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Project No. [REDACTED]

March 25, 2025

Foundation Engineering Letter
[REDACTED]

GreenWorks Engineering has completed an abbreviated review of the foundation at the address referenced above to determine its condition.

Conclusions & Recommendations:

It is our opinion that the foundation is performing as designed and remedial measures are not required at this time. Comprehensive implementation of the foundation maintenance recommendations will help to minimize differential foundation movement and the resultant distress.

General Recommendations

- 1) Comprehensively implement the foundation maintenance recommendations.
- 2) Review the performance of the foundation as a proactive foundation maintenance program every 6 to 12 months. Retain this report as an elevation baseline for the foundation. Compare all future foundation evaluations to this baseline.
- 3) The cosmetic distresses may be repaired; however, future foundation movement will likely cause similar cosmetic distresses to reoccur to some degree so it is recommended to ensure that the foundation maintenance recommendations are fully implemented first, as they are the most effective solution to moderating future foundation movement. At minimum, we recommend repairing any exterior cosmetic distress that compromises the building envelope.

Analysis & Methods:

Our evaluation involved collecting elevation data for the foundation of the structure to assess its performance. No destructive or invasive testing was performed. The foundation system of the structure is a concrete slab on grade.

An abbreviated interior floor elevation survey was performed on the living area of the structure, with the elevations recorded to the nearest 10th of an inch (0.1"). Adjustments were made to account for the thickness of the floor coverings. The elevations within the garage were recorded

from the ceiling, as the slab slopes to the garage door. A benchmark elevation of 0.0 inches was established.

The below foundation movement calculations have been performed according # FPA-SC-13-1 'Guidelines for the Evaluation of Foundation Movement for Residential and Other Low-Rise Buildings.' The calculations separate foundation movement into foundation 'Deflection' (bending) and foundation 'Tilting' - straight line arithmetic of the elevation readings provided on the Elevation Survey will not yield the same results and should not be incorrectly compared.

The standard allowable differential deflection is based on 1.0 inch of vertical movement, up or down, over a horizontal distance of 30 feet; expressed as $\text{Length (in inches)} / 360$. The standard allowable tilt is based on 1% slope over the entire length, width, or diagonal of the foundation.

Based on our observations of the interior and exterior cosmetic distress, the floor elevations, and calculations, the foundation appears to be in relatively good condition. The maximum differential deflection is 0.3 inches and occurred over an approximate distance of 22.5 feet. This amount of deflection is within the standard allowable deflection of 0.8 inches for this distance.

The foundation has also experienced a moderate amount of tilt. The maximum tilt is 0.4%. Tilt is the percentage of elevation change divided by the length between those elevations. The maximum elevation change measured across the foundation is 1.8 inches over an approximate distance of 34.0 feet. This amount of tilt is within the standard allowable tilt of 4.1 inches for this distance.

Frequently Asked Questions:

1. Why am I getting different deflection values than the report when I'm adding and subtracting the elevation readings from the survey?
 - There is not a set number (such as 1.0" for example) that serves as the limit for foundation movement. This is a common misconception - reference 'Foundation Movement Calculations' above to learn more about how the limits are determined.
2. Why did your report conclude that the foundation is performing adequately but I'm seeing distress, such as cracking, to my structure?
 - "Adequate performance" does not mean that there is no foundation movement nor distress. The standard used to perform the evaluation is *structural* in nature. The presence of distress is not an indicator that the foundation requires *structural* repair. Structural repairs are intended to restore critical damage or prevent impending critical damage. Reference the 'Foundation Maintenance Recommendations' to help moderate cosmetic distress occurrence.
3. What do I do if the report does not recommend repairs but I want to structurally modify the foundation (e.g. install underpinning)?
 - Our report does not prohibit repairs if they are desired. Our opinions and recommendations are based on experience and industry standards but ultimately you as the owner are welcome to proceed with repairs on your own terms.

Foundation Maintenance Recommendations:

Good foundation maintenance practices are the most effective solution to minimizing soil activity. The primary goal of foundation maintenance methods is to maintain a relatively constant moisture content in the soil around and below the foundation. The movement and drainage of water is a critical maintenance element that interacts with the shrink/swell properties of the expansive soil that the structure is supported upon. The goal of proper drainage is to remove excess water from around the foundation to keep the soil around and under the foundation at a stable moisture content.

- 1) Gutters and downspouts are an effective method of directing rainwater away from the structure, but must be employed correctly. To better control the rainwater, ensure gutters, downspouts and extensions are present at each down-sloped area of the roof. The downspouts should discharge the water a minimum of 5 feet from the foundation or into a drainage system.
- 2) To assist in the drainage of free water, the grade surrounding the foundation should be sloped away from the foundation for the first 10 feet around the perimeter where practicable. The slope should drop a minimum of 6 inches in 10 feet - a 5% slope. Swales should have longitudinal slopes of a minimum of 2 inches in 10 feet. If this cannot be done a French Drain may be required. Over-saturated soils can cause foundation heave and/or settlement and contribute to excessive foundation movement. Remediate ponding water immediately.
- 3) Consider removing any trees or large bushes within 6 feet of the foundation. The large vegetation can consume vast amounts of water which can cause active soils to shrink, potentially causing damaging foundation movement. Tree roots can also extend below the foundation and cause damage. Tree roots can typically extend as far as the extent of the tree's canopy. If trees are not to be removed, a root barrier may be used between the tree and the foundation - root barrier installation may negatively affect the vegetation and it is recommended to contact an experienced arborist for recommendations to minimize these affects. Removal of trees or large bushes may stop shrinkage or lead to partial restoration of settled areas of the foundation. Removal may result in upheaval caused by soil moisture increase, especially if the tree predates construction. If trees are removed, a suitable waiting period may be recommended to allow for soil heave. Periodic tree pruning may reduce future downward foundation movement but may not lead to foundation elevation recovery. Tree pruning or additional watering may be a prudent alternative to removal.
- 4) Establish a watering program for the foundation soil to keep the soil moisture content constant during the dry months. Keeping the lawn healthy will help to reduce evaporation and dryness. Water the lawn and other vegetation consistently and evenly. Soil cracking/desiccation at the surface is a sign that the soil is too dry.

Limitations:

The contents of this report supersede any verbal communication regarding the subject foundation during or after the inspection. This report was prepared for the exclusive use of the client listed above. GreenWorks has no obligation or contractual relationship to any party other than our client and their agents in regards to the subject property.

The opinions and recommendations contained in this report are based on the visual observation of the then current conditions of the structure and the knowledge and experience of the engineer. It

is known to all educated engineers with knowledge of differential foundation movement that the most effective long-term solution to foundation movement is deep foundation underpinning for the entire structure, however this method is rarely economically feasible and often causes unwanted cosmetic damage. This report provides engineering advice intended to correct the observed foundation deficiencies assuming normally expected subsurface conditions and conventional construction methods. The client agrees that GreenWorks is not responsible for knowledge of specific subsurface conditions at the subject property.

The evaluation was limited to visual observations and areas not visible, accessible, or hidden behind furniture and appliances were not included in the evaluation. The evaluation did not include any soil sampling or testing, nor any assessment of the existing framing, plumbing, or auxiliary structures and no implication is made on the compliance or non-compliance of the structure with old or current building codes. No verification was made of the existing concrete strength, thickness, location of interior grade beams, reinforcement, nor capacity to support any load.

The evaluation was limited in scope in order to provide a faster and more economical review. By booking this service the client understands the limitations of this abbreviated review.

No guarantee or warranty as to the future performance or need for repair of the building or foundation is intended or implied. Limits of liability for any claims with respect to this report is limited to the fees paid for services and anyone relying on the content of this report agrees to indemnify GreenWorks Service Company for all costs exceeding this fee.

Reviewed by,

[Redacted Signature]

Peter Donegan, P.E.

Professional Engineer



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