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August 31, 2021
GZA File No. 175211.00

Mr. John Lee, Chair
Town of Walpole
Walpole Zoning Board of Appeals
135 School Street
Walpole, MA 02081

RE: Engineering Peer Review
Proposed Residential Development
300 Stone Street (Lot 2)
Walpole, MA

Dear Mr. Lee:

In accordance with our proposal, dated May 21, 2021, GZA GeoEnvironmental, Inc. (GZA) is pleased to provide the Town of Walpole Zoning Board of Appeals (Client) this engineering peer review letter for the proposed single-family dwelling and associated surface grading at 300 Stone Street, Walpole (Site). The Project Applicant is Walsh Brothers Building Company (Applicant).

GZA evaluated the Applicant's proposal with respect to conformance with current engineering practices and the Section 11 of the Walpole Zoning Bylaws dealing with construction of a single-family dwelling withing a designated Flood Plain District. Elevations noted in this letter are referenced to North American Vertical Datum of 1988 (NAVD88). GZA's engineering peer review is subject to the **Limitations** provided in **Attachment A**.

SITE DESCRIPTION

Based on GZA's review of site drawings developed by GLM Engineering Consultant, Inc. (GLM), dated February 24, 2020 (revised), the Site consisted of a fully wooded, currently undeveloped parcel (Lot 2) having a total area of 0.62 acres (27,045 ft²). An aerial photograph taken in 1969 shows a structure on the Site. However, a subsequent aerial from 1978 no longer shows the structure present, per images from HistoricalAerials.com. Refer to **Figure 1** for existing conditions plan. Ground surface elevations across this existing Site range from about El. 171 feet in the eastern portion of the lot (next to the existing stream) to about El. 176 feet to the west (abutting the Stone Street roadway embankment). Please note that there is no datum reference cited by the site plans developed by GLM (last dated April 21, 2020). GZA confirmed with GLM through the Town of Walpole that all elevations shown on the site plans are in the North American Vertical Datum of 1988 (NAVD88). Elevations in this letter refer to the NAVD88 datum unless otherwise noted.

The lot is situated on the northeastern side of Stone Street, with the predominant hydrologic feature being Spring Brook¹, which trends west to east through the southern third of the Site. Stream flow in the brook emanates from Clarks Pond, located on the west side of Stone Street.

¹ The FEMA Preliminary FIRM shows this stream as Diamond Brook.



Water is conveyed from the Pond via twin, 36-inch diameter, 40-foot long reinforced concrete pipes (RCP).

These culverts along with a portion of the Stone Street embankment constitute a dam, which impounds the water of Clarks Pond. The dam is regulated by the Commonwealth of Massachusetts Department of Conservation & Recreation (MADCR). The DCR's database indicates the name of the dam is "Summer Street Culvert", with coordinates: 42.13898877 (degrees in Latitude) and - 71.24146432 (degrees in Longitude) (**Figure 4**). Water level in the pond is controlled by small, 4.5 foot-wide spillway with wooden weir boards immediately upstream of the culvert inlets. The boards are set such that the normal pool is at an approximate elevation of 174.3. The MADCR dam safety database indicates that the dam is privately owned (Foxpole Properties²), is about 6.5 feet in structural height, and has a Small Size and Low Hazard Classifications. Pursuant to the DCR Dam Safety Regulations (302CMR10.00), a Low Hazard Dam is "*located where failure of the dam [i.e. sudden, uncontrolled release] may cause minimal property damage to others [abutters]. Loss of life is not expected.*" Based on GZA's reconnaissance of the Site vicinity, the dam embankment is approximately 35 to 50-feet long. Selected photographs from GZA's site visit on June 15, 2021 are included in **Attachment B**.

A separate drainage feature adjacent to the Site is a bituminous swale located immediately off of Stone Street near the northwest corner of the Site. Surface runoff from the roadway is conveyed from this paved swale to the Site, which generally runs along the northerly property boundary before discharging to the brook. As provided in a letter from Carl Balduf, Town Engineer, to the Walpole ZBA, this paved swale and related drainage feature is "*historic*". The swale became visible on Google Earth Images dated 2008. GZA does not have the information on exact construction date/year of the swale. Furthermore, the Conservation Commission requires maintenance of this drainage system to be a private responsibility.

SITE PROXIMITY TO FLOODPLAIN

The Site is situated within Walpole's Flood Plain Protection Overlay District and is fully encompassed within the 100-year floodplain as published in the latest Flood Insurance Rate Map (FIRM) by FEMA (effective date July 17, 2012). Relevant portions of the FIRM are presented in **Figure 2**. Base flood water surface elevation across the site ranges from approximately 170.0 to 174.0 (NAVD88), based on the published FIRM. The 100-year flood level in Clarks Pond, in the vicinity of the Stone Street dam outlet is at Elevation 177.0. Based on the average roadway grade elevation of 176.5 (taken from the GLM site base map), the dam/roadway would be likely overtopped and susceptible to an erosion failure during the 100-year flood. Shallow flooding depths of about 0.5 foot would be expected across the majority of the Site, under the 100-year event (not including dam failure). However, flood depths in the brook would be more in the range of 2 to 3 feet, with related higher flow velocities.

PROPOSED SITE DEVELOPMENT AND MITIGATION MEASURES

GZA's understanding of the applicant's proposed dwelling configuration and floodplain mitigation measures were primarily derived from review of the GLM engineering drawings (see **Figure 3**). The dwelling is to have a 1,460 ft² footprint with slab-on-grade foundation. The top of foundation slab is to be set at elevation 174.0 with a finished ground floor elevation of 176.0, which is above the published FEMA 100-year flood elevation. However, other portions of the property surrounding the dwelling structure will remain in the 100-year floodplain. Based on the Applicant's documentation, mitigation measures due to the proposed land disturbance will primarily include creation of new flood storage to compensate flood volume loss due to filling and re-grading of the Site. Based on the use of simple flood storage

² GZA understands that the information (such as name of the dam and ownership) contained in the MADCR database could be erroneous. According to the record provided by the Town, Clarks Pond and 10-feet around the Pond is owned by the Town of Walpole under the Conservation Commission.



compensation techniques, the estimated storage volume loss of 276 ft³ will be compensated with a volume of 875 ft³, a 3 to 1 ratio.

In addition, the proposed development is to include a small “sediment basin” located near the northwest corner of the property (**Figure 3**). This basin is to be about 1.5 feet high, with a riprap spillway set at a level about 0.5 feet below the top of the basin. A new grass-lined swale will allow roadway stormwater from the existing paved swale, along with some site runoff, to enter the basin. It appears that the basin will operate as a detention basin, however it is unclear how this structure’s storage volume and spillway configuration were sized (i.e. design storm) and how the basin would operate under the 100-year storm. Please note that GZA did not review regulatory requirements for the proposed detention basin per Massachusetts Clean Water Act.

CONCLUSIONS AND RECOMMENDATIONS

Based on our review of the documents provided, GZA concludes the following:

1. The compensatory storage calculation fulfills the requirement in Section 11.3.B.2 of the Zoning By-Law. However, in GZA’s opinion, reliance solely upon the compensatory storage is an oversimplified mitigation technique given the Site’s extremely sensitive location immediately north of Clarks Pond, in close proximity to Spring Brook, as well as the property being fully within the 100-year floodplain. The compensatory volume technique is static and does not properly address the potential changes in actual flow dynamics at and near the brook as a result of encroachment of the Site’s flood overbank areas due to filling and other land disturbances. Potential changes in flood flow conveyance, due to the proposed filling, may alter flow velocities resulting in increases in water surface elevations. The proposed construction seems to be constricting the flow area downstream of the Stone Street culverts so that depths may increase at the Site and vicinity. This may exacerbate flooding on and off the Site as well as alter the tailwater characteristics at the downstream end of the dam’s outlet culverts at Stone Street. At a minimum, GZA recommends that the Applicant commission the performance of a detailed backwater computer simulation to estimate the 100-year water surface profile under both pre- and post-development conditions. The analysis, using HEC-RAS or other comparable hydraulic program, should be done from a point downstream of the Site and up through the Stone Street culverts up to Clarks Pond.
2. The Walpole ZBA determined (in their original decision letter dated December 21, 2020) that the project does not satisfy the requirements of Section 11.1 of the Zoning By-Law because it is not protective of public health, safety, hazards from periodic flooding nor has it been shown how the project preserves existing flood control characteristics. GZA also notes that Section 11.3.B.5 states: “*The Board may specify such additional requirements and conditions it finds necessary to protect the health, safety, and welfare of the public and the occupants of the proposed use.*” Regardless of the proposed filling to raise the finished ground floor above the base flood level, GZA’s current opinion based on information provided to us and our engineering experience with similar projects is that the dwelling residence would likely remain at risk during base flood conditions, as the floodplain will otherwise encircle the dwelling, which could be subject to flowing water when potential overtopping of the road from the Pond occurs. As noted in Item No. 1 above, the Applicant has not provided information that demonstrates how the development may (or may not) influence existing flood control characteristics and/or off-site flooding characteristics.
3. It should also be noted that the property’s location immediately downstream from a regulated dam also has potential consequences for the dam’s owner and possibly the Town (in the event of dam failure). A dwelling will most likely be within the inundation area of a dam breach. This could trigger reclassification of the dam to Significant or perhaps High Hazard, where dam failure may or would likely cause loss of life, respectively³. Significant and High Hazard dams have

³ GZA notes the hazard potential classification of dams is the responsibility of the Massachusetts Department of Conservation and Recreation, Office of Dam Safety in accordance with Massachusetts Dam Safety Regulations (302CMR10).



additional regulatory requirements including more frequent visual dam inspections, potentially larger spillway design floods, and preparation of an Emergency Action Plan. Additionally, based on the information in the effective FIRM, the dam is likely to overtop during the 100-year flood which could result in dam failure (and by default result in damage or destruction of Stone Street, which forms the dam's embankment). Encroachment of the Spring Brook floodplain due to filling may alter flow velocities, which could raise water levels up to or beyond the Stone Street dam outlet elevation. This could result in exacerbating the overtopping potential of the dam.


4. Additional hydrologic and hydraulic engineering information should be provided related to the design of the Sediment Basin. Specifically, an inflow/outflow storage routing computation should be provided that quantifies the contributory rate of runoff to the basin emanating from the roadway and from the Site. How accumulated sediment will be removed and other maintenance/performance of the basin under the 100-year flood should be included.

Please contact the undersigned if you have any questions or comments related to the contents of this engineering peer review letter.


Very truly yours,
GZA GEOENVIRONMENTAL, INC.




Bin Wang, P.E., CFM
Senior Project Manager



Peter H. Baril, P.E.
Consulting Engineer



David M. Leone, P.E., CFM
Associate Principal



Chad W. Cox, P.E.
Consultant/Reviewer

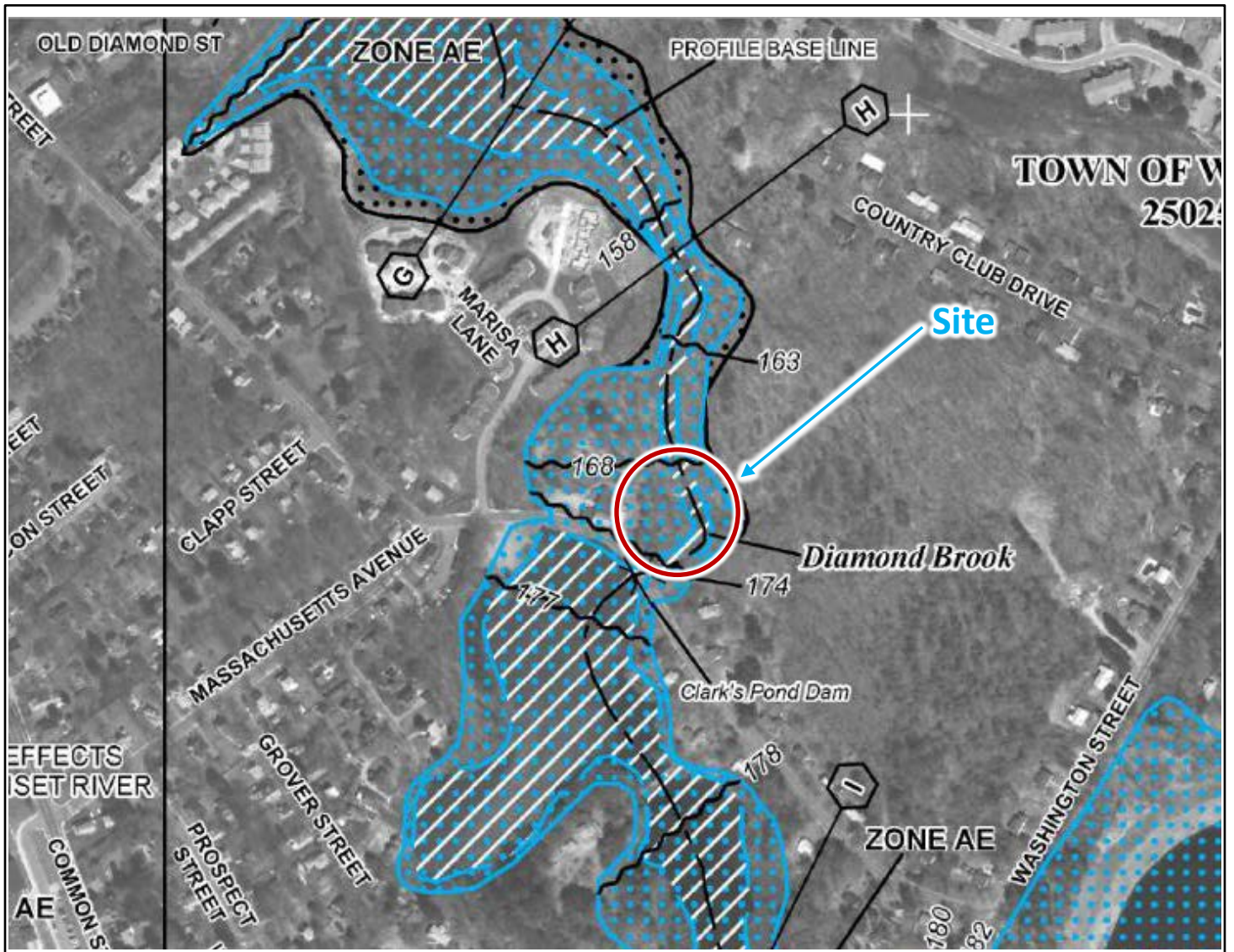
Attachments:

- Figures
Attachment A – Limitations
Attachment B – Site Photographs

FIGURES



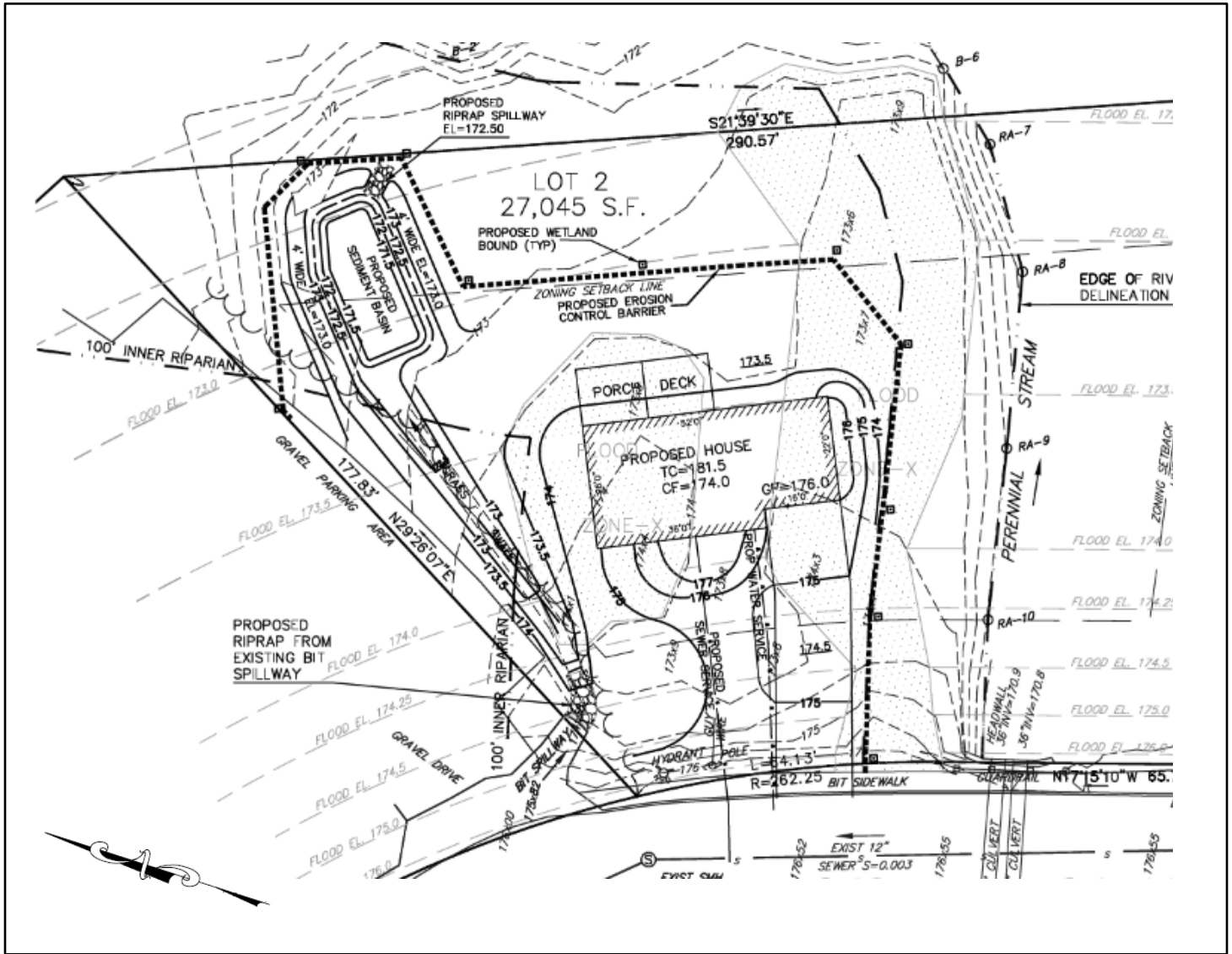
Figure 2: FEMA Flood Insurance Rate Map (2012)



Note: Not to scale; excerpt from FEMA FIRM Panel # 25021C0188E, Effective Date July 17, 2012.



Figure 3: Proposed Development at 300 Stone St Lot 2, Walpole, MA

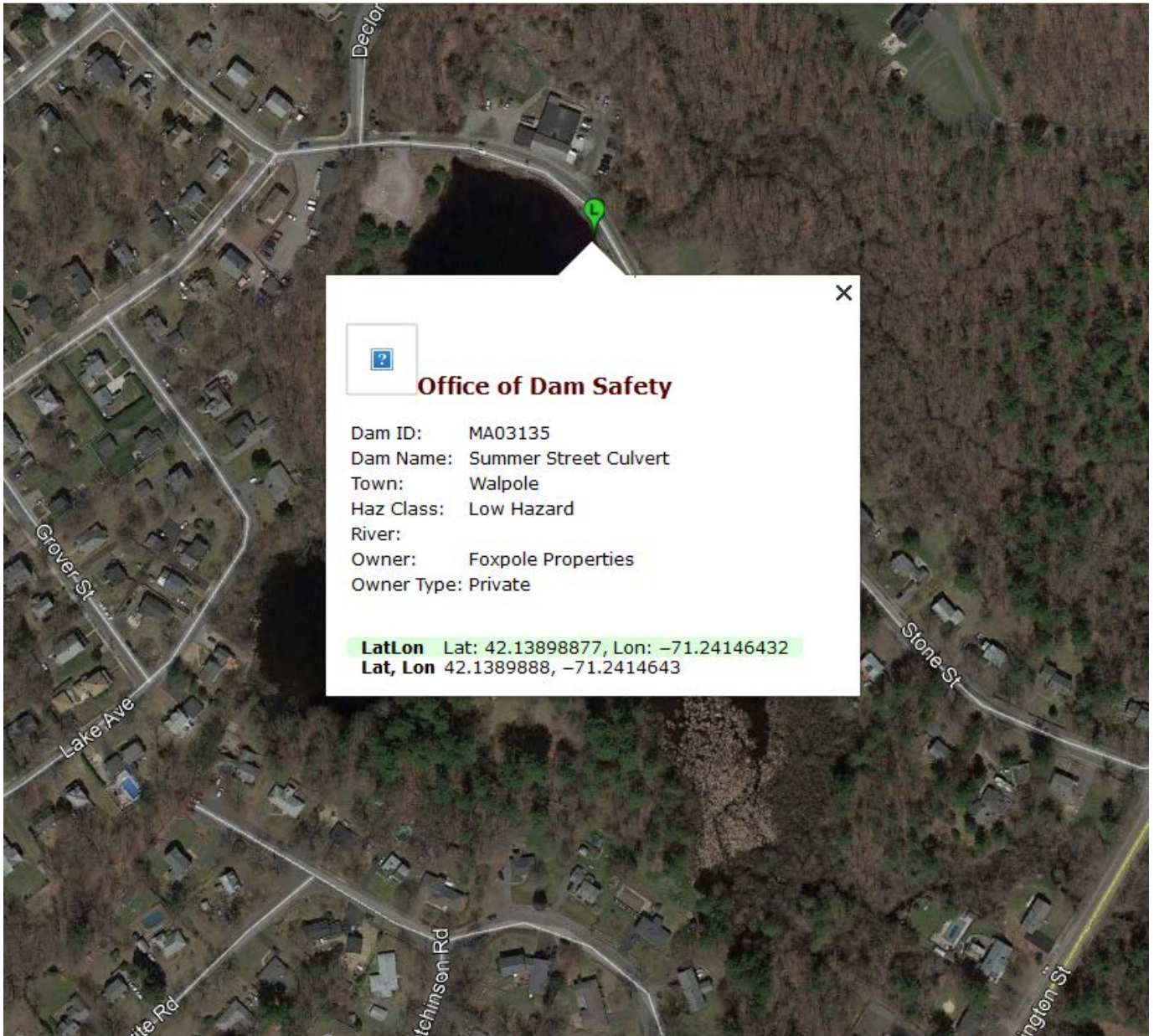


Notes:

1. Not to scale; excerpt from "Site Development Lot 2 – 300 Stone Street, Walpole, Massachusetts", Original Scale 1" = 20'. Plan # 27, 337. Last dated April 21, 2020.
2. GZA did not confirm with the project engineer (GLM) the source of the flood zone designation shown on this drawing.



Figure 4: Screen Capture of Office of Dam Safety Database in Google Earth View





ATTACHMENT A - LIMITATIONS



Use of Report

1. GZA prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.
3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

4. The generalized subsurface conditions provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.
5. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.
6. Limitations related to the technical aspects of the cost estimate analysis have been discussed in the main body of this document. Assumptions have been made based on available information/data and engineering judgment.

Limits to Observations

7. Natural resource characteristics are inherently variable. Biological community composition and diversity can be affected by seasonal, annual or anthropogenic influences. In addition, soil conditions are reflective of subsurface geologic materials, the composition and distribution of which vary spatially.
8. The observations described in this report were made on the dates referenced and under the conditions stated therein. Conditions observed and reported by GZA reflect the conditions that could be reasonably observed based upon the visual observations of surface conditions and/or a limited observation of subsurface conditions at the specific time of observation. Such conditions are subject to environmental and circumstantial alteration and may not reflect conditions observable at another time.
9. The conclusions and recommendations contained in this report are based upon the data obtained from a limited number of surveys performed during the course of our work on the site, as described in the Report. There may be variations



between these surveys and other past or future surveys due to inherent environmental and circumstantial variability.

Reliance on Information from Others

10. Preparation of this Report may have relied upon information made available by Federal, state and local authorities; and/or work products prepared by other professionals as specified in the report. Unless specifically stated, GZA did not attempt to independently verify the accuracy or completeness of that information.

Compliance with Codes and Regulations

11. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

12. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.



ATTACHMENT B – SITE PHOTOGRAPHS



300 Stone Street – Peer Review	Site Visit: 06/15/2021	Project Number 01.175211.00
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Photo 1	Looking northeast at the Site	Bituminous spillway / stormwater swale
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Photo 2	Looking east at the Site and Stone St	Bituminous spillway / stormwater swale, fire hydrant
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300 Stone Street – Peer Review	Site Visit: 06/15/2021	Project Number 01.175211.00
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Photo 3	Looking at the Site/ end of guardrail	Stormwater drain (PVC pipe), guard rail
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Photo 4	Outlet Structure	Concrete weir
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300 Stone Street – Peer Review	Site Visit: 06/15/2021	Project Number 01.175211.00
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Photo 5 Culvert (looking downstream)	Two 36"-diameter outlet culverts from Clarks Pond
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Photo 6 Looking north at the site	Wooded lot, fallen trees/branches
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