

To whom it may concern,



**Objective:**

The purpose of this investigation is to determine root cause of the settlement and deflection issues for the home at 230 Whit Court Angier, NC. and to recommend any necessary remediation procedures or modifications to mitigate future concerns.

**Exclusions:**

This report is limited to the structural framing, foundations and existing conditions. Concealed elements are assumed to be in their as designed condition from the existing plans. Architectural and cosmetic components are not considered part of this investigation. No subsurface or geotechnical investigations were performed. Observations, conclusions, and recommendations are based on the condition of the structure at the first inspection and the performance of the structure over a 4 month observational window between inspections.

**Observations:**

Initial inspection on December 17<sup>th</sup>, 2021, (See Figure 1)

- Significant settlement and deflection of the main girder under the home was observed. A string line was placed under the home and measurements were taken throughout indicating that the interior piers had settled from their original location.
  - Deflections/Settlements peaked under the hallway and at the transition to the kitchen, each was approximately ¾"
- Moisture measurements were taken on various elements and each fell within an acceptable range with the average being 6.8%.
- There were several piers where the LVLs spanning from front to back of the home were suspended above the piers.

Structural Analysis (See Figure 1)

- A load analysis was performed to determine the load path of the framing and to determine if the foundations were adequately sized.
- The analysis was performed with an assumed 10psf load and partition loading was omitted for simplicity.
- Footings and piers were found to be within code allowable ranges, however areas on concentrated load were identified.

Second inspection on April 22<sup>nd</sup>, 2022, (See Figure 1)

- Additional interior cosmetic issues were noted by the homeowner.
- A second round of measurements were taken on the string line and no significant changes were noted.
- Moisture readings were taken and averaged 6.7%.

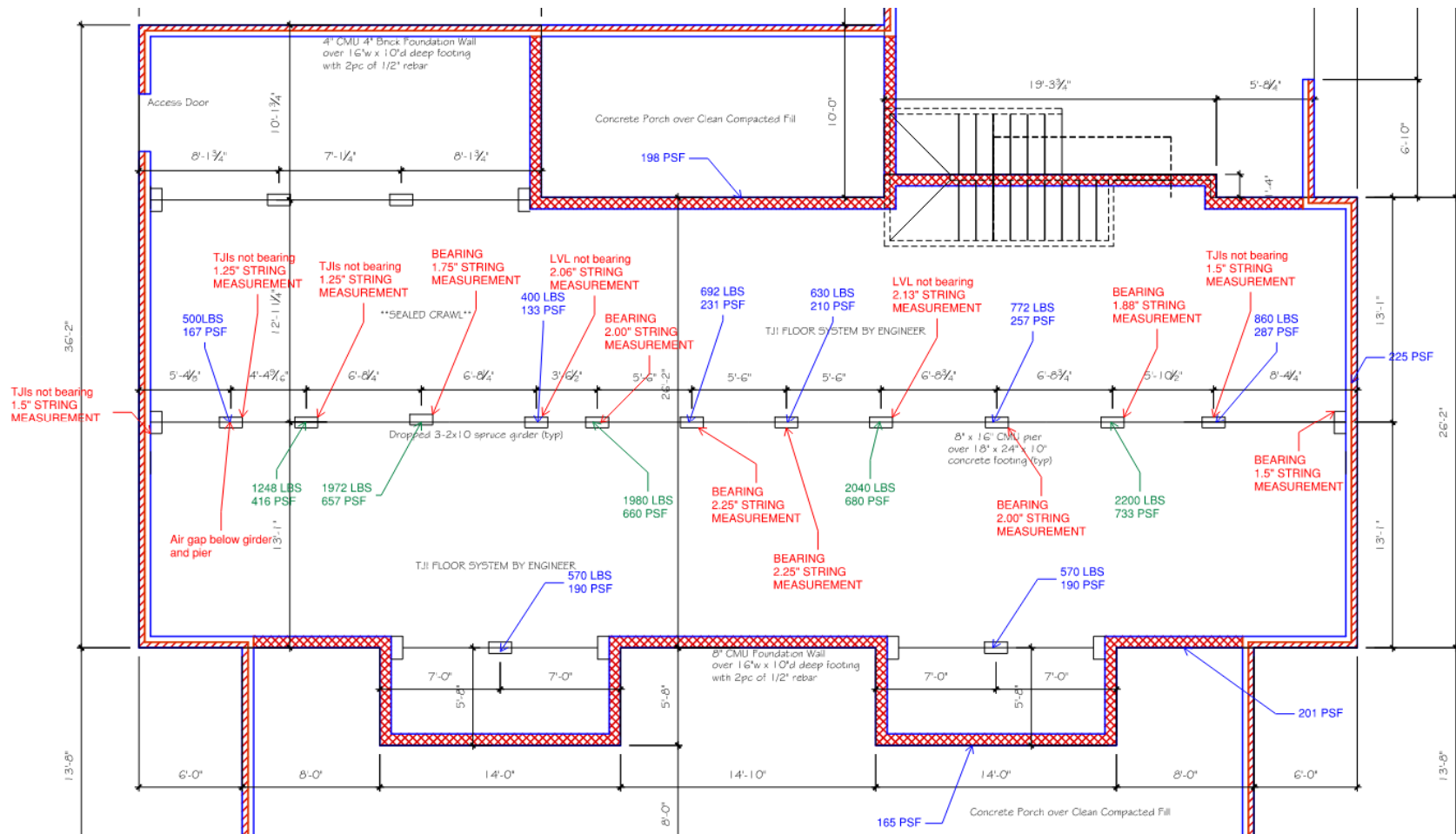


Figure 1

Notes: Measurements and other observations shown in RED.  
 Balanced foundation loading locations shown in BLUE.  
 Locations of concentrated load indicated in GREEN.

**Conclusions:**

Initial indications from the first inspection and from the load path analysis indicated that the settlements and deflections were likely due to a combination of various factors and could not be directly attributed to any one single root cause. Rather a combination of greater than normal deflection of the structure, unequal settlement of the internal piers potential shrinkage of the framing members likely all contributed to the overall problem of greater than normal settlement of the home. The load path analysis aligned with the locations that were seeing additional settlements, indicating the most reasonable solution would be to provide additional support to limit both the concentrated loading on internal piers and to mitigate compounding deflections of the structural framing.

Note that while additional cosmetic concerns have risen on the interior of the home during the 4 month observational window, the measurement data that was taken indicated that no additional settlement had occurred. Moisture readings taken during that time also indicated the dehumidifier in the crawl space is adequately controlling the moisture content and thus no additional material shrinkage would be expected.

**Recommendations:**

To mitigate additional settlement issues and to minimize the existing deflection issues it is recommended to jack the main girder back into its original level condition and replace the existing shims with incompressible shims that would not deform or shrink over time. Jacking should be done slowly (no more than  $\frac{1}{4}$ " for any single movement is recommended), frequent checks and observations of the surrounding structure should be made throughout the process to ensure no negative impacts to the structure or interior of the home.

Additionally, it is recommended to add six new piers to help distribute the concentrated loads and to place them directly under the loading elements to minimize the deflection. Footings for the piers shall be a minimum of 24"x24"x10" thick footing, bearing on previously undisturbed soils. Piers may be either 16" square CMU piers with incompressible shims or they may be adjustable pipe piers. Note adjustable pipe piers shall have a lock nut or similar device to eliminate the potential for movement over time. See Figure 2 for recommended location of piers.

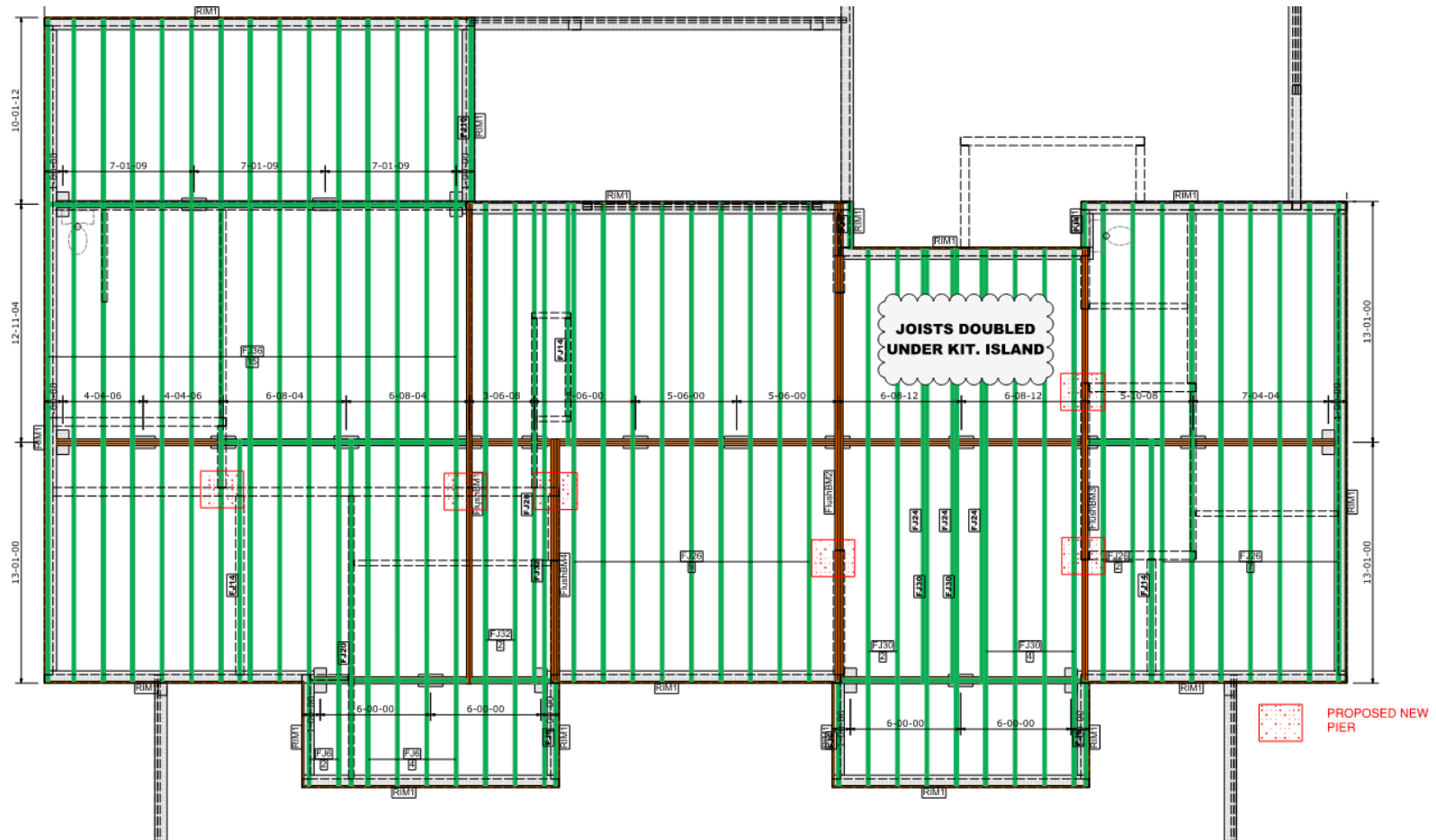


Figure 2

Recommendations were made based on the information above and as noted additional factors were not and could not be investigated, even with the implementation of the recommended solutions no guarantee of future cosmetic or architectural concerns can be made.

Sincerely,

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