Memorandum

To: Zoning Board of Appeals
Town of Winchester
71 Mt. Vernon Street
Winchester, MA 01890

Date: January 27, 2020

Project #: 14773.00

From: Rachel Luna, PE
Luke Boucher, PE
Jake San Antonio, PE

Re: 19-35 River Street Comprehensive Permit - Stormwater, Drainage, and Hydraulic Peer Review – 3rd Review

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VHB has reviewed the responses provided by Allen & Major Associates, Inc. (A&M), dated January 21, 2020 and Hydraulic Modeling Technical Memorandum provided by H.L. Turner Group, Inc. (HL Turner), dated January 13, 2020. Comments from previous memoranda that have been satisfactorily addressed have been omitted. Comment numbering is carried forward from the original memorandum.

Stormwater, Drainage, and Site Plans

1. Initial Comment (11/22/2019): Per Section 6.5.1 of the Subdivision Regulations, the Applicant should provide a description of impact to the 100-year floodplain and regulatory floodway and summary of compensatory storage calculations in the narrative. Supporting compensatory storage calculations should be provided and the description of the floodplain in the Drainage Report should be revised to match the design.

   A&M Response (12/23/2019): The Drainage Report has been updated to include a description of the impact to the 100-year floodplain and regulatory floodway and a summary of compensatory calculations and supporting calculations.

   VHB Response (1/10/2020): Based on spot grades and finish floor elevations shown in the Section 7 figures, it appears the that the proposed parking garage is included in the compensatory storage calculations. While it is acceptable to include the areas within the parking garage, the figure showing the Elevation 24 floodplain area indicates that an unrestricted hydraulic connection is not provided between the floodplain and the storage within the parking garage. The design should be modified to provide this connection. In addition, the Applicant should revise the Section 7 figures to show the limits of the covered parking areas below habitable portions of the building.

   A&M Response (1/21/2019): The applicant has revised the grading to illustrate an unrestricted hydraulic connection at fire access driveway and revised the Section 7 figures to show the limits of the covered parking areas below habitable portions of the building. See attached revised Section 7 figures.

   VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

2. Initial Comment (11/22/2019): Per Sections 7.15.8, 7.15.9, and 7.15.15 of the Subdivision Regulations, the Applicant should provide a closed drainage analysis for the Site to confirm the design can accommodate the 25-

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year storm event. Analysis should confirm that proposed and existing pipes can accommodate outflows from the detention/infiltration systems as designed. In addition, the analysis should incorporate a tailwater condition to confirm no negative impacts. As the entire site eventually discharges to a 12-inch RCP municipal drain in River Street, the analysis must demonstrate that the 12-inch pipe can accommodate the flows from the site.

A&M Response (12/23/2019): The closed drainage analysis included in the Drainage Report has been updated to illustrate the design can accommodate the 25-year storm event. Additionally, the HydroCAD model has been updated to incorporate tailwater conditions confirming no negative effects and demonstrating the 12 inch RCP can accommodate the flows from the site.

VHB Response (1/10/2020): VHB has the following comments regarding the closed drainage analysis:

a) VHB Response (1/10/2020): It appears that in the closed drainage analysis, the Applicant used the rainfall intensity from the Intensity-Duration-Frequency (IDF) curves in the MassDEP's 2002 Hydrology Handbook for Conservation Commissioners (or similar). These IDF curves are based on rainfall data that has since been superseded. Rainfall data from NOAA Atlas 14, Volume 10, Version 3.0 is currently considered the best available data and industry standard. Per NOAA Atlas 14, attached, the 5-minute rainfall intensity for the 25-year storm is 8.32 inches/hour.

   A&M Response (1/21/2019): The closed drainage system analysis was prepared using the MassDOT IDF curves as is directed in Section 7.15.9 of the subdivision regulations. The applicant has revised the calculations to illustrate the NOAA IDF curves as recommended by the Reviewer (VHB).

   VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

b) VHB Response (1/10/2020): The drainage areas in closed drainage analysis do not match the areas in HydroCAD.

   A&M Response (1/21/2019): The closed drainage analysis has been coordinated with the areas in HydroCAD.

   VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

c) VHB Response (1/10/2020): The drainage areas, weighted land use cover (C) and the weighted land use area (CA) for pipes downstream of DMHs and WQUs should be revised as they do not represent the entire upstream area.

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A&M Response (1/21/2019): Drainage areas for DMHs and WQUs are not evaluated because they do not take into consideration the upstream retention/detention system so the pipes downstream of these structures are sized on summation of upstream flows based on C and CA and calculations from proposed HydroCAD model.

VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

d) VHB Response (1/10/2020): The closed drainage analysis does not include tailwater condition. A direct connection from private site drainage into a municipal closed drainage system is proposed. As the municipal system is designed and intended to handle flow from the public right of way, the tailwater condition must be considered to confirm that the system will not surcharge the on-site closed drainage and subsurface infiltration/detention systems or result in on-site ponding.

A&M Response (1/21/2019): See response to 2.f. for additional discussion on tailwater conditions and on-site ponding.

VHB Response (1/27/2020): Based on the provided analysis and response to Comment 2.f, it is VHB's opinion that the provided narrative and calculations provided by the Applicant satisfactorily address the comment. Item to be removed on subsequent review memos.

VHB Response (1/10/2020): VHB has the following comments regarding the revised HydroCAD analysis:

e) VHB Response (1/10/2020): The HydroCAD Model uses the NRCS Method, per Section 7.15.9 of the Subdivision Regulations, the closed drainage analysis should be performed using the Rational Method. If the Applicant prefers to use HydroCAD for the closed drainage analysis, they must provide a separate analysis using the Rational Method.

A&M Response (1/21/2019): The applicant has provided a pipe sizing table using the rational method supplemented with information from the proposed HydroCAD model.

VHB Response (1/27/2020): Based on the provided analysis and response to Comment 2.f, it is VHB's opinion that the provided narrative and calculations provided by the Applicant satisfactorily address the comment. Item to be removed on subsequent review memos.

f) VHB Response (1/10/2020): The Applicant used a dynamic tailwater condition; however, since they didn't set a tailwater elevation at the Reach (Study Point -1), the model is operating as free flow discharge from DMH-6 to the design point. If the applicant wants to use the DSI method, the study point should be a link instead of a reach in so they can set a tailwater elevation. The tailwater elevation can be set in the

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elevation tab of the link. The water elevation of the Aberjona River, the pipe between study point and the river, and any additional flows tributary to that pipe should be used to determine the tailwater elevation.

A&M Response (1/21/2019): The Applicant did not use a tailwater elevation at Study Point 1 Reach as they did not believe it was relevant understanding the proposed stormwater system is located entirely below the Federal Emergency Management Agency (FEMA) regulated 100 year flood elevation (24.9), predominantly below the 50 year flood elevation (23.9) and also partially below the 10 year flood elevation (21.4). See attached FEMA Flood Profile.

The Applicant is proposing to install the proposed stormwater system within a FEMA floodplain area and understands that incorporation of on-site flooding is required in any future conditions per FEMA regulations. It is understood that portions of the proposed parking lot and portions of the non-habitable areas of the building are proposed within the regulated FEMA floodplain and thus have been designed to meet applicable FEMA regulations.

Portions of the proposed stormwater system located in the areas of regulated floodplain will experience surcharging due to existing neighborhood flooding issues regardless of what the tailwater is. Per discussions with the Reviewer (VHB), the Applicant believes it is VHB's goal to confirm that any on-site surcharging will result in decreased downstream and off-site flooding and will mitigate potential flood damage. Particularly the downgradient abutting property located at 43 River Street. The Applicant has prepared this narrative to address those concerns.

Please note aside from the tailwater discussion presented in this letter, the Applicant believes that they have already illustrated a stormwater design that mitigates the proposed volumes and peak flows beyond what is required by the MassDEP Stormwater Standard #2 using the free flow discharge conditions noted by VHB for the following reasons:

- *The existing municipal connection from the site to the street is a 12" RCP. In the proposed conditions the site will have a similar 12" pipe connection, but will have a reduced flow due to the proposed Outlet Control Structure (OCS-3) which has a 10" orifice in order to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year & 100-year 24-hour storm events.*
- *The proposed infiltration systems on-site would only be affected by a tailwater elevation above Elev. 31.80 (NAVD88), at the weir proposed within outlet control structure OCS-2, which is not feasible as multiple existing and proposed catch basin rim elevations and other points of stormwater relief are well below this elevation. Therefore, stormwater would discharge from these catch basin grates prior to any effect by a tailwater condition above the weir elevation at OCS-2. Furthermore, the proposed*

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infiltration systems are designed to decrease the volume of stormwater discharged from 72,430 cubic feet (c.f.) in the 100-year storm event under existing conditions to just 20,075 c.f. under proposed conditions, a 72% decrease.

- *In addition, the Applicant has increased the available 100 year floodplain volume for the site from 56,539 c.f. to 77,681 c.f. and has provided a stormwater detention system within the floodplain which is proposed to hold an additional 5,064 c.f. of stormwater.*
- *This combination of stormwater and floodplain mitigation results in a total volume mitigation of at least 78,561 cubic feet (c.f.) for the existing neighborhood which is prone to flooding. This volume is greater than the entire 100-year storm event in the existing conditions. This volume of additional compensatory flood storage would not be provided without the proposed project. Based on these calculations, the proposed stormwater improvements will provide a net benefit to mitigate any downstream stormwater pipe surcharging or flooding issues when compared to existing conditions regardless of whichever bucket the flood/storm water falls into. Thus, providing evidence that off-site flooding will decrease during the 100-year 24-hour storm event.*

In order to confirm the Applicant has mitigated effects from the expected on-site surcharging to the downgradient 43 River Street, the applicant has provided a supplemental HydroCAD model illustrating a tailwater condition which would surcharge the proposed system to analyze any potential negative impacts. The following assumptions and revisions have been incorporated into the attached HydroCAD model:

- *The Applicant notes that when the proposed stormwater system surcharges there are only two downgradient locations where stormwater would discharge. Stormwater will either discharge out of the proposed southerly fire access driveway into the existing right of way (ROW) a.k.a. River Street; or it will flow overland across the project site onto 43 River Street and then eventually to the ROW. In either case, the Applicant intends to illustrate that the proposed design has reduced any surcharging and/or flooding impacts to 43 River Street to the maximum extent practicable. Both sites will need to be hydraulically connected to some extent to meet FEMA floodplain/floodway requirements.*
- *Although portions of the site are also in the FEMA regulated floodway, for discussions pertaining to tailwater conditions and elevation, the elevations of the floodplain will not be associated with the floodway.*
- *At a 50 year flood elevation of 23.9, the existing site receives flood water from both the ROW and 43 River Street, but is not completely inundated. For the basis of this analysis, an elevation of 23.9 (NAVD88) was used for the tailwater. The 100 year flood elevation (24.9) was not appropriate because it is higher than an existing or proposed stormwater infrastructure.*

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- *To allow surcharging storm waters to discharge from the site into the ROW, the proposed fire lane was modeled as a sharp crested weir outlet/conveyance using the minimum dimensions of 20 feet wide and 6 inches deep (curb) with varying elevations based on localized high points.*
- *Please note the Applicant is currently proposing curbing along the property line of 43 River Street in an attempt to allow any surcharging stormwater to remain on-site to the maximum extent practicable. The minimum top of curb elevation proposed is Elev. 24.85 (NAVD88), with the exception of the driveway entrance low point where the top of curb is proposed at Elev. 24.26 (NAVD88).*

As noted in the attached HydroCAD, all surcharging and/or flooding for the 100-year storm event with a tailwater elevation of 23.9 (50-year rainfall event) will result in no discharges or flooding to the adjacent property at 43 River Street.

VHB Response (1/27/2020): It is VHB's opinion that the provided narrative and calculations provided by the Applicant satisfactorily address the comment. Item to be removed on subsequent review memos.

9. Initial Comment (11/22/2019): Due to the presence of existing buildings, the Applicant was unable to perform test pits within the proposed footprints for Underground Infiltration Systems #2 (UIS-2) and #5 (UIS-5). VHB recommends that the Board include a requirement for the Applicant to perform, and submit results for review, confirmatory test pits within the footprints of these systems prior to construction to confirm that actual soil texture and seasonal high groundwater is consistent with that used in the design.

   A&M Response (12/23/2019): The applicant would anticipate that confirmatory test pits within the existing building footprints be a condition of approval as noted by VHB. These can occur after the demolition of the existing structures.

   VHB Response (1/10/2020): VHB takes no exceptions to completing test pits within the existing building footprints after building demolition. VHB recommends that the Board include a requirement for the Applicant to perform, and submit results for review, confirmatory test pits within the footprints of these systems prior to construction to confirm that actual soil texture and seasonal high groundwater is consistent with that used in the design.

   A&M Response (1/21/2019): No response required.

11. Proposed HydroCAD Model:
    a. Initial Comment (11/22/2019): As indicated in Comment 9.a., VHB suggests modeling the existing drain manhole as the design point. Regardless of how the system functions under existing conditions, the proposed system design should demonstrate that flows from the site do not overwhelm the existing system in River Street.

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A&M Response (12/23/2019): The drainage design has been updated to illustrate that the flows from the site do not overwhelm the existing system in River Street.

VHB Response (1/10/2020): The drainage report shows a reduction in peak rates to the Study Point but does not include acceptable parameters to demonstrate that the on-site closed drainage analysis will be able to discharge into the municipal closed drainage system without surcharging back onto the site. See VHB response to item #2.

A&M Response (1/21/2019): Please refer to A&M Response to 2.f.

VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

c. Initial Comment (11/22/2019): The peak elevation of the water within the systems is above the top of the stone. The design should be revised to ensure that the water elevation during the 100-year storm does not exceed the top of stone to eliminate potential heaving of subgrade material and buckling of pavement.

A&M Response (12/23/2019): The HydroCAD model has been updated to illustrate the water elevation during the 100-year storm does not exceed the top of stone.

VHB Response (1/10/2020): The 100-year ponding elevation of UIS-5 exceeds the top of stone elevation listed in on the plans by 0.44 ft. The Applicant should modify the plans to match the top of stone elevation indicated in the HydroCAD printouts (El. 33.75).

A&M Response (1/21/2019): The drainage plan has been updated to illustrate the top of stone of the UIS-5 is 33.75.

VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

16. Initial Comment (11/22/2019): The proposed 12" HDPE pipe connecting OCS-5 to DMH-1A appears to fall one foot off of the building. As a result, this pipe would be subject to plumbing code requirements and, depending on the type of foundation proposed, could be subject to the bearing pressure of the building foundation. The Applicant should consider revising the layout to prevent potential undermining and negative impact on the integrity of the building foundation.

A&M Response (12/23/2019): The Drainage plan has been updated to illustrate additional separation between the building and the drainage pipes, where possible.

VHB Response (1/10/2020): There are some locations where the pipes are still within 10-feet of the building corners. Pipes in these locations will be subject to Plumbing Code requirements. The Applicant

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should coordinate with the geotechnical and mechanical engineers to determine pipe inverts and pipe materials based on the footing zone of influence and depth of pipe.

A&M Response (1/21/2019): This has been noted and will be coordinated after the permitting process prior to Building Permit Application.

Hydraulic Flood Study

20. Per the NFIP regulations 44 CFR 60.3(d)(3) development within the adopted regulatory floodway is prohibited unless it has been demonstrated through hydrologic and hydraulic analyses in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community. Standard engineering practice for proposed regulatory floodway encroachments (i.e. no-rise analysis) is to follow a process similar to the Letter of Map Revision (LOMR) MT-2 instructions, and should utilize the same model used to prepare the effective Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM). The applicant should revise their hydraulic analysis accordingly.

    VHB Update (1/10/2020): Awaiting revised calculations and narrative from HL Turner.

    A&M Response (1/21/2019): This item has been coordinated with VHB under separate cover.

    VHB Response (1/27/2020): Revised hydraulic modeling has been resubmitted using the effective FIS model as the basis. The effective FIS model was simplified to remove model reaches outside the potential influence of this project. In simplifying the model, several lateral inflow hydrographs were left out of the revised model, which reduced the modeled 100-year flow discharge by approximately 30 percent. This led to differences between the duplicate effective and the effective model of greater than 0.5 feet, which shows that model is not being accurately reproduced.

    Given the issues with the submitted analysis, VHB performed our own analysis using the updated model cross sections from the Applicant's submittal for both existing and proposed conditions. VHB updated the full effective FIS model with the modified cross sections, ran the full model, and reviewed the results. Having done this additional modeling exercise, VHB is in agreement with the HL Turner Group's conclusion that the project will have no impact on the 1-percent annual chance flood. The Applicant should submit a "no-rise" certification (sample attached) to the Town for their records based on the preliminary design, and an updated "no-rise" certification based on the final design once complete.

21. Electronic files of the HEC-RAS model including all plans and geometries for the duplicate effective, corrected effective, and proposed conditions analysis should be provided.

    VHB Update (1/10/2020): Awaiting revised calculations and narrative from HL Turner.

    A&M Response (1/21/2019): This item has been coordinated with VHB under separate cover.

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VHB Response (1/27/2020): VHB received electronic files to assist with the review. The duplicate effective, existing condition, and proposed condition model runs were setup as separate projects. In the future, VHB would recommend these be completed as separate plans within a single project to simplify result comparison. Item to be removed on subsequent review memos.

22. Cross sections should extend far enough to contain all flood profiles modeled.

    VHB Update (1/10/2020): Awaiting revised calculations and narrative from HL Turner.

    A&M Response (1/21/2019): This item has been coordinated with VHB under separate cover.

    VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

23. The effective and proposed condition hydraulic models should contain the same cross section locations. Currently, four cross section are in the proposed model only.

    VHB Update (1/10/2020): Awaiting revised calculations and narrative from HL Turner.

    A&M Response (1/21/2019): This item has been coordinated with VHB under separate cover.

    VHB Response (1/27/2020): The Applicant has satisfactorily addressed the comment. Item to be removed on subsequent review memos.

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ENGINEERING "NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified engineer licensed to practice in the State of _____.

It is to further certify that the attached technical data supports the fact that proposed _____ will
(Name of Development)
not impact the 100-year flood elevations, floodway elevations and floodway widths on _____ at published sections
(Name of Stream)
in the Flood Insurance Study for _____,
(Name of Community)
dated _____ and will not impact the 100-year flood elevations, floodway elevations, and floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

_____

_____

_____

_____

_____

_____

(Date) _____

(Signature) (Title)

_____

_____

_____

(Address)

(Seal)