GEOTECHNICAL REPORTS DATED
11/6/18, 7/9/15 AND 6/8/01

ATTACHMENT E

GEOENGINEERING, INC.

Geotechnical Engineering Consultants

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November 6, 2018
File 1-186-br

GEOTECHNICAL FEASIBILITY
AMD NEGATIVE DECLARATION
PROPOSED DOWNSLOPE DWELLING
ON SLOPES BELOW PROJECTION FROM
TOYON DRIVE REVERSE CURVE
200 TOYON DRIVE
FAIRFAX, CALIFORNIA

Our firm had submitted a 6/8/01 geotechnical evaluation report and a 6/9/15 update report for the initially planned dwelling, which lies on the same downslopes, below the access roadway, but nearly 500 ft to north. We later submitted 7/3/17 report outlining stability conditions and slippage features further downslope from that dwelling. This report follows a recent site visit and supersedes our 6/27/18 Geotechnical Feasibility study.

As the attached Site Plan shows, the current building site lies on irregular slopes that originate ~ 100 ft upslope from the unimproved access road cut. They fall easterly at 50% to 70 % from the roadway shoulder to Cypress Road, which lies ~500 ft further downslope. The dwelling will lie ~20 to ~60 ft downslope from the access road shoulder.

Weathered bedrock or hard residual soils were typically sounded at 2 to 3-1/2 ft depths using an impact probe, although it was measured 4 ft deep at random positions. This formation is exposed on the cuts into the rising slopes above the access roadway.

The mantle soils are mainly typical stiff sandy clay slope deposits with heavy roots within their upper foot.

Concerns have been raised regarding the potential for new earth slippage downslope from the planned construction site due to the increase in runoff from the roofs and hardscape. The civil engineers have designed two bio-retension storage basins emptying into dissipators on each side of the house. The drainage from the access road will be diverted to the street where this is possible.

The thick vegetation, irregular topography, and absence of topographic data limit stability evaluation and slide volumes to judgement and case histories. Nonetheless , these slopes show no apparent indications of recent significant movement that would be sufficient to affect the dwellings on Cypress Drive. There had been a slide that washed out a segment of Cypress Drive several decades ago, but this apparently resulted from roadway grading and is unrelated to any earth movement on these slopes

We have reviewed techniques for improving stability on these slopes. Slope reconstruction would be an enormous undertaking that would involve disturbance of at least two acres; which renders it infeasible. Localized grading, although less disturbing, also entail adverse impacts on this complex drainage system. For example, drainage diversions intended to improve stability at one position may adversely affect the stability at other positions.

Indicators are that the drainage improvements to the new dwelling and regraded roadway will adequately provide an acceptable degree of protection that complies with current standards for similar projects in comparable settings.

Despite the slope steepnesses and irregularities. this project is feasible from a geotechnical standpoint., but all indicators now show that drilled interconnected foundations will be required..

Nonetheless, a geotechnical evaluation that would entail test borings and include recommendations for foundation design and final grading, will be required after project approval--but would not be needed during planning stages.

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We trust that this report provides the information required.
You may contact us for clarification.

Respectfully submitted,
GEOENGINEERING, INC.

Robert H. Settgast
Professional Geotechnical Engineer

RHS: rhs
Attachments:

Site Plan
Areal Photos
Site Photos

CC: *<jerryfrate@att.net>*
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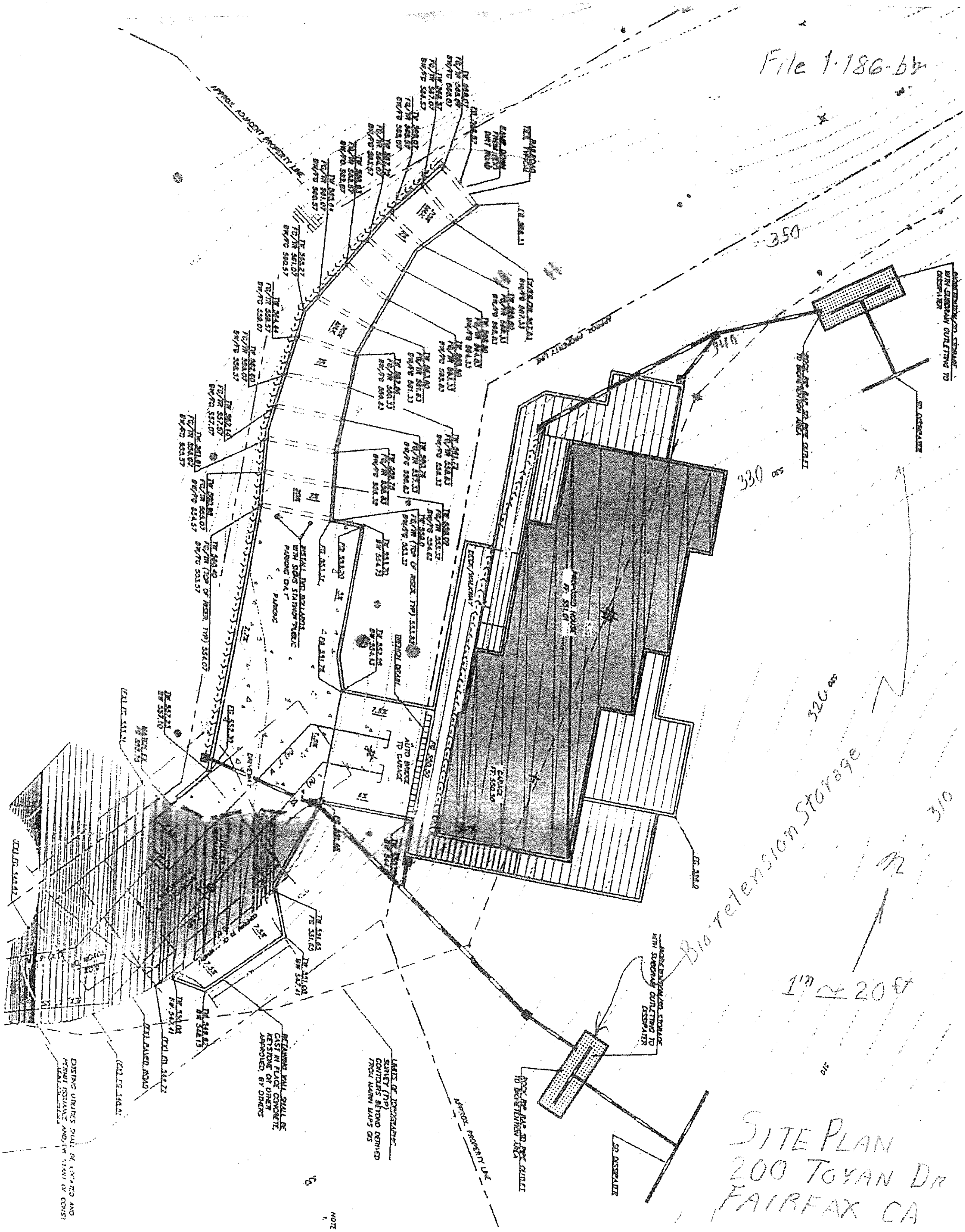
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Bioretension Storage
1" ≈ 20 ft
SITE PLAN
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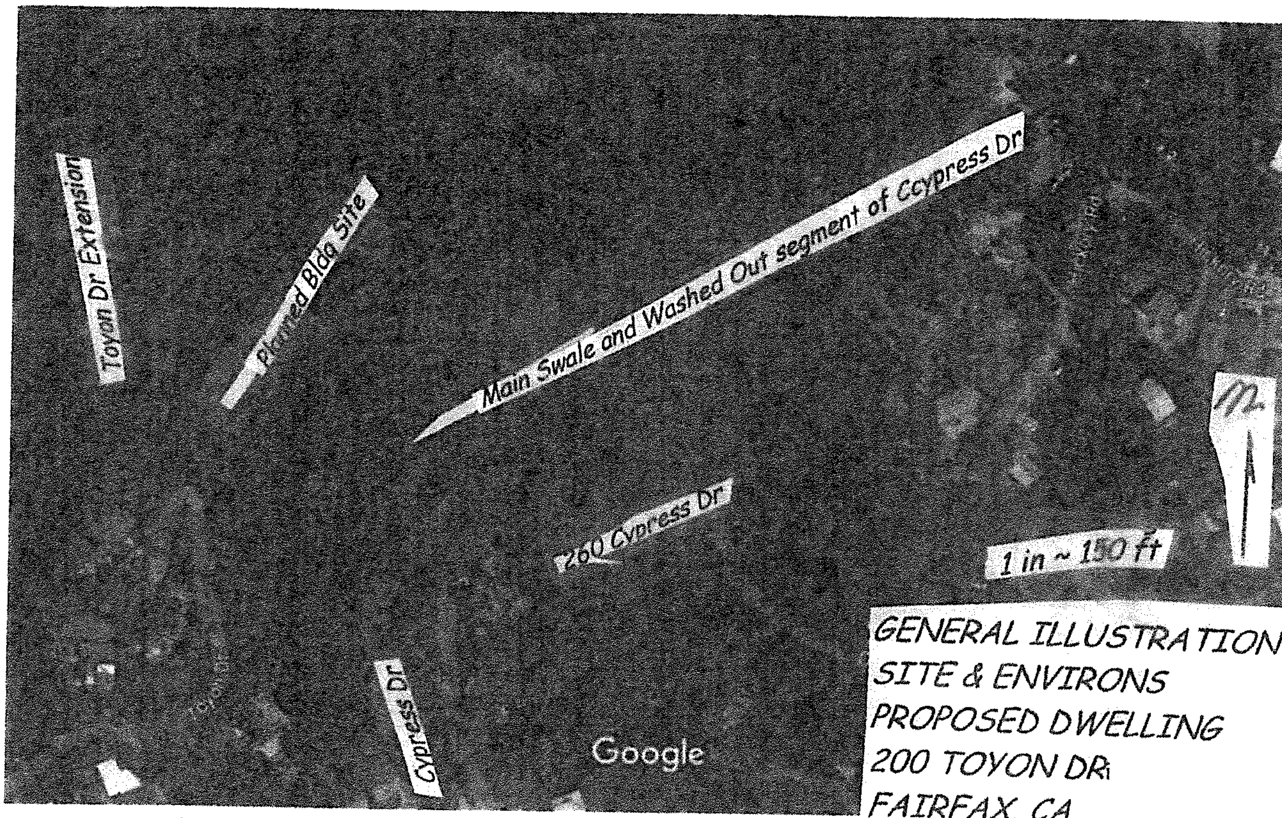
FAIRFAX CA

File 1-186-br

Google Maps



Imagery ©2017 DigitalGlobe, U.S. Geological Survey, USDA Farm Service Agency, Map data ©2017 Google 100 ft

File 186-br

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November 6, 2018
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GEOENGINEERING, INC.

Robert H. Settgast
Professional Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT SETTGAST
No. GE000764
Exp. 6/30/19
GEOTECHNICAL
★ STATE OF CALIFORNIA ★

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Site Photos

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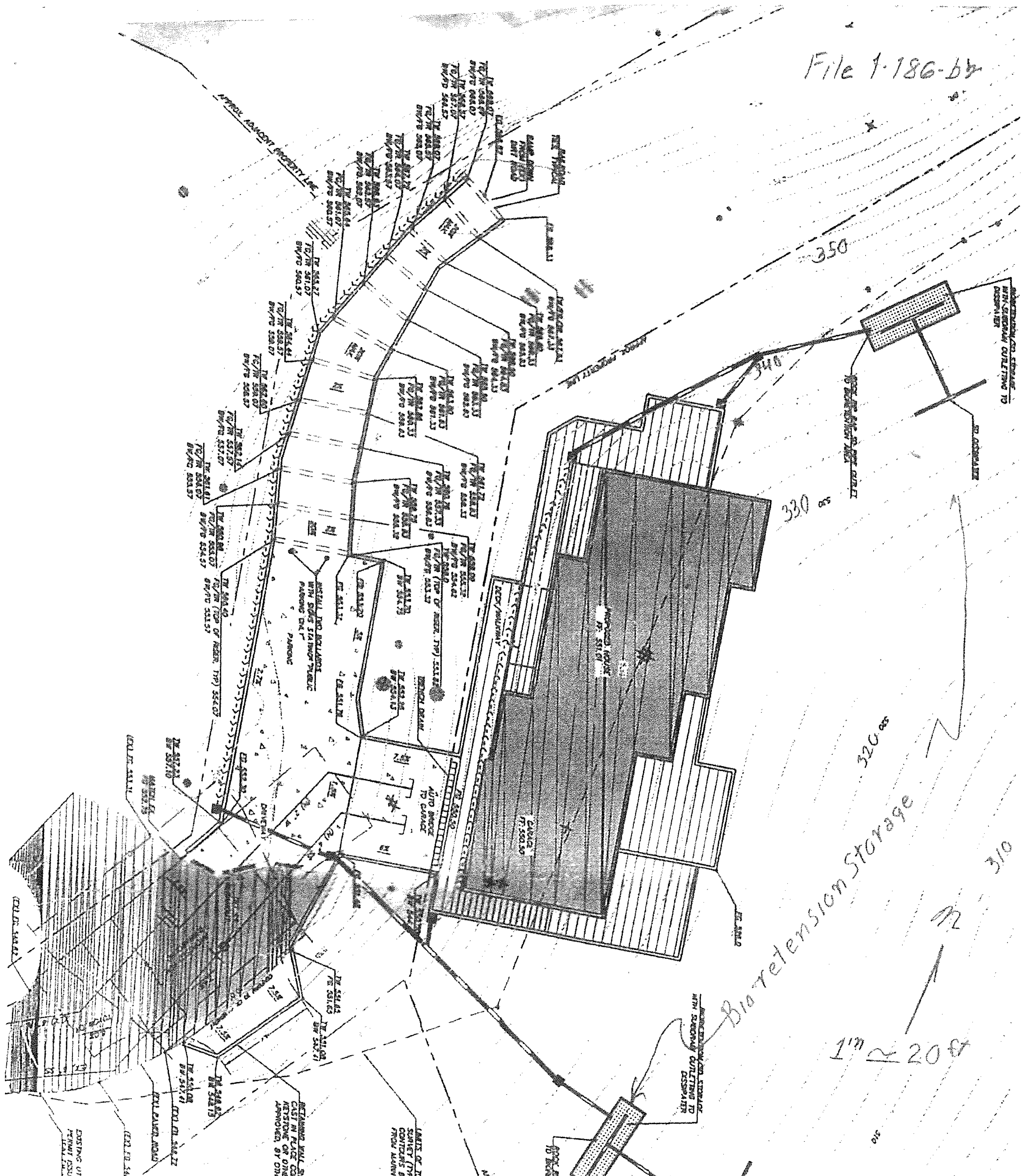
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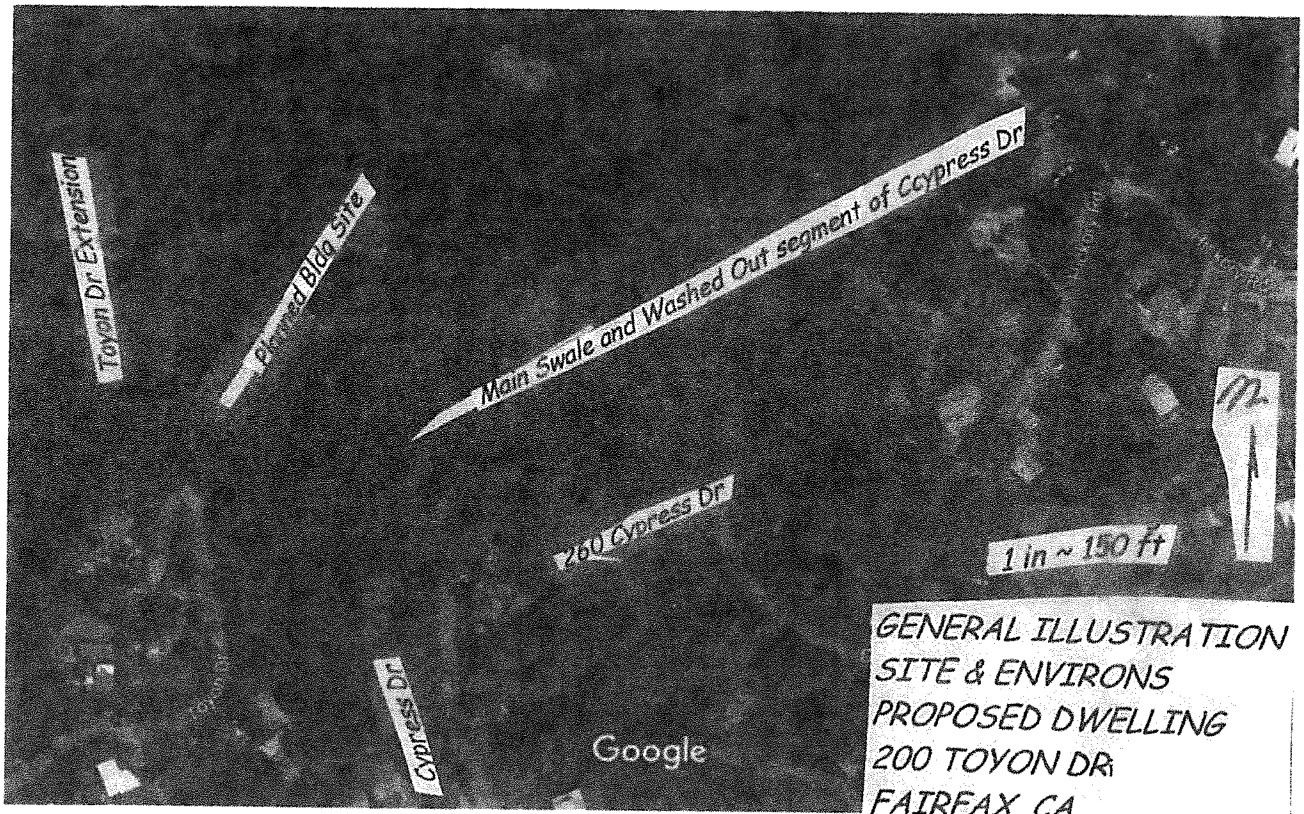

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July 9, 2015
File 1-157-br/ *1-16-br/*

REVIEW & UPDATE
GEOTECHNICAL EVALUATION DATED JULY 8, 2001
DOWNSLOPE RESIDENTIAL BUILDING SITE
AND NORTHERLY EXTENSION OF TOYON DRIVE
FAIRFAX, CALIFORNIA

Our firm had submitted a geotechnical evaluation report for the entitled project to the addressee on 7/8/01 (File 1-16-br). The current architects are Jerry Frate Architecture of San Rafael.

On 7/7/15, we performed a geological reconnaissance of the site and its environs. Vegetation now appears thicker, especially on the access road, and some trees have fallen. Nonetheless we found no significant topographic changes, or changes that would relate to earth movement,. since our 2001 investigation 14 years ago.

The current seismic criteria outlined in current International Building Code (IBC)--also outlined in 2010 ASCE 7-05 Standards-- now applies to structures here,. For the simplified Seismic Base Shear (Sect 12.14.8.1), an Fa value of 1.0 (soft bedrock or stiff soils) now applies. Soil type C (firm soils or soft bedrock) applies for other methods.

All indicators show that geotechnical conditions at this site are unchanged since submission of our 7/8/01 geotechnical evaluation report.
In view of this, the information and recommendations in that report are still valid and still apply.

We trust that this report provides the information required. You may contact us for clarification.

Respectfully Submitted
GeoEngineering Inc

Robert Settgast
Professional Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER ★ ROBERT SETTGAST ★ No. GE000764 Exp. 6/30/17 ★ GEOTECHNICAL ★ STATE OF CALIFORNIA

Photos Attached

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Mr. Ben Ross
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June 8, 2001
File No. 1-16-br

GEOTECHNICAL EVALUATION
DOWNSLOPE RESIDENTIAL BUILDING SITE
AND
NORTHERLY EXTENSION OF TOYON DRIVE
FAIRFAX, CALIFORNIA

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June 8, 2001
File No. 1-16-br

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GEOTECHNICAL EVALUATION
DOWNSLOPE RESIDENTIAL BUILDING SITE
AND
NORTHERLY EXTENSION OF TOYON DRIVE
FAIRFAX, CALIFORNIA

1. SUMMARY AND KEY POINTS

This unoccupied building site occupies a subdued hillside promontory on slopes that fall easterly at 55% to 65%. It is accessed by an approximate 600 ft unpaved northerly extension of Toyon Drive, which follows the hillside contours around a swale to the south of the building site, and will be upgraded and widened as part of this project.

Highly to moderately weathered sandstone/shale bedrock, typical to this area, underlies the building site at depths ranging from 1 to 4-1/2 ft. It is separated from the colluvial mantle soils by a discontinuous stratum of firm residual soils (fully weathered bedrock) ranging up to 3-1/2 ft thick. The colluvium consists mainly of sandy clays typical to this area--it is generally less than 1-1/2 ft thick below the building site but ranges up to 4 ft thick near the swale flowline.

The planned dwelling can be supported on drilled interconnected foundations penetrating 7 ft into bedrock, for typical depths of 8 to12 ft below present grades. Non-drilled rigid grid foundations penetrating into bedrock for total depths of 3 to 6 ft would also suffice, but their excavation costs on the relatively steep slopes would probably preclude the savings recognized through elimination of drilling. Nonetheless, in order to keep design options open, we include criteria for drilled, non-drilled, and combined systems.

As for all comparable projects, we must approve the foundation plans, and foundation drilling/excavation must be monitored by our firm.

2. INTRODUCTION

Our firm has been retained by the addressee to perform the entitled services. The topics and illustrations contained herein are indexed in the preceding Table of Contents. The limitations of our work scope and liability are outlined in the final section of this report and in an agreement signed by the addressee in May 2001.

This investigation was undertaken to provide your designers with the geotechnical information necessary to select and plan the most feasible means of developing the site and providing foundation support.

The information and recommendations contained herein are based on: (1) A site reconnaissance performed by us in May 2001 (2) A review of the Geological and Slope Stability Maps prepared by the State of California during the 1970's; (3) A comparison of the 1976, 1983 and 1989 Stereo Air Photos; (4) and a subsurface investigation performed on 5/31/01 that included nine test pits advanced manually. In-place testing included hand penetrometer readings and soundings with a portable percussion probe.

3. SITE DESCRIPTION

3.1 SETTING AND SURFICIAL FEATURES

This unoccupied, approximate 11 acre undeveloped parcel lies on the upper, easterly slopes of Pam's Blue Ridge. The building site straddles a subdued easterly projecting promontory, on slopes that fall northerly at 55 to 65%--see Topographic Vicinity Map (Fig 3), and Site Plan (Fig 1).

The building site is accessed from Toyon Road via an approximate 600 ft unpaved northerly extension, which traverses the slopes (generally following the contours) around an easterly draining swale to the south of the building site. This extension appears to have been constructed roughly a half century ago by cutting into the hillside, leaving unretained cuts up to 5 ft high, and by placing lesser amounts of fill at its shoulder. Despite its non-conforming construction, which was common at that time, it shows only minimal sloughage and appears to have remained relatively stable throughout the years.

The general area is heavily wooden with oak, bay and madrona trees. Scotch broom, hazelnut, toyon, and poison oak constitute the under-story, much of which has been cleared from the vicinity of the building area.

3.2 GEOLOGY AND SUBSOILS

Highly to very highly weathered sandstone/shale bedrock underlies this site at depths ranging from 1 to 4-1/2 ft, but was encountered nearly 6 ft deep at one location near the swale. It typically grades less weathered within its upper 1 to 2 ft. It belongs to the Franciscan Assemblage, which is the principal bedrock system in this area, and is identified as such on the Geological Map (Fig 4). Exposures may be seen along the nearby roadway cuts.

A discontinuous stratum of residual soils ranging up to 3 ft thick separates the bedrock from the colluvium mantle soils. Residual soils can be generalized as bedrock that has been weathered in place to the consistency of a hard soil. They range in properties from very stiff sandy clays with clear lithology to clayey fine sands with only weak cementation. Included in their designation are zones of deeply weathered sandstone interspersed with sandy clay.

The colluvium mantle consists mainly of medium stiff sandy clays, typical to local hillsides. It averages about 1 ft thick within the planned building envelope, but ranges up to 4 ft thick within the swale near the roadway extension. Depending on root concentrations, its upper 3 to 8 inches can be classed as topsoils (soils with significant organic components).

Groundwater was not encountered in our test pits which were excavated early in the dry season. Perched water can be expected to collect over the relatively impervious bedrock/ residual soils during and following prolonged rainfall and/or irrigation.

Our measured depths to bedrock and residual soils are indicated on the Site Plan (Fig 1) at the respective test pit locations. Our test pits are logged in the Appendix. Their approximate locations relative to the planned structures taken from the Site Plan are also included.

3.3 GENERAL HILLSIDE STABILITY

The Geological Maps identify a older zone of debris flow activity within the canyon to the immediate north of the site, traversed by Cypress Drive. The swale immediately south of the building site has also been identified as a zone of shallow surficial sliding. These are older features predating the original roadway construction, and are common to the steeper flanking slopes and drainages of Pam's Blue Ridge.

Topographic irregularities within the swale and along the roadway shoulders indicate soil creep, along with shallow surficial sliding. We found no indication that these features penetrate significantly below the bedrock surface, or that they indicate deep-seated instability. Oak and bay trees up to 40 inches in diameter within this swale suggest the absence of recent slide activity.

The Slope Stability Maps which were prepared concurrently with the Geologic Maps, class the property as Zone 4. The zoning is based on a scale of 1 through 4 with 4 being the least stable. The Zone 4 classification indicates that past slope movement was apparent to the investigators, and that sites classed as such should be investigated before development. Essentially all slopes flanking Pam's Blue Ridge are classed as either 3 or 4.

Our comparison of the 1973, 1988 and 1989 Air Photos, which include the benchmark rains of the early 1980's, show features that may reflect slippage; but the small scale of these maps (1:24,000) and the vegetative cover did not allow sufficient definition for close evaluation.

4. PLANNED CONSTRUCTION

Current plans include a modular home downslope from the access road. A framed platform may be required to position the house on the foundation system. The positioning of the garage and access from the existing road to the house has not yet been selected--a driveway traversing below the access road from the swale is now being considered.

The current access road will be widened and upgraded. Widening in the downslope direction would require retention bulkheads about 3 ft high on the downslopes, while widening in the upslope direction may require retention bulkheads more than 6 ft high. Selection of the optimum scheme should therefore be made during design. A fire truck turn-around will also be required. It may cut into the promontory crest above the planned building site.

5. DISCUSSION AND RECOMMENDATIONS (Summarized in Sect 1)

5.1 DESIGN REVIEW AND MONITORING SERVICES

Foundation and grading plans should be approved by us before finalization. If the recommendations contained herein pose any costly design or construction penalties, we should be notified. We would then review our criteria and, if possible, modify our recommendations to avoid unnecessary costs. These criteria may be relaxed for ancillary structures such as on-grade decks and minor detached retaining walls, pending our approval.

Foundation excavation/drilling and earthwork must be monitored by the geotechnical engineer, and this must be stated on the foundation plans. It is the owner's/ contractors' responsibility to provide at least three days notice to the geotechnical engineer. The contractor must be prepared to implement any foundation changes that might be deemed necessary by unanticipated soil conditions. Our monitoring services would be billed at our hourly rate unless other arrangements are made.

5.2 FOUNDATIONS

5.2.1 DRILLED INTERCONNECTED FOUNDATIONS (OPTION 1)

Water should be available to facilitate drilling and to aid in extraction of the cuttings. Plywood covers should also be available to keep the holes free of debris. The piers and grade beams need not be poured monolithically.

If water accumulates in the pier holes, it should be pumped out before concrete placement. The lower 1/2 to 1 foot may be displaced by pumping the concrete mix to the hole bottom but this method should be approved by the engineer.

Drilled piers and grade beam foundations may be designed as follows. Drilled and non-drilled foundation systems may be combined but the minimum spanning requirements must extend into the drilled segments. Guideline criteria are included on Fig 5:

1. Piers should be laid out on grids with maximum on-center spacing of about 16 ft, and should be tied upslope-downslope with grade beams.

2. Pier penetrations will be finalized during drilling based on properties of the soils/bedrock encountered. Seven foot penetrations into weathered bedrock for total depths of 8 to 12 feet below present grades are anticipated.

3. Foundation sizing and reinforcement will be designed by the structural engineer, but 18 inch piers with at least four #5 bars are typical.

   The pier steel shall extend to the top grade beam steel and be bent upslope-downslope to achieve transfer of moment stresses. <u>In no case shall it be cut below the top grade beam steel.</u>

   Grade beams should be at least 10 inches wide and 18 inches deep, and reinforced with at least four #5 bars or equivalent. <u>They must meet the drainage and embedment requirements outlined in Section 5.2.3.</u>

4. This system should be designed to resist downslope creep forces within a soil mantle penetrating 4 feet below <u>present</u> grades, but at least to imaginary planes projecting upward from nearby grades or excavations at 50%. New fill must be added to the creep zone thickness, but within cuts it may be reduced accordingly.

   This mantle should be assumed to develop pressures equal to a fluid weighing 50 pounds per cubic foot (pcf) (equivalent fluid pressure) acting downhill against the embedded portions of the grade beams and against projected diameters 2 feet greater than the respective piers. Earthquake forces need not be added cumulatively to creep forces since they act independently.

   Our criteria for pier interconnection and minimum steel must always be met. Depending on our observations during pier drilling, it may be necessary to increase the design creep zone, which could mandate an increase in reinforcing steel--this however is unlikely.

5. The soil/bedrock below the creep zone may be assumed to resist creep forces with ultimate equivalent fluid pressures of 600 pcf*. These pressures should act with confinement from creep zone bottom and against projected diameters 2 feet greater than the respective piers. *As for all sustained lateral restraint parameters, they must be applied with the 1.5 code safety factor specified for retaining walls.

6. The bedrock may be assumed to resist vertical pier loads using allowable friction values of 1,500 psf for dead plus code live loads, but should be limited to 1,100 for dead and sustained loads--they may be increased to 2,000 psf to include earthquake and wind forces.

   The minimum depth criteria outlined in item 2 must be maintained unless we approve. Friction within the creep zone must be neglected. End-bearing may be used only if drilling refusal is met and the pier bottoms are cleaned manually–we would then assign end-bearing values, which normally range from 5 to 15 ksf. The weight of the piers may be neglected in design.

5.2.2 NON-DRILLED GRID FOUNDATIONS (OPTION 2)

1. Foundations must be interconnected and tied upslope-downslope at approximate 16 ft intervals. They should be structurally capable of spanning 12 ft across zones of non-support (assuming fixed end conditions), and cantilevering 5 feet along the intersecting members at their corners.

   As a minimum, all foundations should be reinforced with at least two #5 bars both top and bottom but as directed by the structural engineer.

2. Foundation subgrades should slope no more than 10% and must be approved by the engineer--but they should penetrate:

(a) One ft into weathered bedrock, or 1/2 ft into weathered bedrock after penetrating at least 1 ft of residual soils. Maximum depths of 4 ft below lowest adjacent final grades would suffice where bedrock lies deeper, pending our approval.

(b) Below imaginary planes projected upward at 2h:1v from the base of detached retaining walls or permanent excavations.

(c) Below the lowest grades within 5 feet from their edges. Eight ft distances would be required for foundations not penetrating into bedrock.

3. Such foundations may be sized for allowable soil pressures of 2,000 psf for dead plus code live loads, but should be limited to 1500 for sustained loads such as retaining wall foundations. They may be increased to 2,500 psf for all loads including those caused by wind or earthquake forces. The weight of foundation concrete below grade may be excluded in computing soil pressures.

4. Sustained lateral forces, such as earth pressures, may be resisted by using ultimate friction factors of 1/2* between the foundations and subgrade.

   Additional restraint to sustained lateral loads may be developed by assigning ultimate equivalent fluid passive earth pressures of 600 pcf* acting against the foundation edges. Uniform pressures of 1,000 psf may be added may be added in bedrock. Confinement should begin below imaginary horizontal planes intersecting the lowest grades within 5 feet from the foundation edges. If both friction and lateral restraint are used, one should be reduced by 1/3.

   For transient horizontal forces, such as those caused by wind or earthquake, the above values may be increased by 1/3. *As for all lateral restraint parameters, the standard <u>1.5 code safety factor</u> for retaining walls must be included in design.

5.2.3 FOUNDATION DRAINAGE & PROTECTION

1. Upslope foundation members should extend above grade for protection to the framing. These actual freeboard heights will depend on localized topography and grading. They will be determined by the geotechnical engineer during construction, but they may range up to 3 ft for fully exposed members without catchment walls. The foundation freeboard should be designed to the criteria outlined for retaining walls in Section 5.3.1.

2. Upslope exterior grade beams should penetrate at least 1 ft below adjacent subfloor grades to act as moisture barriers. Other exterior grade beams should penetrate 1/2 ft below adjacent subfloor grades. This criteria may be relaxed to 1/2 ft for upslope members if rat proofing (concrete cover) is applied to the subfloor grades.

3. Upslope exterior foundation members should be provided with backdrains penetrating 1 ft below interior or subfloor grades, or as required by the geotechnical engineer. They may consist of bottom-perforated pipe in drainrock, installed as specified for retaining wall backdrains in Sect 5.3.2.

4. All subfloor grades must slope downhill for drainage, and should be no lower than the adjacent exterior grades unless there are no other options. The lower intersection of the foundation members should be provided with 1 inch weepholes, placed just above grade.

5. The subfloor ground surfaces should be covered with 6 mil plastic or non-structural concrete (rat proofing) to mitigate high crawlspace humidity from ground moisture. This is in addition to a complete venting system. <u>Where subfloor grades are cut into the slope and lie below exterior grades, rat proofing must be applied unless 5% slopes and direct unobstructed ventilation can be achieved.</u>

5.3 RETAINING WALLS AND BULKHEADS
5.3.1 LATERAL PRESSURES AND FOUNDATIONS

Retaining walls may be designed for allowable <u>active earth pressures</u> equal to both of the following:

1. Equivalent fluid pressures (efp) of 50 pcf for walls that retain cuts with only minimal backfill. They should be increased to 60 pcf for segments that sustain new fill.

   Where the ground above the wall rises, the efp should be increased in proportion to 2/3 of the upslope rise--for example, an upslope rise of 60%, corresponds to a pressure increase of 40%, but the efp need not exceed 65 pcf. Pressures may be reduced by 20% for detached site walls that support no pavement or structure.

2. A uniform lateral pressure equal to one third of any anticipated surcharge pressure but at least 75 psf for walls supporting streets, driveways, or garage slabs. This is in addition to the equivalent fluid pressure.

Retaining wall and bulkhead foundations may be designed to the criteria outlined in Section 5.2. For drilled site walls that can tolerate minor deflection, the designated creep zone pressures may be eliminated--but the passive earth pressures must be assumed to develop confinement from the creep zone bottom or bedrock surface. This criteria might be relaxed further where minor deflections pose little or no concern, if we approve.

Foundation criteria for bulkheads supporting the access road shoulder must be adjusted to suit localized bedrock depths and slopes. In most cases, the creep zone must penetrate to the bedrock surface, which was measured 3 to 5 ft deep.

5.3.2 BACKFILL AND BACKDRAINAGE

Retaining walls, that support or are integrated with other structures, must always be backfilled before framing or subsequent construction to avoid effects of initial wall deflections from backfill placement.

Retaining walls shall be backdrained and provided with separate surface drainage to avoid infiltration and related backdrain overcharging. When acting as building walls, they must also be waterproofed.

Backdrains may consist of conventional bottom-perforated pipe in drainrock blankets at least 6 inches wide. The pipe should be placed just above the bottom of the drainrock and sloped toward the flanks. Subdrains may be discharged at most locations where prolonged seepage is acceptable.

If Class 2 Permeable drainrock (or equivalent) is not used, drainrock should be separated from the adjacent soil with geotextile filter cloth. Drainrock should extend from the wall bottom upward to within 1-1/2 to 3 feet from the top depending on the wall height. The upper backfill should be a clayey soil with a low permeability to prevent migration of surface water into the backdrain. The height of the drainrock conduit may be reduced to 1 foot if structured backdrain material (such as Miradrain) is used behind upper section of walls. It should penetrate to the bottom of the drainrock to achieve hydraulic conductivity.

Weepholes may be used in lieu of (or with) perforated pipe, where wall seepage is acceptable. They are more reliable but still require drainrock. They should be about 1 inch wide and spaced at about 3 feet intervals along the base of the wall.

5.4 SITE PREPARATION, GRADING, & DRAINAGE

Site grading should be limited as much as feasible. The ground surface should be sloped for rapid drainage away from building areas. Upslope drainage should be channeled around the structure or into a separate system.

Roof drainage should be channeled downslope away from the structure. Erosion protection could be achieved by discharging through multiple outlets over 6 inch rip rap rock. Horizontal drainage spreaders or flumes that allow uniform spillage, such as lined swales or top perforated pipes, would also suffice--a sketch is included as Fig 6. Multiple discharge points are preferable to concentrated discharge (which should be avoided when feasible). In most cases the downslope downspouts can empty onto splash blocks unless they carry large quantities of water.

Discharge into dry wells (gravel filled unlined excavations) is not acceptable. Surface water should never be introduced into backdrains or other subterranean drainage system that utilizes perforated pipe or drainrock. Such systems are intended only for groundwater, and would be overcharged and likely to become blocked if used for surface drainage.

Even with the above outlined drainage measures, erosion can be expected. Considering this, all exposed unpaved areas should be provided with a vegetative cover. Courts have ruled that property owners are responsible for slide and erosion damage to downslope or adjacent properties, even when natural and without artificial influences.

5.5 EXCAVATION AND ENGINEERED FILL PLACEMENT

Areas to receive fill, or to be used as fill, must be cleared of vegetation and debris, and stripped of topsoil. Stripping depths should be determined during earthwork but we expect they will range up to 6 inches.

Exposed subgrades should be scarified & moisture conditioned to near optimum, and compacted to 90% of the maximum dry density as determined by the Modified AASHTO test.

Engineered fill (that placed below buildings and pavements) should be approved by the geotechnical engineer. It should be spread in approximate 8 inch lifts, and moisturized and compacted as outlined above for the subgrades. The on-site soils can be used as engineered fill, pending our approval.

Keys should be cut at the base of fill slopes. They should be at least 6 ft wide and penetrate into bedrock, or to depths approved by the engineer. In general, a three foot deep key would suffice where bedrock is deeper. Subdrains or drainrock blankets are normally required in the keys. The fill areas should be benched sufficiently flat to allow operation of compaction equipment.

As a general criteria, permanent slopes, should not exceed 50% (2h:1v) unless reinforced with geogrid. These requirements may be relaxed in bedrock, small slopes, or slopes provided with a rip-rap cover.

Temporary cuts deeper than 5 ft should be braced or sloped appropriately to avoid danger to workmen. In general, the soil mantle may be trimmed to about 1.5h:1v and the bedrock to 0.5h:1v depending on its localized properties. In no case can workman enter the space between retaining walls and unbraced cuts over 5 ft high. Indications are that the bedrock can be cut with normal large excavators, although some zones of hard material should be expected.

5.6 SLABS AND PAVEMENTS

The subgrades below slabs and pavements should be prepared as recommended above, and approved by the geotechnical engineer. Prior to placement of baserock or concrete, subgrades for interior slabs cut into the hillside should be sloped for drainage, compacted as recommended above, and rolled to smooth surface.

At least 4 inches of free draining baserock should be placed and compacted over the subgrade to act as a capillary break, and to provide subslab drainage for potential groundwater at the lower corners of the baserock blanket. Drain outlets through the low foundation intersections should be provided within the baserock.

Impervious barriers should be placed below the slab to impede moisture permeation unless slab dampness is acceptable. Durable membranes , which are readily available, should be used in lieu of plastic.

Floor slabs within living areas will require extra precautions with respect to drainage and waterproofing, especially if they abut retaining walls. In view of the potential seepage problems inherit with such slabs, we suggest that they be provided with pressure treated plywood covering bearing on pressure treated fir 2 by 4 "sleepers" if feasible. This is in addition to the other recommended waterproofing and drainage measures. Hardwood floors must always be protected from subfloor humidity unless moisture related distortions are acceptable.

5.7 EARTHQUAKE DESIGN CRITERIA

The structures may be designed to the seismic criteria outlined in chapter 16 of the 1997 Uniform Building Code using the following parameters--no special earthquake or fault studies were performed for this investigation:

Ca (seismic acceleration coefficient) = 0.40
Cv (seismic velocity coefficient) = 0.65

* Based on respective near source factors Na & Nv of 1.00 & 1.16. They reflect an11 km proximity to the San Andreas Fault Zone, the nearest Type A causative fault system.

* Soil profile type Sc, which correspond to soft bedrock or hard soils, was used to compute Ca & Cv

5.8 EROSION MITIGATION FOR WINTER CONSTRUCTION

If construction is performed during the winter months, the downslope areas should be protected from siltation. This can be achieved by placing silt barriers below the construction area. Either straw bales anchored to grade with rebar or silt fencing, which is commercially available, may be used. Guideline details are available on request. This system should be approved by the engineer or building official.

5.9 FIRE ROAD UPGRADE

The extent of upgrading required for the roadway extension will depend on its final positioning, and the degree of future maintenance and risks that the owner is willing to assume. Where the road encroaches onto the shoulder fill, its edge must be restrained with a drilled bulkhead. Alternatively, the road could be shifted into the cut which could dictate bulkheads up to 8 ft high. Both shoulder and cut bulkheads may be designed to criteria outlined in Section 5.3.

The existing cuts may require bulkhead retention or catchment walls at some positions to keep sloughage off the roadway. This will be determined by the geotechnical engineer during final review of the roadway plans, although conditions exposed during construction may dictate upslope bulkhead addition (albeit unlikely).

6. CLOSURE AND LIMITATIONS

By accepting this report the client and other recipients acknowledge their understanding and acceptance of the following terms and conditions. They also acknowledge that no verbal or written guarantees were made by the undersigned.

Even though we see no reason to suspect that the soil or foundation behavior will differ from our predictions, one must recognize that factors contributing to hillside and foundation instability, surface and groundwater seepage, and other geotechnical related problems cannot always be detected.

Our work is limited to geotechnical aspects of design. We may cite minimum criteria, but structural design and inspection are the responsibility of the structural engineer and/or designer. Even though we may comment on toxic materials, their identification is excluded from our services and responsibility. Hydrological and flood studies are also excluded from our work scope. Identification of underground lines is the contractor's responsibility.

Earth slippage and subfloor water are sometimes unavoidable especially during rainfall and/or irrigation. Subdrain performance can never be predicted and blockages in such system are common. Cracks in wallboard and tile as well as some distortions in hardwood floors develop in most structures from normal wood shrinkage and relaxations. Concrete curing and stress cracks will also develop. These occurrences cannot be avoided and we are not responsible for their effects. Since we are not contracted to provide full time observations, we cannot be held liable for construction errors.

This report represents our best judgment based on the available information and complies with current standards of practice for comparable projects. No forms of warranty or insurance coverage are expressed or implied in our reports or other communications.

It is also understood that certain risks must be assumed for all types of foundation and earth systems. These risks can always be lessened by upgrading these systems even though the margin of additional safety may be small compared to the additional costs involved. Although the engineer may assist in selection of the optimum balance between safety and economy, the client and all recipients understand that the risk is their own.

If a claim is made against GeoEngineering, Inc. for any act relating to our professional services, the initiator(s) of the claim shall pay for all costs and lost time associated with our defense. This includes (but is not limited to) attorney fees and our time which would be charged at the prevailing hourly billing rate.

In order to discourage frivolous lawsuits against our profession, we would pursue charges for such action against the attorneys and plaintiffs when a basis exists. In any case, our liability cannot exceed our fee for this project. We carry no errors and omission insurance.

We trust that this report provides you with the information required at this time. You may contact the undersigned as questions and the need for design clarification arise.

Respectfully submitted,

GEOENGINEERING, INC.

Robert H. Settgast
Professional Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT SETTGAST
No. GE000764
Exp. 6/30/05
GEOTECHNICAL
STATE OF CALIFORNIA

RHS:pd

4

1

3

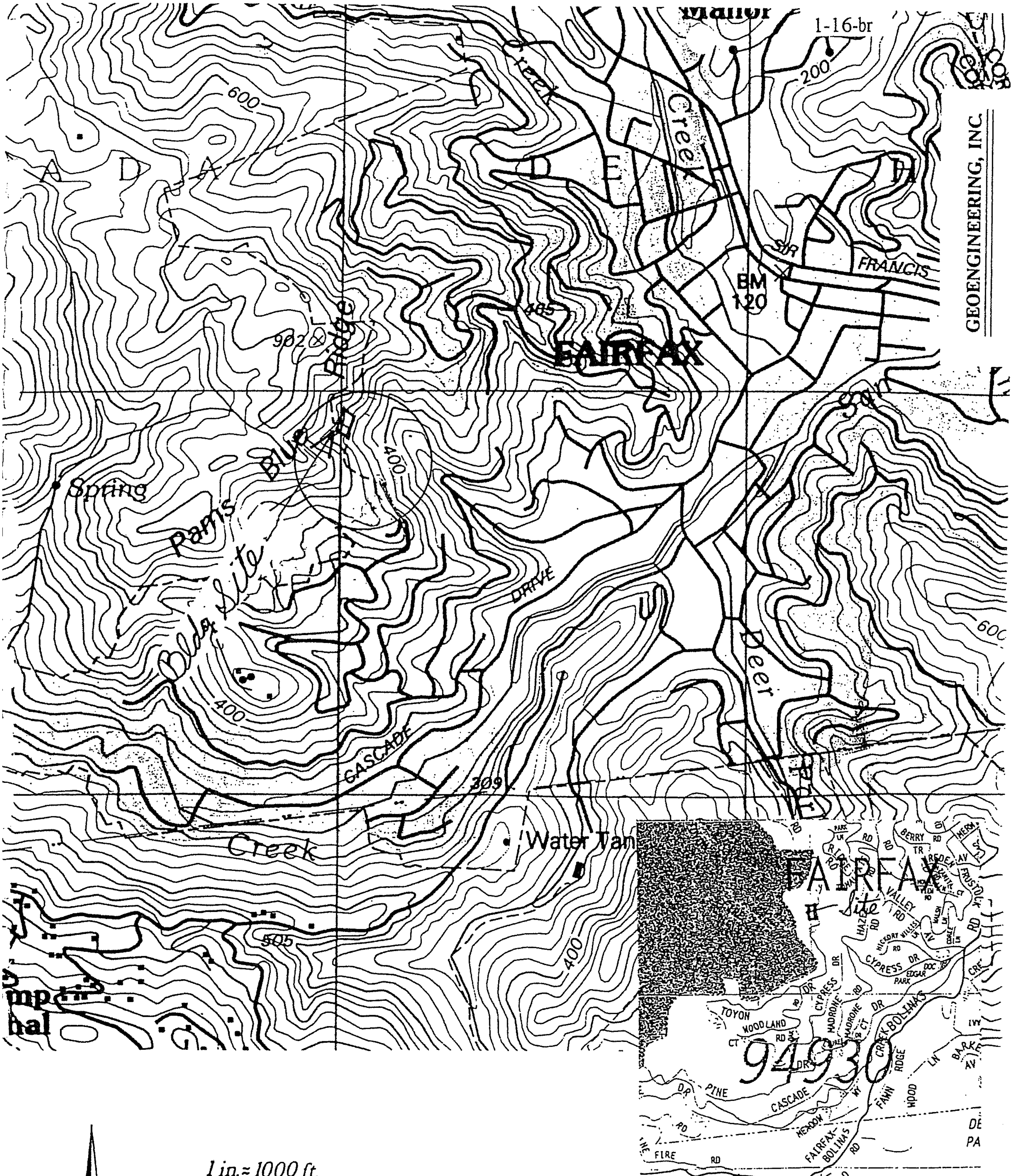
2

FILE NO. 1-16-br

5/31/01

Photos Keyed To Site Plan

GEOENGINEERING, INC.



1 in.≈ 1000 ft.
40 ft. contours

Topographic Vicinity Map

FIG 3

GULLY
SURFICIAL SLIDE
SLIDE ESCARPMENT
LANDSLIDE SCAR
SOIL CREEP

fm–FRANCISCAN MELANGE
SSh–SANDSTONE & SHALE EXPOSURES WITHIN MELANGE
Ks–FRANCISCAN SANDSTONE, SILTSTONE & SHALE
KJs–FRANCISCAN SANDSTONE, SILTSTONE & SHALE

KJg–BASALTIC VOLCANIC ROCKS
KJch–CHERT
KJsch–SCHIST
sp–SERPENTINE
Qc–COLLUVIUM

1 in.≈1000 ft.
40 ft. contours

Geologic Map

FIG **4**

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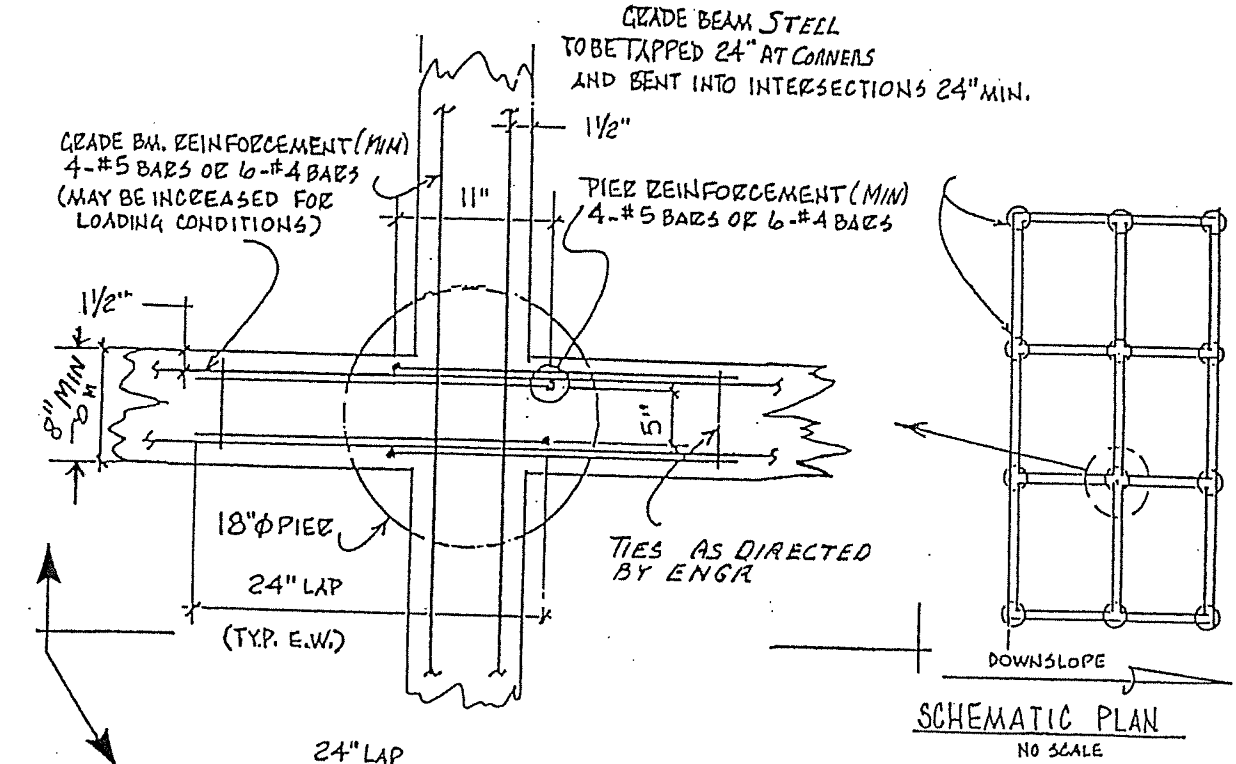
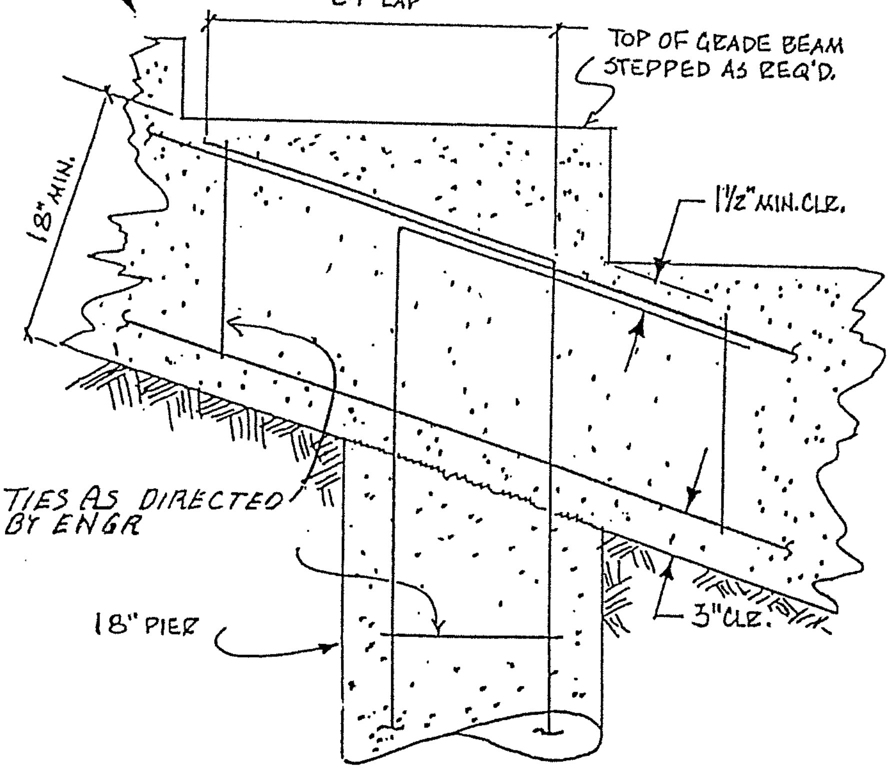
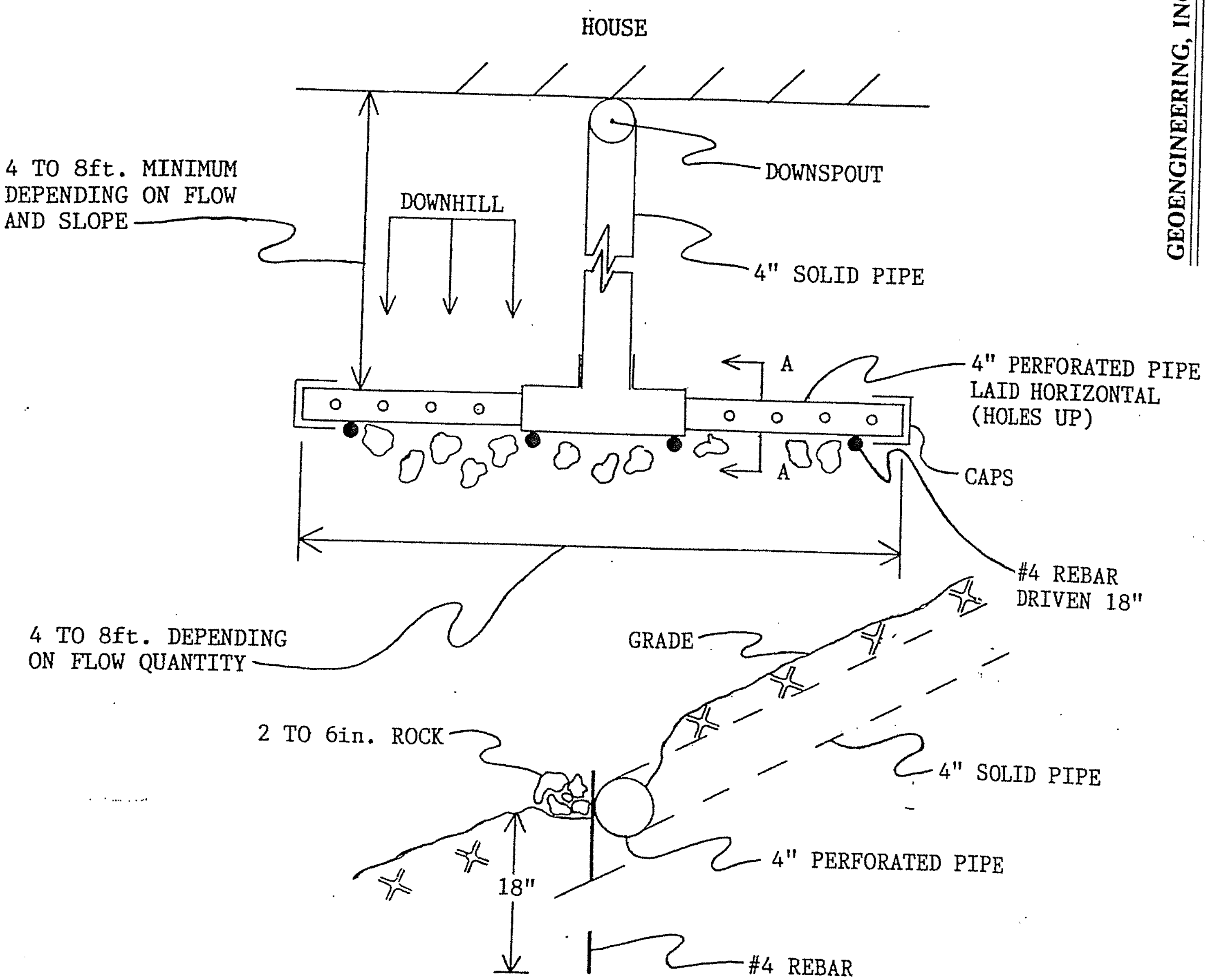




GUIDELINES ONLY
TO BE DESIGNED
BY ENGINEER

Guidelines For Drilled Pier And Grade Beam Foundation Systems



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NOTE: DRAINAGE SHOULD BE DISPERSED AT AS MANY POINTS AS FEASIBLE. CONCENTRATED DISCHARGE POINTS SHOULD BE AVOIDED.

Perforated Pipe Dispersion Flume

FIG 6

APPENDIX

EXPLORATION AND TESTING, AND TEST PIT LOGS

Our measured depths to bedrock and residual soils are indicated on the Site Plan at the respective test pit locations. Our test pits are logged below with some field test data. Their approximate locations relative to the planned structures taken from the Site Plan are also included:

TP A Near NE Corner of Dwelling,--Elev + 558

0-0.5 COLLUVIUM--Brown sandy silt with sandstone fragments, medium dense, sounds 24 inches from grade,* P** =2 to 3, 60% fines***

0.5-4.0 RESIDUAL/BEDROCK--Tan and rusty, weakly cemented clayey sand with traces of lithology and zones of deeply weathered (friable) sandstone. Sounds 6 inches from 4 ft, P=3 to 5, 50% Fines.

4.0-4.7 BEDROCK--Tan sandstone, deeply weathered (friable), grades less weathered with depth. Sounds 2 inches from 4.5 ft.

TP B Near SW Corner of Dwelling, --Elev + 579

0-0.5 COLLUVIUM--Light brown sandy silt with sandstone fragments, moderately dense, sounds 12 inches from grade.

0.5-1.0 RESIDUAL--Tan to rusty clayey sand with deeply weathered sandstone fragments and traces of lithology, firm.

1.0-1.6 BEDROCK--Tan sandstone, highly weathered and fractured, grades less weathered with depth. Sounds 1 inch from 1.5 ft.

TP C Near Downslope Midpoint of Dwelling,--Elev + 561

0-1.0 COLLUVIUM--Brown to tan sandy silt with sandstone fragments and roots, sounds 30 inches from grade, P=2 to 3.

1.0-4.5 RESIDUAL--Tan to rusty clayey sand, weakly cemented with traces of lithology and zones of deeply weathered sandstone. Sounds 10 inches from 4 ft.

4.5-5.3 BEDROCK--Tan to rusty sandstone, deeply weathered, grades less weathered with depth, sounds 3 inch from 5 ft.

TP D	Near Upslope Midpoint of Dwelling, --Elev + 577
0-0.5	COLLUVIUM--Brown, medium stiff sandy clay with sandstone fragments, sounds 10 inches from grade.
0.5-1.0	RESIDUAL--Tan to rusty clayey sand with deeply weathered sandstone fragments and traces of lithology, firm.
1.0-1.4	BEDROCK--Tan sandstone, highly weathered and fractured, sounds 2 inches from 1.2 ft.
TP E	Near SE Corner of Dwelling, --Elev + 566
0-1.0	COLLUVIUM--Brown, medium stiff sandy clay with sandstone fragments, sounds 12 inches from grade.
1.0-1.5	RESIDUAL/BEDROCK--Tan fully weathered sandstone in weakly cemented clayey sand matrix.
1.5-2.2	BEDROCK--Tan sandstone, highly weathered and fractured, sounds 2 inches from 2 ft.
TP F	Along Proposed Driveway Route, --Elev + 584
0-0.5	COLLUVIUM--Brown, medium stiff sandy clay with sandstone fragments, sounds 10 inches from grade.
0.5-1.0	RESIDUAL--Tan, weakly cemented, clayey sand with sandstone fragments.
1.0-2.2	BEDROCK--Tan to rusty sandstone, highly weathered and fractured, sounds 2 inches from 2 ft.
TP G	Along Proposed Driveway Route, N of Swale, --Elev + 577
0-1.5	COLLUVIUM--Brown sandy, clayey silt with minute sandstone fragments and voids, sounds 18 inches from grade.
1.5-2.0	RESIDUAL--Tan to rusty sandy clay with sandstone fragments, stiff.
2.0-2.4	BEDROCK--Rusty, sandstone, highly weathered, sounds 2 inches from 2.2 ft.

TP H	Along Proposed Driveway Route, S of Swale, --Elev + 582
0-4.0	COLLUVIUM--Brown to rusty brown, sandy, silty clay with rock fragments and roots to 3 ft, sounds 36 inches from grade. P=2 to 3.
4.0-5.5	RESIDUAL--Tan to rusty sandy clay with sandstone fragments. Sounds 12 inches from 4 ft, sounds 6 inches from 5 ft.
TP I	Downslope From Toyon Drive Extension, --Elev + 586
0-1.5	FILL--Tan sandstone fragments in brown to rusty sandy clay matrix, stiff, sounds 18 inches from grade.
1.5-3.0	COLLUVIUM--Brown sandy, silty clay, sounds 12 inches from 3 ft.
3.0-4.0	RESIDUAL--Tan to rusty sandy clay with traces of lithology and sandstone fragments.
4.0-4.4	BEDROCK--Tan to rusty sandstone, sounds 2 inches from 4.2 ft.
TP J	Downslope From Toyon Drive Extension, --Elev + 576
0-2.0	FILL--Tan and brown sandy clay with abundant sandstone fragments, sounds 18 inches from grade.
2.0-3.0	RESIDUAL--Tan clayey sand with sandstone fragments and traces of lithology.
3.0-3.4	BEDROCK--Tan to rusty sandstone, sounds 2 inches from 3.2 ft.

* Penetration with a 1/2 inch sounding rod driven by impact with a 7 pound sleeve hammer developing an estimated equivalent fall of 15 feet. It can normally penetrate several inches into highly weathered bedrock.

** P=Hand penetrometer values approximate laboratory unconfined compressive strengths measured in tons per square foot. Reading that exceed the 4.5 limitation of the instrument are estimated.

*** Fines=Percent silt & clay particles--estimated unless noted.

The test pits were excavated with manual equipment.

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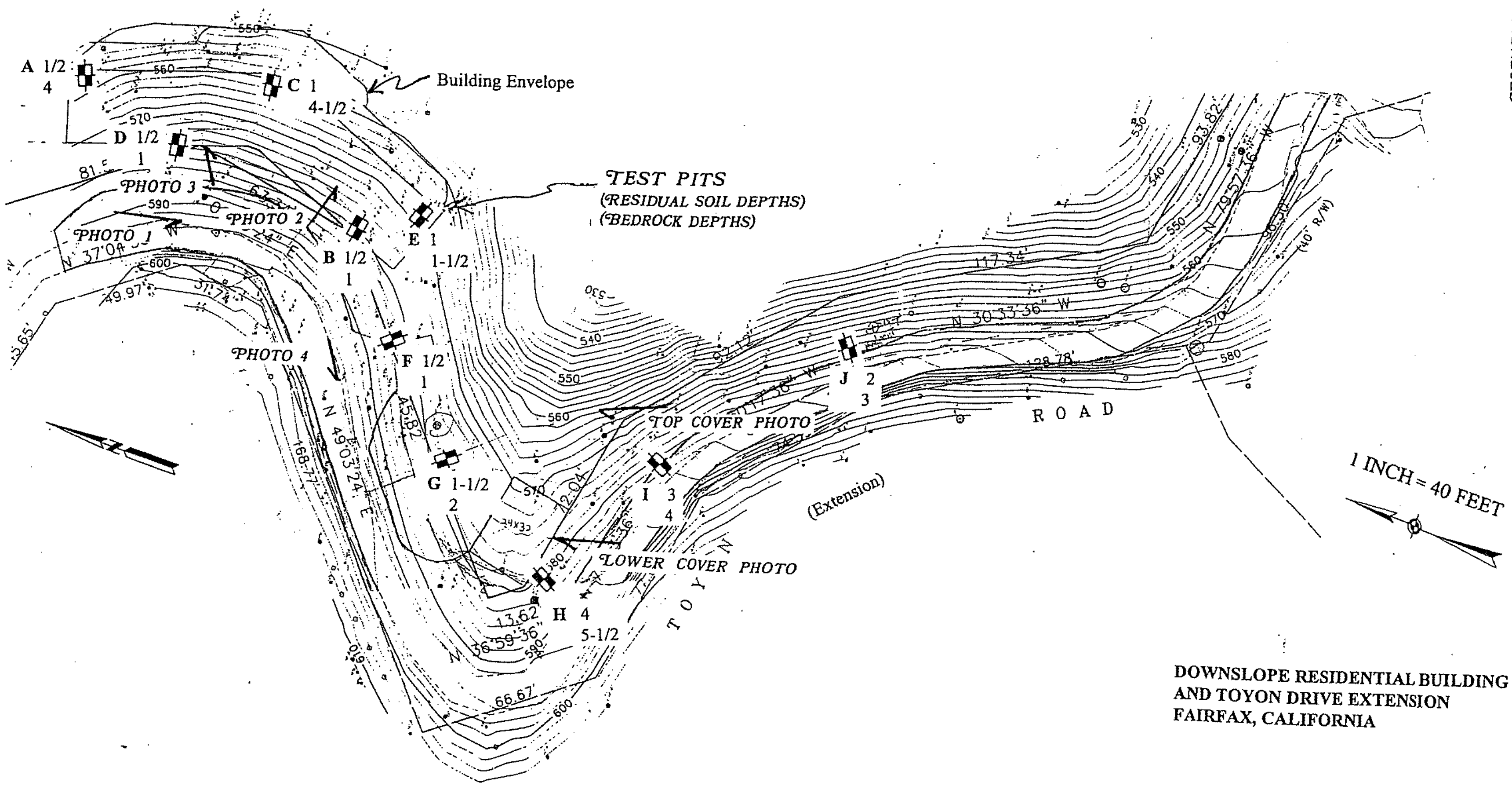

DOWNSLOPE RESIDENTIAL BUILDING SITE
AND TOYON DRIVE EXTENSION
FAIRFAX, CALIFORNIA

Site Plan

FIG 1

ARBORISTS' TREE PROTECTION REPORT

ATTACHMENT F

URBAN FORESTRY ASSOCIATES, INC.
8 Willow Street San Rafael, CA 94901
(415) 454-4212 info@urbanforestryassociates.com

TREE PRESERVATION / PROTECTION PLAN

for

200 Toyon Road, Fairfax

Prepared for:
Ben Ross

Prepared by:
Urban Forestry Associates
8 Willow St.
San Rafael, CA
415.454.4212
info@urbanforestryassociates.com

Contents

SUMMARY

There is a 1-page supplementary map to accompany this report.

Total trees surveyed 49

Total trees to be removed 26

INSPECTION SCHEDULE

Inspection of site: Prior to Equipment and Materials Move In, Site Work, Demolition and Tree Removal: The Project Arborist will meet with the General Contractor, Architect / Engineer, and Owner or their representative to review tree preservation measures, designate tree removals, delineate the location of tree protection / non-intrusion zone fencing, specify equipment access routes and materials storage areas, review the existing condition of trees and provide any necessary recommendations.

Inspection of site: After installation of NIZ fencing: Inspect site for the adequate installation of tree preservation measures. Review any requests by contractor for access, soil disturbance or excavation areas within root zones of protected trees. Assess any changes in the health of trees since last inspection.

Inspection of site: During excavation or any activities that could affect trees: Inspect site during any activity within the Non-Intrusion Zones of preserved trees and any recommendations implemented. Assess any changes in the health of trees since last inspection.

Final Inspection of Site: Inspection of site following completion of construction: Inspect for tree health and make any necessary recommendations.

PURPOSE

Urban Forestry Associates (UFA) was hired to inspect the trees at 200 Toyon Road in Fairfax at the request of Ben Ross in June of 2018. The report was revised in October 2018. The purpose was to assess the condition of the trees and provide a prognosis on tree health, vigor, structural stability and potential impacts to the trees resulting from the proposed development of the property. This report documents the health and structural condition of the trees and provides our conclusions in accordance with the Town of Fairfax tree ordinance.

SITE DESCRIPTION

The subject property is undeveloped and apparently a frequently used walking trail for locals. Predominate tree species on site are California bay (*Umbellularia californica*), coast live oak (*Quercus agrifolia*), black oak (*Quercus kelloggii*) and Pacific madrone (*Arbutus menziesii*). The site has been overrun by broom thus fire risk is high. The general condition of the forest is fair to poor in terms of health. There are many fallen and drought afflicted trees within the project footprint and numerous oak trees display signs of sudden oak (*Phythophthora ramorum*) death infection.

Treatment of Multi-Stemmed Trees

In the event of multi-stemmed trees that fork at or near grade, the DBH was taken of up to three of the largest stems and entered in order from largest to smallest. The largest single stem diameter was then summed with half the diameter of any additional stems up to a total of three.
For example:

Three stems sized:

5", 4" & 4"

Would be calculated as:

5 + (4×0.5) + (4×0.5) = 5 + 2 + 2 = **9" DBH**.

We have found this to be a fair method of approximating multi-stemmed trees and far superior than simply adding each diameter or each circumference, as is done in ordinances of several local cities. This practice makes heritage size trees out of shrubs with twenty, 2" stems.

METHODS

- Trees included in the inventory (Appendix A) were tagged on the main stem with a metal tree tag corresponding to the number in the report.
- Tree diameters were taken to the nearest 1/10th of an inch using a Spencer Diameter Tape.
- In the event of a multi-stemmed tree, either the three largest stems were measured at 4.5' above grade or the tree was measured at the narrow point below the fork, whichever was deemed more representative of the tree's size. The "calculated DBH" was determined using the formula below:

Treatment of Multi-Stemmed Trees

In the event of multi-stemmed trees that fork at or near grade, the DBH was taken of up to three of the largest stems and entered in order from largest to smallest. The largest single stem diameter was then summed with half the diameter of any additional stems up to a total of three.
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We have found this to be a fair method of approximating multi-stemmed trees and far superior than simply adding each diameter or each circumference, as is done in ordinances of several local cities. This practice makes heritage size trees out of shrubs with twenty, 2" stems.

- Tree health and structure were assessed on a qualitative scale of (good, fair, poor, very poor, dead).

OBSERVATIONS

- Please refer to Appendix A for the full inventory and tree descriptions.

- Architectural plans and grading and drainage plans have been reviewed by UFA.

- There is a potential for significant impacts to trees **90-92** (California bay laurel trees) due to their proximity to the proposed public parking area. It is reported (from an engineering perspective) to match grade and accommodate the public access ramp grading of approximately 3-4 feet will be necessary. The grading may result in significant root loss which will adversely impact the trees. Proposed grading is not expected to destabilize the trees but may lead to stress and ultimate decline. As such, removal and replacement with native species suited for the area is a reasonable option. Alternatively, the parking area could be reduced to one parking spot to accommodate the trees and reduce impacts.

- Trenching for installation of storm drainage lines have a potential to impact trees. The project arborist shall provide input to route the lines in a way that avoids damage to critical roots. Limits of trenching shall be a distance of no less than 3 times the calculated trunk diameter of the tree. For example: For a 12" diameter tree the closest one lateral trench may be made is 36" measured from the closest edge of the main trunk at grade (See Figure 1).

- Wood chips created during tree removal operations should be repurposed onsite to benefit/ protect leave trees. Tree protection fencing is shown as the predominant means of excluding construction activities, however, in areas where access is limited a combination of trunk armoring and coarse wood chips may be utilized as an alternative to fencing. This alternative can be discussed onsite during the pre-construction meeting with the contractor.

- Irrigation shall be provided periodically (approximately one deep soaking per month) during construction to promote tree health and vigor of leave trees.

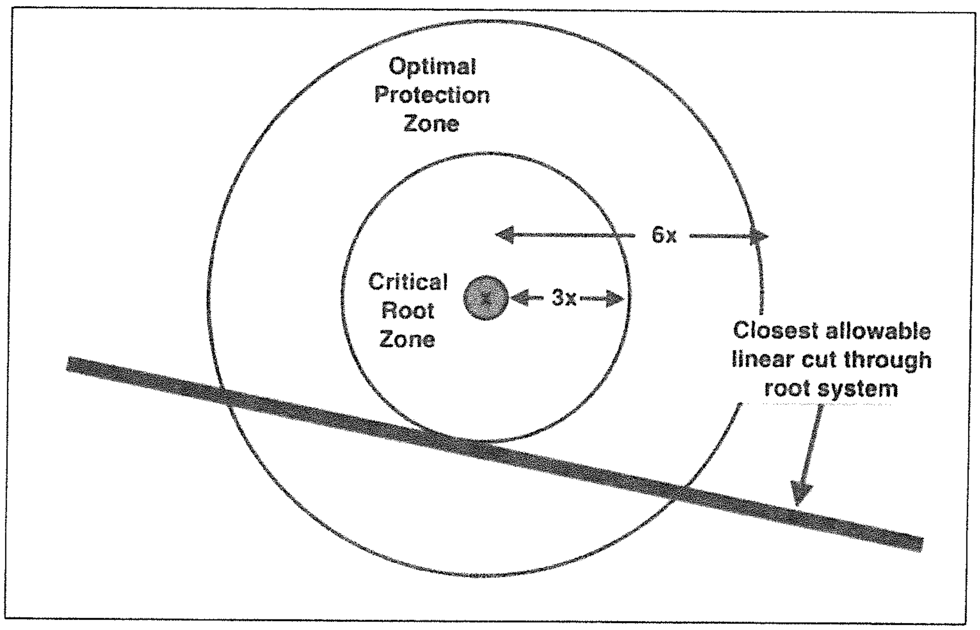

Figure 1.

SCOPE OF WORK / LIMITATIONS

Trees not included on the site survey were located by UFA in the field. As such locations are approximate and may influence the conclusion that a tree will be impacted by development.

Information regarding property boundaries, land ownership, and tree ownership was not evident from a land survey, property fencing and/or provided by the client. UFA has no personal or monetary interest in the outcome of this matter. All determinations reflected in this report are objective and to the best of our ability. All observations regarding the sites and trees were made by UFA personnel, independently, based on our education and experience. Determinations of the health and hazard potential of the subject trees are through visual inspection only and of our best professional judgment.

The health and hazard assessments in this report are limited by the visual nature of the assessment. Defects may be obscured by soil, brush, vines, aerial foliage, branches, multiple trunks or other trees. None of the subject trees were examined using invasive techniques such as increment coring or Resistograph® tests. The probability of tree failure is dependent on a number of factors including: topography, geology, soil characteristics, wind patterns, species characteristics (both visually evident and concealed), structural defects, and the characteristics of a specific storm. Structurally sound, healthy trees are wind thrown during severe storms. Consequently, a conclusion that a tree does not require corrective surgery or removal is not a guarantee of no risk, hazard, or sound health.

TREE WORK STANDARDS AND QUALIFICATION

All tree work, removal, pruning, planting, shall be performed using industry standards as established by the International Society of Arboriculture. Contractor must have a State of California Contractors License for Tree Service (C61-D49) or Landscaping (C-27) with general liability, worker's compensation, and commercial auto/equipment insurance.

Contractor standards of workmanship shall adhere to current Best Management Practices of the International Society of Arboriculture (ISA) and the American National Standards Institute (ANSI) for tree pruning, fertilization and safety (ANSI A300 and Z133.1).

Zachary Vought, Urban Forester
ISA Certified Arborist & TRAQ
WE:9995A

ARBORIST'S CHECKLIST

- An urban forester, certified or consulting arborist shall establish the Tree Protection Zone (TPZ) prior to starting the demolition work. Four-foot-high wire deer fencing will be erected by the contractor and inspected by the arborist to limit access to the TPZ. This will protect the trunk and root zone throughout construction.

- The Arborist shall have a pre-demolition meeting with contractor or responsible party and all other foremen or crew managers on site prior to any work to review all work procedures, access and haul routes, and tree protection. The contractor must notify the Arborist if roots are exposed or if trunk or branches are wounded.

- Any trunk and root crown that is not protected by a TPZ where heavy equipment operation is likely to wound the trunk, install a barrel stave-like trunk wrap out of 2 X 4 studs connected together with metal straps, attached to the 2 X 4's with driver screws or 1" nails. The arborist shall oversee the installation of the trunk protection.

- Storage of equipment shall be on asphalt or ground protected by mulch / plywood in an area specified by the arborist in conjunction with the contractor or responsible party prior to the initiation of any demolition or construction activity.

- Heavy equipment use should be limited around trees and the roots. No equipment may be transported or used on bare ground within the root zone. A 6" layer of mulch and plywood must be placed under the path for access and egress. The protective "bridge' shall be maintained by the contractor and regularly inspected by the arborist.

- Any damage to trees due to demolition or construction activities shall be reported to the arborist within 6 hours, so that remedial action can be taken. Any damage done to the trees in violation of the contract agreement shall be appraised as a casualty loss by the arborist and provided to the tree owner.

- All trenching within the critical root zone shall be done pneumatically or by hand.

- An arborist shall over-see all grading, trenching, tunneling or other excavation within the root zones of trees.

- No chemicals or other waste materials shall be dumped in the root zone of this tree. There shall be no material storage in the.

- Pier and at-grade beam foundation construction should be used around the tree to avoid root damage. The soils shall be probed by the Arborist prior to drilling for piers to avoid major roots. Any minor roots (<3.5") encountered should be cut cleanly with a saw after excavation.

- Patios and walks shall be constructed out of permeable materials on a well-aerated base, such as "Cornell Mix". Radiating, horizontal perforated pipes shall be placed at the pavement base/native soil interface, with vertical air outlets, if the above mix cannot be used.

- Any tree pruning will be done in accordance with ISA standards. <u>All pruning will be supervised by the arborist.</u>

- The soil and drainage shall be rehabilitated and all debris removed after construction.

- The arborist must perform a final inspection to insure that no unmitigated damage has occurred and to specify any pest, disease or other health care. The arborist shall specify and oversee any necessary restorative actions.

- A supplementary irrigation system designed by the Arborist shall be installed where necessary.
- The arborist shall advise the homeowner on landscaping. Landscaping shall conform to arboricultural guidelines.
- Any suspected omissions or conflict between various elements of the plan shall be brought to the attention of the arborist and resolved before proceeding with the work.

SOURCES

- Architectural plans created by Jerry Frate dated April 4th, 2018.
- Grading and Drainage plan created by DVC Group dated June 18th, 2018.
- Field data collected by Urban Forestry Associates in June, 2018.
- Town of Fairfax Tree Ordinance

APPENDIX A: FULL INVENTORY

Tree #	Common Name	Latin Name	Diameter (DBH)			Calculated DBH	Protected Status	Health	Structure	Comment	Removal
			Stem 1	Stem 2	Stem 3						
1	Bay laurel	*Umbellularia californica*	8.1			8.1	Protected	Fair	Fair		
2	Bay laurel	*Umbellularia californica*	4.2			4.2	Protected	Fair	Fair		
3	Bay laurel	*Umbellularia californica*	6.3			6.3	Protected	Fair	Fair	East lean.	
4	Bay laurel	*Umbellularia californica*	8.4	7.9	7.3	16.0	Protected	Fair	Fair	Root crown buried in soil.	
5	Bay laurel	*Umbellularia californica*	12.0	8.4		16.2	Protected	Fair	Fair		
6	Bay laurel	*Umbellularia californica*	10.1	9.1		14.7	Protected	Fair	Fair	Two stems with a common attachment at 1' above grade.	x
7	Bay laurel	*Umbellularia californica*	14.9	13.3	12.8	28.0	Heritage	Poor to fair	Fair	Sparse canopy. Stems extend over the existing road	x
8	Bay laurel	*Umbellularia californica*	11.6	7.5		15.4	Protected	Poor	Fair	Canopy dieback.	x
9	coast live oak	*Quercus agrifolia*	13.9			13.9	Heritage	Fair	Poor to fair	Severe lean east.	
10	Pacific madrone	*Arbutus menziesii*	16.4 below fork			16.4	Protected	Poor	Poor to fair	Canopy dieback. Strong east lean.	
11	Bay laurel	*Umbellularia californica*	7 stems over 12" diameter				Heritage	Fair	Poor to fair	Sparse canopy.	
12	Bay laurel	*Umbellularia californica*	5 stems over 12" diameter				Heritage	Fair	Poor to fair	Sparse canopy.	
88	Bay laurel	*Umbellularia californica*	17.7	16.0	14.5	33.0	Heritage	Fair	Fair	8 stems with a common attachment near grade. It is one of the largest trees in the general vicinity.	
89	coast live oak	*Quercus agrifolia*	21.0			21.0	Heritage	Poor to fair	Poor	Symptomatic of sudden oak death. Severe lean toward provate property. Sudden oak death symptoms have subsided since orginial inspection.	
90	Bay laurel	*Umbellularia californica*	19.6 below fork			19.6	Heritage	Fair	Fair		
91	Bay laurel	*Umbellularia californica*	6.9			6.9	Protected	Fair	Fair		
92	Bay laurel	*Umbellularia californica*	10.4			10.4	Protected	Fair	Fair		
93	Bay laurel	*Umbellularia californica*	5.8			5.8	Protected	Fair	Fair	It is the dominant stem in a cluster from a common base.	x
94	coast live oak	*Quercus agrifolia*	5.3			5.3	Protected	Fair	Fair	Lean toward existing road	x
200	Bay laurel	*Umbellularia californica*	15.4			15.4	Protected	Fair	Fair	East lean.	
201	Bay laurel	*Umbellularia californica*	8.9			8.9	Protected	Fair	Fair	Northeast lean.	x

Tree #	Common Name	Latin Name	Diameter (DBH)			Calculated DBH	Protected Status	Health	Structure	Comment	Removal
			Stem 1	Stem 2	Stem 3						
202	Bay laurel	*Umbellularia californica*	18.4	14.6	8.2	29.9	Heritage	Fair	Poor	Established decay in lower trunk.	x
203	coast live oak	*Quercus agrifolia*	12.1			12.1	Heritage	Fair	Fair	Decay at 10' where tree lost its top	
204	Bay laurel	*Umbellularia californica*	10.4			10.4	Protected	Fair	Fair		x
205	Bay laurel	*Umbellularia californica*	5.1			5.1	Protected	Fair	Fair		x
206	Bay laurel	*Umbellularia californica*	9.7			9.7	Protected	Fair	Fair		x
207	Bay laurel	*Umbellularia californica*	5.5			5.5	Protected	Fair	Fair		x
208	Bay laurel	*Umbellularia californica*	8.4			8.4	Protected	Fair	Fair		x
209	Bay laurel	*Umbellularia californica*	7.4			7.4	Protected	Fair	Fair		x
210	Bay laurel	*Umbellularia californica*	8.8	3.3		10.5	Protected	Fair	Fair		x
211	Bay laurel	*Umbellularia californica*	8.8			8.8	Protected	Fair	Fair		x
212	Bay laurel	*Umbellularia californica*	5.9			5.9	Protected	Fair	Fair		x
213	Bay laurel	*Umbellularia californica*	8.2			8.2	Protected	Fair	Fair		x
214	Bay laurel	*Umbellularia californica*	4.3	4.2		6.4	Protected	Fair	Fair		x
215	Bay laurel	*Umbellularia californica*	5.6			5.6	Protected	Fair	Fair		x
216	Bay laurel	*Umbellularia californica*	6.4	3.0		7.9	Protected	Fair	Fair		x
217	coast live oak	*Quercus agrifolia*	12.5			12.5	Heritage	Fair	Poor to fair	Severe lean east	x
218	Bay laurel	*Umbellularia californica*	7.5			7.5	Protected	Fair	Fair	Lean east.	x
219	Bay laurel	*Umbellularia californica*	11.1	10.2		16.2	Protected	Fair	Fair		
220	Bay laurel	*Umbellularia californica*	9.4			9.4	Protected	Fair	Fair		
221	Bay laurel	*Umbellularia californica*	7.5	7.3		11.2	Protected	Fair	Fair	Dead madrone suspended in canopy	x
222	Bay laurel	*Umbellularia californica*	11.9			11.9	Protected	Fair	Fair	Trunk covered with vines.	x
223	Bay laurel	*Umbellularia californica*	4.2			4.2	Protected	Fair	Fair		x
224	coast live oak	*Quercus agrifolia*	9.6			9.6	Heritage	Fair	Fair	Canopy of this tree may conflict with clearance for the fire deptament turnaround but can mostl likely be pruned and preserved.	
225	coast live oak	*Quercus agrifolia*	4.9			4.9	Protected	Fair	Poor	Significant decay in trunk.	x
226	Bay laurel	*Umbellularia californica*	9.0			9.0	Protected	Fair	Fair		

Tree #	Common Name	Latin Name	Diameter (DBH)			Calculated DBH	Protected Status	Health	Structure	Comment	Removal
			Stem 1	Stem 2	Stem 3						
227	Bay laurel	*Umbellularia californica*	4.9	3.9		6.8	Protected	Fair	Fair		
228	Bay laurel	*Umbellularia californica*	5.6	3.9	3.0	9.0	Protected	Poor to fair	Fair	Stunted and displays marginal vigor	
229	Toyon	*Heteromeles arbutifolia*	8.6	7.2		12.2	Protected	Fair to good	Fair		

APPENDIX B: Tree Protection

Fencing

4 foot tall wire deer fencing shall be used to create the **tree protection zones**, installed as shown on the Arborist's Map. Fencing shall be supported with 6' metal t-stakes and installed on no more than 10 foot centers. Laminated signage shall be attached to fencing and read "Warning Tree Protection Zone Keep Out". Signage shall be kept visible and intact throughout the project. Failure to comply with the tree protection plan may result in a stop work order.

TRUNK AND LIMB PROTECTION IN CONSTRUCTION ZONES

Damage to tree trunks and limbs is common in construction zones, particularly where backhoes or excavators are used, but also simply due to impacts from demolition, material hauling, and other common construction activities.

In specific areas where demolition will occur, heavy equipment must operate or a lot of other construction activity must occur near trees, the trunks of the trees and possibly branches should be protected with a strapped, barrel stave-like armor of stud-length 2"x4"s (if possible given tree shape) around some or all of the circumference of the tree trunk and multiple layers of orange plastic tree protection fencing. Alternatively, a plywood/OSB box can be constructed around the base to a height of at least 6' but preferably higher.

SOIL AND FEEDER ROOT ARMORING

Where appropriate, metal strap-linked minimum 1c" plywood may be required for greater soil and root protection. Areas where heavy equipment will be operated or where heavy foot traffic will occur over an extended period, the soils should be mulched to a depth of 6", plywood armored and maintained throughout the construction period. In specified areas where heavy equipment operates or demolition will occur within the normal TPZ of a tree, the trunks of the trees should be protected with a strapped, barrel stave-like armor of 2"x4"s around the full circumference of the tree trunk.

The consulting arborist shall inspect the installation of mulch, plywood armoring, and any other specified tree protection measures after completion. All work done within the tree protection zone (TPZ) shall be supervised by the Arborist.

Illustration: 1c inch plywood linked with Simpson Strong-tie LSTA18 straps (or better) attached with one inch driver screws. The plywood is laid over three inches (3") of wood chip mulch. The thickness of the plywood depends on the weight of the equipment that must access the TPZ. For very heavy equipment such as cranes steel plates bolted together over five inches (5") of mulch must be employed for adequate soil and root armoring. The integrity of the armor must be maintained throughout the TPZ construction period. Depending on the biology of the tree, sub- armor irrigation (soaker hose or in line drip emitters) may be required.