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Structural Damage Assessment

EFI Global File No.: 024.02873
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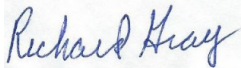
Santa Clara Valley Water District

Reference: Drake residence
2095 Morrison Avenue
Santa Clara, CA 95051

Date of Loss: October 28, 2020

Prepared For:
Sedgwick SMS
Attn: Vince Paolini
vincent.paolini@sedgwick.com

Report Authored By:



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Forensic Civil Engineer

I hereby certify that this engineering document was prepared by me and that I am a duly licensed Professional Engineer in the state referenced in the signature line above. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copy. Hard copies of this report with a "wet-seal" can be provided upon request. This report is furnished as privileged and confidential to addressee. Release to any other party is the sole responsibility of addressee. ©2021 EFI Global, Inc.

ASSIGNMENT

The assignment was received by EFI Global, Inc. (EFI) on December 28, 2020, from Vince Paolini with Sedgwick CMS. The scope of this assignment was to evaluate the claimed damages to the Drake (hereinafter claimant) residence and pool with the recent improvement work completed by the Santa Clara Valley Water District (hereinafter insured) in the adjacent creek. In response to this request, Richard S. Gray, P.E., (EFI) visited the site on January 5, 2021. The claimant was present during our site visit, granted access to the property, and provided background information.

EFI Global, Inc. (EFI) has completed an engineering examination at the subject property located at the above loss location. EFI's findings, analysis, and conclusions are included herein. This report contains a discussion of the information gathered during the assessment and an analysis and conclusions with respect to the condition of the subject property at the time of EFI's assessment. The conclusions contained herein are based on information available to date.

METHODOLOGY

The collection and analysis of information for this project followed an application of engineering principles to the investigation analysis.

The procedures followed included:

1. A site examination was conducted on January 5, 2021.
2. The reported damages claimed in the home, and pool were inspected, and photos were taken.
3. The crawl space was inspected.
4. The creek east of the home was inspected.
5. Public records were researched for the year of construction and the date of the sale.
6. Aerial images of the surroundings were reviewed.
7. Information received from the Santa Clara Valley Water District through Sedgwick CMS was reviewed.
8. The National Resource Conservation Service Web Soil Survey was researched for soil data.
9. The California Department of Transportation (CALTRANS) 2013 Transportation and Construction Vibration Guidance Manual was researched for vibration data.

BACKGROUND

Public records indicated that the home was built in 1959, and the claimant has owned the property since 1998.

The following information was gathered during the site visit, through an interview of the claimant, and from other information gathered:

- Recently, there had been heavy equipment operating on the other side of the claimant's rear (east) fence in the creek. The insured was excavating/cleaning the creek bottom and improving the gravel roadway between the creek and the claimant's property.
- Part of the insured's ongoing maintenance of the creek involved the use of a vibratory sheepsfoot roller while improving the gravel roadway.
- The claimant reported heavy shaking of the home during the nearby operation of the heavy equipment. The claimant noticed shortly after the work in the creek that the front door and another

door no longer operated properly, and both required repairs. The doors required additional repairs a second time a short time after the initial repairs. At the time of this inspection, the doors were operating, but the claimant reported that the doors still had issues operating properly at times.

- The claimant also reported several drywall wall and ceiling cracks in various parts of the home. Some were reported as new and others were reported as existing prior to the insured's work adjacent to the claimant home.
- The claimant noticed a crack in the wall of the pool a short time after the insured's work completed in the creek.

BUILDING SYSTEM DESCRIPTION

The structure was a single-family one-story dwelling constructed of wood framing on an elevated wood framed floor supported by a concrete perimeter stem wall foundation, and by interior wood post on concrete pier foundations. In the east yard, there was an in-ground pool and adjacent hot tub surrounded by hardscape finish concrete walkways, wood decking, and vegetative landscaping. (Photos 1-2, 9-10, 17)

SITE OBSERVATIONS

Observations were limited to visual examinations and measurements of accessible portions of the subject property. Removal of finish materials, qualitative testing, excavation, or other work not specifically described herein was not conducted.

Observations were photographed to document distress and relevant conditions at the subject property on the date of the site visit. Not all damage or distress that may be present was necessarily observed or photographed; however, the selected photographs provide an indication of their types, severity, and distribution. They may also document unusual or contributing conditions that may exist. Photographs captured to document findings and observations are attached to this report. During this investigation, the following observations were made:

INTERIOR SITE OBSERVATIONS:

- The front door was operating properly though the claimant reported ongoing issues with the door. Another door was also operating properly though repairs were required twice recently on both doors. (Photo 3)
- There were newer appearing cracks in wall drywall at multiple locations throughout the home. At one window, the frame was separating. (Photos 4-6)
- There were several other drywall cracks in the walls and ceilings of the home. These were reported as existing for a long duration, and before the insured's work in the adjacent creek.

EXTERIOR SITE OBSERVATIONS:

- Below the home, the floor framing inadequately connected to each other. Beams only lapped partially onto posts and fastened to the posts with a couple of toenails. Posts were toenailed to the wood bases of the concrete pier foundations. Below the kitchen, there was evidence of prior or current moisture exposure damage to framing and sheathing. A beam was visibly deflecting (red) along its span at this location. Throughout the crawl space, concrete pier foundations had settled differentially into the soil substrate. Posts were not plumb. Joists were not adequately connected to beams and were unrestrained against rotation. Large desiccation cracks indicated the presence of a clay element in the soils underlying the home. (Photos 7-9, 18)

- There was an in-ground pool in the east yard. The pool had a peanut shape and was located in the southeast corner of the property a few feet from both south and east fences. The deep end was nearest to the east fence, and the shallow end was west and south, and closer to the home. A hot tub was also in-ground, and between the pool and the east fence. There was a crack in the pool wall in the shallow end near the south fence. The crack was at the skimmer and the crack was visible behind the pool wall and for several feet down into the pool wall. The stonework was also cracked at multiple locations in this area. (Photos 10, 14-17)
- A gate in the claimant's east fence accessed a pedestrian pathway, the creek bank, the improved gravel roadway, and the creek bottom. The creek flowline and profile were apparently re-established through excavation, and the gravel roadway was improved as part of the ongoing maintenance performed by the insured. The gravel roadway was over fifty feet east of the insured's pool and was over ten feet below the top of the bank/pedestrian pathway. The pathway was generally the same elevation as the claimant's east yard with the pool. (Photos 11-13)

RESEARCH

Research was conducted at the National Resource Conservation Service (NRCS) Web Soil Survey web site. The underlying soils were classified as Urbanland-Campbell complex. The suitability of construction on the site was rated as "not rated" which could be due to several reasons. The classification described shallow silty loam soils, then silty clay loam soils, and then deeper silty clayey soils. See Appendix B.

DISCUSSION AND ANALYSIS

The insured's creek maintenance project involved several types of equipment in the process of clearing, excavating, loading, and transporting materials, and improving the gravel roadway. Near the claimant's property there were no signs of any significant large tree removals that may have resulted in large impacts onto the ground. The re-establishment of the creek flowline in the gravelly soils may have been performed using ordinary bulldozers with fabricated blade attachments creating the desired side slopes. Excavators, backhoes, front loaders, tractor-trailers, graders, and water trucks all may have been used at one time during the operation. The gravel roadway was nearest to the claimant's property and pool. Almost thirty feet from the claimant's pool, the road and creek bottom were over ten feet below the claimant's rear yard ground surface. The creek excavation and road improvement were less than ten feet wide respectively allowing smaller machines to work in the somewhat confined space. None of the equipment mentioned would cause great concern of potentially damaging property from the buffer distance mentioned.

Road improvement and/or road construction typically involves the use of a vibratory sheepsfoot roller. This machine can be felt at significant distances laterally from the machines operating position. In this case, a smaller unit was likely employed due to the limitations of the available roadway width. The claimant interviewed neighbors of homes along the street, including those with nearby pools, and reported that nobody had sustained damage as a result of the insured's creek work. The damage to the claimant's pool was not in the deep end nearest to the gravel roadway both in lateral proximity and elevation. The damage was in the shallow end beyond the hot tub in a landscape area next to the skimmer which generates traffic and moisture behind the pool wall. It was an unlikely location to become damaged as a result of operations within the creek.

The CALTRANS 2013 Transportation and Construction Vibration Guidance Manual was used to assist in evaluating the potential for damage to a structure from the use of a nearby vibratory roller. Several tables were referenced in Chapter 7 of the CALTRANS manual regarding Vibration Prediction and Screening Assessment for

Construction Equipment. The tables summarize the potential for vibration to annoy people and damage structures and consider the peak particle velocity, or maximum vibration amplitude, generated by various construction equipment at various distances in differing soil types.

To assess the damage potential to structures from ground vibrations induced by construction equipment, vibration threshold guidelines were provided in the manual. From a continuous source of vibration such as a vibratory roller, the vibratory amplitude (peak particle velocity) threshold for potential damage in an older residential structure was 0.3 inches/second. In this case, the peak particle velocity, or vibration amplitude, generated by a typical vibratory roller almost thirty feet away from the claimant property was approximately 0.17 inches/second. This conservative vibration amplitude was too low to cause damage to the improvements on the property, but high enough to be strongly noticed by humans in the vicinity.

From the visible desiccation cracks in the crawl space, and from the exposed soils in the recently excavated creek profile, there was the presence of clay in the soils confirmed with a field test during this inspection. The expansive nature of clayey soils, along with the annual swelling and shrinkage of the soils likely resulted in soil movements underlying the home's foundation. The sunken and/or differentially settled pier foundations and resulting out of plumb posts were likely the result of soil movements that caused the foundations to move. The nature of the damage in home involved existing cracks and newer developing cracks in the wall and ceiling drywall. Repairs to various doors were ongoing as a result of ongoing movements of the foundation, floor, and wall elements. The ongoing and gradual nature of the damages described were consistent with soil movements in expansive soils more than from work in the creek over a short duration. The issues described continued to be occurring well after the creek work completed.

CONCLUSIONS

Within a reasonable degree of engineering certainty, the analysis of available evidence related to this project supports the following:

1. The damages to the home were likely from ongoing foundation movements.
2. The foundation movements were likely from annual soil movements underlying the foundation system.
3. The soil movements were from annual swelling and shrinkage of the clayey soils the home was built on.
4. The issues were active and ongoing over a long duration of years, both before and after the insured's work in the creek.
5. The moisture source was from storm precipitation and landscape irrigation water.
6. The crack in the pool wall in the shallow end was likely not associated or consistent with the insured's work in the creek. The crack was more likely the result of differential pool wall movements from underlying soil movements.
7. The soil movements were from changing soil moisture contents along with annual expansive soil movements previously mentioned. The crack location associated with moist landscape conditions behind the wall compared with the adjacent transition to hardscape concrete walkway/patio cover along the west and north sides of the pool.

APPENDICES

Representative photographs are included with this report. Additional photographs captured at the time of the inspection are available upon request.

- Appendix A – Photographs
- Appendix B – Soil Map

LIMITATIONS

The information presented in this report addresses the limited objectives related to the evaluation of this assignment. The opinions presented in this report have been made to a reasonable degree of scientific and engineering certainty based upon the information available at the time this report was authored. This report only describes the conditions present at the time of EFI's examination and is only based upon the observations made. This analysis was limited to the scope of work outlined in this report. This report is not intended to fully delineate or document every defect or deficiency throughout the subject property.

The opinions contained within this report are limited to the circumstances associated with this assignment, and are based on this author's education, experience, and training. Should additional information which relates to this evaluation become known, EFI reserves the right to alter the opinions contained in this report as necessary. In some cases, additional studies may be warranted to fully evaluate conditions noted.

This report is furnished as privileged and confidential to the addressee. Release to any other company, concern, or individual is solely the responsibility of the addressee. Any verbal statements made before, during, or after the course of the assignment were made as a courtesy only and are not considered a part of this report. This report is furnished as privileged and confidential to the addressee. Release to any other company, concern, or individual is solely the responsibility of the addressee. Any reuse of this report or the findings, conclusions, or recommendations presented herein without the express written consent of EFI is prohibited.

CLOSING

EFI appreciates this opportunity to provide consulting services related to this matter. Please contact us should any questions arise concerning this report, or if we may be of further assistance.

ENGINEER STAMP

This report has been transmitted electronically. If requested, a hard copy of the report with a "wet-stamp" can be provided. The signature and stamp image on the front is for demonstrative purposes. This report has been electronically signed and sealed by this author on the referenced date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copy.

It is a violation of law for any person to alter this document in any way, unless acting under the direction of a licensed professional engineer. If a document bearing the seal of an engineer is altered, the altering engineer shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.



Photo No. 1: The claimant's home (yellow) with the pool that was almost 30' from the improved gravel roadway between the home and the bottom of the canal (red).

Photo No. 2: Photo removed.

Photo No. 3: Photo removed.



Photo No. 4: There were newer appearing cracks in wall drywall at multiple locations throughout the home.

Photo No. 5: Photo removed.

Photo No. 5: There were newer appearing cracks in wall drywall at multiple locations throughout the home.



Photo No. 6: Wall drywall was cracked, and the window frame was separating.



Photo No. 7: Below the home, the crawl space revealed floor framing inadequately connected to each other. Beams only lapped partially onto posts and fastened to the posts with a couple of toenails.



Photo No. 8: Below the kitchen, there was evidence of prior or current moisture exposure damage to framing and sheathing. The beam was visibly deflecting (red) along its span.



Photo No. 9: Concrete pier foundations had settled differentially into soil substrate. Posts were not plumb. Joists were not adequately connected to beams and unrestrained from rotation.

Photo No. 10: **Photo removed.**



Photo No. 11: Looking south behind the claimant's home. A gate in the claimant's east fence accessed a pedestrian pathway, the creek bank, the improved gravel roadway, and the creek bottom.



Photo No. 12: In the creek looking west at the claimant's east fence and open gate (red). The creek flowline and profile were apparently re-established through excavation and the roadway (yellow) was improved.



Photo No. 13: The gravel roadway (red), improved with heavy equipment including a vibratory sheepfoot roller, was almost 30' east of the claimant's pool. The gravel roadway was over 10' below the top of the bank.



Photo No. 14: The pool was cracked in the shallow end. The crack extended several feet down the wall.



Photo No. 15: The crack continued across the top and back side of the pool wall. The water behind the pool wasn't a leak as some water was used to clean the concrete and expose the crack (red).



Photo No. 16: There were other cracks in the stonework besides the subject crack leading to the pool wall (yellow).

Photo No. 17: **Photo removed.**



Photo No. 18: Large desiccation cracks in the crawl space soils indicated the presence of a clay element in the soils underlying the home.

Dwellings Without Basements—Santa Clara Area, California, Western Part



Map Scale: 1:24,000 if printed on A landscape (11" x 8.5") sheet.

0 350 700 1400 2100 Meters

0 1000 2000 4000 6000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84




**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey


2/10/2021
Page 1 of 5
Attachment 2
Page 16 of 20

MAP LEGEND

Area of Interest (AOI)





 Area of Interest (AOI)

Background





 Aerial Photography

Soils





Soil Rating Polygons

-  Very limited
-  Somewhat limited
-  Not limited
-  Not rated or not available


Soil Rating Lines

-  Very limited
-  Somewhat limited
-  Not limited
-  Not rated or not available






Soil Rating Points

-  Very limited
-  Somewhat limited
-  Not limited
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Clara Area, California, Western Part
Survey Area Data: Version 9, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 13, 2019—Apr 23, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Dwellings Without Basements

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
145	Urbanland-Hangerone complex, 0 to 2 percent slopes, drained	Not rated	Urban land (70%)		17.2	24.4%
165	Urbanland-Campbell complex, 0 to 2 percent slopes, protected	Not rated	Urban land (70%)		53.2	75.6%
Totals for Area of Interest					70.4	100.0%

Rating	Acres in AOI	Percent of AOI
Null or Not Rated	70.4	100.0%
Totals for Area of Interest	70.4	100.0%

Description

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper.

The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification of the soil. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher