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March 18, 2021

Andrew R. Levenbaum, PE
[REDACTED]

Re: 59 Orchard Beach Boulevard Foundation and Structural Assessment
Response to comments from FEMA building Science
Port Washington, New York
MRCE File 13891

Dear Mr. Levenbaum:

Mueser Rutledge Consulting Engineers PLLC (MRCE) has been retained by Pond Ridge Homes LLC to perform a Geotechnical and Structural Engineering Peer Review of Demerara Engineering's (DE) structural and foundation design for 59 Orchard Beach Boulevard (Block 59, Lot 636) in Port Washington, New York.

The structure at 59 Orchard Beach was constructed with Village of Manorhaven approved layout and design drawings. The Owner has been working to address issues raised during subsequent third party inspections for the Village of Manorhaven Board of Zoning and Appeals (BZA). The issues raised by Cameron Engineering & Associates, the consultant for BZA in regards to the structural framing, flooding and erosion control were addressed in our previous submittal to BZA dated December 17th, 2020. BZA subsequently contacted FEMA Building Science to review the project. The comments from FEMA Building Science (FEMA) were made available to us via your email on February 24, 2021.

As summarized herein, we have addressed all comments from the FEMA Building Science team and modified the building design to comply with the FEMA comments.

Attachments:

- Appendix A: Email with comments from FEMA Building Science
- Appendix B: Elevation Certificate
- Appendix C: Drawings showing the proposed helical piles and removal of partial height wall.
- Appendix D: Erosion control mat layout and product information from ACF Environmental.
- Appendix E: Bulkhead Design Approval letter
- Appendix F: Photographs of the Existing Bulkhead, Bulkhead stability analysis and partial failure evaluation
- Appendix G: Flood load calculations

DESIGN MODIFICATIONS

The following modifications are proposed to the building design provided in the December 2020 BZA submission to comply with FEMA comments.

1. Removal of the rear shore parallel partial height wall.
2. Replacement of the existing parking area slab with a thinner, frangible concrete slab.

RESPONSE TO FEMA COMMENTS

For ease of reference, listed below are the FEMA comments (as excerpted from the 2/24 email) grouped by building design component (rear partial height wall, pile foundations etc.) followed by our response. The 2/24 email received from the Village of Manorhaven with complete FEMA comments is included in Appendix A.

1. Structure Compliance

FEMA Comment: FEMA states that *"it does not appear that the structure with proposed modifications complies with 44 CFR 60.3 Section (e)(4) & (5) of NFIP regulations."*

MRCE Response: 44 CFR 60.3 (e)(4) pertains to supporting the structure in V and VE zones on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor is elevated above the base flood elevation (BFE) and (ii) the pile or column foundations and attached structure are anchored to resist flotation, collapse and lateral movement due to effects of wind and water loads acting simultaneously on all building components. The building is compliant with these provisions, as follows:

- As to the first requirement of 44 CFR 60.3 (e)(4), the lowest floor is the first finished floor. The floor below is a frangible slab usable solely for the parking of vehicles or building access and is not a habitable floor. The parking level is therefore not the lowest floor as defined in the CFR. The bottom of the lowest horizontal structural member of the first floor is Elev. 19.5 and is above the BFE (See elevation certificate attached in Appendix B).
- As to the second requirement of the subsection, the proposed helical piles with steel casings are designed to support the building and resist flotation and lateral movements due to wind and water loads on the structure. Further, in compliance with NFIP requirements, two registered professional engineers (MRCE and DE) reviewed the structural design (including specifications and plans for construction) and have certified that the design and proposed methods of construction are in accordance with accepted standards of practice for meeting the requirements noted herein.
- Section (e)(5) pertains to free of obstruction requirements. The building will be modified to remove the partial height wall in response to FEMA comments as further described below.

2. Rear Partial Height Wall

FEMA Comment: FEMA states that “the shore parallel, retaining wall appears to provide grade control for the seaward extent of the parking area and must be evaluated for free of obstruction requirements outlined in NFIP TB-5. If the retaining wall is providing foundation support for any component of the structure, the wall would be considered an obstruction in the V zone as it is oriented parallel to the shoreline. Additionally, the plans indicate that steel columns for the deck bear on the retaining wall. Section 6.2 of NFIP TB-5 provides additional guidance for decks and their foundation requirements when located in V Zones. Please note that the addition of flood openings to these walls would not render the walls compliant with VE requirements.”

MRCE Response: The rear partial height wall, approximately 3 feet in height, is not a retaining wall and does not provide grade control. In response to FEMA comments, the partial height wall will be removed entirely as shown in Figure 1. A discontinuous 6” curb will be installed along the southern edge of the building to prevent vehicle roll off. The modified design Drawings prepared by Demerara in Appendix C show the extent of wall removal.

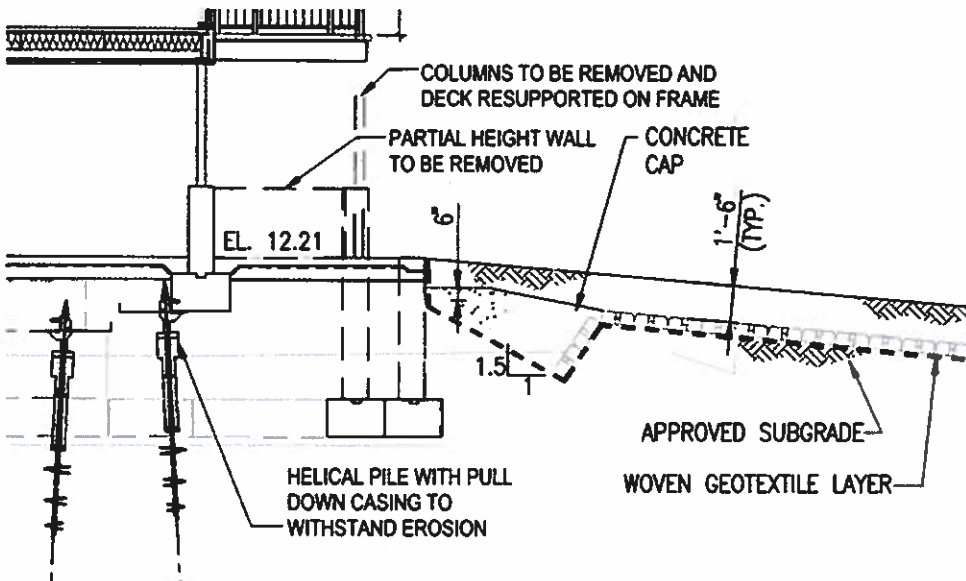


Figure 1 - Wall Removal

3. Shore Perpendicular Shear Walls

FEMA Comment: “The shore-perpendicular shear walls for the structure are permitted under the NFIP, and technical guidance can be found in section 6.8 of NFIP TB-5. Proposed openings in the shear wall are permitted to open or infilled with breakaway wall sections, provided that the shear wall is designed for forces that can be transmitted by the breakaway wall sections. Permanent shore-parallel walls are not permitted by the NFIP.”

MRCE Response: The shear walls for the structure are perpendicular to the shoreline and are provided with openings to allow floodwaters to flow through the walls and are consistent with the technical guidance of NFIP TB-5. There are no shore parallel shear walls.

4. Parking Area Concrete Slab

FEMA Comment: FEMA cites section 6.9 of NFIP TB5 requirement that “concrete slabs located in V Zones are frangible or designed to be self supporting for all associated flood loads”.

MRCE Response: The existing slab on grade in the parking area (See Figure 2) will be removed and replaced with a thinner 4-inch thick unreinforced frangible slab to comply with the FEMA comment. The foundation system for the building frame including the helical piles is independent of the slab and any distress to the concrete slab during flood conditions will not affect the performance of the building foundations. The thinner slab design will include expansion joints and isolation joints to isolate the slab from the building foundations.



Figure 2 - Slab Removal & Replacement

5. Helical Pile Foundations and the Risk of Erosion

FEMA Comment: FEMA states that “For the retrofit of the existing shallow foundation system with helical piles to be successful, the helical piles must not be subject to erosion and scour effects. The designer should evaluate the existing bulkhead and other associated erosion control measures should be evaluated for their ability to survive and maintain site grade when subject to the loading associated with base flood conditions. Since the helical piles are protected by these erosion control measures then the designer should evaluate what the consequences are if any of these measures fail.”

MRCE Response: We confirm that these evaluations have been made which demonstrate the adequacy of the bulkhead and proposed erosion control measures to protect the piles under the design flood event. The helical piles are designed with an outer steel casing to increase lateral pile capacity and withstand local scour or erosion around the pile to a depth of up to 5 feet (depth below slab). The helical piles will therefore remain effective in supporting the elevated structure following scour beneath the parking slab. However, for added protection, the building design adopts a “belt and suspenders” approach of designing piles to withstand erosion and also adding an erosion control mat overlain by a vegetated landscape that will greatly alleviate the risk of erosion given the horizontal offset of more than 30 feet between the building foundations and the bulkhead. NFIP Technical Bulletin 5, Section 7.3 recommends a desirable splash zone width of 30 feet between the bulkhead and the building or a reasonable minimum splash zone width of 10 feet to 15 feet. As shown in Figure 3, the closest pile foundations are set back approximately 35 feet from the bulkhead which exceeds FEMA’s coastal mapping guidance for building position landward of the bulkhead erosion control structure.

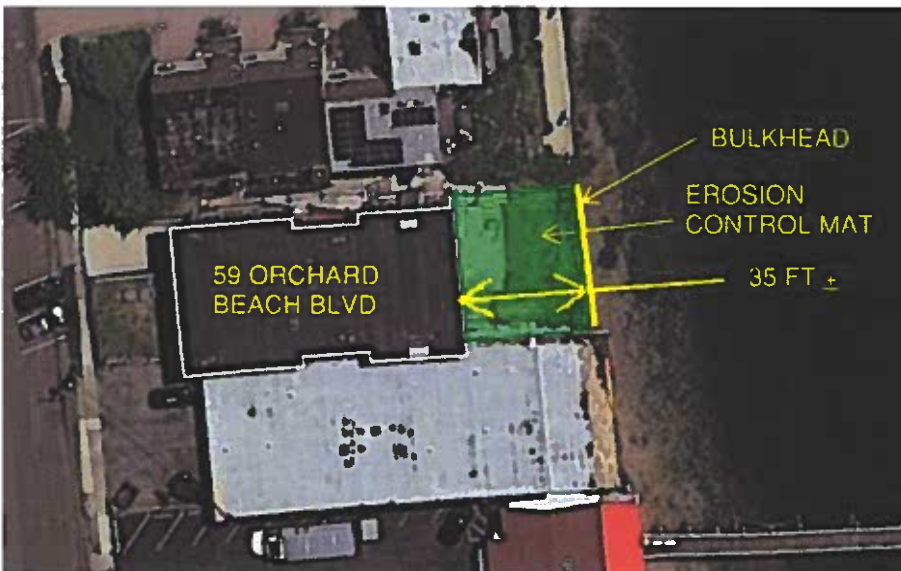


Figure 3- Foundation Offset

In addition to piles designed to withstand erosion, the building design includes installation of an erosion control mat between the bulkhead and rear of the building as shown in the December 2020 BZA submittal. The erosion control mat will be an open cell articulating concrete block mat installed over a geotextile layer with concrete anchorage on all sides. The articulating concrete mat system has proven effective in preventing shoreline erosion in VE zones. The product literature included in Appendix D shows the effectiveness of one such system in preventing shoreline erosion on a project in South West Louisiana subjected to a category 4 hurricane.

Landscaping with vegetation specifically selected to reduce erosion will overlay the articulating concrete block wall and will act as the first line of defense against scour and erosion. Such vegetated slopes are recommended by the New York State Department of Environmental

Conservation (NYSDEC) as an effective erosion control measure. The grade will gently slope up to the building edge to allow wave run up and reduce the wave forces that reach the building. The bulkhead at the edge of the site is an anchored structure and is constructed as permitted by the Army Corps of Engineers (ACOE) and the NYSDEC. In the extreme event of damage to the bulkhead, possible movement of the bulkhead could lead to sloughing of the retained soil. Since the erosion control mat is anchored by non-erodible backfill (concrete) on all sides, the geotextile layer and erosion control mat may slough with the soil along the bulkhead and continue to provide erosion control. Even if the erosion control mat is damaged after continuous operation in a sloughed condition and allows erosion beyond the strip footing along the edge, the helical piles with casing are capable of withstanding up to 5 feet of erosion and supporting the building.

By means of these redundant protective measures (See Figure 4) – specially selected vegetation, articulating concrete block mat, geotextile layer and piles capable of withstanding up to 5 feet of scour – the building is designed to withstand the effects of the design flood event even if one or more of these protective measures fail.

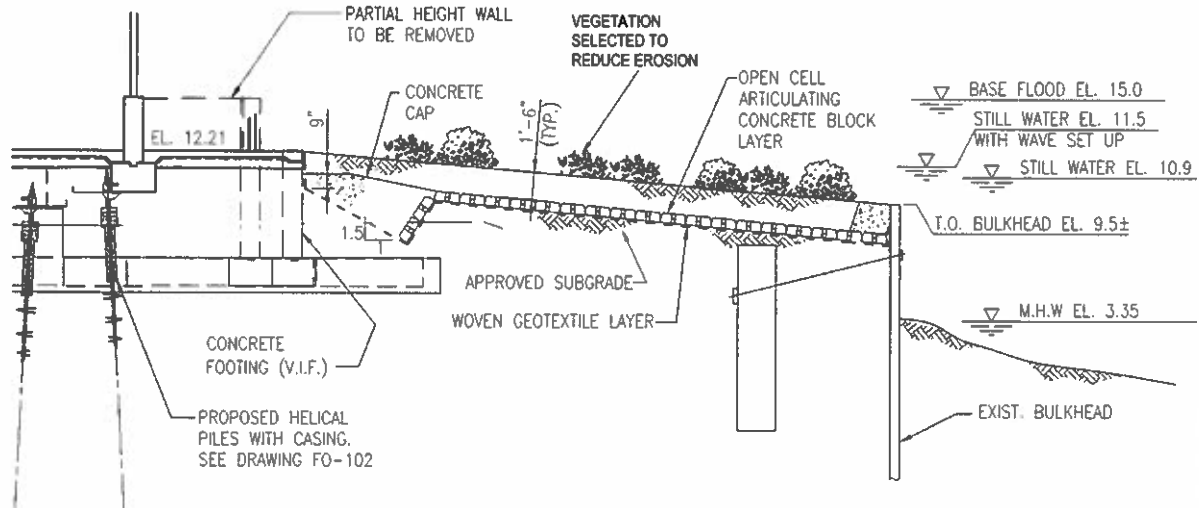


Figure 4 - Erosion Protection

6. Bulkhead Analysis

FEMA Comment: FEMA states that “An analysis of the strength and stability of the bulkhead with the articulated concrete mat, under base flood conditions is required to evaluate the proposed retrofit and should be reviewed by the building official as part of the review process. The analysis would require the same type of coastal hazard and coastal structure calculations that would need to be provide in a Letter of Map Revision (LOMR) submittal.”

MRCE Response: The bulkhead at the site is an anchored bulkhead and was constructed in accordance with the plans approved by ACOE and NYSDEC. The permit letter is included in Appendix E. The bulkhead profile and top elevations are similar to the bulkhead at the neighboring properties immediately east and west of the site. Photographs of the existing bulkhead and neighboring properties are included in Appendix F. The bulkhead does not significantly change the grade along the shoreline, especially relative to the adjacent properties on either side. As illustrated in the

photographs in Appendix F, the building at 59 Orchard Beach Boulevard is located significantly farther back from the bulkhead compared to the neighboring properties. The horizontal offset (or setback) of the building from the bulkhead of more than 30 feet, which exceeds the desired offset in FEMA guidance, allows wave run up and dissipation of wave energy along the gently sloping ground surface, and coupled with the provision for unobstructed flow through the open space in the parking level, reduces flood forces and impact to the building.

We analyzed the stability of the existing bulkhead for an extreme condition with wave induced erosion in front of the bulkhead. Based on the US Army Corp of Engineers empirical method of analysis (Coastal Engineering Manual, Part VI Chapter 5), the depth of potential erosion is estimated as equal to the height of a non-breaking wave or equal to the depth of water in front of the bulkhead. At the bulkhead, stillwater elevation is Elev. 11.5 and the mudline is Elev. 3.5. The water depth during a 1% chance flood event is 8 feet and the height of a non-breaking wave is approximately 6.25 feet. Our analysis demonstrates that the bulkhead remains stable in this extreme hazard event with up to 8.5 feet of soil erosion in front of the bulkhead.

Even if we disregard the inherent stability of the bulkhead under such extreme conditions, consideration of a partial failure of the bulkhead as recommended by the FEMA Coastal Structures Guidance Document 42 shows adequate protection of building foundations. As shown in Appendix F, a partial bulkhead failure due to loss of toe embedment could cause the toe of the bulkhead to shift seaward and bulkhead to rotate. In this extreme event, the erosion control mat will remain anchored along the building's edge and continue to provide protection against erosion of soil around building foundations.

As shown in the photographs in Appendix F, the top of the bulkhead is at approximately the same elevation as the bulkhead at the adjacent properties and does not alter the shoreline elevation significantly. In the extreme event of significant damage to the bulkhead, the articulating concrete mat and the geotextile layer are expected to slough with the soil local to the bulkhead and remain engaged due to anchorage on the other three sides. Therefore, by means of pile design and the planned erosion control measures, the foundation system is in compliance with 44 CFR 60.3 Section (e)(4).

7. Flood Loads

FEMA Comment: FEMA indicates that *"A review of the flood load development calculations indicate that they may not be fully compliant with the guidance provided in FEMA P-55, Coastal Construction Manual and it did not appear that the information provided in the FIS report in regard to wave setup was properly incorporated into the stillwater calculations. The flood load calculations should be revised prior to building department review."*

MRCE Response: The flood load calculations in Appendix G are revised with the still water elevation including wave setup.

As summarized above, we have addressed all comments from the FEMA Building Science Team and modified the building design to comply with their application of FEMA comments and guidelines. Copies of this response have been provided to the NYSDEC and FEMA.

Please contact us if you have any questions regarding the responses provided herein.

Very truly yours,
MUESER RUTLEDGE CONSULTING ENGINEERS PLLC



Raj S. Chinthamani, P.E-CA



Walter E. Kaeck, PE

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CC: Mr Michael Boroumand

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