Memo

To: Ms. Rachna Balakrishna – Mason & Murphy, Inc.

From: Douglas Aghjayan, P.E.; Michael Yako, P.E.

c: Raj Dhanda, Jamie Hass

Date: April 18, 2019

Re: Response to Geotechnical/Environmental Technical Review Comments
1299 Beacon Street
Brookline, Massachusetts
GEI Project No. 1804540

The Town of Brookline engaged Fuss & O'Neill to review the technical aspects of documents submitted to the Zoning Board of Appeals for the 1299 Beacon Street project; including architectural submittals, a stormwater prepared by Nitsch Engineering, and GEI's January 2018 geotechnical report. Fuss & O'Neill presented their review comments in their April 11, 2019 letter. We prepared this memo that contains our responses to their geotechnical review comments.

Review Comments and Responses

Fuss and O'Neill's review comments taken from their April 11, 2019 letter are listed below beginning in the order they appear. Our responses in italics follow their comments. We have attached Fuss & O'Neill's letter with hand-annotated comment numbers to correspond to the comments listed below.

1. **Dewatering and Groundwater Management:** The foundation construction will require dewatering and control of groundwater. Groundwater infiltration may pose challenges to construction due to the presence of sandy soils (which can be relatively permeable) and the inconsistent presence of clay lenses (which can inhibit groundwater flow). Furthermore, the effluent flow from dewatering would likely be discharged to municipal infrastructure and further evaluation is warranted to confirm that the system is capable of handling the flows and volume. The extent to which dewatering would affect surrounding properties, including impacts to soil loads and entrainment and mobilization of potential groundwater contaminants from off-site disposal sites, should also be evaluated.

   Generally, the scale of dewatering and groundwater management is proportional to the depth of foundation excavation, and shallower foundation systems could warrant less intensive groundwater management. However, groundwater management would still be warranted under a three-story **foundation** scenario.

   GEI Response: Groundwater infiltration into the excavation and the potential lowering of surrounding groundwater levels outside the excavation due to temporary dewatering activities will be controlled by a continuous perimeter excavation support system and groundwater cutoff that will extend down into an impervious soil or rock layer. Only the area within the proposed building limits and inside the perimeter groundwater cutoff will need to be temporarily dewatered. The temporary dewatering activities are not expected to lower groundwater levels off-site or cause the mobilization of potential contaminants from

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adjacent properties. As we recommended in our report, groundwater observation wells will be installed inside and outside the excavation and monitored during the dewatering activities.

Prior to the start of dewatering, the contractor will be required to prepare and submit for review a dewatering plan. The discharging of dewatering effluent into municipal storm drains will require the contractor to apply for the appropriate permits. The estimated quantity and quality of the effluent will be addressed in the permit application. The permit will outline the requirements for the allowable quantity, testing, and pretreatment of dewatering effluent to be discharged into the storm drain system.

Once the project is better defined and within about 6-months before the start of construction, the soil and groundwater will be pre-characterized. The soil disposal facilities generally require that the analytical testing data be less than 1 year old.

2. **Foundation Waterproofing:** The foundation system is proposed with a waterproof exterior membrane. The geotechnical report recommends a temporary earth retention system (e.g. slurry walls or drilled secant piles) ultimately integrated into the permanent foundation walls. The Applicant should address the potential conflict between waterproofing the exterior of the foundation and use of an earth retention system that is designed to be incorporated into the permanent building foundation walls when the buried wall face of the earth retention system is not accessible due to the installation methods.

   This condition is not related specifically to the depth of the foundation, as waterproofing has been proposed from the bottom of the proposed mat foundation to approximately 15 feet below ground surface and would be applied under either scenario.

   GEI Response: The matt foundation or lowest level structural slab will be membrane waterproofed. The perimeter groundwater cutoff/foundation wall may be left exposed within the below grade space. The contractor will be required to grout any leaks in the perimeter walls. Alternatively, an interior concrete liner wall may be constructed inside of and attached to the perimeter foundation wall and membrane waterproofing installed between the two. The design and installation of the membrane waterproofing would be specified by the project's building envelope consultant.

3. **Building Loads and Design Parameters:** GEI recommended an allowable bearing capacity for a reinforced mat foundation or spread footings and stated that the proposed bearing stress should be less than the weight of soil excavated for the foundation system. Supporting information on the magnitude of the building loads was not provided and therefore Fuss & O'Neill could not confirm that the bearing capacity was sufficient to support the building. The Applicant further recommends a friction coefficient assuming that the spread footings would bear directly on a rough concrete mud mat surface. The Applicant should identify where membrane waterproofing would be situated for the spread footing alternative and adjust the recommended friction coefficient if necessary. We further note that design changes relating to building height and massing have been proposed by the Applicant. The extent to which those design changes have been coordinated with the geotechnical recommendations is not clear.

   Reducing the potential foundation depth to three stories would reduce the "pre-loading" weight of existing soil removed from the bearing surface, which may result in a condition where the weight of the existing soil is less than the recommended bearing capacity. We

further note that the three-story foundation system would bear in saturated soils and may exhibit lesser bearing resistance due to buoyancy. These issues should be vetted by the geotechnical design engineer with respect to the recommended bearing resistance and the potential for issues with total and differential settlement.

GEI Response: Building loads are not available at this time. GEI will confirm the allowable bearing capacity and evaluate settlement once the building loads and final configuration of the building are known.

The recommended net allowable bearing capacity is a conservative presumptive value based on the subsurface conditions encountered in the borings and the Massachusetts Building Code, which are intended to limit total settlement to 1 inch. The load for each building story above grade for a typical commercial/residential building equates to about a one-foot-thick layer of soil. Thus, the assumption that the weight of an 11-story building is less than the weight of the displaced soil for the 30- to 40-foot-deep parking garage is conservative.

See Comment No. 2 regarding waterproofing.

GEI will work with the project team as the project evolves to confirm that our recommendations are properly incorporated into the design.

4. **Abutting Property Impacts:** The proposed excavation would extend to depths exceeding 40 feet below grade and occupy effectively the entire property, leaving virtually no buffer area between the excavation and neighboring properties and structures. The geotechnical report recommends the use of either slurry walls or drilled secant pile walls, meaning the use of vertical walls to the full depth of construction along the property line. Construction activities have the potential to modify soil stresses on and near the site due to changes in groundwater elevations from dewatering, and changes in building loads. The Applicant should address how the integrity of neighboring properties and structures, as well as the integrity of abutting public rights-of-way, will be protected.

   Groundwater impacts potentially exist in both scenarios. Because the shallower foundation would bear on soil closer to the elevations of the nearby buildings, it may impact the foundation systems more directly than a deeper foundation. Additional review of impacts to nearby foundation systems is warranted under both scenarios.

   GEI Response: GEI has prepared a conceptual support of excavation design for the project that provides minimum requirements for the support of excavation. The design consists of an internally brace secant pile wall designed to support the building loads from the abutting properties and infrastructure without the need for ground improvement or underpinning. The contractor will be required to submit their own design and installation sequence, which will be reviewed by GEI. See Comment No. 1 regarding groundwater impacts.

   Protection and monitoring adjacent structures and infrastructure are discussed in detail in Section 6.6 of our geotechnical report and includes recommendations for monitoring movements, vibrations, and surrounding groundwater levels. Measures for the protection and monitoring of adjacent structures and infrastructure are the same for either the three-level or four-level garage options.

5. **Soil Management:** Excavation for the proposed foundation cavity will generate approximately 25,000 cubic yards of soil for off-property disposal. Disposal may generate approximately 1,000 truck trips and construction conditions should be evaluated with regard

to traffic, noise, and related issues. Furthermore, environmental characterization data of soil was not provided. Given the urban setting of the site and the identification of a fill horizon in the subsurface of the site, the soil quality should be evaluated with enough lead time to identify and permit appropriate management strategies prior to excavation.

Reducing the depth of excavation could reduce the volume of soil managed for off-site disposal. However, conditions related to soil quality and off-site disposal would not change.

GEI Response: Our geotechnical scope of work did not include environmental testing of soil for offsite disposal. Environmental pre-characterization of soil for offsite disposal will performed later as a separate task as discussed in our response to Comment No. 1.

The methods for soil removal, truck trips and routes, noise are construction-related issues to be addressed by the general contractor.

6. **Building Loads Information:** GEI indicated that the building could bear on the underlying sand and clay and recommended an allowable bearing pressure of 3 kips per square foot (KSF) and stated that total settlement would be expected to not exceed one inch. A bearing capacity and settlement analysis was not provided.

   a. The bearing capacity was presumed to be adequate because the building would weigh less than the displaced soil. No building loads or bearing capacity assessments were included with the application to validate this assumption. The bearing capacity should be evaluated against the proposed building loads once the building configuration and associated loads have been identified.

      GEI Response: See response to Comment No. 3.

   b. In addition, portions of the site design have evolved to address comments on the streetscape, resulting in changes to building massing and with potential impacts to the resulting loads. The extent to which those design changes were coordinated with the geotechnical recommendations was not clear.

      GEI Response: See response to Comment No. 3.

   c. Since the proposed building loads are anticipated to be less than the existing soil weight at the proposed depth of the bottom of the footings, the geotechnical engineer should address the potential for displacement as a result of soil swelling due to unloading rather than consolidation settlement.

      GEI Response: GEI will evaluate the potential for soil displacement due to swelling (heave) once the building loads, final configuration of the building, and thickness and properties of the clay layer are known. Based on the available information, we do not anticipate that heave of the clay layer will affect the design of the proposed building or the adjacent existing buildings.

7. **Waterproofing Method Clarification:** The dewatering concept recommends exterior waterproofing on portions of the vertical walls and indicates that the shoring system (i.e. the slurry walls or drilled secant pile walls) can be incorporated into the permanent foundation walls. The method to install the exterior waterproofing under this scenario should be clarified.

   GEI Response: See response to Comment No. 2.

8. **Additional Boring Coverage:** The geotechnical assessment was performed in accessible areas of the site, namely the rear (south) parking lot. The area occupied by the building was not explored. We recommend that if the project is approved, additional borings be performed in the existing building footprint following building demolition, to confirm the assumed subsurface conditions beneath the building are consistent with those under the parking lot.

   GEI Response: We agree with this recommendation. Our geotechnical report recommends that additional (and deeper) borings be performed to evaluate the subsurface conditions at other locations on the site and to identify a suitable impervious soil or rock layer for groundwater cutoff.

9. **Dewatering:** Two of the four deep soil borings extended into a silty sand horizon. The proposed excavation would pass the shallow groundwater table, and dewatering would be required. Deeper exploration would be necessary to ensure that a contiguous impervious horizon can be used to isolate the work from infiltration during construction which may reduce the potential for continuous construction dewatering. GEI noted that dewatering would be warranted but did not comment on the potential groundwater yield or associated dewatering requirements. Therefore Fuss & O'Neill could not confirm that the dewatering and management of groundwater is feasible.

   GEI Response: See response to Comment No. 1. Only the area within the perimeter cut-off wall will require dewatering.

10. **Off-property Access:** Temporary observation wells are recommended to be installed outside of the proposed excavation area on adjacent private property or the public right of way and would require additional outside coordination.

    GEI Response: The installation and monitoring of temporary groundwater observation wells are recommended outside the perimeter of the excavation to evaluate if dewatering activities are impacting surrounding groundwater levels outside the excavation. We acknowledge that installation of the wells on private property and in the public right-of-way will require approvals from the abutting property owners and Town of Brookline.

11. **Excavation Method Details:** The proposed excavation depth of greater than 40 feet below grade relative to the site dimensions would limit the potential for a ramped access to the bottom of the excavation. The proposed methods for excavating and loading out soil from that depth should be identified, and the anticipated level of off-site impact (laydown and staging areas, use of public roads, etc.) should be documented for the ZBA's review. Depending on the methods selected, impacts to neighboring properties and public ways should be evaluated.

    GEI Response: This is a construction means and methods issue that will be addressed by the general contractor and earthwork subcontractor.

12. **Three-story alternative:** A potential three-story foundation alternative (under circumstances which do not affect building massing or programming) could affect the foundation system in the following ways:

    a. Building Loads would be distributed onto soil which has not been previously loaded to the same degree, being shallower and under less existing soil weight and pressure. The

potential for settlement associated with the building loads should be reevaluated if a shallower foundation system is proposed. Further, the loads would be applied at a higher elevation, closer to ground surface, and would have an undefined impact on adjacent foundation systems.

GEI Response: See response to Comment No. 3.

b. Waterproofing would be applied from above the groundwater table to the bottom of the proposed mat foundation and this condition would be present regardless of whether the final proposed depth is three or four stories.

GEI Response: Comment noted.

c. Additional boreholes would be warranted in the existing building location under either scenario.

GEI Response: See response to Comment No. 8.

d. Off-Property Access would still be required to monitor groundwater levels.

GEI Response: See response to Comment No. 10.

e. Excavation Methods could change based on the anticipated depth of excavation and accessibility for earth-moving equipment, but because the excavation would involve the entire property, off-site impacts would remain and should still be evaluated.

GEI Response: See response to Comment No. 11.

13. Prolonged construction dewatering could lower the groundwater table on adjacent properties during and for some time following parking garage construction, and could affect the soil stress profiles on adjacent foundations. GEI recommended installing off-property monitoring wells to evaluate changes to groundwater levels during the project. Those wells would be installed on properties owned by other parties, potentially including the Town. Town-owned properties would include roadways and warrant additional coordination (e.g. street opening permits).

GEI Response: See response to Comment No. 10.

14. Dewatering effluent would be discharged to the municipal storm infrastructure. The stormwater report, prepared by Nitsch Engineering, indicates that the storm infrastructure is located in Sewall Avenue, exclusively. Neither report evaluated dewatering flows or quantities, nor identified the capacity of the storm infrastructure.

GEI Response: See response to Comment No. 1

15. Excavation to the dimensions indicated on the proposed plans (i.e. 40 feet deep, 18,000 square feet) would generate approximately 25,000 cubic yards of soil for off-site disposal. Removal of that soil may generate approximately 1,000 truck trips of roughly 25 cubic yards or approximately 30 tons per truck, to and from the site during construction. The Applicant

should provide some level of detail regarding traffic management during soil excavation, specifically addressing potential queueing, noise and similar issues.

GEI Response: See response to Comment No. 11.

16. Construction-phase dewatering should be quantified, and evaluated as it pertains to the following issues:

    - Hydraulic loading to municipal infrastructure
    - Stresses on nearby foundations
    - Environmental quality of pumped groundwater
    - Zone of influence and potential contaminant migration from off-site releases

    GEI Response: See response to Comment No. 1.

17. Excavation and construction-phase soil management should be evaluated regarding the following conditions:

    - Means and methods to achieve the excavation depth,
    - Impacts (property use, access requirements) to surrounding areas.
    - Evaluation of soil quality and selection of appropriate disposal locations
    - Traffic and public safety impacts related to large-volume soil management

    GEI Response: See response to Comment No. 5.

18. Additional information should be provided relative to building loads and the evaluation of bearing capacity, settlement and related conditions.

    GEI Response: See response to Comment No. 3.

Attachment:

Geotechnical/Environmental Technical Review Letter, prepared by Fuss & O'Neill, dated April 11, 2019

[DJA:--]
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FUSS & O'NEILL

April 11, 2019
Original Report March 28, 2019

Ms. Maria Morelli
Senior Planner
Planning and Community Development Department
Town of Brookline
333 Washington Street, 3rd Floor
Brookline, MA 02445

RE: Geotechnical / Environmental Technical Review
Proposed Mixed-Use Development
1299 Beacon Street, Brookline MA

Dear Ms. Morelli:

Fuss & O'Neill has completed a review of documents associated with the proposed redevelopment of the 1299 Beacon Street property (hereafter, the Site). The materials reviewed included the Zoning Board of Appeals (ZBA) submittals prepared by the Applicant (Brighton Allston Properties, LLC). These materials include architectural submittals, as well as a stormwater report and a geotechnical design report, prepared by Nitsch Engineering (Nitsch) and GEI Consultants (GEI), respectively. We further performed a limited review of Massachusetts Department of Environmental Protection (MassDEP) case files for nearby environmental sites.

In addition, Fuss & O'Neill's reviewers performed an inspection of the Site to observe the present site conditions.

The objective of our review was to evaluate if the proposed development of the site may pose potential risks to nearby structures, to public safety, or to the environment, so that the ZBA may consider identified risks in its permitting process. We have prepared a summary of our understanding of the conditions, including technical comments based on those site conditions, followed by construction considerations and recommendations for the ZBA to consider in its deliberations of the proposed project.

We have further revised this report to evaluate a shallower foundation proposal (three stories below grade) which could be considered as a result of reduced parking requirements. Revisions to our Technical Review dated March 28, 2019 are in italics below.

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Executive Summary

Based on the materials provided for review, the Applicant proposed a four-story underground parking garage and 11-story mixed-use building with ground floor commercial spaces and upper-level residential units. Construction would involve demolition of an existing low-rise structure and excavation between two existing low-rise buildings on abutting properties. GEI's report and the proposed construction activity raise technical questions which should be further evaluated prior to approval of the project. The following conditions warrant further consideration:

#1

- **Dewatering and Groundwater Management:** The foundation construction will require dewatering and control of groundwater. Groundwater infiltration may pose challenges to construction due to the presence of sandy soils (which can be relatively permeable) and the inconsistent presence of clay lenses (which can inhibit groundwater flow). Furthermore, the effluent flow from dewatering would likely be discharged to municipal infrastructure and further evaluation is warranted to confirm that the system is capable of handling the flows and volume. The extent to which dewatering would affect surrounding properties, including impacts to soil loads and entrainment and mobilization of potential groundwater contaminants from off-site disposal sites, should also be evaluated.

  Generally, the scale of dewatering and groundwater management is proportional to the depth of foundation excavation, and shallower foundation systems could warrant less intensive groundwater management. However, groundwater management would still be warranted undera three-story foundation scenario.

#2

- **Foundation Waterproofing:** The foundation system is proposed with a waterproof exterior membrane. The geotechnical report recommends a temporary earth retention system (e.g. slurry walls or drilled secant piles) ultimately integrated into the permanent foundation walls. The Applicant should address the potential conflict between waterproofing the exterior of the foundation and use of an earth retention system that is designed to be incorporated into the permanent building foundation walls when the buried wall face of the earth retention system is not accessible due to the installation methods.

  This condition is not related specifically to the depth of the foundation, as waterproofing has been proposed from the bottom of the proposed mat foundation to approximately 15 feet below ground surface, and would be applied under either scenario.

#3

- **Building Loads and Design Parameters:** GEI recommended an allowable bearing capacity for a reinforced mat foundation or spread footings, and stated that the proposed bearing stress should be less than the weight of soil excavated for the foundation system. Supporting information on the magnitude of the building loads was not provided and therefore Fuss & O'Neill could not confirm that the bearing capacity was sufficient to

support the building. The Applicant further recommends a friction coefficient assuming that the spread footings would bear directly on a rough concrete mud mat surface. The Applicant should identify where membrane waterproofing would be situated for the spread footing alternative and adjust the recommended friction coefficient if necessary. We further note that design changes relating to building height and massing have been proposed by the Applicant. The extent to which those design changes have been coordinated with the geotechnical recommendations is not clear.

Reducing the potential foundation depth to three stories would reduce the "pre-loading" weight of existing soil removed from the bearing surface, which may result in a condition where the weight of the existing soil is less than the recommended bearing capacity. We further note that the three-story foundation system would bear in saturated soils and may exhibit lesser bearing resistance due to buoyancy. These issues should be vetted by the geotechnical design engineer with respect to the recommended bearing resistance and the potential for issues with total and differential settlement.

#4

- **Abutting Property Impacts:** The proposed excavation would extend to depths exceeding 40 feet below grade and occupy effectively the entire property, leaving virtually no buffer area between the excavation and neighboring properties and structures. The geotechnical report recommends the use of either slurry walls or drilled secant pile walls, meaning the use of vertical walls to the full depth of construction along the property line. Construction activities have the potential to modify soil stresses on and near the site due to changes in groundwater elevations from dewatering, and changes in building loads. The Applicant should address how the integrity of neighboring properties and structures, as well as the integrity of abutting public rights-of-way, will be protected.

Groundwater impacts potentially exist in both scenarios. Because the shallower foundation would bear on soil closer to the elevations of the nearby buildings, it may impact the foundation systems more directly than a deeper foundation. Additional review of impacts to nearby foundation systems is warranted under both scenarios.

#5

- **Soil Management:** Excavation for the proposed foundation cavity will generate approximately 25,000 cubic yards of soil for off-property disposal. Disposal may generate approximately 1,000 truck trips and construction conditions should be evaluated with regard to traffic, noise, and related issues. Furthermore, environmental characterization data of soil was not provided. Given the urban setting of the site and the identification of a fill horizon in the subsurface of the site, the soil quality should be evaluated with enough lead time to identify and permit appropriate management strategies prior to excavation.

Reducing the depth of excavation could reduce the volume of soil managed for off-site disposal. However, conditions related to soil quality and off-site disposal would not change.

Additional detail on these topics is included in the sections below.

Proposed Development Conditions

Based on the materials provided for review, the site is proposed for redevelopment as an 11-story building, consisting of ground-level mixed-use and upper-story residential occupancy. The existing site slopes down gradually from the north to the south, from approximately elevation 57 to 54 feet. The building would be constructed on a four-story underground parking garage extended to a maximum depth of approximately 40 feet below existing ground level (approximately elevation 10 to 15).

Construction is proposed to involve demolition of an existing low-rise (one to two-story) brick building and then excavation. The underground garage would occupy the entirety of the property and extend to the full depth of excavation. The proposed earth retention system is recommended to be incorporated into the permanent foundation walls for the building. Due to its depth beneath the existing groundwater table, the foundation is recommended to be waterproofed and to approximately elevation 40 (i.e. 15 feet below ground surface), and damp-proofed above.

The southern (Sewall Avenue) frontage would feature an entry plaza and setback from the street, and the building footprint would be smaller in upper levels. The northern frontage on Beacon Street would be set along the existing streetscape with minimal setbacks.

Existing Explorations and Documentation

The Applicant's consultant, GEI, provided a geotechnical report for review. GEI prepared geotechnical design recommendations based on a field program performed in December 2018. The field program involved the performance of five test borings and installation of one monitoring well in the current parking areas on the southern side of the property. GEI documented the presence of a horizon of fill material between 10 and 22 feet thick on the property, over horizons of sand, silt and clay that may or may not be continuous.

Four of the borings extended to 51 feet below ground surface. Two of these borings terminated in lean clay, while the other two terminated in soil identified as silty sand. GEI identified the groundwater table at a depth of approximately 20 to 26 feet below ground surface. GEI indicated that the depth of groundwater varied within the monitoring interval (December 12 to 27, 2018), and recommended an evaluation of seasonal variation. Waterproofing recommendations were benchmarked to elevations higher than the measured groundwater elevations.

As construction practices, GEI recommended that the selected earth retention system be designed to act as a ground water cut off by extending the bottom of the earth retention system into a restrictive contiguous soil horizon (i.e. clay or bedrock). The foundation area would be dewatered and excavated to finished depth. During construction, internal bracing of the shoring system is anticipated due to the depth of the excavation. The building foundation was proposed as a waterproofed mat slab, with foundation walls waterproofed to approximately 15 feet below ground surface (five to ten feet above the observed water table). GEI recommended installation of temporary observation wells to monitor the groundwater levels outside of the foundation on adjacent properties during construction.

In reviewing GEI's report, we have identified the following technical questions and considerations:

#6

- **Building Loads Information:** GEI indicated that the building could bear on the underlying sand and clay and recommended an allowable bearing pressure of 3 kips per square foot (KSF), and stated that total settlement would be expected to not exceed one inch. A bearing capacity and settlement analysis was not provided.
    a. The bearing capacity was presumed to be adequate because the building would weigh less than the displaced soil. No building loads or bearing capacity assessments were included with the application to validate this assumption. The bearing capacity should be evaluated against the proposed building loads once the building configuration and associated loads have been identified.
    b. In addition, portions of the site design have evolved to address comments on the streetscape, resulting in changes to building massing and with potential impacts to the resulting loads. The extent to which those design changes were coordinated with the geotechnical recommendations was not clear.
    c. Since the proposed building loads are anticipated to be less than the existing soil weight at the proposed depth of the bottom of the footings, the geotechnical engineer should address the potential for displacement as a result of soil swelling due to unloading rather than consolidation settlement.

#7

- **Waterproofing Method Clarification:** The dewatering concept recommends exterior waterproofing on portions of the vertical walls, and indicates that the shoring system (i.e. the slurry walls or drilled secant pile walls) can be incorporated into the permanent foundation walls. The method to install the exterior waterproofing under this scenario should be clarified.

#8

- **Additional Boring Coverage:** The geotechnical assessment was performed in accessible areas of the site, namely the rear (south) parking lot. The area occupied by the building was not explored. We recommend that if the project is approved, additional borings be performed in the existing building footprint following building demolition, to confirm the

assumed subsurface conditions beneath the building are consistent with those under the parking lot.

#9

- **Dewatering:** Two of the four deep soil borings extended into a silty sand horizon. The proposed excavation would pass the shallow groundwater table, and dewatering would be required. Deeper exploration would be necessary to ensure that a contiguous impervious horizon can be used to isolate the work from infiltration during construction which may reduce the potential for continuous construction dewatering. GEI noted that dewatering would be warranted, but did not comment on the potential groundwater yield or associated dewatering requirements. Therefore Fuss & O'Neill could not confirm that the dewatering and management of groundwater is feasible.

#10

- **Off-property Access:** Temporary observation wells are recommended to be installed outside of the proposed excavation area on adjacent private property or the public right of way, and would require additional outside coordination.

#11

- **Excavation Method Details:** The proposed excavation depth of greater than 40 feet below grade relative to the site dimensions would limit the potential for a ramped access to the bottom of the excavation. The proposed methods for excavating and loading out soil from that depth should be identified, and the anticipated level of off-site impact (laydown and staging areas, use of public roads, etc.) should be documented for the ZBA's review. Depending on the methods selected, impacts to neighboring properties and public ways should be evaluated.

#12

- ***Three-story alternative:*** *A potential three-story foundation alternative (under circumstances which do not affect building massing or programming) could affect the foundation system in the following ways:*

  a. ***Building Loads*** *would be distributed onto soil which has not been previously loaded to the same degree, being shallower and under less existing soil weight and pressure. The potential for settlement associated with the building loads should be reevaluated if a shallower foundation system is proposed. Further, the loads would be applied at a higher elevation, closer to ground surface, and would have an undefined impact on adjacent foundation systems.*
  b. ***Waterproofing*** *would be applied from above the groundwater table to the bottom of the proposed mat foundation and this condition would be present regardless of whether the final proposed depth is three or four stories.*
  c. ***Additional boreholes*** *would be warranted in the existing building location under either scenario.*
  d. ***Off-Property Access*** *would still be required to monitor groundwater levels.*

e. ***Excavation Methods*** *could change based on the anticipated depth of excavation and accessibility for earth-moving equipment, but because the excavation would involve the entire property, off-site impacts would remain and should still be evaluated.*

Additional information is warranted to evaluate these conditions.

Environmental Assessment (21E) Documents

No environmental site assessments were provided for Fuss & O'Neill's review as part of this process. Fuss & O'Neill reviewed publicly available environmental case files for the vicinity of the site, maintained by the Massachusetts Department of Environmental Protection (MassDEP). The 1299 Beacon Street property was not, itself, identified as a "disposal site" in the context of the Massachusetts Contingency Plan (310 CMR 40.0000 and MGL 21E). Release tracking numbers (RTNs, MassDEP case files) were identified for nearby properties and are summarized briefly below:

- 11 Longwood Avenue, RTN 3-3675 – Mike's Texaco. Petroleum contamination related to a former gasoline filling station was closed via a Class A3 Response Action Outcome (RAO) and Activity and Use Limitation (AUL) in 1999. Light non-aqueous phase liquid (LNAPL, petroleum product) was reportedly present at the time of the AUL filing, and the AUL prohibited uses which would allow site occupants to come into contact with soil and groundwater in the proximity of the groundwater table.

- 30 Longwood Avenue at Sewall Avenue, RTN 3-15954: located immediately south of the 1299 Beacon Street property, a release of benzene affecting groundwater was identified in the late 1990s. In 1999, IES, Inc. (IES) submitted a *Class B Response Action Outcome* (RAO) reporting that the condition originated from Mike's Texaco at 11 Longwood Avenue, but that the release posed No Significant Risk. At the time of closure, benzene and petroleum hydrocarbons were detected in multiple groundwater samples.

- 1285 Beacon Street, RTNs 3-2048 and 3-30852: A gasoline filling station was historically located approximately 200 feet northeast of the 1299 Beacon Street property and releases of petroleum were identified in the 1980s in connection with historical fuel storage and distribution practices. Between 2006 and 2007, petroleum-contaminated soil was removed to a depth of approximately 25 feet below grade during site construction and a Class A2 RAO was provided for the primary release. In 2012 and 2013, a Utility-Related Abatement Measure (URAM) was performed to replace drain lines in Beacon Street, and to manage petroleum-contaminated soil derived from 1285 Beacon Street.

Generally, the nearby environmental releases are inactive, having achieved regulatory status of "No Significant Risk" pursuant to the Massachusetts regulations. For several sites, those findings are predicated on AULs and relate to (at the time of filing) ongoing or foreseeable conditions. A longstanding dewatering project which lowers the groundwater table significantly may have the potential to draw groundwater flow toward the project site. An evaluation of construction dewatering should include an evaluation of the zone of influence and whether the proposed activity may draw potentially contaminated groundwater toward the project site.

A potential three-story parking garage would, at its lowest level, intersect the groundwater table and require groundwater dewatering and management. However, the bottom depth of the garage (30 feet below ground surface) would be in the range of five to ten feet below the groundwater table (20 to 25 feet, based on GEI's observations), rather than 15 to 20 feet below the water table to a bottom depth of 40 feet below ground surface in the four-story scenario. Generally, the reduced excavation depth would reduce, but would not eliminate groundwater generation. Impacts associated with off-property 21E sites could still potentially occur under a dewatering scenario and should still be evaluated.

Furthermore, while 1299 Beacon Street is not a listed disposal site, it is located within a densely urbanized area and a horizon of fill material, ranging from 10 to 22 feet thick, was identified in the geotechnical borings. Given the large volume of soil proposed for excavation and off-site disposal (as noted below), construction-phase fill management strategies should be developed, with consideration for potential "urban fill" conditions, and appropriate off-site locations should be identified.

Soil and groundwater generated from the site may have the potential to contain contaminants. Due to the absence of environmental soil and groundwater quality from the site the presence, nature and magnitude of potential contaminants is not documented. If management of contaminated soil or groundwater is required at the site, these activities may require regulatory permitting and coordination which could pose unanticipated delays to the project schedule if not completed prior to construction. The applicant should propose a strategy to manage the potential impacts to the construction schedule for soil and groundwater management and the potential for complications from environmental conditions.

External Construction Impacts

In consideration of the potential construction, we have identified the following:

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- Prolonged construction dewatering could lower the groundwater table on adjacent properties during and for some time following parking garage construction, and could affect the soil stress profiles on adjacent foundations. GEI recommended installing off-property monitoring wells to evaluate changes to groundwater levels during the project.

Those wells would be installed on properties owned by other parties, potentially including the Town. Town-owned properties would include roadways and warrant additional coordination (e.g. street opening permits).

#14

- Dewatering effluent would be discharged to the municipal storm infrastructure. The stormwater report, prepared by Nitsch Engineering, indicates that the storm infrastructure is located in Sewall Avenue, exclusively. Neither report evaluated dewatering flows or quantities, nor identified the capacity of the storm infrastructure.

#15

- Excavation to the dimensions indicated on the proposed plans (i.e. 40 feet deep, 18,000 square feet) would generate approximately 25,000 cubic yards of soil for off-site disposal. Removal of that soil may generate approximately 1,000 truck trips of roughly 25 cubic yards or approximately 30 tons per truck, to and from the site during construction. The Applicant should provide some level of detail regarding traffic management during soil excavation, specifically addressing potential queueing, noise and similar issues.

As noted elsewhere throughout this report, reducing the foundation depth to three stories would reduce the groundwater and soil generation. Due to the site constraints, the development would continue to affect traffic, stormwater, and other off-site conditions in a similar fashion, though potentially to a lesser degree.

Additional information is warranted to evaluate these conditions.

Conclusions and Recommendations

Based on our review of the materials provided by the Applicant's design team, we have identified the following conditions which warrant additional evaluation:

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- Construction-phase dewatering should be quantified, and evaluated as it pertains to the following issues:
    - Hydraulic loading to municipal infrastructure
    - Stresses on nearby foundations
    - Environmental quality of pumped groundwater
    - Zone of influence and potential contaminant migration from off-site releases

#17

- Excavation and construction-phase soil management should be evaluated regarding the following conditions:
    - Means and methods to achieve the excavation depth,
    - Impacts (property use, access requirements) to surrounding areas.
    - Evaluation of soil quality and selection of appropriate disposal locations
    - Traffic and public safety impacts related to large-volume soil management

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- Additional information should be provided relative to building loads and the evaluation of bearing capacity, settlement and related conditions.

Please feel free to contact the undersigned with questions or comments.

Sincerely,

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Project Manager

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Senior Vice President