if detailed sequencing information needs to be submitted.

The phasing plan on Sheet 26 has been revised. We don't have an issue with the general project phasing. We understand that the Conservation Commission and its staff will also review and comment on the proposed phasing.

5. The infiltration basin slopes must be revised. The inside and outside slopes must not be steeper than 3:1. As an example, on the southern side, between contours 378 feet and 380 feet, the outside of the basin slopes are steeper than 3:1. (§V. B.5.h.1)

March 21, 2017:

The grading on the infiltration basin slopes was revised and the slopes are now generally no steeper than 3:1. However, the topography adjacent to the Basin #1 outlet control structure was revised and the proposed grading is too steep (up to 1H:1V) in this area. The outlet structure needs to be moved farther into the basin and the grading revised to be no steeper than 3H:1V. Likewise, the location of and grading adjacent to the Basin #2 outlet control structure needs to be revised.

June 15, 2017:

The location of the Basin #1 outlet control structure was revised but the structure is now at a location such that the three orifices will be below the proposed ground elevation. The outlet control structure's location needs to be revised by perhaps as much as 18 feet; the lowest orifice is proposed at elevation 375.00 but the structure is located at elevation 381.4. At Basin #2, black lines that might represent two wing walls were added to the plans. The plans propose a narrow channel at elevation 370 for approximately twelve feet in length. This narrow channel needs to be avoided; the location of the outlet control structure needs to be moved farther into the basin. Lastly, the two black lines on the Basin #1 and Basin #2 outlet control structures need to be labeled or eliminated.

Acknowledged. The locations of the two outlet control structures were revised and the black lines on the outlet control structures were deleted.

Regulations Governing Stormwater Management

11. The Engineer must revise the drainage system design. Drainage pipes must be designed to have velocities that do not exceed ten (10) feet per second (fps). The following drain pipes as currently designed would have velocities that are too high: the eighteen-inch pipe from DMH#11 to DMH#12; the twenty-four-inch pipe from DMH#15 to DMH#16; the thirty-six-inch pipe from DMH#16 to proposed diverter manhole; the thirty-six-inch pipe from the proposed diverter manhole to the infiltration basin's inlet; and the thirty-six-inch pipe from the infiltration basin's proposed outlet control structure to the headwall. Water velocities will be further reviewed once rational Method pipe sizing calculations are submitted. (§6.B.3.d)

March 21, 2017:

The Engineer has revised the drainage pipes which has resulted in lower velocities within the system, however the following two drain pipes (as currently designed) will have velocities that exceed ten (10) fps (based upon pipe slope, these pipes were not yet

included in the Rational Method calculations): the 24-inch diameter pipe from the stormceptor to the proposed headwall and the 36-inch diameter pipe from Basin #1's outlet control structure to the proposed headwall.

June 15, 2017:

Revised Rational Method calculations were submitted. GEI reviewed the calculations and found them to be in order except as follows:

- A. On the sheet labeled "Brooke St. Bas. #1", none of the inlets into DMH9 (five inlets total) account for the flow from the Dylan Way drainage system (1.09 acres of tributary area) and there are two inlets from CB18. The calculations need to be revised accordingly. With the additional flow from Dylan Way, there may or may not be adequate capacity in some of the pipes downstream of DMH9 (e.g. the pipes between: DMH9 and DMH10, DMH10 and DMH11, DMH13 and DMH14, DMH14 and DMH5, and DMH 15 and DMH16).
- B. On Sheet 30, the following information is not consistent with the calculations: labeled pipe slope (2%) between DMH16 and DMH17; labeled pipe slopes (2%, 4%) and lengths (135' and 20') between DMH 17 and the discharge point into the basin; and the labeled pipe slope (2%), pipe diameter (36") and headwall invert elevation (371.20 feet) at the Basin #1 outlet. The design engineer needs to coordinate the information on the two documents. It appears that Sheet 30 needs to be revised.

Acknowledged. The Rational Method calculations and plans were revised as needed. We have no issue with the drainage system's capacity.

15. The plans show the site's existing and proposed topographic contours at two (2) foot intervals whereas one (1) foot intervals are required. (§7.B.1.h)

March 21, 2017

The Engineer has requested a waiver from this requirement. We have no technical issues with the request to depict the site's topography using 2-foot contour intervals (§7.B.1.h). We understand that the Conservation Commission will address any waiver requests. No further comment necessary.

17. The Erosion and Sediment Control Plan (drawing and narrative) must be revised to provide an estimate of the total area and the total volume of earth expected to be disturbed by excavation, grading or other construction activities. (§7.B.2.g)

March 21, 2017:

The Engineer stated that the total area and the total volume of earth to be disturbed were added to the plans. We did not find the total area or the total volume of earth to be disturbed on the plans, this may be because the submitted plans were slightly blurry and illegible (see Comment 36). We could not find the total area and the total volume of earth to be disturbed in the narrative of the stormwater report.

GEI did not receive a response letter that identifies plan or document revisions, or responds to our review comments in narrative form.

18. The Operation and Maintenance Plan must be revised to address the following:
 - a. The plan must include the addresses and contact information of the property owner. (§7.B.3.c)

March 21, 2017:

The Plan did not include the address and contact information of the property owner.

- b. The plan must include the addresses and contact information of the persons responsible for site operation and maintenance. (§7.B.3.d)

March 21, 2017:

The Plan did not include the person responsible for site operation and maintenance.

- c. The persons responsible for financing the maintenance and emergency repairs. (§7.B.3.e)

March 21, 2017:

The Plan did not include the person responsible for financing the maintenance and emergency repairs.

June 15, 2017:

GEI did not receive a response letter that identifies plan or document revisions, or responds to our review comments in narrative form.

Acknowledged. The requested information was added to the upper left corner of Sheet 27 and the right side of Sheet 28.

Hydrology & Stormwater Management Review

23. In the post-development hydrology calculations, the modeling of the infiltration basin (Pond 5P) must include the outlet pipe. The outlet control structure has three inlet orifices in parallel and one outlet pipe in series with the three orifices. As currently configured the outlet pipe appears to be more restrictive to flow than the three orifices.

March 21, 2017:

The hydrology calculations were not revised to address this comment. The calculations must model both this outlet pipe and the outlet pipe for Basin #2, a new basin.

June 15, 2017:

The Rational Method calculations were revised to address the capacity of a 24" diameter outlet pipe at Basin #1, however, the capacity of the Basin #2 outlet pipe was not addressed. The capacity of the proposed 18" diameter pipe at Basin #2 is approximately two cubic feet per second less than the peak discharge during a 100-year storm event. A 24" diameter pipe needs to be proposed instead.

Acknowledged. On Sheet 32 the diameter of the Basin #2 outlet pipe was revised to 24".

32. The Engineer must provide the following calculations: rip-rap apron sizing calculations, Basin #1 drawdown time calculations, required water quality treatment volume calculations and sediment forebay sizing calculations to demonstrate compliance with MassDEP Stormwater Management Standards 1, 3, and 4.

March 21, 2017:

The Engineer provided rip-rap apron sizing calculations, drawdown time calculations, and sediment forebay sizing calculations (for both basins) and the diverter manhole was

eliminated (stormwater flow will not bypass the treatment train). However, the flowrate used for the Basin #2's rip-rap stone size calculation is incorrect (based on the hydroCAD results) and must be revised.

June 15, 2017:

*The riprap sizing calculations were not revised to address this comment.
Acknowledged. The riprap sizing calculations were revised.*

General Engineering Comments

34. *The plans show a sidewalk beginning at the intersection of Audrina Lane and Institute Road, extending southerly along Institute Road and terminating north of the existing vernal pool. Consideration should be given to extending the sidewalk southerly along Institute Road from the currently-proposed terminus to the intersection of Brooke Street to provide pedestrian access along Institute Road. The use of this section of Institute Road by pedestrians will be inevitable once the project is developed. In our opinion, the width of the pavement on Institute Road and the horizontal alignment of the road warrant that pedestrians should be separated from vehicular traffic. Condition C6a of the Planning Board's Decision for Major Residential Permit MSRP 2014-10 requires that the Applicant resolve whether or not the sidewalk is to be extended from its currently-proposed terminus. Resolution of this issue will likely also require input from the Conservation Commission.*

March 21, 2017

The Engineer responded that the area was reviewed in the field with the Conservation Commission Agent and it was determined that a sidewalk could not be constructed in the vernal pool area due to the impacts to the vernal pool. Potential alternatives to placing fill in or adjacent to the vernal pool could be explored (e.g. bridging the sidewalk over the vernal pool using a grated (or similar) decking material or locating the sidewalk on the opposite side of the street). We defer further consideration of this issue to the Planning Board and the Conservation Commission.

The plans were revised to propose a pedestrian route along Institute Road between Audrina Lane and Brooke Street. The pedestrian improvements can best be viewed on Sheet 26. (Please note that on Sheet 26, Brooke Street was inadvertently labeled "Audrina Lane".) The concept of these improvements appears to strike a compromise relative to the separation of pedestrians and vehicles, potential impacts to the vernal pool, and maintaining the Institute Road drainage paths. GEI offers two recommendations: the pedestrian walkway should be a minimum of four feet wide (a three-foot width is proposed on the east side of Institute Road) and tactile plates must be provided at each end of the two crosswalks.

35. *The Engineer must match either the pipe crown elevations or 0.8 pipe diameter elevations at manholes with changes in pipe diameter (unless a drop manhole is proposed, in which case the incoming pipes would be higher). For example, pipe inverts at DMH #4, DMH #8, and DMH #12 must be revised.*

March 21, 2017:

The Engineer has revised the drainage system, but has not matched all of the pipe crown elevations or 0.8 pipe diameters at manholes where the pipe diameters change (specifically DMH #1, DMH#5, and DMH #15).

June 15, 2017:

The pipe invert elevations at DMH #1 and DMH #15 were adequately revised. Based upon information on Sheet 18, it appears that the pipe invert elevations at DMH #5 were adequately revised, but the DMH #5 information on Sheet 16 is not consistent with the information on Sheet 18; the information on the two plan sheets must be consistent. The drainage system at DMH #16 was not revised; the plans must be further revised to provide the requisite pipe elevations for drain manholes with changes in pipe diameter.
Acknowledged. The pipe invert elevations have been satisfactorily coordinated at manholes with changes in pipe diameters.

Additional Comments, March 21, 2017

37. *The Post-Development Plan shows that the Subcatchment DA #1P discharges to a water quality swale treatment system. The Engineer must submit calculations to demonstrate that the proposed water quality swale treatment system (at the outlet pipe near the intersection of Brooke Street and Institute Road) is adequately sized to handle the required water quality volume.*

June 15, 2017:

No information was submitted to address this comment. Water quality volume calculations and any necessary supporting information needs to be submitted to demonstrate compliance with MassDEP Standard #4.

Acknowledged. Water quality volume calculations and TSS removal calculations were submitted. The water quality volume calculations are in order. Please see Comment #42 relative to the TSS removal calculations.

39. *The design plans show that a proprietary treatment device (Stormceptor) for TSS removal is now proposed and as such the Engineer must provide backup calculations to demonstrate that the device was adequately sized (i.e. calculations in accordance with MassDEP's "Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing..." Also, TARP and/or MASTEP Performance Evaluation data must be submitted to support the proposed TSS removal efficiency.*

June 15, 2017:

No information was submitted to address this comment.

Performance evaluation data was provided for the treatment unit in the Basin #1 drainage system, however calculations in accordance with MassDEP's "Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing..." were not submitted. It appears that the proposed STC 2400 proprietary treatment unit is appropriate for the Basin #1 system. For the record, calculations prepared in accordance with MassDEP's "Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices" must be submitted. As for the treatment unit that serves Basin #2, supporting information needs to be submitted, the model number needs to be provided on Sheet 32 (as was done on Sheet 31 for the other treatment unit) and it needs to be confirmed whether the construction detail for a STC 900 treatment unit on Sheet 31 is applicable to this project.

42. *The Engineer must provide a TSS worksheet for the water quality treatment train (Subcatchment DA #1P) which demonstrates that eighty percent TSS is removed.*

June 15, 2017:

No information was submitted to address this comment.

A TSS worksheet was submitted. However, the TSS removal calculations took credit separately for TSS removal by the sediment forebay (25%) and water quality swale (70%). Per MassDEP Stormwater Handbook (Vol. 1, Ch. 1, Pg.11, Note 17 and Vol. 2, Ch. 2, Pg. 77), the combination of the sediment forebay and water quality swale are eligible for 70% TSS removal credit. The 70% removal credit results in the entire treatment train having a TSS removal rate of only 77.5% whereas 80% is required. Additional TSS removal must be achieved for this treatment train.

44. *We are aware of review comments by others pertaining to potential changes in runoff volumes to Potential Vernal Pool #2 (PVP #2), located within wetland flags 1 – 14. Please be aware that currently there is no modeling of the pre- and post-development tributary areas to PVP #2 to quantify runoff volumes. Furthermore, on Sheet 12 of the plans the existing topography south, north and east of PVP #2 is a mix of two-foot and ten-foot contour intervals; this makes estimation of the tributary area more difficult than if just two-foot contour intervals are used. We defer to the Conservation Commission if calculations of runoff volumes to PVP #2 need to be submitted.*
No further comment necessary.

Additional Comments, June 15, 2017

45. *On Sheets 10 and 30, the riprap formerly shown at the inlet and outlet of the Proposed Settling Basin (at the outlet of Basin #1) was omitted on these revised plans. The plans need to be revised to show the riprap. Similarly, on Sheet 31, the riprap at the discharge point into the Basin #2 forebay needs to be extended to the base of the 3H:1V slope.*
Acknowledged. The plans (now Sheets 11, 31 and 32) were revised to show the riprap.

Additional Comments, July 26, 2017

46. **The latest version of the Stormwater Report (revised June 26, 2017) contains obsolete pre-development and post-development hydrology (HydroCAD) calculations. These calculations have a "printed" date of February 1, 2017 and we confirmed that they have since been superseded. For the record, the final Stormwater Report must contain the latest version of the hydrology calculations.**

We trust this letter addresses your review requirements. Feel free to contact this office if you have any questions or comments.

Very truly yours,
Graves Engineering, Inc.


Jeffrey M. Walsh, P. E.
Vice President

Cc: Peter Lavoie, Guerriere & Halnon, Inc.
Normand Gamache, PLS; Guerriere & Halnon, Inc.
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