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STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, *Governor*

CALIFORNIA COASTAL COMMISSION

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STAFF REPORT: CONSENT CALENDAR

APPLICATION NO.: **4-96-101**

APPLICANT: **Charles S. Offer, Jr.** AGENT: **David Lawrance Gray, F.A.I.A.**

PROJECT LOCATION: **21910 Pacific Coast Highway, City of Malibu, Los Angeles County**

PROJECT DESCRIPTION: **Construct a 867 sq. ft. 2nd story addition & remodel existing two story, single family residence within existing footprint while maintaining 4 bedrooms. Remove 2nd floor bedroom above garage. Install new piles and underpin existing footings within existing building footprint. Construct 'as built' rock revetment along seaward portion of property, and provide offer to dedicate lateral public access.**

Lot area:	8,725 sq. ft.
Building Coverage:	2,972 sq. ft.
Pavement Coverage:	473 sq. ft.
Landscape Coverage:	76 sq. ft.
Parking Spaces:	2 existing
Zoning:	Residential 8A
Project Density:	2-4 du/acre
Height abv fin grade:	29 feet

LOCAL APPROVALS RECEIVED: City of Malibu Planning Department, Approval in Concept dated 6/12/96 and 9/20/96; and City of Malibu Environmental Health Department, Approval in Concept.

SUBSTANTIVE FILE DOCUMENTS: Coastal Permit No. 4-96-014, Riley; Coastal Permit No. 4-94-060, O'Hara; Coastal Permit No. 5-91-663, Pozzo; Coastal Permit No. 4-96-142, Sintek; Coastal Permit No. 5-83-691, Carpentier; Coastal Permit No. 5-90-555, Campbell; Coastal Permit No. 4-93-092, Higgins.

SUMMARY OF STAFF RECOMMENDATION:
Staff recommends approval of the proposed project with four (4) Special Conditions addressing issues related to: the plans conforming to the recommendations of the consulting geologists and engineers; applicant's assumption of risk; construction responsibilities and debris removal; and condition compliance. The proposed residential remodel, addition, and revetment, as conditioned, is consistent with the applicable Coastal Act Policies.

STAFF RECOMMENDATION:

The staff recommends that the Commission adopt the following resolution:

I. Approval with Conditions

The Commission hereby grants a permit, subject to the conditions below, for the proposed development on the grounds that the development, as conditioned, will be in conformity with the provisions of Chapter 3 of the California Coastal Act of 1976, will not prejudice the ability of the local government having jurisdiction over the area to prepare a Local Coastal Program conforming to the provisions of Chapter 3 of the Coastal Act, is located between the sea and the first public road nearest the shoreline and is in conformance with the public access and public recreation policies of Chapter 3 of the Coastal Act, and will not have any significant adverse impacts on the environment within the meaning of the California Environmental Quality Act.

II. Standard Conditions

1. Notice of Receipt and Acknowledgment. The permit is not valid and development shall not commence until a copy of the permit, is signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. Expiration. If development has not commenced, the permit will expire two years from the date this permit is approved by the Commission. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. Compliance. All development must occur in strict compliance with the proposal as set forth in the application for permit, subject to any special conditions set forth below. Any deviation from the approved plans must be reviewed and approved by the staff and may require Commission approval.

4. Interpretation. Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.

5. Inspections. The Commission staff shall be allowed to inspect the site and the project during its development, subject to 24-hour advance notice.

6. Assignment. The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

7. Terms and Conditions Run with the Land. These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

III. Special Conditions:

1. Plans Conforming to Geologic Report Recommendations

Prior to the issuance of the coastal permit, the applicant shall submit for the review and approval of the Executive Director, evidence of the consultant's review and approval of all project plans. All recommendations included in the four Geology and Engineering Reports titled: "Reconnaissance Engineering Geologic Evaluation for Addition and Remodel of 21910 Pacific Coast Highway, Malibu, California", dated March 18, 1996 prepared by Donald B. Kowalewsky, Environmental & Engineering Geology; "309 Statement, Proposed Second Story House Addition and Remodel, 21910 Pacific Coast Highway, Malibu, California", dated June 14, 1996 by Raymond Yang, C. Y. Geotech, Inc.; and "Application No. 4-96-101, Charles Offer Remodel and Addition, 21910 Pacific Coast Highway, Malibu, CA, Addendum # 1", dated September 11, 1996, and "Partial Wave Up-rush Study", dated April 29 and July 24, 1996, prepared by David C. Weiss, Structural Engineer & Associates, Inc., shall be incorporated into all final design and construction plans including the structure's foundation piles, surface drainage, and revetment benchmark. All final plans must be reviewed and approved by the geology, geotechnical engineer, and engineer consultants. The final plans approved by the consultants shall be in substantial conformance with the plans approved by the Commission. Any substantial changes in the proposed development approved by the Commission which may be required by the consultant shall require an amendment to this coastal permit or a new coastal permit.

2. Applicant's Assumption of Risk

Prior to the issuance of the coastal development permit, the applicant as landowner shall execute and record a deed restriction, in a form and content acceptable to the Executive Director, which shall provide: (a) that the applicant understands that the site may be subject to extraordinary hazard from storm waves, wave runup, erosion, and or flooding and the applicant assumes the liability from such hazards; and (b) that the applicant unconditionally waives any claim of liability on the part of the Commission, and agrees to indemnify and hold harmless the Commission, its officers, agents and employees relative to the Commission's approval of the project for any damage due to natural hazards. The

document shall run with the land, binding all successors and assigns, and shall be recorded free of prior liens that the Executive Director determines may affect the interest being conveyed, and free of any other encumbrances that may affect said interest.

3. Construction Responsibilities and Debris Removal

The applicant shall, by accepting this permit, agree and ensure that the project contractor: (a) not store any construction materials or waste where it may be subject to wave erosion and dispersion; (b) not allow any machinery in the intertidal zone; and (c) remove promptly from the beach any and all debris that results from the construction activities.

4. Condition Compliance

All requirements specified in the foregoing condition that the applicant is required to satisfy as a prerequisite to the issuance of this permit must be fulfilled within 120 days of Commission action. Failure to comply with such additional time as may be granted by the Executive Director for good cause, will terminate this permit.

IV. Findings and Declarations

The Commission finds and declares:

A. Project Description and Location

The applicant proposes to construct a 867 sq. ft. second story addition, 29 feet above finished grade, and remodel an existing two story, single family residence with a two car garage within the existing footprint while maintaining four bedrooms in the residence. The existing second floor bedroom above the garage, 440 sq. ft., will be removed. New foundation piles will be installed under the existing building footprint as well as underpinning of existing footings. The pilings will be installed with track mounted drill rig which will access the site through a nearby vacant lot along the sandy beach adjacent to the existing residences landward of the mean sea level. The drill rig will remain onsite for about five working days and exit through the same access point to Pacific Coast Highway. The existing septic system is adequate for the remodeled residence.

The applicant, who has recently purchased the property, also requests approval of an unpermitted "as built" rock revetment along the seaward portion of the property and will provide an offer to dedicate a lateral public access easement across the width of the parcel from the mean high tide line to the base of the rock revetment. The revetment is about 50 feet long, 14 feet high and extends to about a 27 foot width at the base below the sand level at +4.0 mean sea level. The top of the revetment is at about the +13.8 foot elevation. The sandy beach elevation has been observed to range from +11.6 to +13.8 mean sea level during 1996. Most of the revetment is covered with sand during the summer months. A portion of the revetment is located landward beneath the existing deck, extending about 22 feet seaward of the deck at the base as observed by the

applicant's engineer. A prior property owner had completed the construction of the rock revetment in 1983 without the benefit of a coastal development permit. The revetment crosses the applicant's property at the west end and continues downcoast across adjoining parcels to the east. A total of eight to ten properties are protected by this "as built" rock revetment.

The property is a 8,725 square foot lot located on the sandy beach along Pacific Coast Highway between Malibu Pier and Carbon Canyon Road. Exhibits 1 and 2 locate the project site. The property, located between the highway and the high tide line, is developed as a two story, single family residence supported on wooden piles, as is typical for this area. Exhibits 3 - 8 include the site plan and elevations. The rock revetment located between the residence and the ocean is identified on Exhibits 9 and 10.

The Malibu Land Use Plan has designated the site as Residential 8A, which allows 2 - 4 dwelling units per acre, the residence is therefore, considered non-conforming.

The Commission approved coastal permit number 5-90-475, Spector, for the remodel and addition of this same residence in 1990. At that time, no shoreline protective device was identified on the site and the project was approved without special conditions. This coastal permit expired in 1992.

B. Shoreline Development

1. Shoreline Protective Devices

The applicable polices of the Coastal Act which relate to the construction of new shoreline protective devices are as follows:

Public Resources Code Section 30235 states:

> Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.

Public Resources Code Section 30253 states:

> New development shall:
>
> (l) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.

(2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.

The seaward extension of development, i.e. rock revetments or seawalls, on beachfronting lots raises issues with respect to the public access and hazards policies of the Coastal Act.

a. There is an ongoing debate over the effects of seawalls on shoreline stability.

The proposed project involves a shoreline structure which will affect the configuration of the shoreline and the beach profile and have an adverse impact on the shoreline. The precise impact of shoreline structures on the beach is a persistent subject of controversy within the discipline of coastal engineering, and particularly between coastal engineers and marine geologists. Much of the debate focuses on whether seawalls or other factors are the primary cause of shoreline retreat. This debate tends to obscure the distinction between the long-term trends of the shoreline, and the effects of seawalls on those long-term trends, and the shorter term effects that might not be permanent but may significantly alter the width and utility of a beach over the course of a year. The long-term and short-term effects of seawalls will be discussed separately below.

The Coastal Act recognizes that protective devices may be needed to protect existing structures, that such structures may alter shoreline processes, and that those alterations should be minimized and mitigated. The ongoing debate in the literature does acknowledge that seawalls have some effect, at least on the supply of sand. A succinct statement of the adverse effects of seawalls, and the viewpoint of coastal geologists that view beach processes from the perspective of geologic time, is contained in Saving the American Beach: A Position Paper by Concerned Coastal Geologists (March 1981, Skidaway Institute of Oceanography) which was signed by 94 experts in the field of coastal geology (page 4):

> These structures are fixed in space and represent considerable effort and expense to construct and maintain. They are designed for as long a life as possible and hence are not easily moved or replaced. They become permanent fixtures in our coastal scenery but their performance is poor in protecting community and municipalities from beach retreat and destruction. Even more damaging is the fact that these shoreline defense structures frequently enhance erosion by reducing beach width, steepening offshore gradients, and increasing wave heights. As a result, they seriously degrade the environment and eventually help to destroy the areas they were designed to protect.

It is widely recognized that large structures such as groins and breakwaters will have significant and obvious impacts on sand supply and beach profiles, but even a relatively small structure such as the one proposed can have an impact on the site and the adjoining area. As stated in a publication by the State Department of Boating and Waterways

(formerly called Navigation and Ocean Development), Shore Protection in California (1976) (page 30):

> While seawalls may protect the upland, they do not hold or protect the beach which is the greatest asset of shorefront property. In some cases, the seawall may be detrimental to the beach in that the downward forces of water, created by the waves striking the wall rapidly remove sand from the beach.

This impact is reiterated in the paper, "Economic Profiling of Beach Fills" by Herman Christiansen which is contained in the proceedings of Coastal Sediments '77 (November 1977). It states (page 1047):

> Observations at some of the investigated beaches have shown that an optimal profile becomes instable, if structures, such as rocks, groins, revetments, piles, stairs etc., are placed within the wave action zone of a beach. Steady erosions, caused by complex high turbulent surf currents, lead to heavy sand losses.

In contrast to the perspective of coastal geologists, a number of coastal engineers argue that seawalls are symptoms of coastal erosion rather than causes. At least in part, the perspective of coastal engineers reflects their perspective of a time scale that involves the life of a structure. This viewpoint is perhaps best expressed by the renowned expert in beach processes R. G. Dean, who attributes changes in beach profiles to erosion rather than structures, in this discussion from "Coastal Sediment Processes: Toward Engineering Solutions" in Coastal Sediments '87 (page 22):

> Placed along a shoreline with an erosional trend, armoring can perform the intended function of upland stabilization while the adjacent shoreline segments continue to erode. The resulting offset between stabilized and unstabilized segments may be interpreted incorrectly that the armoring has caused the adjacent erosion.

Dean's article goes on to acknowledge potential adverse effects and the responsibility for mitigation of those effects (page 23):

> ...Armoring can cause localized additional storm scour, both in front of and at the ends of the armoring... Under normal wave and tide conditions, armoring can contribute to the downdrift deficit of sediment through decreasing the supply on an eroding coast and interruption of supply if the armoring projects into the active littoral zone.
>
> If armoring is deemed warranted to protect a threatened structure and if rational assessment concludes that installation of the armoring would adversely affect the shoreline, mitigation in the form of periodic additions of beach quality sediment should be considered.

Research on the effects of seawalls continues, and many of the results are not yet available. Much of the research is anecdotal, with diminished beach width evident, but the major causes not clearly identified. The potential role of seawalls remains disturbing, as noted in the conclusion to "Coastal Erosion on the Barrier Islands of Pinellas County, West-central Florida', by William O. Sayre, also in Coastal Sediments '87 (page 1049):

> In two years of surveying, beach erosion and recovery on the barrier islands of Pinellas County has been measured. An undeveloped island's beach recovered quickly after winter-time and hurricane-caused erosion. A highly developed beach without a seawall and near a jetty fared almost as well, recovering more slowly, but showing no net erosion over the two year period. The two other sites, on highly developed barriers and backed by seawalls, have suffered greatly. One narrow beach was completely destroyed by a hurricane and only partially recovered. The other was reduced by at least a quarter and was artificially nourished.

The Commission notes the continuing debate over the effects of seawalls, the lack of convergence in the literature, and the strong identification of viewpoints with the disciplines of coastal engineering and marine geology. The Commission does not believe that it is entirely accidental that this debate has arisen between disciplines with such fundamentally different perspectives on the time scale involved in analyzing physical processes. The Commission believes that more information can be shed on this subject through explicit consideration of long-term and short-term processes active on a beach.

b. The effects of a protective device on an eroding shoreline.

The location of a proposed shoreline structure on the seasonal profiles of a beach (that is, the proximity of the structure to the waves), and the overall erosion pattern of a beach, are two key factors that determine the impact of seawalls. Although debate persists as to whether a shoreline structure is the cause or merely a symptom, it is generally agreed that where a beach is eroding, a seawall will come to define the boundary between the sea and the upland. H.V. McDonald and D.C. Patterson state, in "Beach Response to Coastal Works Gold Coast, Australia" in Coastal Engineering 1984 (page 1537):

> On the persistently eroding beaches at North Kirra and Palm Beach, the receding beachline has effectively placed the seawall progressively further and further seaward on the beach profile until no beach exists at all in front of the wall. Clearly, the establishment of fixed seawall alignments on persistently eroding sections of beach will lead eventually to loss of the beach as a useful recreational amenity.

Whether or not the seawall or erosion leads to the loss of the beach continues to be debated in the literature, but the distinction does not alter the result; when the beach in front of the structure disappears over time the natural shoreward migration of the beach is blocked by the structure. The net effect is documented in a recent National Academy of Sciences Study "Responding to Changes in Sea Level, Engineering Implications" (1987), which provides (page 74):

> A common result of sea wall and bulkhead placement along the open coastline is the loss of the beach fronting the structure. This phenomenon, however, is not well understood. It appears that during a storm the volume of sand eroded at the base of a sea wall is nearly equivalent to the volume of upland erosion prevented by the sea wall. Thus, the offshore profile has a certain "demand" for sand and this is "satisfied" by erosion of the upland on a natural beach or as close as possible to the natural area of erosion on an armored shoreline...

While the experts continue to discuss the exact manner in which seawalls affect shoreline processes, the Commission must make decisions about specific projects. The Commission notes that the debate focuses on the cause of erosion rather than the loss of the beach, and begs the critical factual question of whether or not the beach disappears.

On an eroding shoreline fronted by a beach, a beach will be present as long as some sand is supplied to the shoreline. As erosion proceeds, the entire profile of the beach also retreats. However, this process stops when the retreating shoreline comes to a seawall. While the shoreline on either side of the seawall continues to retreat, shoreline retreat in front of the seawall stops. Eventually, the shoreline protected by the seawall protrudes into the water, with the winter MHT fixed at the base of the structure. The Commission is led inexorably to the conclusion that if the seawall works effectively on a retreating shoreline, it results in the loss of the beach, at least seasonally. If the shoreline continues to retreat, however slowly, the seawall will be where the beach was, and where the beach would be absent the presence of the seawall. This represents the loss of a beach as a direct result of the seawall. The Commission has observed this phenomena up and down California's coast, where a seawall has successfully halted the retreat of the shoreline, but only at the cost of usurping the beach. Although this may occur only slowly, the Commission concludes that it is the inevitable effect of constructing a seawall on an eroding shoreline. For such areas, even as erosion proceeds, a beach would be present in the absence of a seawall.

c. <u>The effects of shoreline structures on an "equilibrium" shoreline</u>.

The term equilibrium cannot accurately be applied to a feature that varies as much as a shoreline. Almost all California beaches vary dramatically in profile between winter and summer; the variation in the width of beach that can accompany that seasonal change can be over 200 feet. The persistent analytical problem in dealing with shore processes in California is to try to discern long-term trends in shoreline change from the normal, seasonal variation. The term "dynamic equilibrium" has come into use and has been applied to beaches that vary seasonally in width, but are approximately the same when summer (or winter) profiles are compared over a number of years. Essentially, a beach in dynamic equilibrium is one where the supply and loss of sand are in approximate balance (See Griggs and Jones, 1984). This term must be used with some caution, as there will be some variation in width even seasonally, shown graphically by J. W. Johnson in "Seasonal Bottom Changes, Bolinas Bay, California", <u>Proceedings of the Twelfth Coastal</u>

Engineering Conference, September 13-18, 1970. That variability can mask long-term changes (either erosion or accretion) unless sufficient data is available to detect a clear direction. This discussion will be equally applicable to shorelines that are truly in "dynamic equilibrium", that is, not eroding on the long-term, and to shorelines that are eroding at a relatively slow rate so that seasonal changes are approximately the same when viewed in the time frame of a few years.

The question of the effects of seawalls on shorelines that are in 'dynamic equilibrium' is more complicated, and research on the effects is even more anecdotal. At the same time, because the short-term effects may be of great importance, much more rigorous data collection is required in order to establish any clear effects. The Corps of Engineers has begun funding research efforts into the effects of seawalls through their Coastal Engineering Research Center (CERC). One of the research efforts funded by CERC is that of Professor Gary Griggs of UC Santa Cruz. Professor Griggs is monitoring the profiles of beaches in Monterey Bay over the course of several years, and comparing the profiles of beaches with seawalls to control beaches without seawalls. Professor Griggs has completed work during the relatively storm-free winter of 1985-86, and presented his results on October 30, 1987 before the 1987 Conference of the California Shore and Beach Preservation Association. Professor Griggs is the author of various popular and technical works on beach processes and recently chaired a technical discussion of the effects of seawalls on beaches at "Coastal Sediments '87", a specialty engineering conference in coastal sediment processes. Griggs' work appears to establish two distinct effects of seawalls. First, beach profiles in front of seawalls differ from profiles along the control beaches selected during the process of beach erosion. Although the beach profiles are similar at their most accreted (summer profile) stage and at their most eroded (winter profile) stage, the beaches monitored were narrower and steeper in front of seawalls during the period when the beach was eroding from the summer profile to the winter profile. This difference represents a temporal loss in beach width in the short term, even where the time series is of too short a duration to detect erosion patterns on the beach. Second, beach profiles at the end of a seawall are further landward than natural profiles. This effect appears to extend for a distance of about 6/10 the length of the seawall. This effect represents both a spacial and temporal loss of beach width directly attributable to seawall construction. Dr. Griggs' own conclusion about the effects of seawalls, in a manuscript submitted to the Journal of Coastal Restoration titled "The Impacts of Seawalls on Beaches" is:

> Based on 12 months of surveying at 4 locations in northern Monterey Bay (including a winter of only mild or moderate wave conditions) where seawalls or revetments abut unprotected beaches, some consistent seasonal beach changes have been documented. These changes or differences in beach profiles are a result of greater wave reflection from the protective structures than from the adjacent control beaches. All of these changes observed in this study appear to be temporary or seasonal in nature and are best developed in the fall and winter months during the transition from summer swell to winter storm conditions.

The seasonal effects documented include:

1) Loss of the summer berm sooner in front of all seawalls relative to adjacent unprotected control beaches.

2) Erosion of the berm in front of a vertical impermeable seawall (due to greater wave reflection) before berm loss on an adjacent beach backed by a permeable sloping revetment.

3) A lack of significant difference in winter beach profiles seaward of seawalls or revetments and adjacent control beaches.

4) Loss of beach up to 150 m downcoast from seawalls due to reflection from end of structure.

5) Late spring/summer berm rebuilding takes place independently of any protective structure leaving a uniform alongshore berm crest.

The Commission concludes from this information that seawalls have serious adverse effects on the width of the beach, even when examined over a relatively short period on a beach that might not be eroding. Although the beach profile at its widest and narrowest may not differ significantly, the beach width and utility will differ markedly during the period when the beach is changing from summer to winter profile. These effects have been observed by the Commission's staff over the years, and can lead to a situation where there is a narrow but usable beach on an unprotected portion of the beach, while the adjacent, protected beach is not passable.

The 1981 statement signed by 94 respected coastal geologists indicates that important public interests in shoreline resources can be harmed through the introduction of shoreline defense structures. Thus, in evaluating an individual project, the Commission must assume that the principles reflected in that statement are applicable. To do otherwise would be inconsistent with the Commission's responsibilities under the Coastal Act to protect the public's interest in shoreline resources.

d. Mechanisms of Impact.

Concern about adverse impacts on sand supply particularly apply to vertical seawalls because they reflect most wave energy. This is a well known impact of vertical seawalls. For example, the generally accepted "standard" for designing shoreline structures, the U.S. Army Corps of Engineers' Shore Protection Manual (1983) has several references to the proficiency of vertical seawalls to reflect wave energy and as a result scour the beach it fronts (see pages 1-16, 2-113, 5-4, 6-15). This impact can be lessened somewhat by the placement of rock (or rubble) at the base of the wall, but nevertheless, the wall will still cause scour and steepening of the beach profile.

Although they do not have as great an impact as smooth, vertical seawalls, rock revetments, have effects on the beach sand in front of and around the structure. A rock seawall operates on the principle that the wave's energy is dissipated within the voids of the wall, therefore producing less reflected wave energy. However, the rock seawall will still reflect enough energy to change the beach profile, steepen the beach, and cause accelerated erosion of the downcoast area. One mechanism that accounts for rock walls' impact on beaches is stated in "The Role of Wave Reflection in Coastal Processes" in Coastal Sediments '77 by Richard Silvester (page 653):

> Rubble-mound structures can reflect long period wave components with little dissipation and hence short-crested phenomena [waves] in front of and downcoast from them should be considered in design and maintenance.

Moreover, the literature on coastal engineering repeatedly warns that unprotected properties adjacent to the seawall may experience increased erosion. A rock wall very often protrudes seaward from development and exacerbates this situation. Field observations have verified this concern, see for example the paper by Gerald G. Kuhn of the Scripps Institution of Oceanography entitled "Coastal Erosion along Oceanside Littoral Call, San Diego County, California" (1981). In this paper, it is written and pictorially illustrated that erosion on properties adjacent to rock seawall is intensified when wave run-up is high. This subject is presently being researched by scientists at Oregon State University. The preliminary results of that work was reported in "Laboratory and Field Investigations of the Impact of Shoreline Stabilization Structures on Adjacent Properties" by W.G. McDougal, M.A. Sturtevant, and P.D. Komar in Coastal Sediments '87. These researchers are investigating the length of shoreline affected by heightened erosion adjacent to seawalls. Their conclusion is (page 972):

> Results to date indicate that erosion at the ends of seawalls increases as the structure length increases. It was observed in both the experimental results and the field data of Walton and Sensabaugh (1978) that the depth of excess erosion is approximately 10% of the seawall length. The laboratory data also revealed that the along-coast length of excess erosion at each end of the structure is approximately 70% of the structure length.

A discussion of the physical processes of wave run-up on a natural shore will help establish the effects of seawalls on shoreline processes. Sandy beaches are dynamic systems, the individual grains of sand adjust quickly to reflect both the overall supply of sediment and the ongoing forces of waves. A typical non-storm profile of the beach has adjusted to a low-energy wave environment, reflecting the short period, low energy waves that strike the beach. When attacked by longer period, higher energy waves, the beach adjusts by changing its profile. First, higher wave energy erodes material from the foreshore and deposits the material off-shore in a bar. Second, the shoreline profile flattens to absorb the greater amount of wave energy, even with waves breaking on the bar. These adjustments are fundamental to the shore's adjustment to high wave energy. The migration of the material to an energy dissipation far from the inland extent of the

beach. The dynamic process of eroding material from the foreshore enables the shoreline to absorb wave energy.

This process goes on continuously, if a given shore profile is not sufficient to absorb wave energy without further erosion, additional material is moved from the shore to the bar to increase the distance between the bar and the inland extent of the wave uprush. The value of the bar cannot be over-emphasized, it is on the bar that winter waves break, and the dynamic processes of the actual shoreline are affected by wave uprush, not actual breaking waves.

When a seawall is installed, there are dramatic effects on the shoreline. Material formerly available to nourish the bar is now unavailable because it is either behind the seawall, or has been replaced by the seawall. As a result, the bar receives less nourishment. This makes the bar less effective in causing waves to break offshore, and results in greater wave energy reaching the shoreline. That energy is then dissipated by uprush and reflection against the face of the seawall. However, since more energy comes on-shore, more energy is reflected and sand is scoured from the base of the revetment.

The Commission concludes from the opinion of experts and from an analysis of the process of shoreline dynamics that placement of a seawall within the areas of a shore affected by those processes adversely affects shoreline processes in front of the seawall as well as property on either side of the seawall. Obviously the impact of a seawall is greater the more often it is exposed to wave attack, and seawalls located far up the beach have less impact than seawalls lower on the beach. Past Commission actions have approved shoreline protection devices similar to that proposed by the applicant only if the device served coastal-dependent uses, protected existing structures in danger from erosion, or protected new structures which were infill development, provided that they tied into adjacent devices to minimize impacts on adjacent properties and that they were designed to eliminate or mitigate adverse impacts on local shoreline sand supply. In any of these three cases, the Commission has required that the protective device approved is the preferable alternative to minimize adverse environmental impacts.

There is a concern about adverse impacts on sand supply due to the revetment. This impact is lessened somewhat by the rock revetment design, but nevertheless, the revetment will still cause scour and steepening of the beach profile. A rock revetment operates on the principal that the wave's energy is dissipated within the voids of the wall, therefore producing less reflected wave energy. However, the revetment will still reflect enough energy to change the beach profile, steepen the beach, and cause accelerated erosion of the downcoast area.

The Commission concludes from the opinion of experts and from an analysis of the process of shoreline dynamics that placement of a revetment within the areas of a shore affected by those processes adversely affects shoreline processes in front of the revetment as well as property on either side of the revetment. Obviously, the impact of a revetment

is greater the more often it is exposed to wave attack, and revetments located far up the beach have less impact than those lower on the beach. In this case, the revetment is located far back from the beach, about 400 feet from the mean high tide line as surveyed in 1967 and even further landward as observed on March 1, 1996.

The Coastal Act recognizes that protective devices may be needed to protect existing structures, that such devices may alter shoreline processes, and that those alterations should be minimized and mitigated. The proposed rock revetment is located seaward of the existing residence and the existing foundation piles. The revetment encroaches about 22 feet seaward of the existing deck and is placed in a pyramid fashion at + 4.0 mean sea level. The weight of the rocks are estimated at four to six tons each. This "as built" rock revetment is part of a continuous shoreline protective device protecting eight to ten properties to the east, including the applicant's property. This application is only for the portion of the revetment across this applicant's property. The remaining portion of the revetment will be the subject of a subsequent application. The revetment extends across the applicant's 50 foot wide lot. The applicant has submitted a Partial Wave Up-rush Study, a letter, and an Addendum Report #1 regarding the project site and the design of the proposed revetment by David C. Weiss, Structural Engineer & Associates. These reports conclude that:

> ... the existing rock revetment on the subject site is adequate to provide a measure of protection to the timber pile system.

However, the proposed revetment is located in the storm wave uprush zone and will exacerbate erosion of the beach and steepen the beach profile. The Commission finds that the negative impacts of this revetment must be weighed against the property owner's need to protect the residence behind it. The Commission recognizes that the revetment may change the beach by steepening it and increasing erosion around it; this in turn will interfere with and decrease the amount of sandy beach available for public access. Based on Coastal Act Sections 30250 (a) and 30253, the Commission has approved coastal permits similar in nature to the subject application for development on beachfront lots where the proposed structure is located in an existing developed area, and is designed to minimize and/or mitigate adverse impacts on coastal resources and access.

Past Commission action also approved shoreline protective devices similar to that proposed by the applicant only if the device served coastal-dependent uses, protected existing structures, or protected new structures which were infill development, provided that they tied into adjacent devices to minimize impacts on adjacent properties. The proposed revetment will protect an existing residential structure and does tie into the downcoast portion of this same revetment on the adjoining property to the east.

2. Public Access

All beachfront projects requiring a coastal permit must be reviewed for compliance with the public access and scenic provisions of Chapter 3 of the Coastal Act.

Public Resources Code Section 30210 states that:

> In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.

Public Resource Code Section 30211 states that:

> Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.

Public Resources Code Section 30212 states that:

> (a) Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where
>
> (l) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources,
>
> (2) adequate access exists nearby, or,
>
> (3) agriculture would be adversely affected. Dedicated access way shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability of the access way.

Section 30221 of the Coastal Act states that:

> Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.

Section 30251 of the Coastal Act states that:

> The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those

designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

The Commission has required public access to and along the shoreline in new development projects and has required design changes in other projects to reduce interference with access to and along the shoreline. The major access issue in such permits is the occupation of sand area by a structure and the impacts of the structure on the beach profile and the future availability of sand supply, in contradictions of Coastal Act policies 30211, 30212, and 30221. However, a conclusion that access may be mandated does not end the Commission's inquiry. As noted, Section 30210 imposes a duty on the Commission to administer the public access policies of the Coastal Act in a manner that is "consistent with ... the need to protect ... rights of private property owners..." The need to carefully review the potential impacts of a project when considering imposition of public access conditions was emphasized by the U.S. Supreme Court's decision in the case of Nollan vs. California Coastal Commission. In that case, the court ruled that the Commission may legitimately require a lateral access easement where the proposed development has either individual or cumulative impacts which substantially impede the achievement of the State's legitimate interest in protecting access and where there is a connection, or nexus, between the impacts on access caused by the development and the easement the Commission is requiring to mitigate those impacts.

Interference by the proposed revetment has a number of effects on the dynamic shoreline system and the public's beach ownership interests. First, changes in the shoreline profile, particularly changes in the slope of the profile, alter the useable area under public ownership. A beach that rests either temporarily or permanently at a steeper angle than under natural conditions will have less horizontal distance between the mean low water and mean high tide lines. This reduces the actual area in which the public can pass on their property. The second effect on access is through a progressive loss of sand as shore material is not available to nourish the offshore sand bar. The lack of an effective bar can allow such high wave energy on the shoreline that materials may be lost far offshore where it is no longer available to nourish the beach. The effect of this on the public's beach is again a loss of area between the mean high water line and the actual water. Third, shoreline protective devices, such as revetments, cumulatively affect public access by causing greater erosion on adjacent public beaches. This effect may not become clear until such devices are constructed individually along a shoreline and they reach a public beach. Finally, revetments interfere directly with public access by their occupation of beach area.

The Commission's experience in reviewing shoreline residential projects in Malibu indicates that individual and cumulative impacts on access of such projects can include among others, encroachment on lands subject to the public trust thus physically excluding the public; interference with natural shoreline processes which are necessary to maintain publicly-owned tidelands and other public beach areas; overcrowding or congestion of such tideland or beach areas; and visual or psychological interference with the public's access to an ability to use and cause adverse impacts on public access such as above.

The State Lands Commission, in letters dated July 22, 1996 and October 29, 1996 reviewed the proposed remodel of the residence and the "as built" revetment. The State Lands Commission staff noted that they do not have sufficient information to determine whether the project will intrude upon state sovereign lands and accordingly asserted no claims.

The applicant has included in the project description the provision for an offer of lateral public access across the sandy beach between the base of the revetment and the mean high tide line. Therefore, the Commission need not make a determination as to whether imposition of an access easement would be appropriate in this project. The applicant's offer to dedicate lateral public access will adequately mitigate any potential adverse access impacts resulting from the proposed revetment.

3. Hazards & Geologic Stability

Regarding the geologic hazard, the applicant submitted a geologic report titled: "Reconnaissance Engineering Geologic Evaluation for Addition and Remodel of 21910 Pacific Coast Highway Malibu, California", dated March 18,1996, by Donald B. Kowalewsky. The geology report addresses the site geology issues by noting that:

> Structures founded into bedrock, should not be significantly affected by liquefaction. ... Because no active faults are believed to underlie the building site, future potential for surface fault rupture beneath the structure is remote. ... No evidence for large scale landslides exists north of the highway across the property.

The applicant submitted a letter dated July 30, 1996 from Dimitry K. Vergun, Structural Engineer, regarding a review of the foundation system. The letter states:

> This letter is intended to notify the Coastal Commission that the existing foundation system at 21910 P. C. H., Malibu, after underpinning the existing concrete footings and after the addition of some piles under the existing footprint, behind the stringline, is adequate to support the proposed second story addition.

The applicant submitted a letter dated June 14, 1996 from Raymond Yang, C. Y. Geotech, Inc. which states:

> Based on this finding of the investigation as described in this referenced reports and provided the recommendations in these reports are followed, the proposed building site will be safe from geologic hazards including landslide, settlement, and slippage, and the development of the proposed house addition and septic system will not adversely affect geologic stability of adjacent properties.

Therefore, the applicant's consultants determined that the proposed project site is suitable from a soils and engineering geologic standpoint for construction of the proposed

residential remodel and addition development, provided their recommendations are followed. Special condition number one (1) provides for final review and approval by the consulting geologist, geotechnical engineer, and structural engineer of the final project design and foundation plans for the project prior to the issuance of the permit.

The proposed revetment and remodeled residence will extend into an area exposed to wave attack, flooding and erosion hazards that in the past have caused significant damage to development along the California coast, including the Malibu coastal zone and the beach area of the subject property. The Coastal Act recognizes that new development, such as the revetment and residence, may involve the taking of some risk. The Coastal Act policies require the Commission to establish the appropriate degree of risk acceptable for the proposed development and to determine who should assume the risk. When development in areas of identified hazards is proposed, the Commission considers the hazard associated with the project site and the potential cost to the public, as well as the individual's right to use the property.

The Commission finds that due to the unforeseen possibility of storm waves, wave runup, erosion, and or flooding, the applicant shall assume these risks as a condition of approval. Because this risk cannot be completely eliminated, the Commission is requiring the applicant to waive any claim of liability on the part of the Commission for damage to life or property which may occur as a result of the permitted development. The applicant's assumption of risk, special condition number two (2), executed and recorded on the property deed, will show that the applicant is aware of and appreciated the nature of the hazards which exist on the site, and which may adversely affect the stability or safety of the proposed development.

Lastly, as noted above, the project involves some demolition and construction on a beachfront lot subject to tidal influence. Construction equipment, materials and demolition debris could pose a significant hazard if used or stored where subject to wave contact or situated in a manner that a hazard is created for beach users. New foundation piles will be installed under the existing building footprint as well as underpinning of existing footings. The pilings will be installed with track mounted drill rig which will access the site through a nearby vacant lot along the sandy beach adjacent to the existing residences landward of the mean sea level. The drill rig will remain onsite for about five working days and exit through the same access point to Pacific Coast Highway. Therefore, the Commission finds it necessary to impose condition number three (3) requiring construction responsibilities and debris removal. This condition will ensure that the construction of the proposed project will minimize risks to life and property in this public beach area which is subject to wave hazards.

The Commission finds that only as conditioned to incorporate all recommendations by the applicant's consulting geologists and engineers, an applicant's assumption of risk, and a construction responsibilities and debris removal, will the proposed project be consistent with Section 30253 of the Coastal Act.

4. Stringline Review

Through Coastal Act Sections 30210, 30211, 30251 and 30253, the Commission has developed the "stringline" policy to control the seaward extent of buildout in past permit actions. As applied to beachfront development, the stringline limits extension of a structure to a line drawn between the nearest corners of adjacent structures and limits decks to a similar line drawn between the nearest corners of adjacent structures and decks.

The Commission has applied this policy to numerous past permits involving infill on sandy beaches and has found it to be an effective policy tool in preventing further encroachments onto sandy beaches. In addition, the Commission has found that restricting new development to building and deck stringlines is an effective means of controlling seaward encroachment to ensure maximum public access as required by Sections 30210 and 30211 and to protect public views and scenic quality of the shoreline as required by Section 30251 of the Coastal Act.

The applicants have submitted a plan with a stringline connecting the existing residences on either side of the project site. The plan indicates that the existing first floor and deck structure are located behind the stringline with the adjacent buildings. The first floor walls will be retained in the proposed project. The proposed second floor, new development, will be setback about 34 feet from the first floor and, thus, will meet the building stringline.

Therefore, the Commission finds that the proposed project does conform to this setback. As proposed the additions to this project, except for the revetment discussed above, will not extend new development further seaward than adjacent development, minimizing potential impacts to public access opportunities, public views and the scenic quality along the sandy beach.

And lastly, the Commission reviews the publicly accessible locations along adjacent public roads and the sandy beach where the proposed development is visible to assess visual impacts to the public. The Commission examines the building site and the size of the building. The existing residence and solid wall along Pacific Coast Highway already blocks public views from the highway to the beach and ocean. Although the proposed second floor addition and remodel may be visible from the public sandy beach, however, the existing two story residence blocks inland views from the beach. Moreover, the more scenic inland views of the Santa Monica Mountains as viewed from the water are well above the proposed development. Thus, the proposed addition and remodel will not adversely affect existing public views.

Conclusion

The proposed project, as conditioned, will have no individual or cumulative adverse impacts on public access and visual quality. The applicant is also aware of the hazards associated with development of beachfront property. Therefore, the Commission finds the

project, as conditioned, is consistent with Sections 30210, 30211, 30212, 30221, 30235, 30251, and 30253 of the Coastal Act.

C. Violation

Although development has taken place prior to submission of this permit application (the rock revetment), consideration of the application by the Commission has been solely based upon the Chapter 3 policies of the Coastal Act. Review of this permit does not constitute a waiver of any legal action with regard to any violation of the Coastal Act that may have occurred.

Because a portion of the proposed project includes after the fact development (rock revetment) and requires a coastal development permit in order to be in conformance with the Coastal Act. The Commission finds it necessary to require the applicant to fulfill all the special conditions as a prerequisite to the issuance of this permit, as required by special condition number four (4) within a reasonable period of time, within 120 days of Commission action. Only as conditioned is the proposed development consistent with all of the Chapter 3 policy sections listed above.

D. Septic System

The Coastal Act includes policies to provide for adequate infrastructure including waste disposal systems.

Section 30231 of the Coastal Act states that:

> The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

Section 30250(a) of the Coastal Act states in part that:

> New residential, ... development, ... shall be located within, ... existing developed areas able to accommodate it ... and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources.

The proposed development includes continuing the use of the existing septic system by connecting it to the remodeled residence. The applicant has submitted an 'Approval In Concept' for the sewage disposal system from the Environmental Health, City of Malibu. This approval indicates that the sewage disposal system for the project in this application

complies with all minimum requirements of the City of Malibu Uniform Plumbing Code. The Commission has found in past permit actions that compliance with the health and safety codes will minimize any potential for waste water discharge that could adversely impact coastal waters. Therefore, the Commission finds that the proposed septic system is consistent with Sections 30231 and 30250 of the Coastal Act.

E. Local Coastal Program

Section 30604 of the Coastal Act states that:

> (a) Prior to certification of the local coastal program, a coastal development permit shall be issued if the issuing agency, or the commission on appeal, finds that the proposed development is in conformity with Chapter 3 (commencing with Section 30200) and that the permitted development will not prejudice the ability of the local government to prepare a local coastal program that is in conformity with Chapter 3 (commencing with Section 30200).

Section 30604(a) of the Coastal Act provides that the Commission shall issue a coastal permit only if the project will not prejudice the ability of the local government having jurisdiction to prepare a Local Coastal Program which conforms with Chapter 3 policies of the Coastal Act. The preceding sections provide findings that the proposed project will be in conformity with the provisions of Chapter 3 if certain conditions are incorporated into the project and accepted by the applicant. As conditioned, the proposed development will not create adverse impacts and is found to be consistent with the applicable policies contained in Chapter 3. Therefore, the Commission finds that approval of the proposed development, as conditioned, will not prejudice the City of Malibu's ability to prepare a Local Coastal Program for this area of Malibu that is also consistent with the policies of Chapter 3 of the Coastal Act as required by Section 30604(a).

F. California Environmental Quality Act

The Coastal Commission's permit process has been designated as the functional equivalent of CEQA. Section 13096(a) of the California Code of Regulations requires Commission approval of Coastal Development Permit applications to be supported by a finding showing the application, as conditioned by any conditions of approval, to be consistent with any applicable requirements of CEQA. Section 21080.5 (d)(2)(i) of CEQA prohibits a proposed development from being approved if there are feasible alternatives or feasible mitigation measures available that would substantially lessen any significant adverse impacts that the activity may have on the environment.

As discussed above, the proposed project has been mitigated to incorporate all recommendations by the applicant's consulting geologists and engineers, an applicant's assumption of risk, a construction responsibilities and debris removal condition, and condition compliance. As conditioned, there are no feasible alternatives or mitigation measures available, beyond those required, which would lessen any significant adverse

impact that the activity may have on the environment. Therefore, the Commission finds that the proposed project, as conditioned to mitigate the identified impacts, is the least environmentally damaging feasible alternative and is found consistent with the requirements of CEQA and the policies of the Coastal Act.

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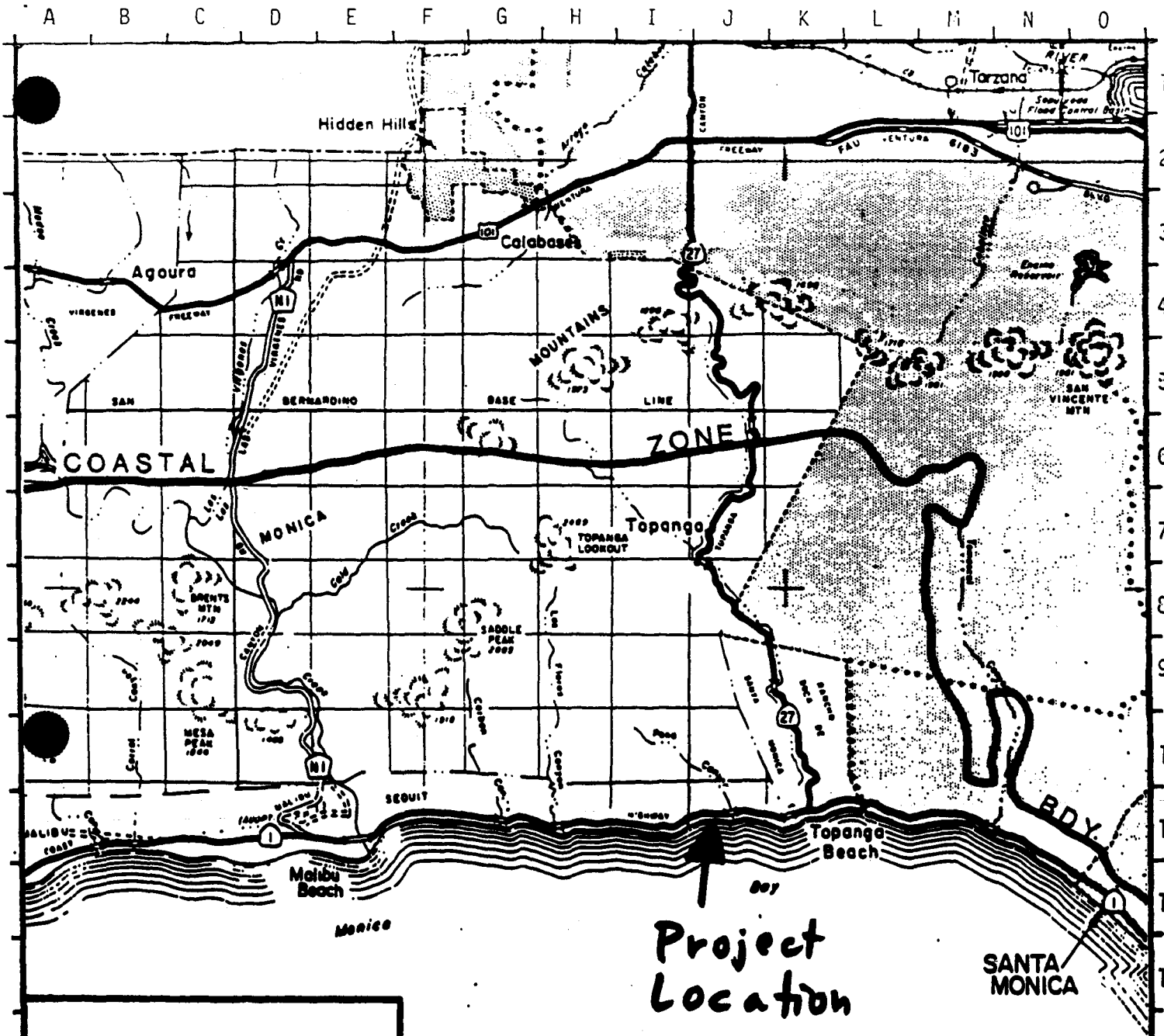


EXHIBIT NO. 1
APPLICATION NO. 4-96-101
Project Location

California Coastal Commission

LOCATION MAP

1 0 1 2 miles

N

County of Los Angeles

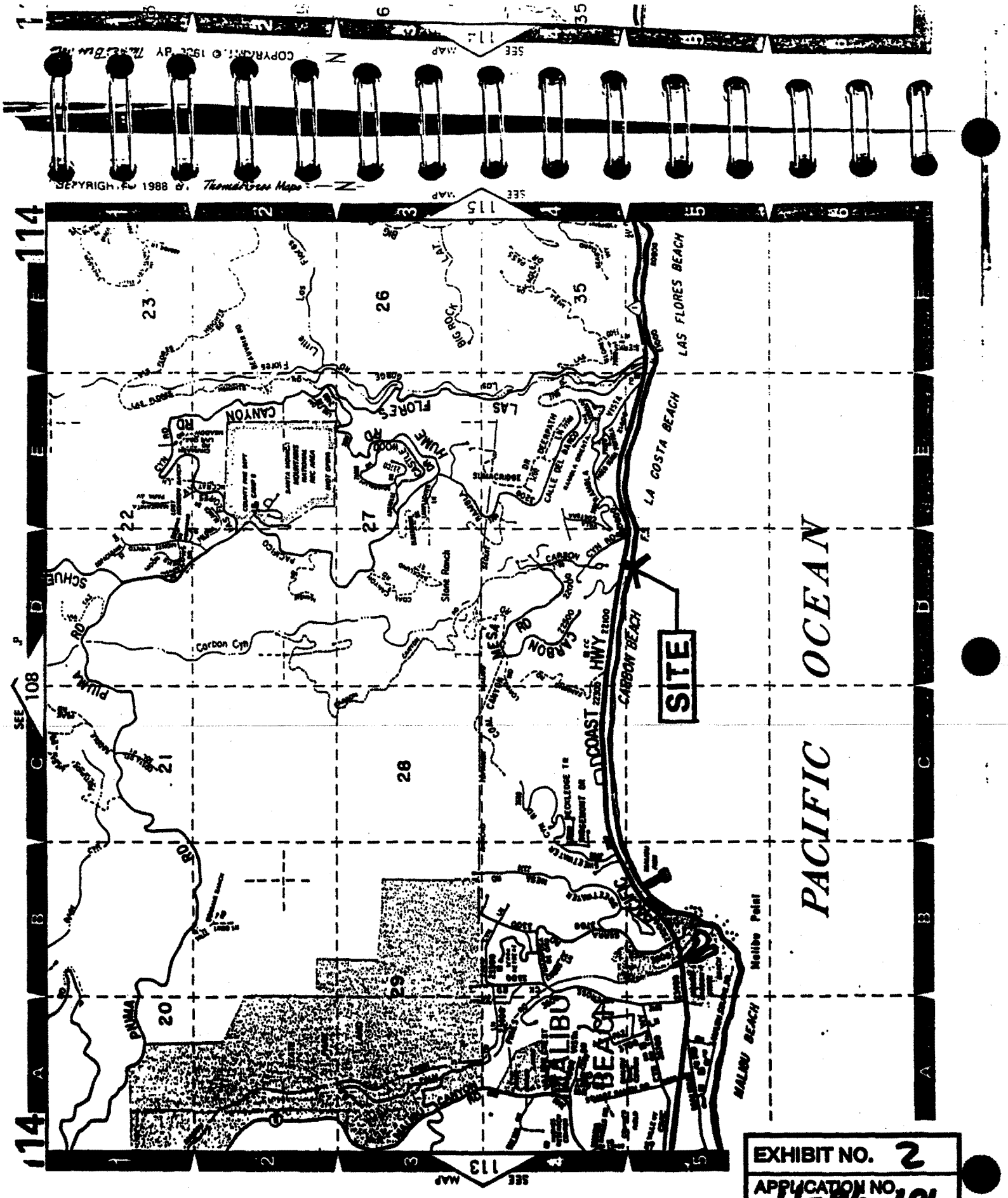
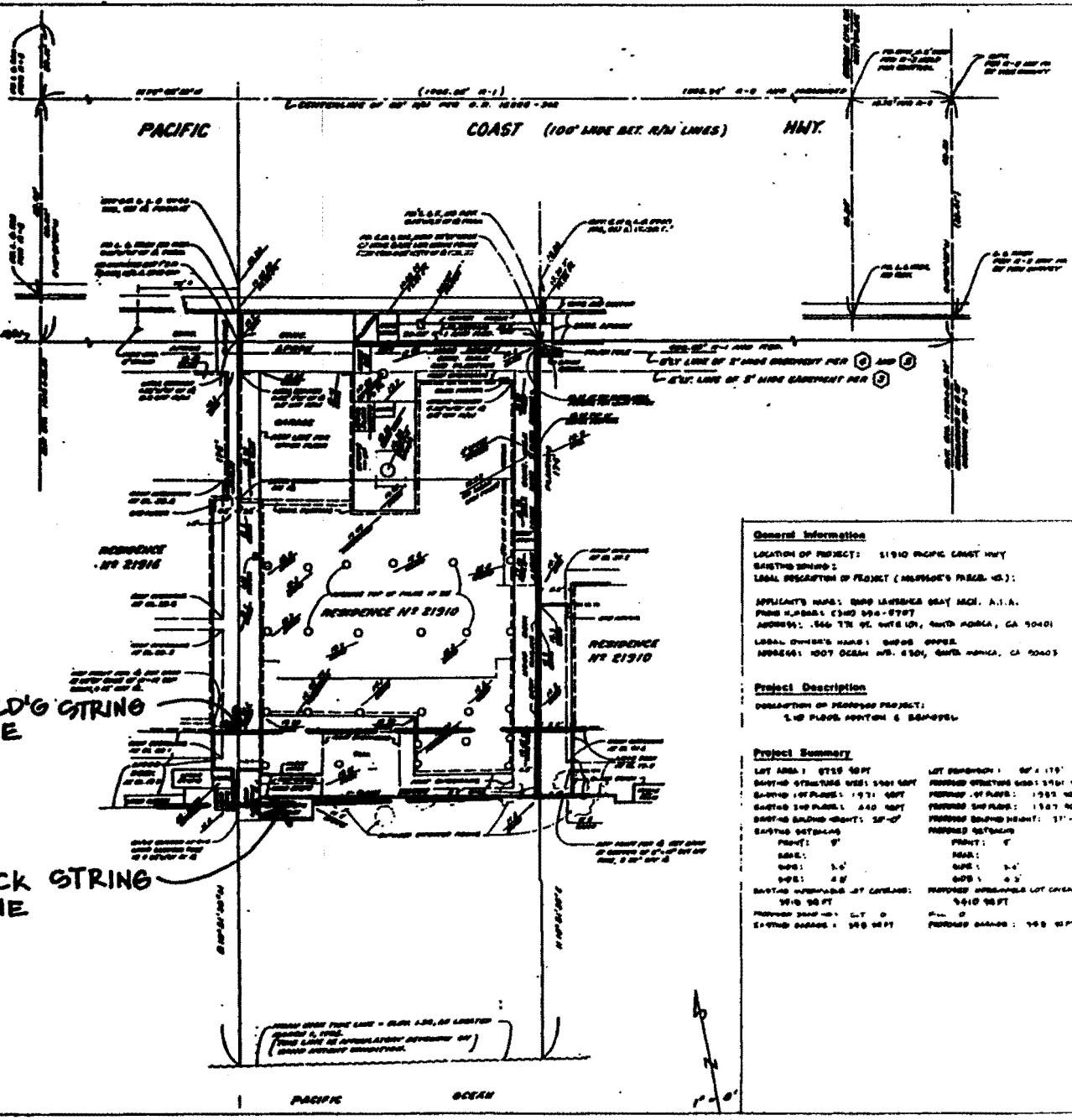


EXHIBIT NO. 2
APPLICATION NO. 4-96-101
Project Location



MAP SHOWING SURVEY AND TOPOGRAPHY OF PARCEL AT
COAST HWY.
MALIBU
LOS ANGELES, CA

General Information

LOCATION OF PROJECT: 21910 PACIFIC COAST HWY
EXISTING ZONING :
LEGAL DESCRIPTION OF PROJECT (ASSESSOR'S PARCEL NO.):

APPLICANT'S NAME:
PHONE NUMBER:
ADDRESS:

LEGAL OWNER'S NAME:
ADDRESS:

Project Description

DESCRIPTION OF PROPOSED PROJECT:
1 ST FLOOR ADDITION & REMODEL

Project Summary

LOT AREA : 9715 SQ FT	LOT DIMENSION : 50' x 175'
EXISTING STRUCTURE USE: SINGLE FAMILY	PROPOSED STRUCTURE USE: SINGLE FAMILY
EXISTING 1ST FLOOR: 1971 SQFT	PROPOSED 1ST FLOOR: 1983 SQ FT
EXISTING 2ND FLOOR: 440 SQFT	PROPOSED 2ND FLOOR: 1983 SQ FT
EXISTING BUILDING HEIGHT: 25'-0"	PROPOSED BUILDING HEIGHT: 27'-9"
EXISTING SETBACKS	PROPOSED SETBACKS
FRONT: 9'	FRONT: 9'
REAR:	REAR:
SIDE: 5.6'	SIDE : 5.6'
SIDE: 4.8'	SIDE : 4.8'
EXISTING HARDSCAPE AT GARAGE: 1410 SQ FT	PROPOSED HARDSCAPE AT GARAGE: 1410 SQ FT
PROPOSED ROOF AREA : 1ST 0	PROPOSED ROOF AREA : 0
EXISTING GARAGE : 348 SQ FT	PROPOSED GARAGE : 348 SQ FT

OFFER RESIDENCE
21910 Pacific Coast Hwy
Malibu, CA 90265

2nd Story Addition
& Remodel

SITE PLAN

A-1

EXHIBIT NO. 3
APPLICATION NO. 4-98-101
Site Plan

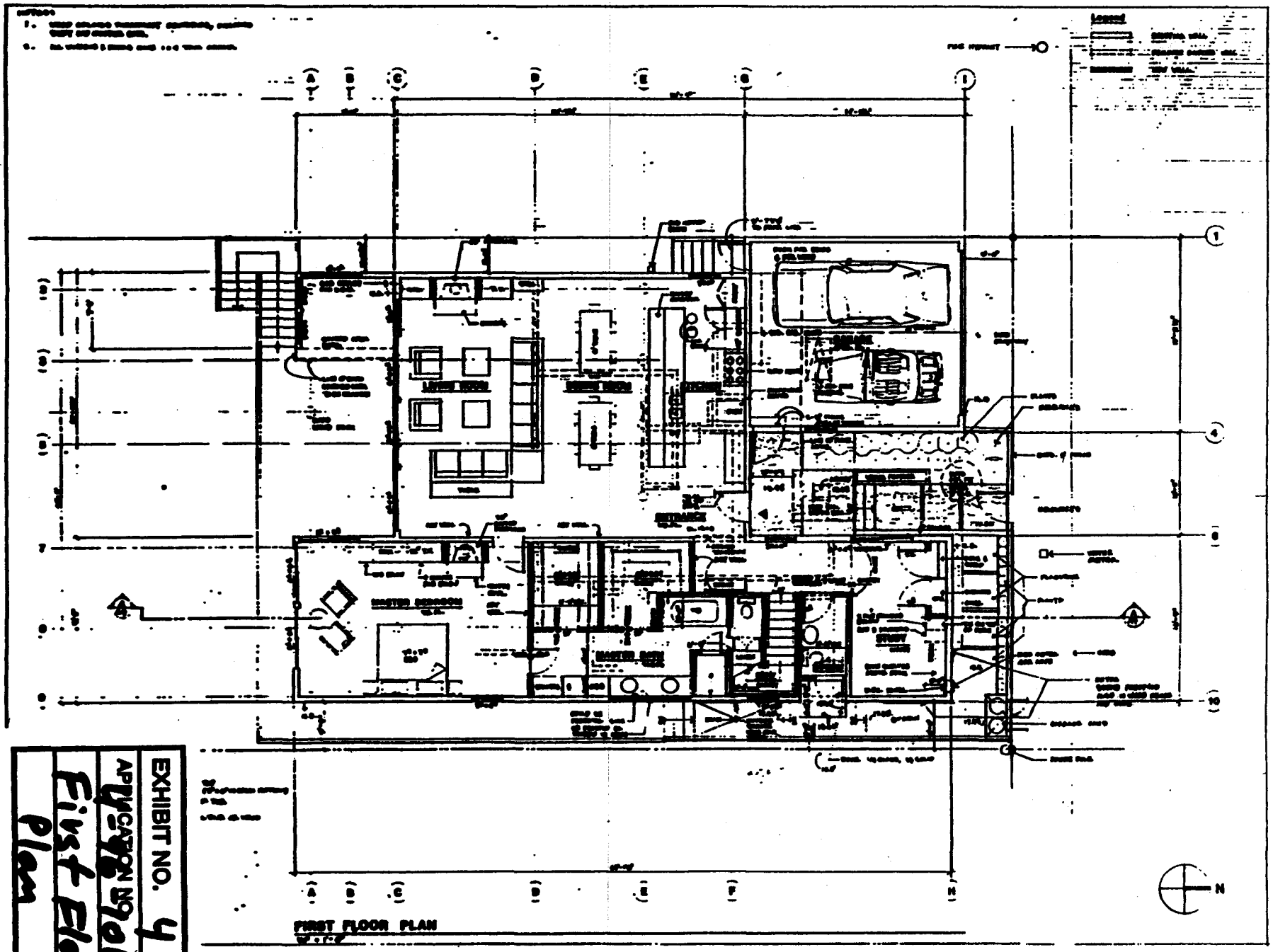


EXHIBIT NO. 4
APPLICATION NO. 4-98-101
First Floor Plan

OFFER RESIDENCE
21910 Pacific Coast Hwy
Malibu, CA 90265

FIRST FLOOR PLAN

A-2.1

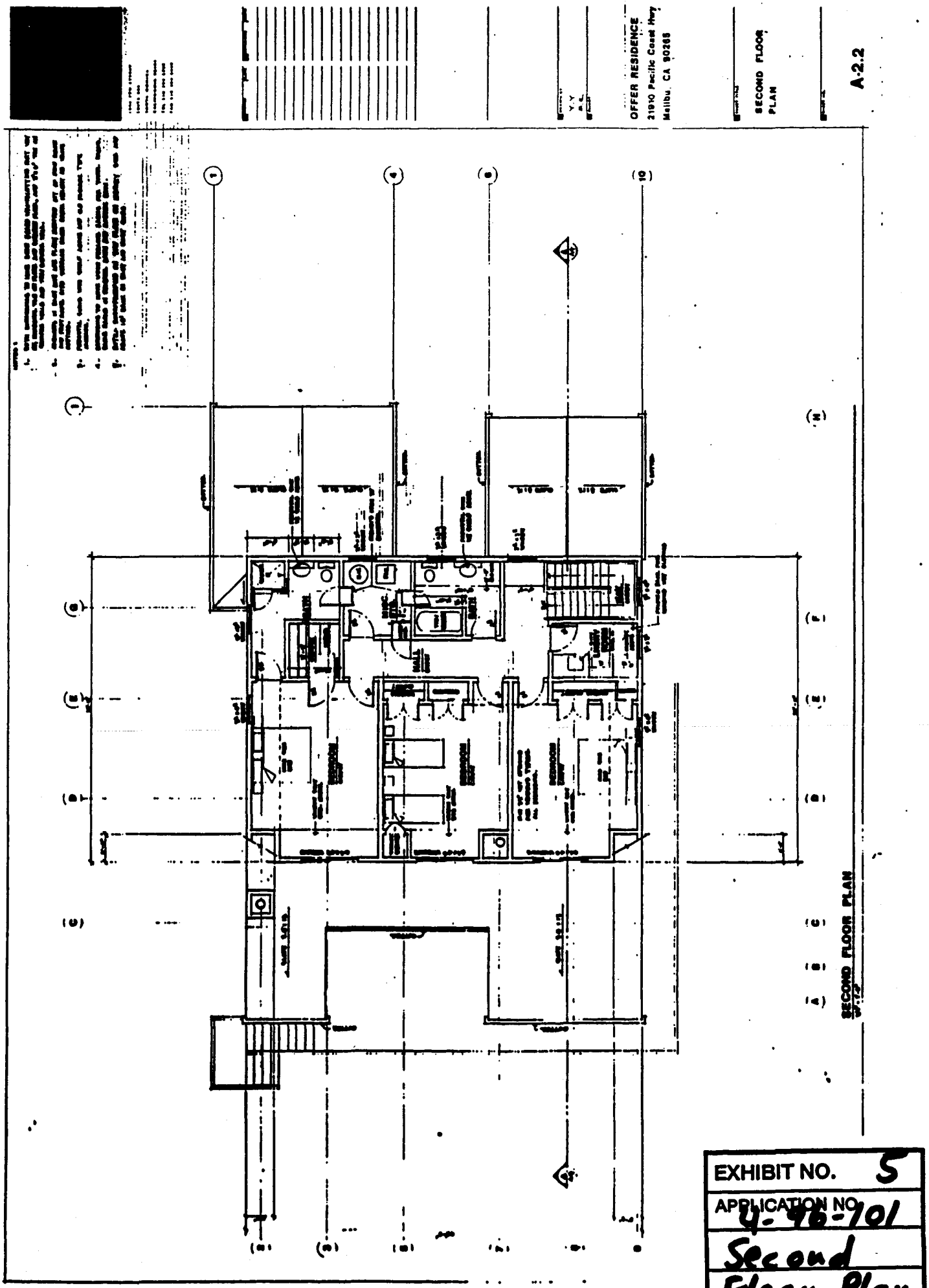
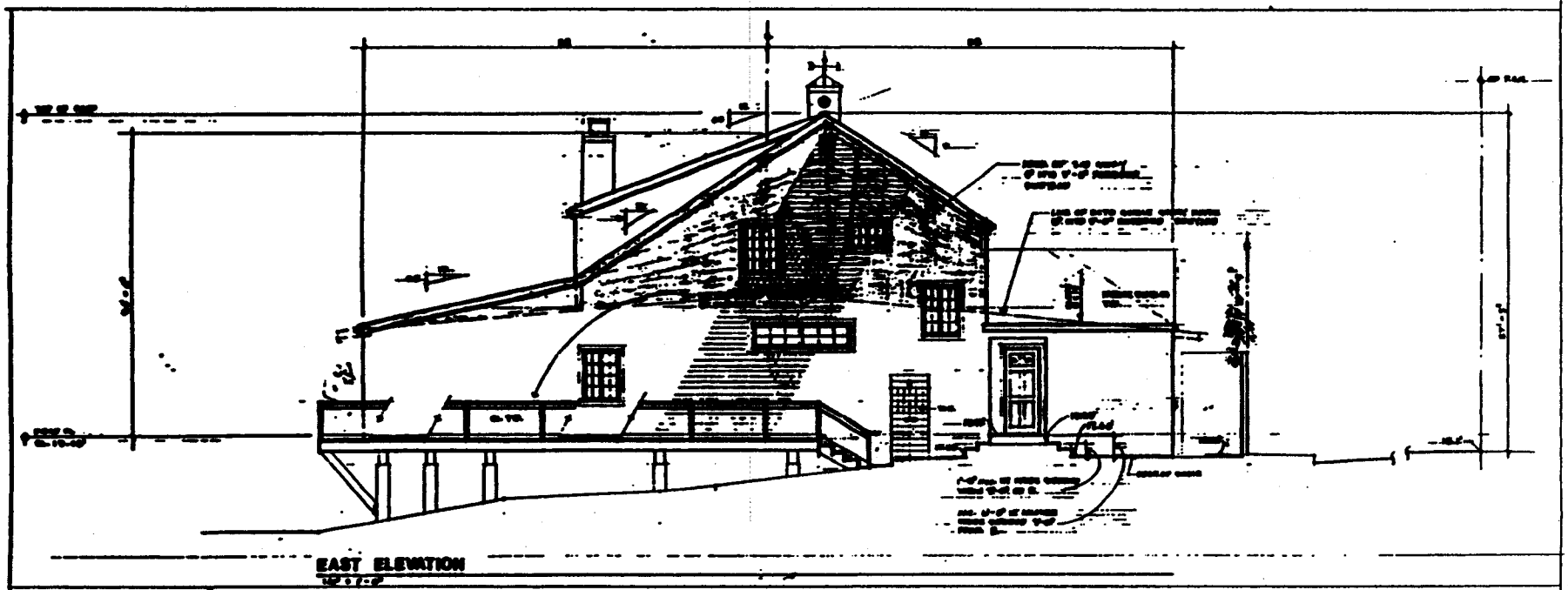
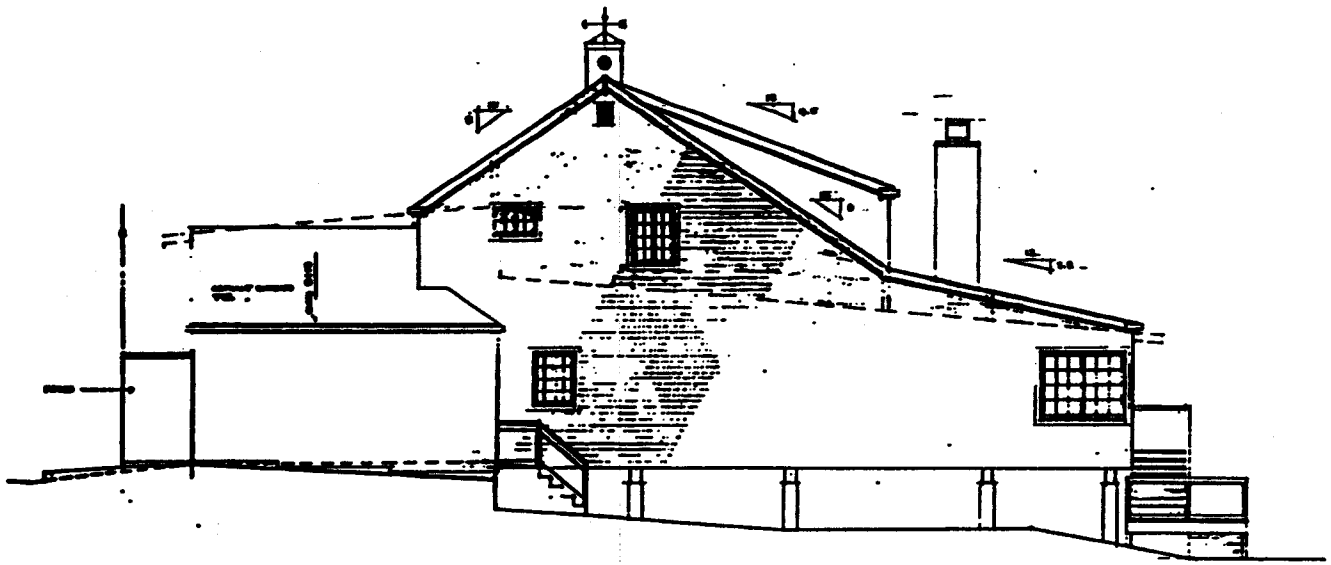


EXHIBIT NO. 5
APPLICATION NO. 4-98-101
Second Floor Plan



EAST ELEVATION



WEST ELEVATION

EXHIBIT NO. 6

APPLICATION NO. 4-98-101

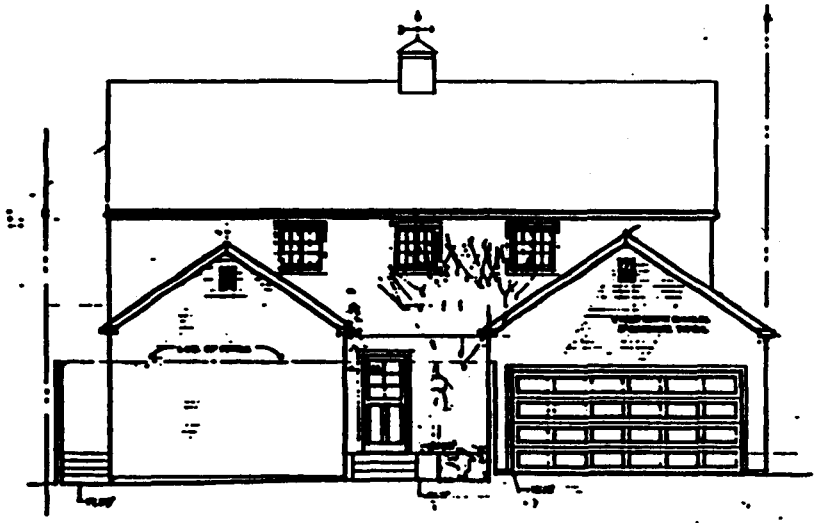
Elevations

OFFER RESIDENCE

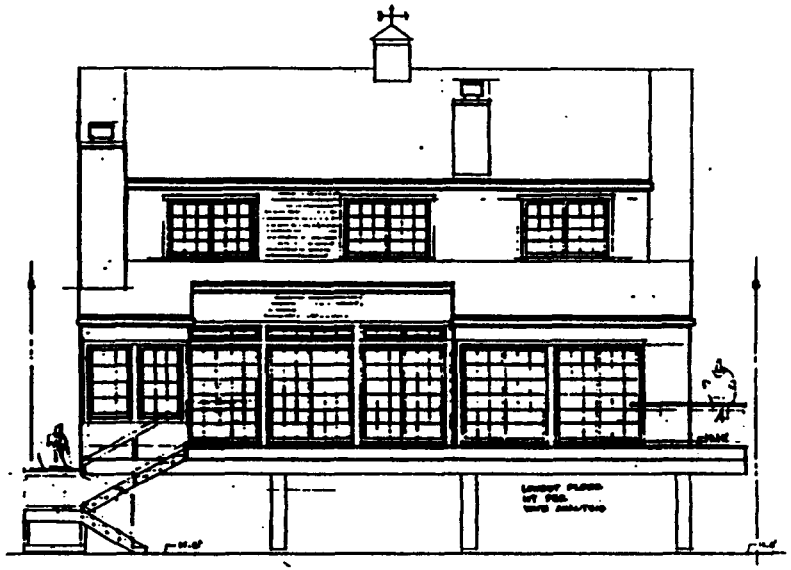
Malibu, CA 90265

ELEVATIONS

A-3.1



NORTH ELEVATION



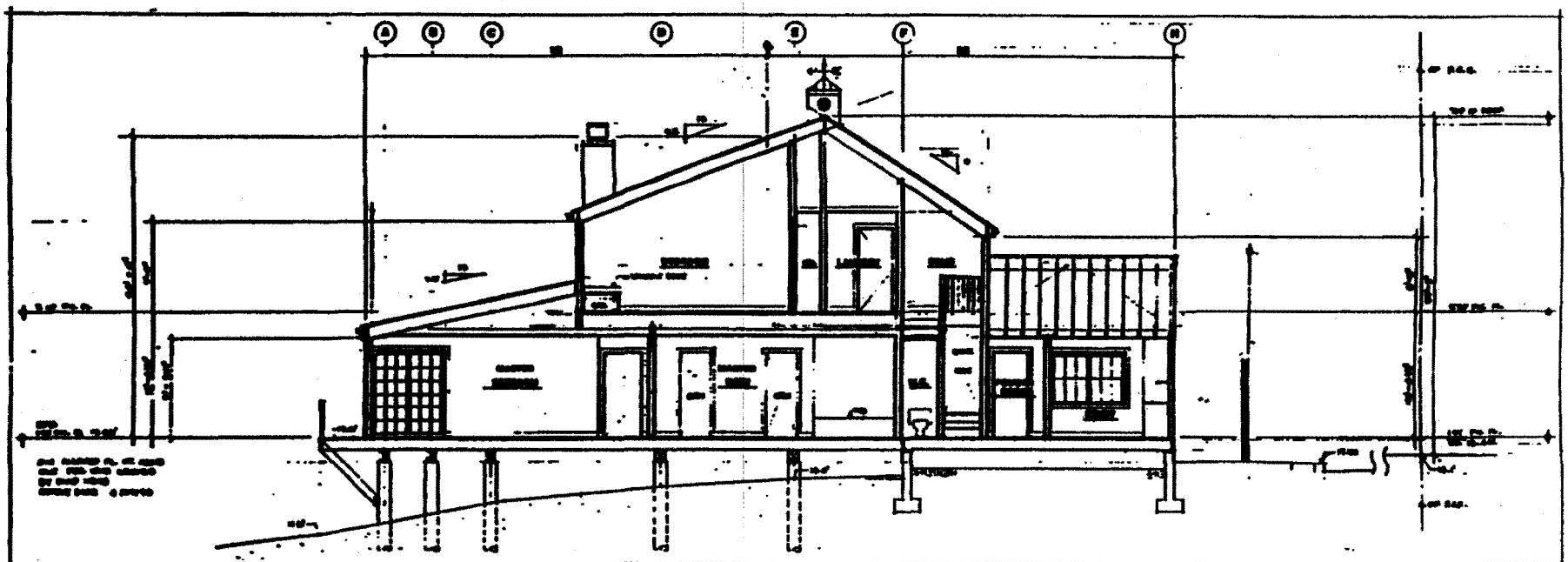
SOUTH ELEVATION

OFFER RESIDENCE
21910 Pacific Coast Hwy
Malibu, CA 90265

ELEVATIONS

A-3.2

EXHIBIT NO. 7
APPLICATION NO. 4-98-101
Elevations



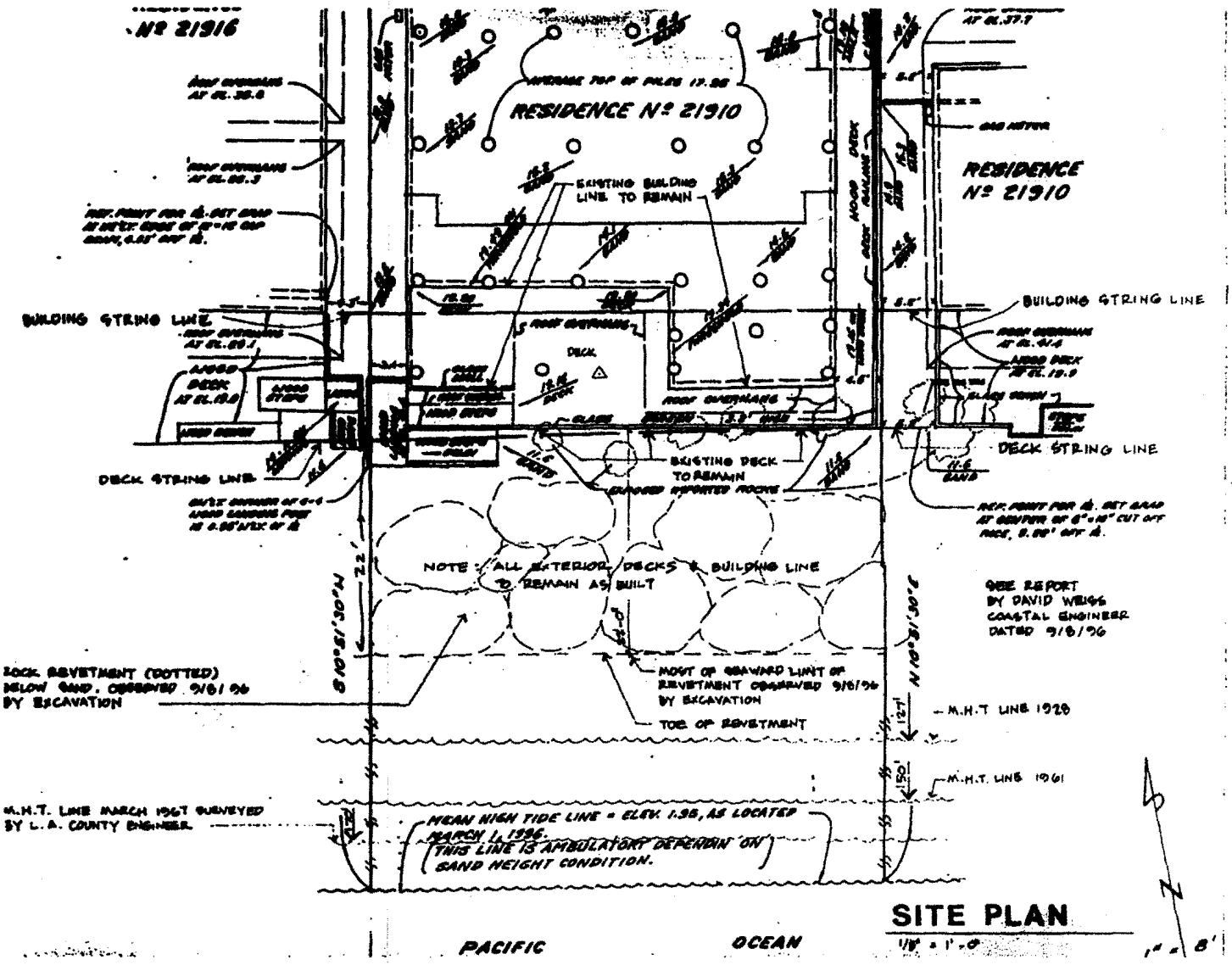
BUILDING SECTION

OFFER RESIDENCE
21910 Pacific Coast Hwy
Malibu, CA 90265

BUILDING SECTION

A-4

EXHIBIT NO. 8
APPLICATION NO. 4-98-168
Section



LOCATION OF
EXISTING ZONI
LEGAL DESCRIP

APPLICANT'S N
PHONE NUMBER
ADDRESS: 15

LEGAL OWNE
ADDRESS: 1C

Project De

DESCRIPTION
2 ND FI

Project Sur

LOT AREA :
EXISTING STRUC
EXISTING 1 ST FL
EXISTING 2ND F
~~EXISTING BUILDI~~
EXISTING SETB
FRONT:
REAR:
SIDE:
SIDE:
EXISTING IMPER
3510 SC
PROPOSED GRAD
EXISTING GARA

TOTAL EXIS
TOTAL EXIS
PERCENT

EXHIBIT NO. 9
APPLICATION NO. 5-96-161
Revetment
Site Plan

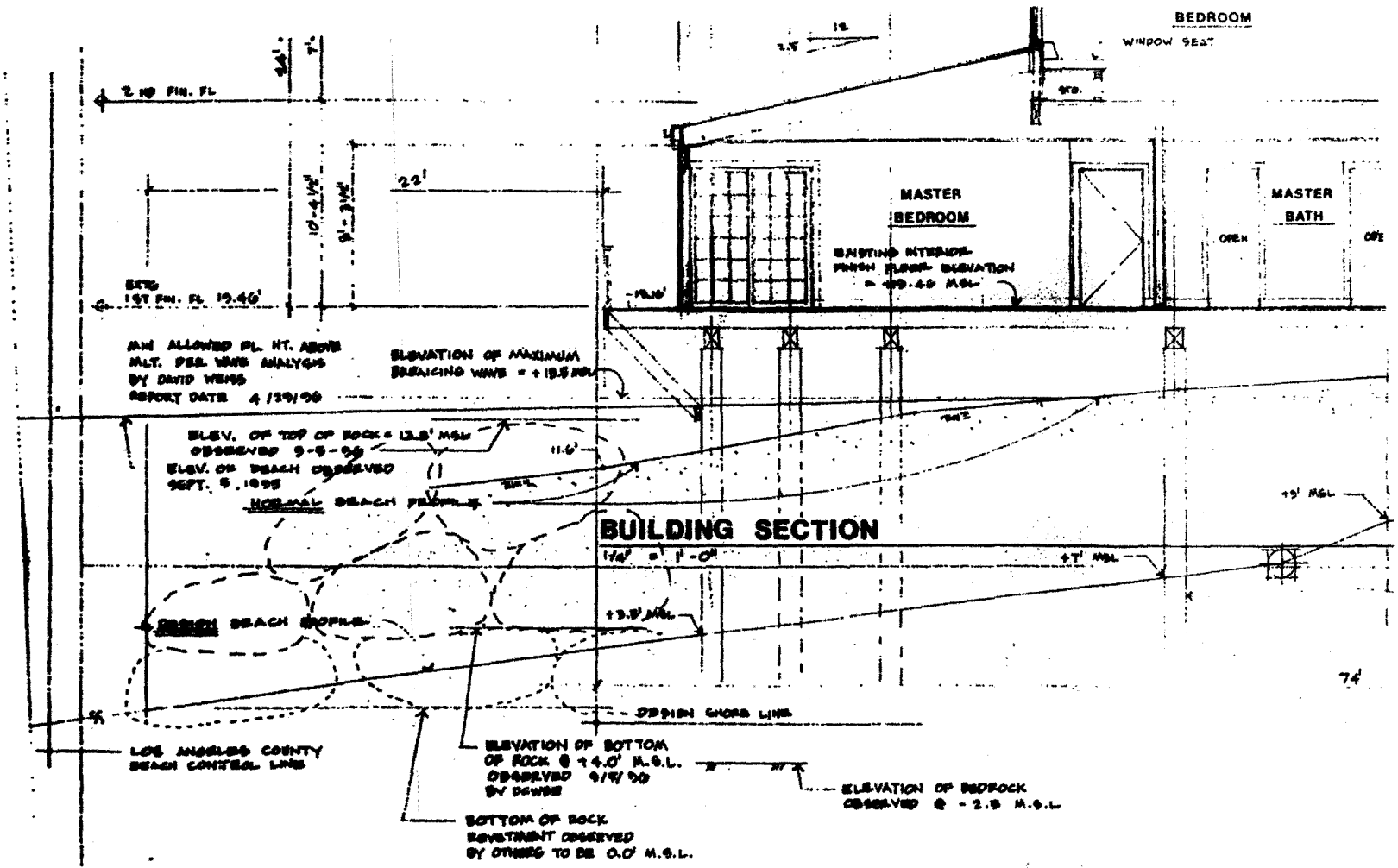


EXHIBIT NO. 10
APPLICATION NO. 5-96-101
Revetment Section