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PRELIMINARY GEOTECHNICAL STUDY REPORT

PARKLAND FARMS SUBDIVISION
120 PARKLAND FARMS BOULEVARD
HEALDSBURG, CALIFORNIA

Project Number:

3047.04.01.1

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INTRODUCTION

This report presents the results of our preliminary geotechnical study for the proposed subdivision to be constructed at 120 Parkland Farms Boulevard in Healdsburg, California. The property is approximately 11½ acres in size and is designated as (APN 091-040-111). The site location is shown on Plate 1.

The undeveloped property is moderately sloping and moderately to heavily wooded. We understand that it is planned to subdivide the property into nine residential lots that range in size from about 0.31-acres to 2.75-acres.

We performed a fault study for the property and presented our results in a report dated January 26, 2015. The purpose of our study as outlined in our additional services request dated March 27, 2015 was to evaluate the soil and geologic conditions to provide geotechnical conclusions regarding the planned use of the property.

SCOPE

Our scope of work was limited to a brief site reconnaissance, a review of our fault study for the project, selected published geologic data and stereo-paired aerial photographs pertinent to the site, and preparation of this report. A site-specific subsurface exploration was not requested, authorized or performed for this phase of our services.

SERVICES PROVIDED

We reviewed stereo-paired aerial photographs of the site and select published geologic information pertinent to the site. A list of the geologic references reviewed is presented at the end of this report. On May 7, 2015, our engineering geologist conducted a surficial reconnaissance of the property to observe exposed topographic features, surface soils, rock outcroppings and cut banks. A topographic map of the property showing the geology, fault trench locations, landslides and cut and fill areas is presented on Plate 2. A landslide identification chart is presented on Plate 3.

Based on the geologic literature review and site reconnaissance, we were to develop the following information:

1. A brief description of geologic and surface soil conditions observed during our reconnaissance;

2. Distance to on site and nearby active faults and a discussion of geologic hazards that may affect the proposed project;

3. Our opinions regarding the geotechnical feasibility of the project; and

4. Preliminary conclusions and recommendations concerning:

a. Primary geotechnical engineering concerns and possible mitigation measures, as applicable;

b. Suitable foundation systems for the residences;

c. Stability and feasibility of stable building envelopes and access routes; and

d. Supplemental geotechnical engineering services.

SITE CONDITIONS

General

Sonoma County is located within the California Coast Range geomorphic province. This province is a geologically complex and seismically active region characterized by sub-parallel northwest-trending faults, mountain ranges and valleys. The oldest bedrock units are the Jurassic-Cretaceous Franciscan Complex, and the Upper Cretaceous Great Valley sequence sediments originally deposited in a marine environment. Subsequently, younger rocks such as the Tertiary-age Sonoma Volcanics group, the Plio-Pleistocene-age Clear Lake Volcanics and sedimentary rocks such as the Guinda, Domengine, Petaluma, Wilson Grove, Cache, Huichica and Glen Ellen formations were deposited throughout the province. Extensive folding and thrust faulting during late Cretaceous through early Tertiary geologic time created complex geologic conditions that underlie the highly varied topography of today. In valleys, the bedrock is covered by thick alluvial soils.

Geology and Soils

Published geologic maps (Delattre et al., 2010) indicate that the site is underlain by five distinct geologic units. The westernmost portion of the site encompassing Lots 1 through 4 and the western portion of Lot 5 is shown to be underlain by the early Pleistocene to Pliocene age Glen Ellen formation. The Glen Ellen formation is described as light brown to yellow brown weakly consolidated gravel, sand, silt, clay and reworked tuff. The middle portion of the site which encompasses the eastern portion of Lot 5 and the majority of Lots 6 and 7 is shown to be underlain by Pliocene to Miocene age andesite, basaltic andesite and basalt members of the Sonoma Volcanics Group. This unit is described as dark gray to dark brownish gray flows and flow breccias with intercalated tuff and tuff breccia. The east facing slope for Lot 8 and the western portion of Lot 9 is shown to be underlain by mudstone, shale and sandstone from the Early Cretaceous and Late Jurassic age Great Valley Sequence. This unit is described as a dark gray to black marine mudstone and shale, with occasional thin interbeds and thicker intervals of greenish gray sandstone and sporadic concretionary carbonate beds. The lower portion of Lot 8 is shown to be underlain by Holocene age alluvium, which is described as poorly to moderately sorted sand, silt and gravel. The eastern portion of Lot 9 is shown to be underlain by Late and Middle Jurassic age Serpentinite. The Serpentinite is described as highly sheared, variably serpentinized ultramafic rocks.

A trace of the Healdsburg Fault Zone is mapped crossing the eastern portion of the site, in the vicinity of Lot 8. This is identified as Trace 1 on Plate 2. Recent work by other consultants in the immediate vicinity of the site have identified that this trace should be considered active. An

additional bedrock fault was mapped within the Glen Ellen formation extending through Lots 1 and 2. Based on our fault investigation for the site (RGH, 2015) we concluded that there was no evidence of recent activity along this fault.

Landslides

Published landslide maps (Huffman, 1980) reviewed do not indicate large-scale slope instability at the site. However we did observe one landslide at the site during our study. The observed landslide is mapped on Plate 2 and consists of an active translational slide that appears to be between 5 and 20 feet deep.

Surface

The property extends over moderately steep to steeply sloping terrain. A northwest trending ridge line bisects the center of the site with its flanks sloping downward to the west and east. A city street traverses the eastern portion of the site which was constructed by cutting along the eastern side and filling on the western side of the road. Vegetation at the site is generally comprised of relatively dense stands of oaks with some open grassy areas.

In general, the ground surface is hard. Even surface soils that appear hard when dry can become soft and compress when saturated. This is a condition generally associated with weak, porous surface soils. Based on our fault trenches, the weak and porous surface soils extend to depths of 1 to 2 feet. Natural drainage consists of overland flow across the ground surface that concentrates in natural drainage elements such as swales and creeks.

DISCUSSION AND CONCLUSIONS

Seismic Hazards

Faulting

Based on the investigation and analysis conducted in our fault study for the project, we judge that an active trace of the Healdsburg fault traverses the site through the incised drainage that crosses the eastern portion of Lot 8. This fault trace is depicted as Trace 1 on Plate 2. Several other northwest-trending Earthquake Fault Zones exist in close proximity to and within several miles of the site (Bortugno, 1982). The shortest distances from the site to the mapped surface expression of these faults are presented in the table below.

ACTIVE FAULT PROXIMITY		
Fault	**Direction**	**Distance-Miles**
San Andreas	SW	21
Concord-Green Valley	SE	42
Cordelia	SE	44

ACTIVE FAULT PROXIMITY		
Fault	**Direction**	**Distance-Miles**
West Napa	SE	31½
Maacama	NE	4½
Hunting Creek	NE	27¼
Konocti	NE	20

Seismicity

Data presented by the Working Group on California Earthquake Probabilities (2007) estimates the chance of one or more large earthquakes (Magnitude 6.7 or greater) in the San Francisco Bay region within the next 30 years to be approximately 63 percent. Therefore, future seismic shaking should be anticipated at the site. It will be necessary to design and construct the proposed improvements in strict adherence with current standards for earthquake-resistant construction.

Lurching

Seismic slope failure or lurching is a phenomenon that occurs during earthquakes when slopes or man-made embankments yield and displace in the unsupported direction. Provided the foundations are installed as recommended in a design level geotechnical study and the proposed fills are adequately keyed into underlying bedrock material, we judge the potential for impact to the proposed improvements from the occurrence of these phenomena at the site is low. However, some of these secondary earthquake effects are unpredictable as to location and extent, as evidenced by the 1989 Loma Prieta Earthquake.

Geotechnical Issues

Based upon the results of our geologic data review and reconnaissance, we judge that it is geotechnically feasible to subdivide the property to create the nine lots, and construct single-family residences and access roads on the new lots. The primary geotechnical considerations and potential mitigating measures recommended for parcel creation, building site development and roadway construction are discussed in the following sections of the report. These conclusions are preliminary and will need to be verified or modified during final design following a detailed site-specific subsurface exploration, laboratory testing and geotechnical engineering evaluation, as recommended herein.

Residence Locations

The proposed building areas must be located outside active faults, unstable areas and steep slopes, to reduce the risks associated with fault rupture and slope instability respectively. A structural setback of approximately 50-feet from the active fault located crossing Lot 8, unstable

areas and breaks in slope of 2:1 or steeper should be established. The planned building areas within Lots 8 and 9 are located approximately 120 feet northeast of the building envelope for Lot 8 and approximately 140 feet southwest of the building envelope for Lot 9. As such, we judge the setbacks of 50 feet have been satisfied.

As shown on Plate 2, the building areas considered for Lots 2 and 3 fall within 50 feet of an active landslide. The building areas should be moved to establish a 50-foot setback from the landslide, or alternatively the active landslide could be repaired and setbacks would only be needed to address slopes steeper than 2:1 in the area.

Foundations

We anticipate that, in general, after remedial grading of weak, compressible and/or expansive surface soils, spread footings could be used for foundation support. As an alternative, within level areas of deep, weak, compressible and/or expansive soils or in sloping areas, the structure could be supported on a deep foundation system. The system could consist of deep spread footings and/or well reinforced grade beams supported on piers. On sloping terrain the spread footings and the piers and grade beams must be interconnected as a rigid grid and reinforced to resist lateral loads. Either foundation system needs to derive its support in bedrock or in engineered fill keyed into bedrock. Criteria for the design of such systems should be developed by a site specific geotechnical study as recommended in the supplemental services section of this report. These foundations are considered traditional foundation systems.

Supplemental Services

We should perform a detailed geotechnical study prior to the construction of the residences and roadways. The study should include test borings or backhoe pits, laboratory testing and engineering analyses. The geotechnical study should address specific design and locating aspects of each planned residential location and the access road, and the data generated should be incorporated into the project plans. The plans should then be reviewed by the geotechnical engineer prior to receiving bids for the planned work.

LIMITATIONS

This report has been prepared by RGH for the exclusive use of Urban Green Investments and their consultants to evaluate the geotechnical feasibility of residential development within the proposed subdivision.

Our services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. We provide no warranty, either expressed or implied. Our conclusions and recommendations are based on the information provided to us regarding the proposed parcel split: the results of our field reconnaissance, data review: and professional judgment. As such, our conclusions and recommendations should be considered preliminary and for feasibility and planning purposes only. A subsurface study, such as recommended herein, may reveal conditions different from those inferred by surface observation

and data review only. Such subsurface study may warrant a revision to our preliminary conclusions.

Site conditions and cultural features described in the text of this report are those existing at the time of our field exploration on May 7, 2015, and may not necessarily be the same or comparable at other times.

It should be understood that slope failures including landslides, debris flows and erosion are on-going natural processes which gradually wear away the landscape. Residual soils and weathered bedrock can be susceptible to downslope movement, even on apparently stable sites. Such inherent hillside and slope risks are generally more prevalent during periods of intense and prolonged rainfall, which occasionally occur in northern California and/or during earthquakes. Therefore, it must be accepted that occasional slope failure and erosion and deposition of the residual soils and weathered bedrock materials are irreducible risks and hazards of building upon or near the base of any hillside or steep slope throughout northern California. By accepting this report, the client and other recipients acknowledge their understanding and acceptance of these risks and hazards.

The scope of our services did not include an environmental assessment or a study of the presence (or absence) of hazardous, toxic or corrosive materials in the soil, surface water, groundwater or air on, below, or around this site, nor did it include an evaluation or study for the presence (or absence) of wetlands.

APPENDIX A - PLATES

LIST OF PLATES

Reference: Maptech Topoquad, Geyserville and Jimtown, California Quadrangles

Scale: 1" = 2000'

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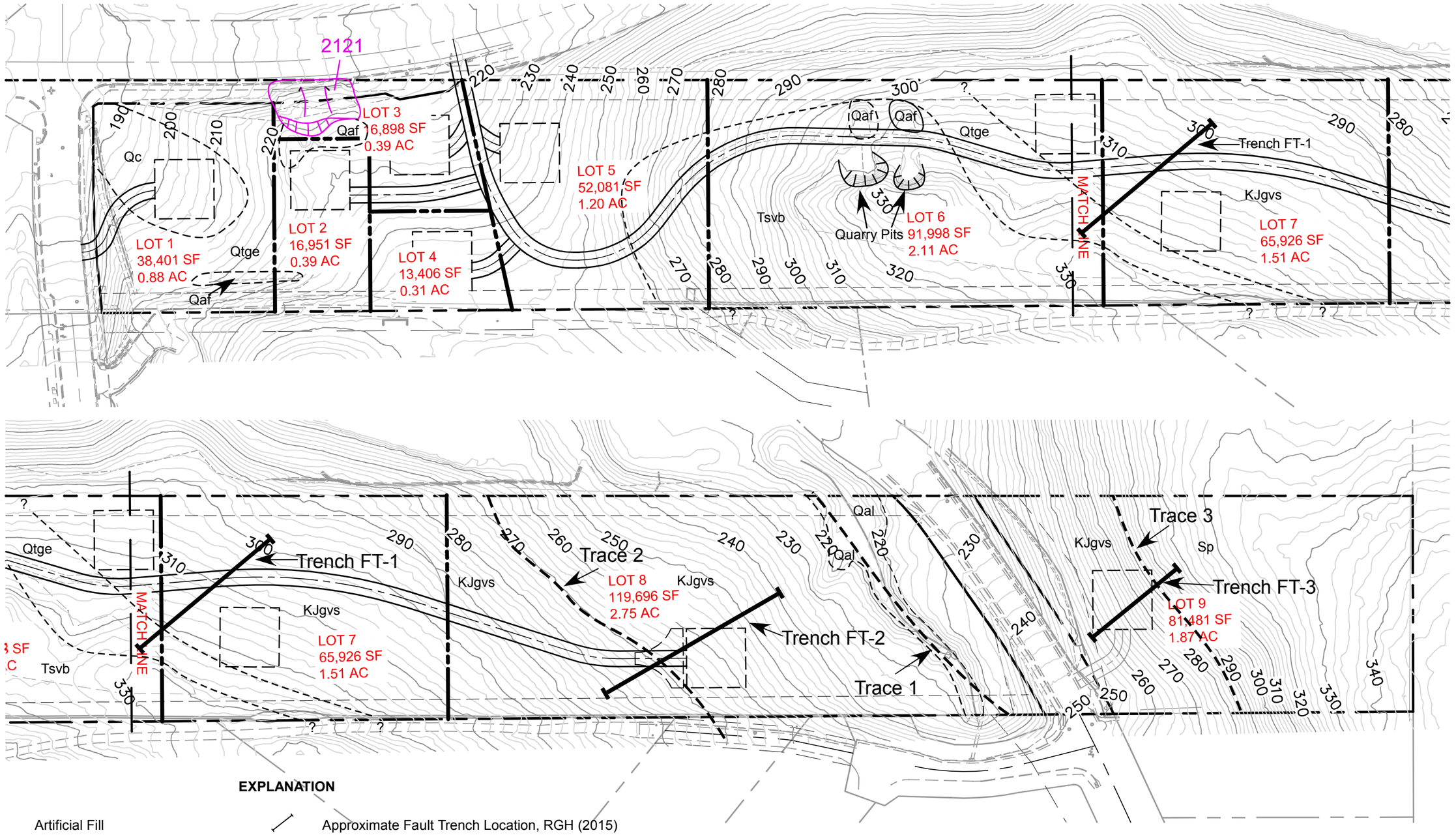
SITE LOCATION MAP
Parkland Farms Subdivision
120 Parkland Farms Boulevard
Healdsburg, California

PLATE
1



EXPLANATION

Qaf	Artificial Fill
Qal	Quaternary Age Alluvium
Qc	Colluvium
Qtge	Glen Ellen Formation
Tsvb	Sonoma Volcanics Group Andesite, Basaltic Andesite and Basalt
KJgvs	Great Valley Sequence Mudstone, Shale, and Sandstone
Sp	Coast Range Ophiolite Serpentinite

Approximate Fault Trench Location, RGH (2015)

Approximate Reported Fault (Trend and Location Determined from Review of Reports by Harding Lawson Associates (1983 and 1985), Giblin Associates (1994, 1995 and 2006), and Glomb (1995).

Approximate Geologic Contact

2121 Landslide, Number Indicates Landslide Identification Nomenclature Described on Plate 3

Reference: Preliminary Site Plan, APN 091-040-111, Healdsburg, California, December 4, 2014 by Adobe Associates

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EXPLORATION PLAN AND GEOLOGIC MAP
Parkland Farms Subdivision
120 Parkland Farms Boulevard
Healdsburg, California

PLATE 2

Landslide Identification Nomenclature *

Type of Landslide Movement

1	Rotational (Earth Slump)	Movement due to forces that cause a turning moment about a point above the center of gravity of the unit.
2	Translational	Movement predominantly along more or less planar or gently undulatory surfaces.
3	Debris Flow	Rapid movement (50 to 80 kph) within displaced mass such that the form taken by moving material or the apparent distribution of velocities and displacements resemble those of viscous fluids.
4	Earth Flow	Downslope viscous flow of fine grained materials that have been saturated and moves under the pull of gravity. Typically slow moving (a few meters per day or less).
5	Debris Slide	Unconsolidated rock and soil moved downslope along a relatively shallow failure plane
6	Rock Fall	Fragments of rock detached by toppling or falling that falls along a vertical or sub-vertical cliff.
C	Many landslides consist of one or more type of movement. The listed type of movement is modified with a "C" to indicate a Complex of landslides.	

Certainty of Landslide Identification

1	Definite
2	Probable
3	Questionable

Estimated Thickness of Landslide Deposits

1	Less than 5 feet
2	5 to 20 feet
3	20 to 50 feet
4	Greater than 50 feet

State of Landslide Activity

1	Recently Active	Currently moving or estimated movement within recent years.
2	Dormant	Marginally stable with mature and subdued expression of the landslide. Mostly re-vegetated.
3	Ancient	Most landslide features are eroded. Heavily vegetated.

* The landslide identification mapping is designed for planning purposes only and should not be used in lieu of a detailed site specific investigation. Our mapping should be considered preliminary and for feasibility and planning purposes only. A subsurface study may reveal conditions different from those inferred by surface observations and data review only. Such subsurface study may warrant a revision to our preliminary mapping.

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LANDSLIDE IDENTIFICATION CHART
Parkland Farms Subdivision
120 Parkland Farms Boulevard
Healdsburg, California

PLATE
3

APPENDIX B - REFERENCES

Bortugno, E.J., 1982, Map Showing Recency of Faulting, Santa Rosa Quadrangle in Wagner and Bortugno, Geologic Map of the Santa Rosa Quadrangle: California Division of Mines and Geology, Regional Geologic Map Series, Map No. 2A, Santa Rosa Quadrangle, Scale 1:250,000.

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Giblin Associates, 1995, Soil and Geologic Investigation, Brush Property, Healdsburg, California with attachment by Jim Glomb, 1995, Engineering Geologic Reconnaissance, Brush Property APN 091-040-090, Healdsburg, California, Job No. 1764.1.2.

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WAC Corporation, Sonoma County, 1996, Black and White Aerial Photographs, Roll 18, Frames 208 & 209, Approximate Scale 1"=2000'.

Working Group on California Earthquake Probabilities, 2007, Uniform California Earthquake Rupture Forecast (UCERF): Notes on Southern California Earthquake Center (SCEC) Web Site (http://www.scec.org/ucerf/).

APPENDIX C - DISTRIBUTION

Urban Green Investments, LLC (4,1 and electronic)
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REP:TAW:ejw

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