Alison Foulis - City Clerk

From: Geoffrey Strage <geoff_strage@yahoo.com>
Sent: Monday, January 08, 2018 2:16 PM
To: Alison Foulis - City Clerk
Subject: Re: RE: 1/8/2018 City Council Agenda - Late Mail - Item 10
Attachments: Peter Culley Structural Report.pdf

Hi Alison,

Please find attached a copy of the Structural Engineers report that I submitted at the planning meeting. I think it is relevant.

I will bring a copy also.

Thank you,

Geoff Strage
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May 4, 2016

C5674

Gerald and Suzanne Morgan

E-mail: sgcpmorgan@comcast.net

RE: OBSERVATION OF RESIDENCE AND OPEN CARPORT STRUCTURE AT 2 FERN AVE., BELVEDERE, CA 94920

Dear Gerald and Suzanne:

As requested, I met with Suzanne at the above-referenced site on Tuesday, May 3, 2016. The purpose of the site visit was to observe the condition and organization of the principal structural elements of the house, garage and exterior wooden patio deck with particular reference to the stability of the foundations and material condition of the structural members so that opinions relative to their soundness, capability to resist seismic loadings and a preliminary scope of recommended work could be formed.

Please note that the scope of this review was solely visual, and that no calculations or analyses have been made to verify the capability of any member to resist prescribed lateral or vertical loadings. No drawings, plans or data describing the original construction, repairs or upgrade work or a Soil Report describing site conditions were available for my review. Also, no intrusive investigation or numerical analyses have been made to verify the construction or capability of any member to resist prescribed lateral or vertical loadings.

No representations or warranties are made with respect to the condition or capability of members hidden by surface finishes or otherwise obscured. The observations, conclusions and guideline recommendations contained in this report have been made using that degree of care and skill customarily performed under such conditions by reputable Engineers practicing in that field. No guarantees or warranties, implied or explicit are, or have been made particularly in regard to work performed by other contractors, design professionals or local Geologic conditions, please note that the undersigned is not providing expertise in regard to specific geologic conditions of the site. Any cost estimates contained in this report are strictly "ball park" estimates and guidelines provided as a courtesy to you and are not solicitations for work. This report has been prepared for your exclusive use, based upon your particular personal specific concerns; it may not be relied upon by others without the written permission of the undersigned. Third party readers of this report should engage their own experts to provide them with opinions and advice.

EXISTING BUILDING DESCRIPTION & OBSERVATIONS

There are three structures on the site, a garage and parking ramp at the north side of house at road level, the main house situated midway across the lot to the south of the garage whose upper floor level is approximately 8' below Fern Avenue and an open wooden deck structure between the 2 structures located approximately level with the lower floor level of the house. The house is a conventionally constructed two-story wood-frame single-family residence with a no underfloor area beneath lower floor level which is fully below grade at the west (rear) wall. Due to the slope of the site the upper floor of the house is at grade level at the (front) west wall and approximately 14' above grade at the east wall. Apart from an upper floor addition at the east side of the upper floor which is supported on drilled concrete piers, the building is supported on a shallow depth bearing grade beam type footing which includes old unreinforced brick masonry piers, concrete connecting grade beams and strip exterior footings formed with a combination of old, and new concrete.

The open ramp from Fern Avenue roadway to the covered carport is a post and beam structure with wooden joist and planking, which appears to have been relatively recently constructed. However, the covered carport which is a similarly constructed structure was originally constructed circa 1956. The wooden deck/patio is an area with a raised wooden decking supported on earth fill formed behind a retaining wall at the east side formed with mortared stone and possibly concrete block masonry construction.

Original construction of the house appears to have occurred circa 1910. It is probable that the lower level of the house was developed to its current extent over time and may not have been in the original constructed layout. It has a concrete slab on grade subfloor beneath the wooden finished floor. As was typical of vacation house construction of this period individual members are adequately sized in regard to capability to carry normal basic vertical loadings, although some may be more flexible than current building standards would require.

Vertical Load Carrying System

The vertical load carrying system of the house consists of a pitched roof rafters, and 2x upper floor joists generally spanning across the structures (i.e., E-W) supported by the wooden stud bearing walls located at the exterior wall lines and at an intermediate N-S location. The addition at the east wall is supported on a PT wooden post and beam structure with an intermediate section of plywood shear wall lateral load bracing.

The parking ramp and carport deck is supported on parallel lines of glulam and heavy timber beams supported at the east side of the Fen Avenue roadway on a low concrete shallow depth bearing wall and 2 lines of posts parallel with the roadway. There are wooden 2x12 joists between the beam lines with 2x plank surface. The relatively newer ramp section of the structure is supported on shallow depth bearing pads with downslope connecting grade beams while the carport is supported on 14" dia. Wooden PT piles embedded into the ground an unknown depth. Those members of the ramp structure which were observed in the underfloor area specifically, appeared to be in good serviceable condition without any of the widespread signs of dry rot

deterioration observed throughout the carport section areas. Significant pile, beam, joist and planking dry rot damage was observed throughout the carport section

Foundation

The foundations of the house which were variously observed from the exterior perimeter, are shallow depth bearing, mixed continuous agglomeration of original unreinforced brick masonry pads, concrete and stone, grade beam footings extending continuously around the perimeter with drilled piers supporting the east wall addition. The carport and ramp as noted above are supported on shallow depth bearing concrete grade beams and pads or embedded wooden piles.

There is an open wooden patio deck structure is possibly supported by wooden sleepers laid directly on the soils retained by the east side retaining wall structures.

Site observation and review of Geologic Data suggests the site to be underlain by rocky shale material at a relatively shallow depth with a surface layer of loose soil. This general area is characterized by the wide variability of competency of the various shallow depths of surface soils to experience earthquake motions or gravity forces without sliding or settlements. The foundations appear to extend into a solid material.

Lateral Load Resisting System

Lateral loads of the house are resisted by a *shear wall* or *box* type systems. This type of system consists of the building's stud walls clad with their respective finish materials and the floor and roof structures where strength is derived from the straight 1x6 wood sheathing sub-floor and the finish flooring. The exterior walls generally have good capability due to the use of the horizontal 1x6 sheathing in combination with the diagonal blocking between studs. Interior walls are generally formed with plasterboard on both sides. These two types of walls although not having the capability of plywood sheathing walls do have significant strength and may provide good capability. It should be noted that all of the structures appear to have been constructed prior to the introduction into Building Codes of specific lateral load resistance capabilities for this class of structures.

The lateral load resistance capability of the carport section relies upon the cantilever action of the embedded pilings because unlike the ramp area , beams are not securely anchored back to the concrete wall at the street side of the structure.

Field Observations

During our walk-through of the structures, the following observations were made:

1. The interior walls throughout the house and lower unit were in good condition. However, there is a significant sloping of the upper floor and lower floor level toward the east side of the building.

2. The house structure appears to be in good serviceable condition, however there is a concern regarding the continuing capability of the original east wall foundation to provide both vertical support to the structure due to the deteriorating condition of the brick pier elements. There is no indication of any recent differential settlements or sliding, but significant movements have occurred in the past, including rotation of the foundation to the east.

3. Because of the presence of surface wall finishes the presence and or details of anchor bolts could not be determined.

4. The wooden material condition of the ramp structure appeared generally sound although not all posts were secured to the concrete foundations with bolted plate connectors.

5. The overall material condition of the wooden members of the old 1956 carport structure is poor. Significant dry rot damage has occurred to all of the heavy timber beams and is widespread throughout the joists and planking. Several of the wooden piles also have significant damage. The concrete foundations of this structure are also not completed and in poor condition.

6. The lateral bracing of the carport including the covered roof section is not good. The platform and roof posts are not adequately secured to the concrete foundations or to each other.

7. The wooden decking of the open patio/deck structure should be replaced and levelled. It is probable that when the deck structure is removed it will be found that the retaining wall along the east side is not adequately constructed to retain the 5' height of retention.

8. Surface water drainage around the properties appears good but should be examined in detail to eliminate any areas of potential erosion and subsequent loss of support for foundations etc.

9. There are many locations at exterior walkways at the west side of the house where handrails are necessary. Also, significant settlements of the steps and path areas at these location have caused serious tripping issues.

EARTHQUAKES

Local Seismic History

The San Francisco Bay Area is located in an area of highest seismic risk; the United States Geological Survey predicts a 67% chance of a large earthquake occurring in the Bay Area within the next 25 years. The California Building Code contains five different seismic risk zones which categorize the various regions of the United States. Zone 0 is the category for no seismic risk, and zone 4 is for the highest level of risk. According to the code, the Bay Area as well as most of the West Coast of California is located in zone 4. The area has had a history of seismic events which have caused significant levels of damage and loss of life. Some of the major events and geologic faults on which they occurred are as follows:

Previous Earthquakes and Local Faults

The San Andreas Fault extends for a distance of more than 800 miles from the Gulf of California in the south to an area north of San Francisco. It has caused several very large earthquakes. The recorded history of earthquakes on this fault starts with the 1800 earthquake with the epicenter located near San Juan Bautista. Other major events in northern California included the June 1838 earthquake with an estimated magnitude of 7.0 and presumed epicenter south of San Francisco; the October 18, 1865 earthquake with an estimated magnitude of 7.0 and resumed epicenter near San Jose; the "Great" San Francisco earthquake of April 18, 1906, with an estimated magnitude of 8.3 and presumed epicenter north of San Francisco at Point Reyes Station; and the Loma Prieta earthquake of October 17, 1989 with a magnitude of 7.1, centered in the Santa Cruz Mountains. The latter is discussed in greater detail below. This building site is approximately 8 miles from the San Andreas Fault.

The Seal Cove/ San Gregorio Fault lies just west of the San Andreas Fault, and extends in a generally south direction along the California Coastline, it has the possibility of generating and earthquake of similar magnitude to the San Andreas Fault and lies approximately 9 miles from the site.

The Hayward Fault is believed to extend from the southeastern part of San Jose to San Pablo in the northwestern portion of Contra Costa County. It passes through the district referred to as the Montclair District along Highway 13. It was the source of the June 1836 earthquake with an estimated magnitude of 7.0 and presumed epicenter located north of Hayward and the October 1868 earthquake with an estimated magnitude of 7.0 and presumed epicenter location in the Milpitas areas, as well as less strong earthquakes of 1915, 1933, and 1937. The Hayward Fault system also has the potential to provide strong ground shaking for this building site. The building site is 11.0 miles from the Hayward Fault. The structure is located on a rock outcropping area, which suggests it would be subject to relatively less violent movements in a large earthquake.

Another nearby known fault is the Concord Fault. Present information on the seismic activity of this fault is incomplete and is a matter of current controversy. The building site is 22.0 miles from the Concord Fault.

Loma Prieta

The Loma Prieta earthquake measured 7.1 on the Richter scale and with an epicenter some 60 miles south of San Francisco in the Santa Cruz Mountains, nine miles northeast of Santa Cruz. The focus, or point of actual rupture, was approximately 11.5 miles below the surface of the earth. (*The Loma Prieta Earthquake of October 17, 1989*, U.S. Geological Survey, January 1990.) The rupture between the Pacific and North American plates never reached the earth's surface but stopped short of it by approximately 3.7 miles. The rupture apparently propagated in both the northerly and southerly directions. It is for these reasons and others that geologists presently believe that the recorded duration of strong ground shaking (approximately 15 seconds) was only one half of that expected for an earthquake of this Richter magnitude.

Peak ground accelerations, which were experienced as a result of the earthquake, varied considerably around the Bay Area due its highly varied geology. 2 Fern Avenue is located midway up the east face of Belvedere Island, over the base rock foundation where varying depths of surface fill occur in ancient gullies. Peak ground accelerations which were measured in this general area were on the order of magnitude of 0.05 G. [*C.S.M.I.P. Strong Motion Records from the Santa Cruz Mountains (Loma Prieta) California, October 17, 1989, Report # O.S.M.S. 89-06.* California Strong Motion Instrumentation Program, November 17, 1989.] These measurements are relatively low when compared to other Bay Area sites where maximum measurements of approximately 0.27 G were made in areas founded in other landfills or bay mud. Loma Prieta, as experienced by the greater northern Bay Area (Oakland, San Francisco, etc.), was not considered by geologists to be a major or a "maximum probable" seismic event. Certainly an earthquake of similar magnitude with an epicenter closer to San Francisco, or an earthquake of greater magnitude, is still possible and could cause higher accelerations and greater damage.

SUMMARY AND RECOMMENDATIONS

In general, the house superstructure is in good serviceable condition however, there is noticeable floor settlement at the east side of the structure. The settlement occurred at the east wall foundation probably as a result of the original brick foundations not being dug to sufficient depth to bear on firm material. Although, it is noted that the foundations do not appear to have experienced further or continuing movement for an extended period of time. It is recommended that the brick pier sections of the east wall are replaced with drilled reinforced concrete piers embedded into the underlying rock with a haunch to support the remaining concrete grade beam sections. It is further recommended that the presence of anchor bolting at the perimeter walls is also determined by the removal of surface wall finishes and additional bolts installed to achieve current requirements for minimum anchor bolting.

Recommended work on the ramp section includes a general upgrade of the fastenings of the posts to the beams with Simpson Metal Plate fasteners, including post to concrete foundation attachments and a comprehensive examination of the lateral load resistance capability of the

ramp platform. Replacement of the deck planking with a metal deck and concrete topping surface could also be considered to satisfy current Belvedere Building Department requirements.

The carport structure because of the widespread dry rot damage, poor initial construction, including the competency of the existing foundations and consequent scope of remedial repairs exceeding 40% of the structure, will require complete replacement in compliance with the Building Department requirements for an incombustible platform and support.

The repairs to the patio/deck area will require that the existing wooden surface be partially if not completely lifted to restore an acceptable level walking surface. As previously noted this will probably reveal structural problems with the retaining wall along the eastern edge and consequential scope of work that probably will be replacement with reinforced concrete construction.

Recommendations

A. Installation of 8-9, 18"dia. Reinforced concrete drilled piers at the east wall of the house and installation of 5/8"dia sill bolting @ 48"o.c. in the exterior perimeter walls. (Estimated Cost $90K)

B. Installation of metal and concrete decking on the existing auto ramp area structure with existing members connection upgrades; replacement of the Carport Structure in conformance with Belvedere Building Department Requirements. (Estimated Cost $180K)

C. Reconstruction of the patio deck area including replacement of the east side retaining wall. (Estimated Cost $45K)

D. Preparation of Soil Report for installation of drilled piers and reconstruction of retaining walls. (Estimated Cost $7K)
E. Preparation of Architectural and Engineering plans and documents for scope of work noted above. (Estimated Cost $50K)

Limitations and Limitation of Liability

The opinions contained in this report are based on a limited walk-through visual inspection of the premises. No materials were removed or tested. This report shall not be misconstrued as a statement regarding structural integrity related to material quality standards or current design codes. Observations and structural engineering services have been performed in accordance with generally accepted structural engineering principles and practices. Statements and conclusions in this report are based upon exposed conditions and access available at the time of the site visit, which was severely limited. We do not imply that other hazards do not exist and do not assume responsibility for the capacity of the structure or foundation to resist vertical or lateral forces.

This report has been prepared under a written contractual agreement with the addressee, (client) indicated above. The client has agreed to limit the liability of Peter A. Culley, S.E. LLC and Peter A. Culley personally to $750 or the amount of the fee whichever is greater for the services described above, for any and all matters arising from this visual examination and report. The information contained herein is for the exclusive use of the specified client. Any and all recommendations provided should be treated as preliminary only and are not intended as completed construction plans. Peter A. Culley, S.E. Consulting Engineer, LLC and Peter A. Culley shall assume no liability for other parties who use this report without express written consent of the undersigned.

Please note that both the Belvedere Planning and Building Departments are very strict regarding plan submittal and plan preparation necessary for any submittal. If you have any further questions, please do not hesitate to call.

Sincerely,

Peter A. Culley, S.E.
Peter A. Culley, S.E. Consultant LLC

Attachment: Letter of Agreement

Peter A. Culley, S.E.
Consultant, LLC.

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May 4, 2016

C5674

Gerald and Suzanne Morgan

E-mail: sgcpmorgan@comcast.net

INVOICE

RE: OBSERVATION OF RESIDENCE AND OPEN CARPORT STRUCTURE AT 2 FERN AVE., BELVEDERE, CA 94920

Fee, paid in full: $825.00