HETHERINGTON ENGINEERING, INC.

GEOTECHNICAL CONSULTANTS

September 7, 1990
Project No. 548.1

P.S.D.D. Inc.
Architecture, Planning
P.O. Box 1521
Solana Beach, CA 92075

Attention: Farshid Mohseni

Subject: FOUNDATION PLAN REVIEW
Proposed Building Addition
5143 Shore Drive
Carlsbad, California

References: 1) "Geotechnical Investigation, Proposed Building Addition, 5143 Shore Drive, Carlsbad, California," by Hetherington Engineering, Inc., dated July 18, 1990.

2) "Foundation Plan and Details, Turro Residence," Sheets 9 and d1, by P.S.D.D. Inc., dated September 1, 1990.

Owner

Dear Mr. Mohseni:

In accordance with your request, we have reviewed the referenced report and plans. The purpose of our review is to comment on the geotechnical aspects of the plans.

Based on our review, it appears that the plans have incorporated the recommendations provided in the referenced "Geotechnical Investigation...". The conclusions and recommendations provided in Reference 1 remain applicable.

Please call if there are any questions.

Sincerely,

HETHERINGTON ENGINEERING, INC.

MARK D. HETHERINGTON
Civil Engineer 30488
Geotechnical Engineer 39
(both expire 3/31/92)

REGISTERED PROFESSIONAL ENGINEER
MARK D. HETHERINGTON
No. 397
Exp. Date _____
GEOTECHNICAL
STATE OF CALIFORNIA

MDH/ss

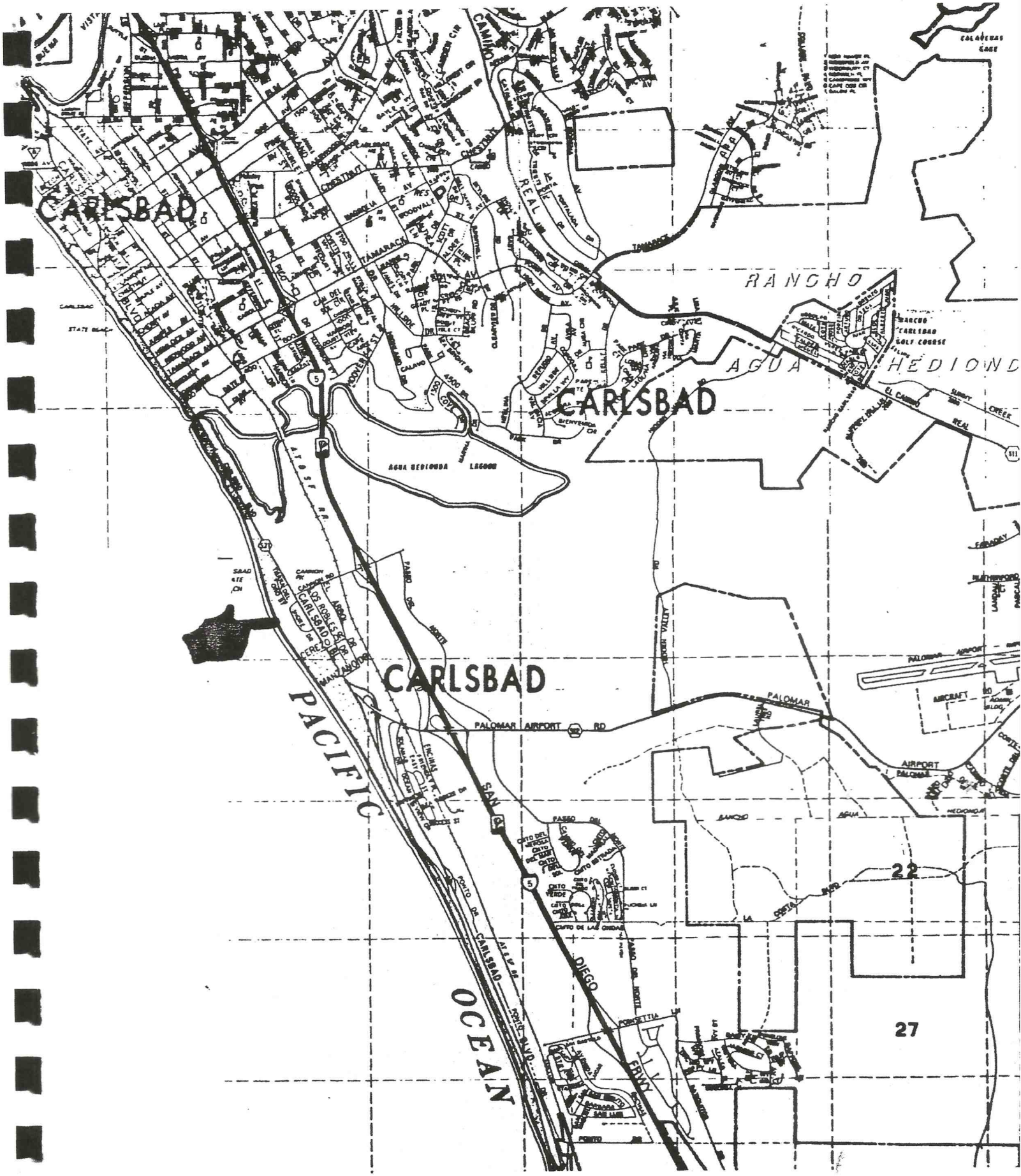
ENGINEERING GEOLOGIC EVALUATION OF DEVELOPMENT FEASIBILITY, PLANNED DWELLING ADDITION AT 5143 SHORE DRIVE, CARLSBAD, CALIFORNIA

FOR

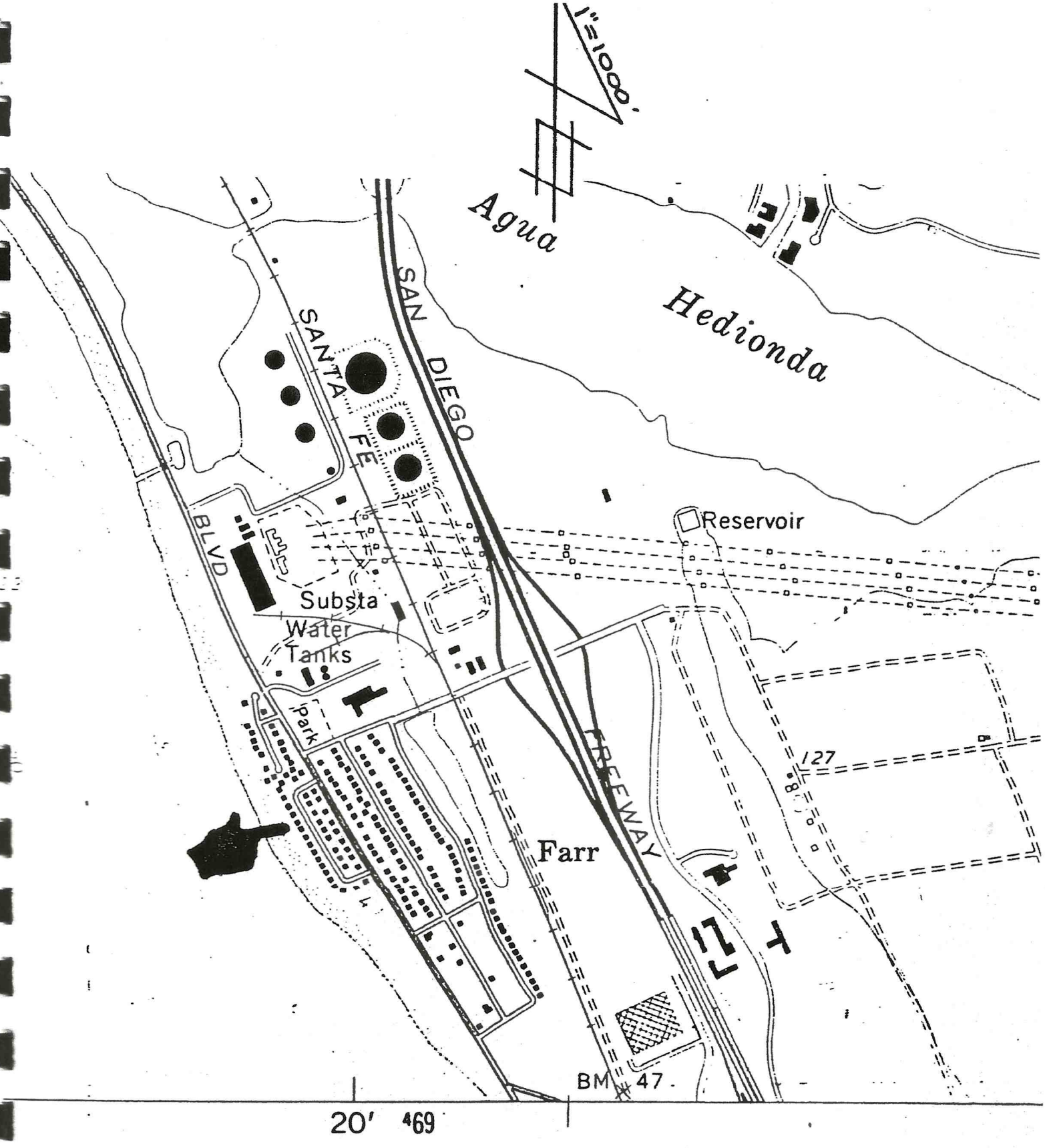
PAUL J. TURRO, D.D.S.

Prepared by:

WILLIAM R. MUNSON, INC.



STREET INDEX MAP



Topographic Index Map

William R. Munson a professional corporation
consulting engineering geology

February 11, 1990

Paul J. Turro, D.D.S.
5143 Shore Drive
Carlsbad, CA 92008

SUBJECT: **Limited Engineering Geologic Evaluation of Development Feasibility, Planned Dwelling Addition at 5143 Shore Drive, Carlsbad, California**

Legal Description: A.P. #210-031-10-00, San Diego County

Dear Mr. Turro:

Pursuant to the request and authorization of Mr. Mark Fehlman, Architect, the undersigned conducted a limited examination of the subject property and proximity on 7 August 1990. The purpose of the field work and study was to provide the basis for evaluating the feasibility of constructing a proposed second story addition and partial full two story addition at the site, from an engineering geologic standpoint.

32302 camino capistrano • suite 207 • san juan capistrano • 92675 • p.o. box 857 • (714) 661-2902

Reportedly, the work and this report were prompted by a desire to document exposed and apparent attendant geotechnical conditions at the site, to render a geotechnical opinion of the project feasibility, and to provide relevant recommendations within the limitations of the work, for project submittal to the California Coastal Commission.

This report summarizes the findings of the limited examination and study, and presents relevant conclusions and recommendations for decision-making in this matter.

SCOPE

The field work comprised visual examination of the interior and exterior of the dwelling, appurtenances, and terrain features at the site and proximity, including the ocean bluff and beach. Moreover, the integrity of near-surface soils was qualitatively evaluated by random probing with a 3-foot long narrow steel shaft (a device used for that purpose); the property was traversed by the undersigned to evaluate soil, drainage and other terrain conditions; and structural conditions and features, and evident structural distress, were noted.

Due to the attendant gunited bluff face, which extends several hundred feet southerly beyond the property, and due to the extensive rip-rap protected bluff northerly of the site, the identification and classification of the earth materials concealed beneath the gunite face was made beyond the southerly end of the gunite where bedrock and overlying unconsolidated terrace deposits are exposed in the bluff.

The field work and preparation of this report were augmented by the writer's knowledge and understanding of local geologic conditions and associated physical impacts imposed thereon by residential ocean front development; and review of the following technical documents:

1. Young, J.M. and Berry, R.W., April 1981, **Tertiary Lithostratigraphic Variations, Santa Margarita River to Agua Hedionda Lagoon,** Paper in **Geologic Investigations of the Coastal Plain, San Diego, California** prepared for the 1981 San Diego Association of Geologists Field Trip (Pages 33-51).
2. Mark Fehlman, undated, conceptual site plan and section (Turro Residence) of proposed second story addition (1-sheet).
3. Weber, Harold F., 1963, **Geology and Mineral Resources of San Diego County, California,** County Report 3 of the California Division of Mines and Geology.
4. Lajoie, K.R., et al, November 1979, **Quaternary Marine Shorelines and Coastal Deformation, San Diego to Santa Barbara, California,** Paper Prepared for the 1979 Geologaical Society of American Annual Meeting.
5. Houston, J.R. and Garcia, A.W., September 1973, **Type 16 Flood Insurance Story: Tsunami Predictions for Pacific Coastal Communities,** (working draft), Technical Report 4-73 by the U.S. Army Engineer Waterways Experiment Station.

The scope of the examination and study did not include subsurface exploration (i.e., backhoe trenches or drilled borings), nor field/laboratory testing and analyses by a geotechnical engineer.

Accordingly, the subject examination is classified surficial whereby only surface and very near-surface conditions, apparent and obvious to the writer, were evaluated. Evaluation of subsurface conditions, and conclusions therefrom, which were not reflected at the ground surface, in the building exterior/interior and appurtenances, or in the referenced documents, is beyond the scope of the subject examination and this report. Such information would have to be secured from a comprehensive subsurface geotechnical investigation that would include excavated trenches and/or exploratory drilled borings.

Moreover, the scope of work did not include research, evaluation and/or investigation for the presence of toxic waste products at the surface and beneath the property.

Within the limitations of the subject field examination, the following attendant features and conditions were recorded and/or evaluated:

- Composition/geometry and integrity of exposed earth materials at the surface and in the near-surface.
- Apparent man-made alternations of the terrain.
- Evidence, if any, of prior ground instability.
- Conditions conducive to site stability/instability.
- Engineering properties of earth materials, including expansivity and erodibility, based upon visual examination.

Notice to the owner/client and all successor owners of the subject property: This limited report was prepared as an information document by

the undersigned as a professional service and should not be construed as an insurance policy or guarantee against future instability. Interested parties are hereby cautioned that this report renders opinions based on interpretation of reference data and physical conditions readily evident at the site and proximity at the present time, and does not predict future events and conditions that may affect the property. Moreover, it does not imply knowledge of all planes of weakness and other potentially problematic conditions that may be present in the earth materials concealed in the subsurface beneath the site and proximity.

ROLE OF THE GEOTECHNICAL CONSULTANT: The primary role of the geotechnical consultant is to use his professional expertise in evaluating the site's geotechnical features to the best of his capability, and to present professional opinions plus statements of facts as determined from the scope of work, as described heretofore (i.e., surficial examination, review of the reference documents, and a manometer level survey.) This information is then presented in a written manner to benefit the client in decision-making regarding a course of action, and the degree of risk acceptable to him in undertaking the purchase or sale of property, or the development of a planned project, or the remedy of a problematic condition. At no time does the consultant partake in the risk taking, since the decisions are always and ultimately made by the owner or others. Accordingly, the consultant is not responsible for financial gains or losses accrued by the owner and/or others from this property/project.

PRINCIPALS

o **Owner:**	Paul J. Turro, D.D.S. 5143 Shore Drive Carlsbad, CA 92008 (619) 431-7040
o **Architect:**	Mark Fehlman 3504 Ibis Street San Diego, CA 92103 (619) 481-5571
o **Governmental Agencies:**	California Coastal Commission/City of Carlsbad
o **Engineering Geologist:**	William R. Munson (714) 661-2902

ENCLOSURES

- o Figure 1 - Geologic/Topographic Index Map
- o Figure 2 - Site Plan/Geotechnical Map
- o Figure 3 - Schematic Geologic Sections A-A' and B-B'
- o Figure 4 - Major Earthquakes and Recent Active Faults in Southern California....

SITE DESCRIPTION

The seaside property is rectangular in shape, and fronts on the westerly side of Shore Drive off of Carlsbad Boulevard in the incorporated city of Carlsbad. The overall dimensions are 60-feet wide by [+/-] 232-feet deep

to the mean high tide line. The developed portion of the property terminates seaward at the base of moderately high ocean bluff that has a gunited face. Beach access from the top-of-bluff is provided by wooden stairs, above, and gunite stairs, below. The southerly adjacent property, which has approximately the same elevation as the subject site, comprises an older single-story residence. By contrast, the northerly-adjacent property, which is occupied by a newer split-level residence, is slightly lower at the street, and is [+/-] 8-feet lower at the rear.

Terrain

The seaward margin of the elevated site is marked by a [+/-] 22-foot high bluff (current height relative to the beach) that is everywhere concealed by a gunite blanket reportedly constructed about 1978. Apparently, the protective gunite construction was necessitated by excessive bluff erosion that resulted from intense rainfall and wave action associated with the major ocean storms of winter 1977-78. Apparently, the erosion jeopardized the circa 1972 gunited bluff face on the southerly-adjacent property by exposing and undermining its lateral edge, thus prompting the 1978 gunite construction. The gunite bluff protection now extends monolithically [+/-] six to eight hundred feet southerly of the property.

By contrast, the bluff northerly of the property for many hundreds of feet is protected by a rock rip-rap (i.e., angular armor stone) blanket.

The configuration of the gunited bluff, from top to bottom, comprises a [+/-] 15-foot high 1/4:1 to 1:1 precipitous face, a [+/-] 10-foot wide

near level to gently seaward sloping natural bench, and [+/-] 6.5-foot high near-vertical face that terminates at the sandy beach. The southerly half of the gunited face above the level bench is markedly concave. Apparently, the feature reflects the eroded retreat of the bluff caused by the 1977-78 storms.

The apparent monolithic gunite face exhibits numerous drain holes, both above and below the bench. Moreover, the lower face is marked by several vertical tight to slightly open tension cracks and one major horizontal tension crack.

The front [+/-] 115-feet of the lot, which includes the existing residence and most yard improvements is very gently inclined in a seaward to northwest direction. The inclined pad beneath the rear wall of the dwelling is estimated to be 37-feet above the beach at the toe-of-bluff.

The terrain between the elevated dwelling pad and the bluff comprises a relatively uniform [+/-] 4:1 (i.e. 14-degree) natural slope at and near the bluff, and a variable 20:1 to 5:1 (2- to 11-degree) slope, above. the lower slope is interpreted to be substantially natural; whereas, the higher slope is believed to have been manufactured by fill placement. There, the natural ground supports a dense growth of thick-bladed ice plant that partially drapes the gunited bluff, and the manufactured fill ground supports a moderate to dense growth of African daisies.

Note: Although the details of construction of the gunite blanket are unknown to the undersigned, the condition of the gunite suggests that

reinforcement steel (or equal) was used and, possibly, the system was anchored by rock bolts and/or earth anchors.

Improvements

- Reportedly, the existing single-story residence was constructed during the period of the late 1950s to early 1960s.
- The dwelling consists of two bedrooms, a living room, bathroom, dining room, kitchen, a family room, study addition, and a laundry room. Apparently, the addition was converted from an original covered patio/breezeway between the house and the 2-car garage at the front.
- The exterior walls of the building are covered with stucco; and the interior walls are plaster over plaster board (apparently), except in the family room/study addition, where the walls appear to be drywall (i.e., gypsumboard).
- The dwelling has a raised wooden floor.
- The foundation of the dwelling (for support of bearing walls) appears to comprise a perimeter continuous footing and interior pier footings and/or continuous footings. Moreover, the raised wooden floor and non-bearing walls are also supported on pier footings.
- The dwelling interior wall exhibit few distress cracks. The two most prominent are above the interior passage openings between the living room and kitchen, and between the living room and the northerly wing. Elsewhere, the wall by the dining room window exhibits deterioration by water damage.
- The lower portion of southerly (side) and rear (seaward) walls of

the dwelling exhibit stucco deterioration and some cracking that is substantially attributed to effects of excessive ground moisture at the perimeter foundation.

- Entry courtyard improvements include decking of clay tile pavers; recessed planters adjacent to building walls; a low height retaining wall that supports a level grass lawn in the front yard; and perimeter wood and concrete block privacy fences.
- Rear and side yard improvements include an elevated wood deck that extends from the rear wall of the living room to the side door of the family room/study in the northerly side yard; a concrete patio deck by the rear wall of the living room and dining room; a concrete walk that extends from the northerly side yard to the existing wooden stairs (beach access) and to the top-of-bluff where there was a previous beach access stairs; and a block garden wall-over-retaining wall that apparently marks the northerly property boundary (apparently, the wall was constructed in conjunction with the newer adjacent dwelling).

DRAINAGE

- The building is not equipped with a roof gutter/downspout system.
- Rear yard drainage comprises sheet flow runoff of incident rainfall that cascades over the gunited bluff and to the beach.
- Elsewhere, the earthen yard areas are poorly drained and, in the case of confined recessed planters, do not drain by surface means.
- The paved courtyard is equipped with a drain that discharges through a wooden drain structure at the top-of-bluff.
- The front yard and southerly side yard are crudely drained by an

open concrete device that drains to the bluff via a drainpipe beneath the rear yard.

PLANNED DEVELOPMENT/CONSTRUCTION

According to the Reference 2 conceptual plans, proposed construction is to comprise a [+/-] 1000-square foot second story addition above the existing kitchen, dining room, living room, rear bedroom and bathroom. Moreover, the addition will include a partial 2-story addition to square off the building where it is inset by the front bedroom and bathroom.

Reportedly, the upper level will include two large bedroom/bathroom suites and interior access stairs, and the lower level is to be remodeled for conversion to a kitchen, dining room and living room.

GEOLOGIC SETTING

Regionally, the property is regionally situated on the coastal plain at the seaward margin of the foothills of the Santa Ana Mountains, which comprises a part of the Peninsular Range Province. Locally, the underlying Santiago formation bedrock of Eocene age is capped by Quaternary age marine (ancient beach) terrace deposits. At the property, the natural southeast to northwest sloping terrain was modified by fill placement to roughly level the building site prior to the circa 1960 dwelling construction.

GEOMORPHOLOGY

The gently seaward sloping surface of the building site comprises a fill mantle overlying a substantially natural platform that is widespread in

the coastal plain of the Carlsbad-Oceanside area of Northwest San Diego County. There, it is generally [+/-] 40-feet above sea level.

The feature comprises the remnant of a late Pleistocene marine terrace and superimposed ancient beach deposits that emerged from the ocean 85 to 120 thousand years ago. The sandy beach sediments, termed marine terrace deposits, were formed on a trancated bedrock platform (i.e. marine terrace) cut by wave action at a time when sea level was roughly 20- to 45-feet below the present ocean level (i.e. during the last Pleistocene Ice Age when global glaciation caused a corresponding lowering of sea level). The process of the ensuing emergence to the present terrace level has been tectonic (i.e. by mountain building forces associated with compression along a global plate boundary) at a continuing, but very gradual, rate. Although imperceptible, the rate of movement is measureable by sophisticated equipment over a period of many months or years.

GEOTECHNICAL CONDITIONS

Earth Materials

Fill (symbol Af) - Based on probing and terrain analysis, the ground beneath the proposed addition comprises fill (or fill-over-loose natural ground) to estimated depths of 3.5- to 5.0-feet at the southerly side yard and 4.0- to 6.0-feet at the southerly side yard. The fill-like soil consists of low density (i.e., medium loose to loose) fine to medium sand with a trace to slightly silty and clayey, that was moist to wet.

Marine Terrace Deposits (symbol - Qmt) - The gently dipping wave-cut marine terrace platform (i.e. bedrock) is capped by an estimated 15- to 25-foot thick prism of pale yellowish brown, trace to slightly silty and clayey, very fine to medium grained sand. These ancient beach sediments are dense, very friable to weakly cemented (imparted by iron oxide and natural salt compounds), non-expansive, very permeable, and very erosive. Bedrock (symbol - Ts) - Apparently, the underlying Santiago formation bedrock forms the lowermost [+/-] 8-feet of the bluff. It consists of crudely stratified dark gray-brown clayey siltstone (i.e., mudstone) that is very stiff to hard, and exhibits moderate to high expansivity. Moreover, the fine grained bedrock is generally impermeable and relatively erosion resistant.

The bluff comprises a near-vertical rise above the sandy beach and a level bench above -- both of which are comprised of bedrock. By contrast, the variably-inclined precipitous erosional cliff face, above, comprises the sandy marine terrace deposits. Of course, these features are concealed by the gunite blanket.

The circa 1978 gunite blanket appeared to be substantially in-place and undisturbed, as orignally constructed. The only evidence of marked distress were some vertical and horizontal cracks at the face of the gunited vertical rise above the beach, and some curvilinear cracks on the inclined ledge. They are attributed to toppling of the bedrock along a joint fracture, and to expansivity pressures, respectively. Notwithstanding, the gunite face also exhibits several minor hairline cracks.

Geologic Structure

Based on outcrops in the general area, available published data, and interpretation of site conditions, the following determinations are made:

- The marine terrace sands are very crudely to indistinctly stratified, with low angle seaward dips.
- The Santiago bedrock strata dip 3- to 6-degrees seaward (i.e. westerly), and are cut by a system of high angle (i.e. near-vertical) joint fractures that strike roughly north-south and east-west, respectively.

Groundwater

Groundwater seepage in ocean bluffs is commonplace in the coastal margin of Southern California. Typically, water derived from incident rainfall and irrigation percolates downward through the relatively permeable granular terrace deposits until reaching relatively impermeable wave-cut surface of the bedrock. The groundwater then migrates seaward at the top of the bedrock until it "daylights" as seepage in the bluff.

Although not evident at the site or proximity due to the gunite blanket, the above described relationships are believed to exist. The drainholes in the gunite are for the purpose of outletting seepage and to preclude the buildings of problematic hydrostatic pressure behind the gunite.

BLUFF/SITE STABILITY

The attendant terrain exhibits no evidence of landsliding, or other deep-seated ground instability. Moreover, there is no evidence of significant downslope creep movement inclined earthen surface or in

superimposed structures. A cursory examination of structures on the contiguous properties likewise revealed no evidence of major distress. Accordingly, apparent overall stability of the site terrain is attributed to the coarse grained, dense and massive characteristics of the thick sequence of terrace deposits, and to the favorable geologic structure and density characteristics of the underlying bedrock. However, the apparent fill and underlying insitu soil exhibits a relatively low density and compactness. Accordingly, the fill is subject to vibro-consolidation by earthquake-induced ground shaking which, evidently, has caused some differential settlement in the dwelling.

DOWNSLOPE CREEP PHENOMENA

The attendant fill and terrace deposits are subject to major downslope movement within the outermost few feet of the slope face. Moreover, the margin of the building pad nearest the slope is also subject to movement.

The natural phenomena affects nearly all sloping terrain to some degree, is most dramatic in fine grained (clayey) soils, and affects granular soils least. It is termed downslope creep, and the affected zone below the slope face and pad margin is termed the creep zone.

By definition, downslope creep is the imperceptibly slow downslope movement of surface and near-surface earth materials under the perpetual force of gravity. The rate and magnitude of downslope creep is a function of slope height, slope inclination, soil density, expansivity and ground moisture.

SEISMICITY/FAULTING

There are no active or potentially active faults that are known to transect the property. The nearest known location of major faulting is the fault zone [+/-] 3-miles offshore, which is associated with the Rose Canyon Fault. The Rose Canyon Fault, which has been classified potentially active to possibly active (i.e. it is controversial), may be linked with the active Newport-Inglewood Structural Zone that parallels the coastline. The magnitude 6.3 Long Beach earthquake was caused by a sudden strain release along this structural zone of faulting. Accordingly, a magnitude 6.0 and 6.5 earthquake may occur within the economic life of the structure (i.e., 50 to 100 years).

Of course, there are numerous other faults in the Southern California region that have the potential for generating strong ground shaking at the site. Accordingly, the planned construction should incorporate standard aseismic design considerations to mitigate the effect of ground shaking induced by a moderate earthquake along a nearby fault (i.e., Newport-Inglewood, Rose Canyon, and Whittier-Elsinore), or by a major or great earthquake generated along a distant fault (i.e., San Andreas or San Jacinto).

Earthquakes during 1968, 1986 and 1987

On 8 April 1968 the magnitude M=6.4 Borrego Valley earthquake occurred. It resulted in a maximum ground acceleration of .029g at San Diego, and an Intensity of V to VI was reported in the general vicinity of the site.

On 8 July 1986 the site was shaken by a magnitude M+6.0 earthquake that was centered on the Mission Hills Fault (within the San Andreas Fault zone), located northwest of Palm Springs in Riverside County. Subsequently on 13 July 1986, the site was again strongly shaken by an earthquake centered [+/-] 28-miles offshore from Oceanside in San Diego County. The causative fault of the 13 July event has not been determined, but it may have been associated with the system of unnamed faults in the deep water area known as the San Diego Trough.

CONCLUSIONS

1. Based on the limited surficial investigation and study described heretofore, it is the opinion of the undersigned that the proposed addition construction to the existing dwelling at the subject property is feasible from an engineering geologic standpoint, subject to the recommendations rendered hereinafter.

2. The attendant terrain exhibits no deleterious geologic conditions that would preclude implementing the planned construction, provided that foundations bear in suitably competent natural ground for uniform support, and that site drainage conditions be improved to minimize or preclude future building movement/distress, and slope erosion.

3. The presence of apparent low density fill and/or loose insitu soil will require deeper than conventional foundations in order to bear in firm natural ground.

4. Attendant subgrade earth materials at the building site exhibit soil expansivity potential in the range of low to nil (i.e. fill and insitu marine terrace deposit sands).

5. The circa 1978 protective gunite blanket on the bluff face has affectively arrested bluff regression, which is an otherwise active process along the Oceanside-Carlsbad coastline. Moreover, except for a few open cracks, the gunite system has survived the test of time (i.e. 12 years) during which it has been battered by numerous assaults by a storm whipped ocean.

6. In the absence of evidence to the contrary (i.e., in the form of marked distress), the gunite blanket is inferred to have a functional subdrain system to effectively collect and dispose of migrating groundwater along the interface between the clayey siltstone bedrock and the overlying marine terrace sands.

7. Surficial sandy terrace deposits on and near a descending slope are prone to minor downslope creep movement.

8. Foundation excavations should encounter relatively loose sand fill underlain by insitu sandy terrace deposits. Accordingly, they may be made utilizing conventional excavation equipment.

9. Groundwater should not be problematic to the proposed construction, or to the continued stability of the bluff.

10. The causative factors of the limited evident distress in the dwelling are attributed to poor planter and side yard drainage, and slight ground adjustments/foundation settlement induced by infrequent earthquake- induced ground shaking (viz., 1968 and 1986).

11. Apparently, the reason the dwelling doesn't exhibit more distress is due to an oversized perimeter foundation and use of a low allowable foundation pressure in its design.

12. Being located in Southern California, the site is subject to strong ground shaking by nearby or distant earthquakes. However, the performance of structures built in compliance with current Uniform Building Code criteria and founded in firm ground, such as occurs within the underlying subgrade earth materials, has generally proven to be satisfactory under conditions of earthquake-induced ground shaking.

13. Local mapped faults and inferred fault traces are deemed inactive in the classical sense, and not problematic from the standpoint of earthquake induced ground rupture or shaking.

14. According to Reference 5, the postulated runup of one or more tsunami events during a 100 year period and a 500 year period is 5.7-feet and 11.3-feet, respectively. Accordingly, the building site is well above those levels of maximum wave action.

15. The design criteria/parameters and construction of the gunited bluff face is unknown to the writer and, accordingly, its integrity can only be evaluated by its evident performance over time (which has been relatively good!). Likewise, since the gunite conceals the terrace deposits and underlying bedrock, an evaluation of bluff stability can also be made based on its evident performance since 1978 (which has been good). In general, the seaward slope above the bluff exhibits friable and highly erosive sand, but no reflection of gross slope instability was evident.

RECOMMENDATIONS

1. A limited subsurface geotechnical investigation of the site should be conducted prior to finalization of foundation and grading plans. The purpose, of course, is to verify the preliminary findings described heretofore, and to provide the basis for specific recommendations including: foundation design criteria and parameters, recommendations, and in-construction inspections.

2. For preliminary design purposes, all foundations for structures should be founded a minimum 12-inches in competent/dense terrace sand, which is generally estimated to 4- to 6-feet below the ground surface. Accordingly, a pier/grade beam foundation system should be considered as a cost effective alternative to conventional footings.

3. All structures on or near sloping terrain (i.e. ocean slope and bluff) should have a minimum embedment in dense terrace sand to a

depth determined by a minimum 10-foot horizontal edge distance, measured from the bottom outside of the footing to the face of the slope.

4. For preliminary design purposes, pursuant to Table 29-B of the Uniform Building code the following criteria are deemed applicable for foundations in the bedrock:

   - Allowable foundation pressure - 2000 lbs/square foot
   - Coefficient of friction - 0.35
   - Lateral bearing - 200 lbs/square foot/foot of depth

5. Structures should be designed in accordance with applicable earthquake standards contained in Chapter 23 of the Uniform Building Code.

6. Unless otherwise recommended by a qualified Soil Engineer based on chemical testing, Type II cement should be used in concrete for all construction.

7. The dwelling should be equipped with a roof gutter-downspout system to minimize ground saturation and nuisance water.

8. All site and roof drainge received should be collected and conducted to the beach in a nonerosive manner. Moreover, surface water should not be allowed to pond on earthen areas (including planters), and no lot pad runoff or drainpipe discharge should be allowed on the unprotected sandy slope below the building site.

9. All slope and pad irrigation should be applied at minimal rates to maintain health and growth. Automatic sprinklers are not recommended. Moreover, slope planting should consist of drought tolerant, deep rooted and light weight species.

10. All earthwork utility trench backfill should be placed in a compacted manner in accordance with recommendations, testing, observation and approval of a qualified Soil Engineer. Alternately, utility trench backfill may consist of washed concrete sand, or equal self-densifying select earth materials.

11. Foundation excavations deeper than 4-feet will probably require shoring due to the attendant loose sand that is prone to caving. Notwithstanding, the contractor should safeguard the safety of workers by monitoring excavation embankments and proximity for evidence of instability (i.e., tension cracks, etc.), and by requiring them to wear protective clothing and equipment at all times when working in excavations or in other potentially hazardous situations.

12. Any open cracks in the gunite blanket should be caulked and maintained to minimize moisture from reaching the expansive bedrock and, thus to minimize future cracking.

13. Finalized project plans and specifications should be reviewed and approved by the project Engineering Geologist upon formulation, to determine compatibility with attendant geotechnical conditions, and

to provide additional recommendations deemed necessary under the circumstances.

14. To verify adequate excavation depths for foundations, the project Engineering Geologist should be notified at least 48 hours in advance of the excavation to provide timely inspection.

15. The applicability of California Civil Code Section 832, (which addresses lateral and subjacent support, excavations, degree of care, damage, and protection of other structures), should be determined by the owner and his designer prior to construction.

CLOSURE/LIMITATIONS:

The undersigned warrants that the work performed in the preparation of this limited report was accomplished in accordance with generally accepted principles and practice in the field of engineering geology. This warranty is in lieu of all other warranties, either expressed or implied.

This report was prepared to augment and facilitate the design engineering of the planned project, and is not for the benefit of a third party.

The findings, conclusions and recommendations are based on information and data secured from the limited field exploration and reconnaissance geologic mapping, the referenced plans and published geotechnical data, and interpretations made therefrom.

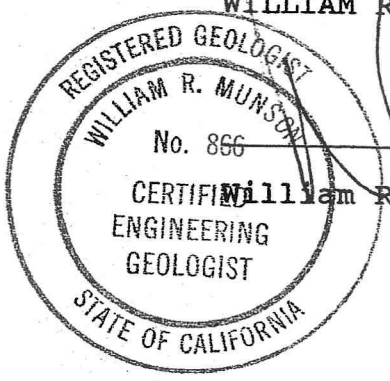
Conditions may be encountered by the construction excavations that may differ from those presented herein. Thus, the consultants should be requested to provide inspections of all excavations.

NOTE: This report describes attendant conditions and renders opinions of site stability that are apparent at the present time, (i.e., February 1990) based on the field examination. Therefore, the undersigned Engineering Geologist assumes no responsibility for the following circumstances: Attendant geotechnical conditions that are not represented by the attendant terrain features and structures; financial gains or losses associated with the sale of the property and future improvements by the owner and/or interested third parties including adjacent property owners; past and future work of a grading, geotechnical or construction nature done by others; and damage to property associated with past and future maintenance or lack of maintenance by others. Moreover, the geotechnical data delineated on Figure 3 are based on the field examination and referenced documents, and interpretations therefrom. Accordingly, the representation of subsurface conditions and relationships at the site are based solely on the reference documents, and projections and interpretations arrived at by use of established geologic methods, and logic. Thus, the degree of accuracy is limited thereby.

Should you have any questions regarding this report, or if I may be of further service, please contact me at your convenience.

Respectfully submitted,

WILLIAM R. MUNSON, INC.

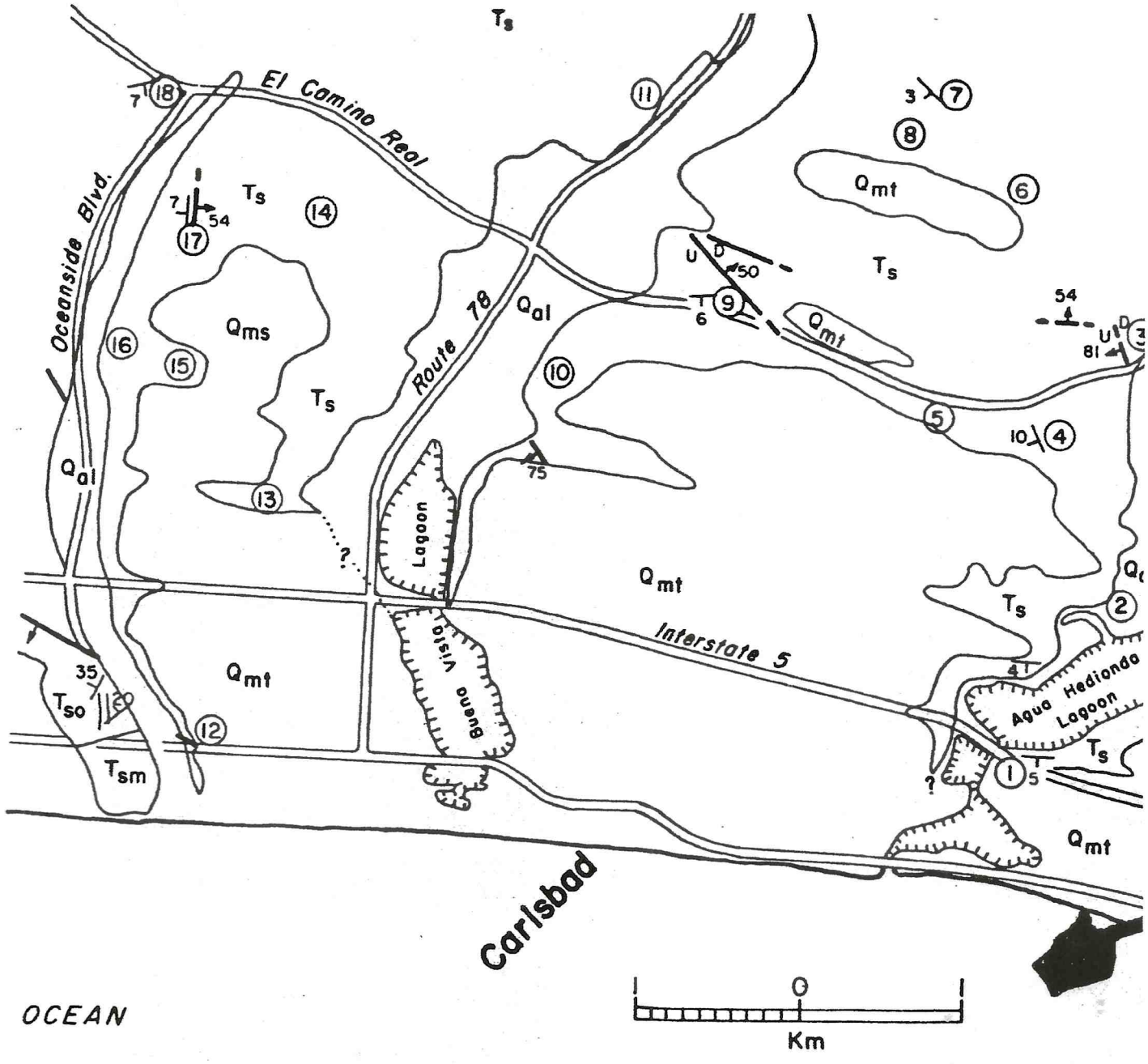


William R. Munson, C.E.G. 866

WRM/slm

Enclosures

Distribution: (4) Addressee



Faults

Ponds or Lagoons

(13) Outcrop, location and number

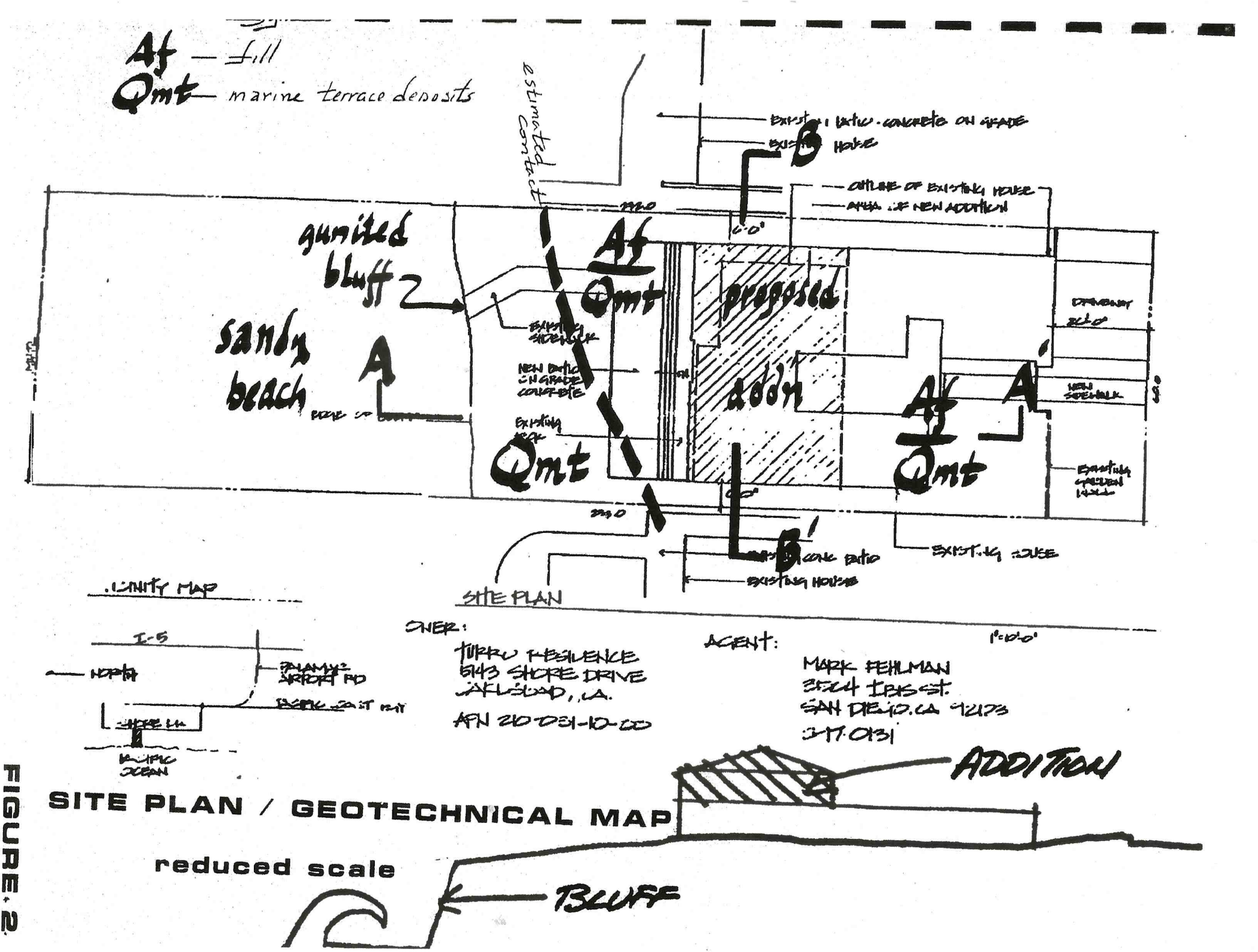
Q_{al}	Alluvial Deposits	T_{sm}	San Mateo Formation (Pliocene)
Q_{mt}	Marine Terrace Deposits	T_{so}	San Onofre Formation (Miocene)
		T_s	Santiago Formation (Eocene)

Young & Berry, 1981

GEOLOGIC INDEX MAP

source: Ref. 1

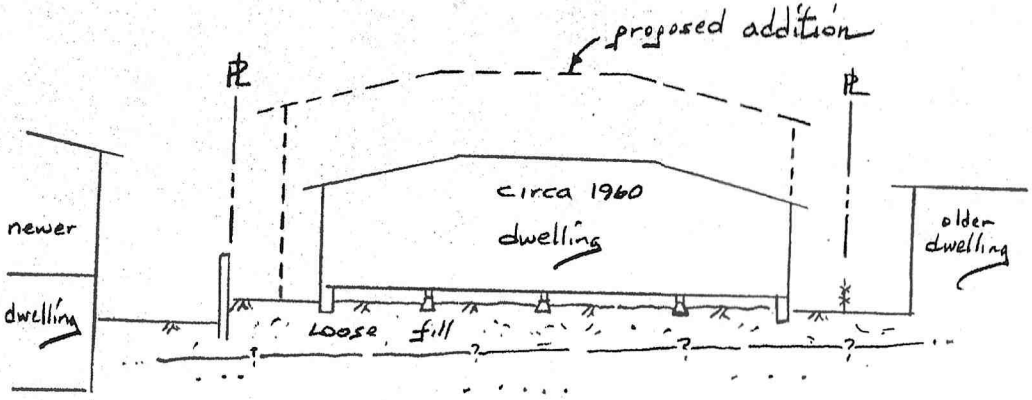
FIGURE 1



SITE PLAN / GEOTECHNICAL MAP

reduced scale

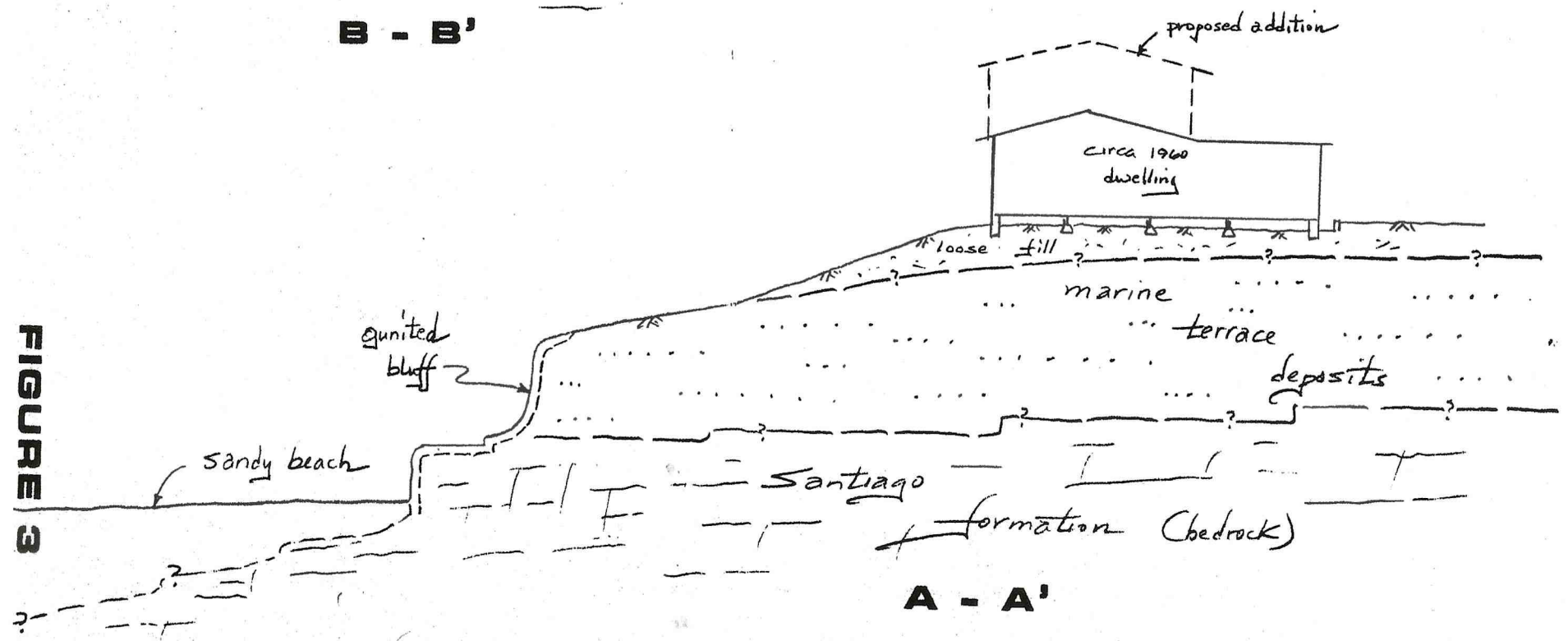
FIGURE 2



B - B'

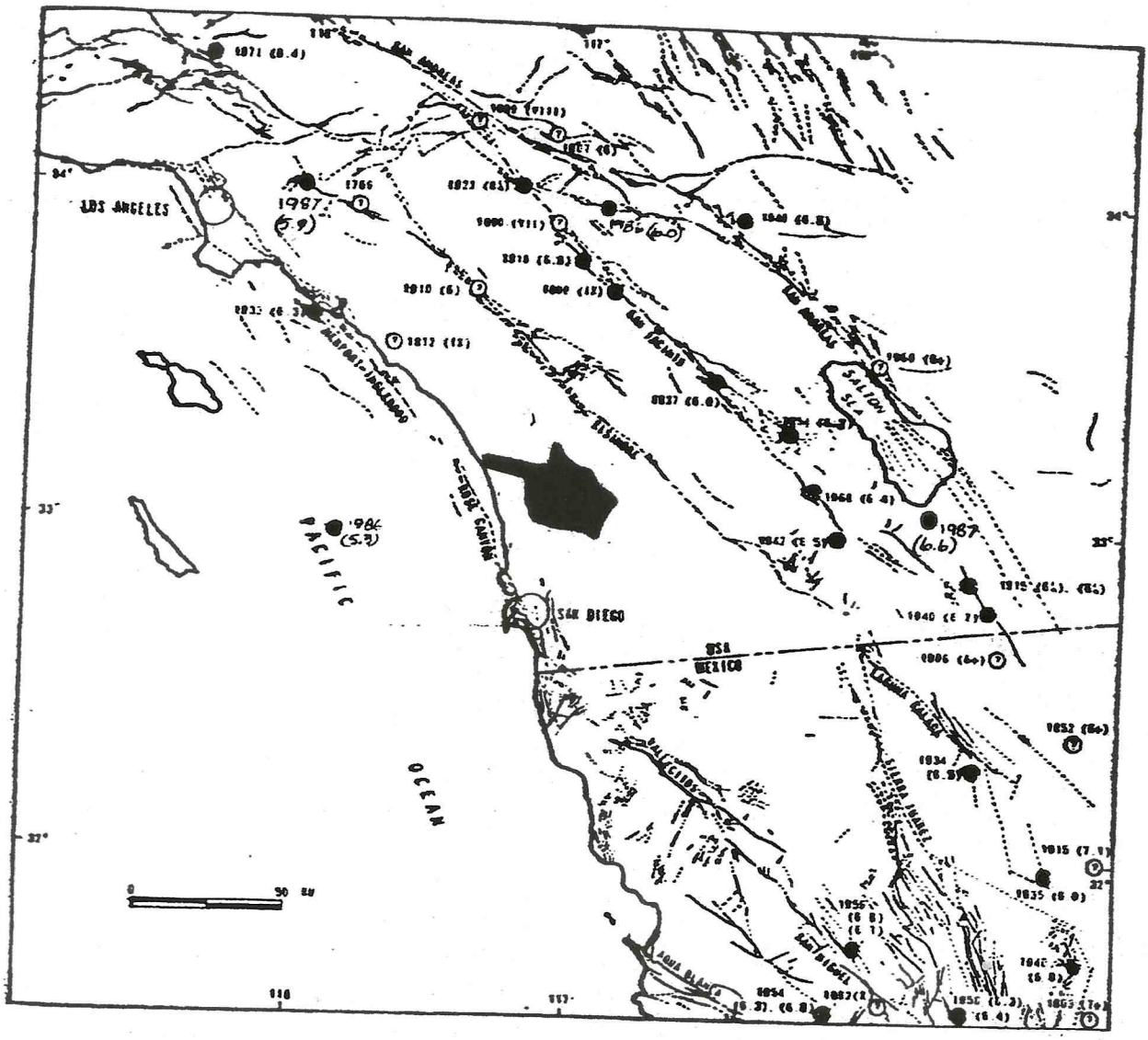
SCHEMATIC GEOLOGIC SECTIONS

scale : 1":20'



A - A'

FIGURE 3



LOCATION OF MAJOR FAULTS IN SOUTHERN CALIFORNIA
AND
EPICENTERS OF EARTHQUAKES OF MAGNITUDE 6.0 OR GREATER

Solid circles show epicenters with year of earthquake and magnitude or maximum intensity. Open circles with question marks indicate poorly known epicenters.

FIGURE 4