

**GEOLOGIC INVESTIGATION
BODEGA R.E.Y.N. CORPORATION
3800 BAY HILL ROAD
BODEGA BAY, CALIFORNIA
FOR MR. CLARENCE FREEMAN**

**Cooper Engineers, Inc.
Santa Rosa, California**

July 30, 1987



CONSULTING ENGINEERS

340 Tesconi Circle, Suite C

Santa Rosa, California 95401-4676

707-575-1554

July 30, 1987
Our Job #3043-A

Mr. Clarence Freeman
Bodega R.E.Y.N. Corporation
1409 Highway 1
Bodega Bay, California 94923

Geologic Investigation
Bodega R.E.Y.N. Corporation
3800 Bay Hill Road
Bodega Bay, California
for Mr. Clarence Freeman

Dear Mr. Freeman:

At your request, Cooper Engineers performed a geologic reconnaissance of the proposed Bodega R.E.Y.N. Corporation property lot split. The reconnaissance was performed on July 20 and 29, 1987 and consisted of visual observations of the subject property. Subsurface exploration was not performed. The purpose of our reconnaissance was to assess the geologic suitability of the proposed lot split and identify the most suitable appearing building envelopes within each of the parcels. Items addressed during our reconnaissance are those required by the Sonoma County Department of Planning in their letter dated December 4, 1986.

Prior to performing our geologic reconnaissance, we discussed the project with the co-owner, Mr. Clarence Freeman, and Melanie Perry, Project Planner, Sonoma County Department of Planning. Ms. Perry stated that item #6, "Marginal Water Availability Area" (#3), need not be addressed as part of this study. A Lot Split Map was obtained for mapping purposes from Adobe Associates, Santa Rosa, California. An additional map was obtained from Mr. Freeman entitled "Bodega R.E.Y.N. Corporation and Sonoma County Scenic and Restrictive Easements", prepared by Stuber-Stroeh Associates, Inc.

The project property is located north of Bay Hill Road and east of State Highway 1. The property as a whole occupies approximately 55 acres. Evaluated by us were Parcels #1,2,3 and the restrictive easement portion of Parcel #4. (See attached map for locations).

Prior to the field reconnaissance, one of our engineering geologists reviewed geologic maps and reports from our files pertinent to the project. A field geologic reconnaissance was then performed on all of the above parcels and geologic notations plotted on the attached map of the project property.

The vast majority of the project property is underlain by graywacke sandstone (Fs) of the Franciscan Complex, which in turn is mantled or partly mantled by terrace deposits and/or soils. All of the restrictive easement portion of Parcel #4 is underlain by sandstone, as is Parcel #3. Approximately two-thirds of Parcel #2 and the extreme northern corner of Parcel #1 is directly underlain by sandstone. Where observed in outcrop and in drainage ditches, the sandstone is typically light orangish-brown to gray, moderately weathered, moderately hard, closely fractured, and tight (see attached Plate 2 for description of rock properties). Limited amounts of scattered surficial fragments and blocks indicate that irregular chert interbeds are likely present in the sandstone.

The terrace deposits (Qt) overlie the sandstone. These deposits are found in the majority of Parcel #1, approximately one-third of Parcel #2, and possibly in a small area along the western boundary of the restrictive easement portion of Parcel #4. Where best observed in outcrop, outside of the project boundaries, the terrace deposits are brownish-orange in color, severely weathered, soft, and semi-consolidated. They consist of stiff clays and silts with sands and gravels. The deposits are approximately 3-4 feet in depth along the western boundary of Parcel #1 and appear to progressively thin towards the east. (Parcels 2 and 3).

Unconsolidated deposits of residual soil have developed on top of the terrace deposits or directly on the sandstone. Residual soils derived from the underlying sandstone are characteristically dark brown in color, medium stiff to stiff, silty clays with weathered rock fragments.

Soils derived from the terrace deposits are brown in color, medium stiff, sandy clays with variable amounts of rounded rock fragments. Field evidence strongly indicates the soils are erodible, particularly where vegetation cover is missing.

No landslides were observed within the study area. One small landslide was noted in the scenic easement area in the northern portion of the property. This is well outside of any of the proposed building envelopes.

No active springs were noted in any of the parcels. Moist areas were observed as noted on the accompanying map. Groundwater levels in these areas and throughout the property change seasonally and with time. Groundwater studies were not within the scope of this study.

Based on our reconnaissance, it is our opinion that there are no geologic hazards present which could preclude development of the proposed lots. However, it should be recognized that any improvements located on sloping terrain are by virtue of their topographic position, subject to some potential for slope failure effects. Assuming the utilization of proper engineering design, construction, and maintenance, the risk of such failures is low.

A portion of Parcel #4 is approximately located within the boundaries of an Alquist-Priolo Special Studies Zone. Development in the zone is controlled for reasons of public safety. Coastal California is subject to the effects of periodic earthquake shaking, if sufficiently severe, such shaking can cause a variety of effects, including slope failure and structural damage. Although this risk must be accepted if development is to take place, it can be minimized by adequate site selection, proper construction and maintenance.

Building envelopes have been identified where standard foundation and conventional construction techniques can most likely be utilized. The building envelopes are located in relatively flat areas where construction will have minimal effect on slope stability. Once the actual building sites have been selected, it would be desirable to excavate one to two backhoe pits to directly observe soil conditions, soil depths and to confirm that soft, weak, or otherwise undesirable conditions are not present. This could be accomplished by observing septic percolation pits.

Mr. Clarence Freeman
July 30, 1987

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Proposed access road routes have also been identified. These corridors have been delineated where slope conditions appear favorable to road construction with limited impact on the existing topography. Due to the locally high clay content of the soils, increased moisture content could create soft areas detrimental to road stability. It is recommended that an appropriate road base, surfacing and drainage be an integral part of access road development.

We suggest that leachfields not be located immediately downslope of any structures to maintain slope stability. On Parcels 1 - 3, it is recommended that the systems be installed within the building envelopes to avoid moist areas and slightly steeper slopes immediately adjacent to the envelopes. On Parcel 4, relatively flat to gently sloping areas should be utilized for septic systems. Moist areas which lie within the boundaries of Parcel 4 should be avoided.

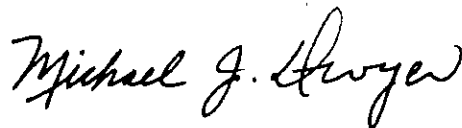
Site soils are erosion prone. For that reason, surface runoff from structures and roads should be directed into existing natural or man-made drainage courses. Minimal disturbance of existing vegetation and sloping ground is recommended to minimize erosion.

We trust this report contains the information you require at this time. Please contact us if you have questions or comments. The following plates are attached and complete this report.

Plate 1 Site Plan and Geologic Map
Plate 2 Description of Rock Properties

Yours very truly,

COOPER ENGINEERS INC.



Michael J. Dwyer
Certified Engineering Geologist 782

BKC/MJD/mb
SR/R-Rep.3043-A
(4 copies submitted)



WEATHERING

Fresh - Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.

Very Slight - Rock generally fresh, joints stained, some joints may show clay if open, crystals in broken face show bright. Rock rings under hammer if crystalline.

Slight - Rock generally fresh - joints stained and discoloration extends into rock up to 1 inch. Open joints contain clay. In granitoid rocks some feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.

Moderate - Significant portions of rock show discoloration and weathering effects. In granitoid rocks most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.

Moderately Severe - All rock except quartz discolored or stained. In granitoid rocks all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck. (Saprolite)

Severe - All rock except quartz discolored or stained. Rock "fabric" clear and evident but reduced in strength to strong soil. In granitoid rocks all feldspars kaolinized to some extent. Some fragments of strong rock usually left. (Saprolite)

Very Severe - All rock except quartz discolored or stained. Rock "fabric" discernible but mass effectively reduced to "soil" with only fragments of strong rock remaining.

Complete - Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small scattered locations. Quartz may be present as dikes or stringers.

BEDDING THICKNESS AND FRACTURE SPACING

<u>Centimeters</u>	<u>Inches</u>	<u>Bedding</u>	<u>Fracture Spacing</u>
0-1	0-1/2	Laminated	Very Close
1-5	1/2-2	Thin	Close
5-30	2-12	Medium	Moderate
30-100	12-36	Thick	Wide
100	36	Very Thick	Very Wide

HARDNESS*

Very Hard - Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.

Hard - Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.

Moderately Hard - Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blow of point of geologist's pick. Hand specimens can be detached by moderate blow.

Medium - Can be grooved 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.

Soft - Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.

Very Soft - Can be carved with knife. Can be excavated readily with point of pick. Pieces an inch or more in thickness can be broken by finger pressure. Can be scratched readily by finger nail.

*Note: For engineering description of rock - not to be confused with Moh's scale for minerals.

References:

1. Subsurface Investigation for Design and Construction of Foundations of Buildings: Part II", by the Task Committee for foundation Design Manual of the Committee on Shallow Foundations of the Soil Mechanics and Foundations Division, Journal of the Soil Mechanics and Foundations Division, Proceedings of the American Society of Civil Engineers, June, 1972.
2. "Description of Geologic Map Units San Mateo County, California", by Ellen, Wentworth, Brabb and Pampeyan, U.S. Geological Survey, 1970.

Revisions: _____ Date _____
 By _____ Date _____
 By _____ Date _____
 Location: Bodega Bay, California
 By JHD Date 7/30/87
 Checked By JHD
 Job Number 3043-A Name Mr. Clarence Freeman



SONOMA COUNTY



DEPARTMENT OF PLANNING

575 Administration Dr., Room 105A ■ Santa Rosa, California 95401 ■ (707) 527-2412

Kenneth L. Milam, AICP
Planning Director

Nedra Burke
P O Box 926
Bodega Bay, CA 94923

December 4, 1986
MNS 86-719

Geologic conditions on your site may present significant hazard and constraint to your project. Therefore, the Department of Planning, per the California Environmental Quality Act, is requiring an on-site geologic investigation. This evaluation will determine the geologic suitability of your site and whether each newly created lot will contain a building site.

This report, prepared by a registered geologist of your choice, will summarize and map the following:

1. The surficial geology on the site.
2. Identification on the site plan of areas of geologic hazard.
3. The following three areas:
 - a. Areas where standard foundation and other conventional construction techniques are satisfactory.
 - b. Areas where geological hazards may exist, but which, in the opinion of the geologist, can be mitigated (i.e., foundation design).
 - c. Areas where geologic suitability is uncertain without additional geo-technical and/or subsurface investigation.
4. Identification of stable access road and/or driveway routes to the buildable areas.
5. If the new lots will be serviced by septic systems, the report should address land stability in relation to leachfield sites and the possibility of instability being induced by leachfield construction.
6. If it is determined your site is within "Marginal Water Availability Area (#3)" a report shall be prepared by a registered geologist addressing the potential for adequate water supply. This report shall include data descriptive of the underlying geologic formation, depths, locations, and yields of neighboring wells, and any history of failures or unsuccessful attempts to develop water in the area.

Please provide us with 3 copies of the report. Upon receipt of the report, we will proceed with the processing of your application. If you or your geologist have questions regarding this requirement contact us.

Sincerely,


Project Planner - Melanie Perry

:csb

c: Bodega R.E.Y. Jim Olmsted, Senior Planner
Adobe Assoc. Current Planning • 527-3697

Kenneth M. Curtis, Senior Planner
Comprehensive Planning • 527-3703

Richard Lehtinen, Senior Planner
Environmental & Resources Planning • 527-3695

Robert B. Gaskill, Senior Planner
Administrative and Planning Services • 527-3693



CONSULTING ENGINEERS

340 Tesconi Circle, Suite C

Santa Rosa, California 95401-4676

707-575-1554

July 15, 1987
Our Job #3043-A

Mr. Clarence Freeman
1409 Highway 1
Bodega Bay, California 94923

Dear Mr. Freeman:

Confirming Proposal
Geologic Investigation
Bodega R.E.Y.N. Corporation
3800 Bay Hill Road
Bodega Bay, California

INTRODUCTION

Following discussions with you on July 13, 1987, we are pleased to submit this confirming proposal to provide geologic investigation services for the proposed lot split of the captioned property. The lots to be assessed consist of three approximately one-acre parcels located in the southern portion of the property and a single parcel consisting of approximately 41 acres.

We understand you are initiating this project as a representative of Bodega R.E.Y.N. Corporation.

SCOPE OF SERVICES

The purpose of our geologic investigation will be to evaluate the geologic conditions at the site with respect to the feasibility of the proposed lot split. Our scope of services will consist of a review of stereo-paired aerial photographs and published geologic maps and literature of the area, and a site reconnaissance to identify significant surface features including exposed bedrock conditions, unstable soils and springs and seepage areas. Concerns of the Sonoma County Department of Planning, as expressed in their letter dated December 4, 1986, will be addressed.

Mr. Clarence Freeman
July 15, 1987

Confirming Proposal #3043-A
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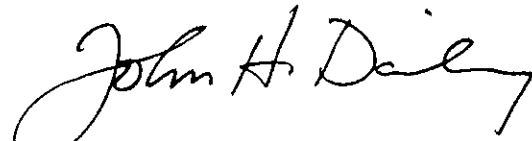
The results of our investigation will be presented in a written report providing conclusions as to the feasibility of developing the planned lots.

FEE AND CONTRACTUAL ARRANGEMENTS

We will provide our services on a time-and-expense basis and in accordance with the attached "Schedule of Charges" and "Terms and Conditions of Agreement". We estimate that the total fee for the above scope of work will be on the order of \$1,100.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding our scope of services or fee estimate, please call us. As our formal authorization, please sign and return one copy of this proposal

Yours very truly,
COOPER ENGINEERS, INC.



John H. Dailey
Civil Engineer 30345

BKC/JHD/mb
SR/P-Conf.Prop.3043-A
(3 copies submitted)

THE ABOVE PROPOSAL, INCLUDING ALL ENCLOSURES, HAS BEEN READ AND UNDERSTOOD AND IS HEREBY AGREED TO AND ACCEPTED. IT IS AGREED THAT "SCHEDULE OF CHARGES" AND "TERMS AND CONDITIONS OF AGREEMENT" FORM AN EXPRESS PART OF THE CONTRACT AS EVIDENCED BY MY SIGNATURE BELOW:

July 16 1987
Date

Clarence R. Freeman Sec.
Signature and Title

Bodega Keys Corp
Company



1987 SCHEDULE OF CHARGES

A new schedule of charges is issued at the beginning of each year. Unless other arrangements have been made, charges to all projects, including those continuing from previous years, will be based on the latest schedule of charges. "Terms and Conditions of Agreement" (Form B, Rev. 1-83) forms an express part of this "Schedule of Charges".

PERSONNEL CHARGES

Individual billing rates, based on actual salaries, are used in determining project charges. These billing rates are determined in accordance with Manual No. 45 of The American Society of Civil Engineers. Current billing rates for the various employee classifications are as follows:

<u>Personnel</u>	<u>Hourly Billing Rate</u>
Support Services (Technical Typing, Reproduction, Technical Editing, etc.).....	\$ 25-35
Drafter, Administrative Assistant, or Union Engineering Technician (ET)	30-47
Engineer, Geologist, Environmental Planner, or Union Senior Engineering Technician (SET 1)	36-50
Project Engineer, Geologist, Environmental Planner, or Union Senior Engineering Technician (SET 2)	45-70
Supervisory Engineer, Geologist, or Project Manager	60-90
Principal	70-100
Senior Principal	100-150

Personnel charges are for technical work. Charges are made for technical typing and for the time and costs of compiling and printing technical reports. Direct charges are not made for office management.

For other than professional employees, all time spent over eight hours per day and all Saturday work will be charged at 1½ times the hourly billing rate. All Sunday work will be charged at 2 times the hourly billing rate, and holiday work will be charged at 2½ times the hourly billing rate. All field personnel charges are portal-to-portal. Premium charges are not made for overtime work by professional employees, with the exception of weekend field work requested by client.

For field inspection services, the minimum personnel charges are as follows:

- Show-up time = 2 hours
- Inspection services 2 to 4 hours = 4 hours
- Inspection services 4 to 8 hours = 8 hours

Travel time, up to a maximum of eight hours per day, is charged in accordance with the foregoing schedule for personnel.

Charges for special consultants are billed at cost plus 15%.

The minimum charge for a court appearance as an expert witness is \$1,200 per day or any portion thereof plus expenses. Preparation for a court case or giving a deposition for a court case will be charged at 1½ times the regular hourly rates.

When outside the continental United States, employees' total salary costs are increased by the premium customarily paid for work at that location.

EQUIPMENT CHARGES

The following charges are for special equipment and are in addition to personnel charges:

Field vehicles equipped with testing or sampling equipment, per hour (portal-to-portal).....	\$3.00
Printing and Reproduction, per sheet	0.25
Car or Pick-up Truck, per mile	0.50
Drill Rig Rental and Operation	Cost plus 15%
Sampling Equipment, per sample	4.00
Nuclear Density Gauge, per hour	4.00
Other Special Equipment	Prices on request

Equipment in transit to or from the job site, or retained by the client on a standby basis, is billed on the basis of four hours per calendar day, or at actual cost (plus 15%) in case of equipment which is leased or subleased or otherwise arranged for by Cooper Engineers through its subcontractors or others.

If equipment is exposed to unusual climatic conditions, an appropriate charge will be made for resultant abnormal deterioration.

TERMS AND CONDITIONS OF AGREEMENT

This schedule of Terms and Conditions sets forth the terms and conditions under which Cooper Engineers will provide consulting engineering services to Mr. Clarence Freeman pursuant to Our Confirming Proposal #3043-A.

CHARGES

Services performed on a time-and-expense basis will be charged in accordance with Cooper Engineers current "Schedule of Charges" detailed on Form A.

Any unusual types of services not specifically covered by the foregoing schedule will be charged at a rate determined to be equitable in relation to the scheduled rates.

Services performed under lump sum contracts will be charged at the agreed lump sum.

TERMS OF PAYMENT

The Client's obligation to pay for the services contracted is in no way dependent upon the Client's ability to obtain financing or upon the Client's successful completion of the project. In the absence of specific arrangements to the contrary, monthly statements will be submitted. Such statements will be due and payable when rendered. To be recognized, any dispute over charges must be claimed in writing within thirty (30) days of the billing date. Liquidated damages equal to one and one-quarter percent (1¼%) per month from the date of statement will be added to any statement which remains unpaid more than thirty (30) days from the statement date. If suit is instituted to collect any sum due, Client shall be liable for such sums as the court may adjudge reasonable for attorney's fees and other costs in such suit. It is expressly agreed that venue for any such suit shall be, at the discretion of Cooper Engineers, in any court of competent jurisdiction located within the County of Santa Clara, State of California. Cooper Engineers may at its option withhold delivery of reports and other data pending receipt of payment of all services rendered.

In the event that the Client requests termination of the services prior to completion of a report, Cooper Engineers reserves the right to complete such analyses and records as may be necessary to place its files in order and, where considered necessary to protect its professional reputation, to complete a report on the services performed to date. A termination charge to cover the costs thereof in an amount not to exceed 10 percent (10%) of all charges incurred up to the date of the stoppage of the services may be made at the discretion of Cooper Engineers.

DOCUMENTATION OF SERVICES

Any documentary report or tangible item developed and furnished under this agreement is intended solely for the purpose of communicating and transferring tangible information relating to professional and engineering services.

All documents, including reports and letters, reflecting or summarizing the results of technical studies, analyses, consultations, field exploration, field inspections or tests, or laboratory test results, prepared by Cooper Engineers shall remain the property of Cooper Engineers until all fees incurred in their preparation have been paid. The Client agrees that all documentation of services furnished to the Client not fully paid for will be returned to Cooper Engineers upon demand and will not be used for licensing, permits, design, construction, or for any other purpose.

In the absence of prior contractual arrangements, the Client will be entitled to six copies of each technical report. The Client may later obtain additional copies of the reports at costs based upon the then current fee schedule.

With the exception of technical reports, all documents, including original boring logs, field data, field notes, laboratory test data, calculations and estimates, are and remain the property of Cooper Engineers.

SCOPE OF EXECUTION OF SERVICES

Client recognizes that there are risks of earth movement and property damage inherent in Client's land development and/or repair activities, and that Cooper Engineers has not been authorized to perform the exhaustive and economically unfeasible investigations necessary to eliminate such risks. Client and Cooper Engineers expressly agree that all of the consequences of such risks are totally assumed by Client.