CALIFORNIA COASTAL COMMISSION
CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060-4508
VOICE (831) 427-4863 FAX (831) 427-4877

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT

Please Review Attached Appeal Information Sheet Prior To Completing This Form.

SECTION I. Appellant(s)

Name: William J. Comfort

Mailing Address: P.O. Box 1750

City: Aptos Zip Code: 95001 Phone: 831-688-3982

SECTION II. Decision Being Appealed

RECEIVED
DEC 2 3 2008
CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST AREA

1. Name of local/port government:

Santa Cruz County

2. Brief description of development being appealed:

Three houses, Application numbers: 08-221, 08-223, 08-224

3. Development's location (street address, assessor's parcel no., cross street, etc.):

Property located off a proposed right of way to the southeast of 660 Bay View Drive.

4. Description of decision being appealed (check one.):

☐ Approval; no special conditions

☒ Approval with special conditions:

☐ Denial

Note: For jurisdictions with a total LCP, denial decisions by a local government cannot be appealed unless the development is a major energy or public works project. Denial decisions by port governments are not appealable.

TO BE COMPLETED BY COMMISSION:	
APPEAL NO:	A-3-SCO-09-001 A-3-SCO-09-002 A-3-SCO-09-003
DATE FILED:	January 8, 2009
DISTRICT:	Central Coast

CCC Exhibit 5
(page 1 **of** 18 **pages)**

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 2)

5. Decision being appealed was made by (check one):

- ☒ Planning Director/Zoning Administrator
- ☐ City Council/Board of Supervisors
- ☐ Planning Commission
- ☐ Other

6. Date of local government's decision: 12/5/08

7. Local government's file number (if any): ____________________

SECTION III. Identification of Other Interested Persons

Give the names and addresses of the following parties. (Use additional paper as necessary.)

a. Name and mailing address of permit applicant:

Matson-Britton Architects, 728 North Branciforte, Santa Cruz

b. Names and mailing addresses as available of those who testified (either verbally or in writing) at the city/county/port hearing(s). Include other parties which you know to be interested and should receive notice of this appeal.

(1) Fay Levinson

(2) Gary Waltz

(3) John Shook

(4) Please see attached list titled: Interested Parties; I will add addresses ASAP

CCC Exhibit 5
(page 2 **of** 18 **pages)**

SECTION IV. Reasons Supporting This Appeal

PLEASE NOTE:

- Appeals of local government coastal permit decisions are limited by a variety of factors and requirements of the Coastal Act. Please review the appeal information sheet for assistance in completing this section.
- State briefly **your reasons for this appeal**. Include a summary description of Local Coastal Program, Land Use Plan, or Port Master Plan policies and requirements in which you believe the project is inconsistent and the reasons the decision warrants a new hearing. (Use additional paper as necessary.)
- This need not be a complete or exhaustive statement of your reasons of appeal; however, there must be sufficient discussion for staff to determine that the appeal is allowed by law. The appellant, subsequent to filing the appeal, may submit additional information to the staff and/or Commission to support the appeal request.

Please see attached nine pages.

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 4)

SECTION V. Certification

The information and facts stated above are correct to the best of my/our knowledge.

Signature of Appellant(s) or Authorized Agent

Date: 12/20/08

Note: If signed by agent, appellant(s) must also sign below.

Section VI. Agent Authorization

I/We hereby authorize ______________________________
to act as my/our representative and to bind me/us in all matters concerning this appeal.

Signature of Appellant(s)

Date: ______________________

CCC Exhibit 5
(page 4 **of** 18 **pages)**

Reasons Supporting This Appeal

Application Number 0221-08

- Assure public access to the beach from Bay View Drive, as has historically been available to residents along Bay View Drive and the public.
  - A portion of the lot on which this structure is proposed includes a lot which has been identified as a trail.
  - Evidence of portions of this trail currently exists, though deviations have had to be made because of sloughing of arroyo bluffs and heavy growths of poison oak.
- Reduce the structure to a single story to minimize its impact on the arroyo viewshed along the paved trail from Hidden Beach Public Park to Hidden Beach.
- Assure that drainage is properly handled and does not do damage or induce erosion to:
  - existing trails along the arroyo
  - fragile bluffs along the arroyo
- Assure drainage is properly permitted by the current and future owners of the arroyo.
- Assure the concept of angle drilling will not ultimately lead to damage to the existing trails along the arroyo.
- Please perform independent review of all reports on drainage and geologic hazards, and resulting setbacks by California Coastal Commission geologist(s).
- Please review the finding of a CEQA Categorical Exemption.

Please see citing of LCPs and Codes in Appendix

Application Number 0223-08

- Reduce the dominance of the structure on the viewshed from Hidden Beach. Reduction of the structure to a single story and increasing the setback from the edge of the bluff would be major improvements over the proposed design and placement.
- 100 year setback should be reassessed to reflect rising sea levels and impact on bluff retreat rates.
- The public viewshed should not be at risk from the miscalculations of the owner or the County. Because of the character and uniqueness of the bluffs, please include a requirement that if the bluff retreat threatens the structure, retaining walls cannot be built; rather that structure must be moved or removed.
- Assure public access to the beach from Bay View Drive, as has historically been available. If access requires use of this property, it is because the applicant intends to use the existing trail lot (see 0221-08) as part of a lot upon which to build the structure (0221-08).
- Assure that drainage is properly handled and does not do damage or induce erosion to:

    - existing trails along the arroyo
    - fragile bluffs along the arroyo
- Assure drainage is properly permitted by the current and future owners of the arroyo.
- Assure the concept of angle drilling will not ultimately lead to damage to the existing trails along the arroyo.
- Please perform independent review of all reports on drainage and geologic hazards, and resulting setbacks by California Coastal Commission geologist(s).
- Please review the finding of a CEQA Categorical Exemption.

Hidden Beach is unique in the area because the beach sand meets the base of the bluffs. The bluffs are topped by trees and natural vegetation, with the exception of a rambling single-story which represents minimal damage to the beach viewshed. Most of the houses on the opposite side of the arroyo that are in the Hidden Beach viewshed are also single story.

Please see citing of LCPs and Codes in Appendix.

<u>Application Number 0224-08</u>

- Reduce the dominance of the structure on the viewshed from Hidden Beach and from Hidden Beach arroyo. The dominance of the structure is particularly evident from the beach at the mouth of the arroyo where the elevation of the bluff is less than 50 feet above the beach. Reduction of the structure to a single story, stepping down or removing the single story portion nearest the arroyo and increasing the setback from the edge of the bluff (both from the beach and from the arroyo) would be major improvements over the proposed design and placement.
- 100 year setback should be reassessed to reflect rising sea levels and impact on bluff retreat rates.
- The public viewshed should not be at risk from the miscalculations of the owner or the County. Because of the character and uniqueness of the bluffs, please include a requirement that if the bluff retreat threatens the structure, retaining walls cannot be built; rather that structure must be moved or removed.
- Assure public access to the beach from Bay View Drive, as has historically been available. If access requires use of this property, it is because the applicant intends to use the existing trail lot (see 0221-08) as part of a lot upon which to build the structure (0221-08).
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- Please perform independent review of all reports on drainage and geologic hazards, and resulting setbacks by California Coastal Commission geologist(s).
- Please review the finding of a CEQA Categorical Exemption.

Hidden Beach is unique in the area because the beach sand meets the base of the bluffs. The bluffs are topped by trees and natural vegetation, with the exception of a rambling single-story which represents minimal damage to the beach viewshed. Most of the houses on the opposite side of the arroyo that are in the Hidden Beach viewshed are also single story.

Please see citing of relevant LCPs and Codes and CEQA in Appendix

<u>Appendix</u>

CEQA Exceptions:

15300.2. Exceptions

(a) Location. Classes 3, 4, 5, 6, and 11 are qualified by consideration of where the project is to be located – a project that is ordinarily insignificant in its impact on the environment may in a particularly sensitive environment be significant. Therefore, these classes are considered to apply all instances, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

(b) Cumulative Impact. All exemptions for these classes are inapplicable when the cumulative impact of successive projects of the same type in the same place, over time is significant.

(c) Significant Effect. A categorical exemption shall not be used for an activity where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances.

5.10.1 Designation of Visual Resources
(LCP) Designate on the General Plan and LCP Resources Maps and define visual resources as areas having regional public importance for their natural beauty or rural agricultural character. Include the following areas when mapping visual resources: vistas from designated scenic roads, Coastal Special Scenic Areas, and unique hydrologic, geologic and paleontologic features identified in Section 5.9.

5.10.2 Development Within Visual Resource Areas
(LCP) Recognize that visual resources of Santa Cruz County possess diverse characteristics and that the resources worthy of protection may include, but are not limited to, ocean views, agricultural fields, wooded forests, open meadows, and mountain hillside views. Require projects to be evaluated against the context of their unique environment and regulate structure height, setbacks and design to protect these resources consistent with the objectives and policies of this section. Require discretionary review for all development within the visual resource area of Highway One, outside of the Urban/Rural boundary, as designated on the GP/LCP Visual Resources Map and apply the design criteria of Section 13.20.130 of the County's zoning ordinance to such development.

5.10.3 Protection of Public Vistas
(LCP) Protect significant public vistas as described in policy 5.10.2 from all publicly used roads and

vista points by minimizing disruption of landform and aesthetic character caused by grading operations, timber harvests, utility wires and poles, signs, inappropriate landscaping and structure design. Provide necessary landscaping to screen development which is unavoidably sited within these vistas.

5.10.7 Open Beaches and Bluff tops

(LCP) Prohibit the placement of new permanent structures which would be visible from a public beach, except where allowed on existing parcels of record, or for shoreline protection and for public beach access. Use the following criteria for allowed structures:

(a) Allow infill structures (typically residences on existing lots of record) where compatible with the pattern of existing development.

(b) Require shoreline protection and access structures to use natural materials and finishes to blend with the character of the area and integrate with the landform.

6.2.10 Site Development to Minimize Hazards

(LCP) Require all developments to be sited and designed to avoid or minimize hazards as determined by the geologic hazards assessment or geologic and engineering investigations. (Revised by Res. 81-99)

6.2.11 Geologic Hazards Assessment in Coastal Hazard Areas

(LCP) Require a geologic hazards assessment or full geologic report for all development activities within coastal hazard areas, including all development activity within 100- feet of a coastal bluff. Other technical reports may be required if significant potential hazards are identified by the hazards assessment. (Revised by Res. 81-99)

6.2.12 Setbacks from Coastal Bluffs

(LCP) All development activities, including those which are cantilevered, and non habitable structures for which a building permit is required, shall be set back a minimum of 25 feet from the top edge of the bluff. A setback greater than 25 feet may be required based on conditions on and adjoining the site. The setback shall be sufficient to provide a stable building site over the 100- year lifetime of the structure, as determined through geologic and/or soil engineering reports. The determination of the minimum 100 year setback shall be based on the existing site conditions and shall not take into consideration the effect of any proposed shoreline or coastal bluff protection measures.
(Revised by Res. 81-99)

6.2.20 Reconstruction of Damaged Structures on Coastal Bluffs

(LCP) Permit reconstruction of structures on or at the top of a coastal bluff which are damaged as a result of coastal hazards, including slope instability and seismically induced landslides, or are damaged by non-coastal related hazards (fire, etc.) and where the loss is less than 50 percent of the value, in accordance with the recommendations of the hazards assessment. Encourage relocation to a new footprint provided that the new location is landward of the previous site at the best possible site not affecting resources (e.g. the most landward location, or landward of the area necessary to ensure a stable building site for the minimum 100-year lifetime, or not necessitating a future shoreline protective structure). When structures located on or at the top of a coastal bluff are damaged as a result of coastal hazards, including slope instability and seismically induced landslides, and where the loss is greater than 50 percent of the value, permit reconstruction if all applicable regulations can be met, including minimum setbacks. If the minimum setback cannot be met, allow only in-kind reconstruction, and only if the hazard can be mitigated to provide stability over a 100-year period.

For structures damaged by other than coastal hazards, where the loss is greater than 50% of the value, allow in-kind reconstruction, subject to all regulations except for the minimum setback. Allow other than in-kind reconstruction only if the minimum setback is met.

Exemption: Public beach facilities and replacements consistent with Coastal Act Policy 30610(g).

Objectives 6.3 Erosion

(LCP) To control erosion and siltation originating from existing conditions, current land-use activities, and from new developments, to reduce damage to soil, water, and biotic resources.

Policies

6.3.1 Slope Restrictions

(LCP) Prohibit structures in discretionary projects on slopes in excess of 30 percent. A single- family dwelling on an existing lot of record may be excepted from the prohibition where siting on greater slopes would result in less land disturbance, or siting on lesser slopes is infeasible.

6.3.2 Grading Projects to Address Mitigation Measures

(LCP) Deny any grading project where a potential danger to soil or water resources has been identified and adequate mitigation measures cannot be undertaken.

6.3.3 Abatement of Grading and Drainage Problems

(LCP) Require, as a condition of development approval, abatement of any grading or drainage condition on the property which gives rise to existing or potential erosion problems.

6.3.4 Erosion Control Plan Approval Required for Development

(LCP) Require approval of an erosion control plan for all development, as specified in the Erosion Control ordinance. Vegetation removal shall be minimized and limited to that amount indicated on the approved development plans, but shall be consistent with fire safety requirements.

6.3.5 Installation of Erosion Control Measures

Require the installation of erosion control measures consistent with the Erosion Control ordinance, by October 15, or the advent of significant rain, or project completion, whichever occurs first. Prior to October 15, require adequate erosion control to be provided to prevent erosion from early storms. For development activities, require protection of exposed soil from erosion between October 15 and April 15 and require vegetation and stabilization of disturbed areas prior to completion of the project. For agricultural activities, require that adequate measures are taken to prevent excessive sediment from leaving the property.

6.3.9 Site Design to Minimize Grading

(LCP) Require site design in all areas to minimize grading activities and reduce

vegetation removal based on the following guidelines:
(a) Structures should be clustered;
(b) Access roads and driveways shall not cross slopes greater than 30 percent; cuts and fills should not exceed 10 feet, unless they are wholly underneath the footprint and adequately retained;

6.4.3 Development on or Adjacent to Coastal Bluffs and Beaches
(LCP) Allow development in areas immediately adjacent to coastal bluffs and beaches only if a geologist determines that wave action, storm swell and tsunami inundation are not a hazard to the proposed development or that such hazard can be adequately mitigated. Such determination shall be made by the County Geologist, or a certified engineering geologist may conduct this review at applicant's choice and expense. Apply Coastal Bluffs and Beaches policies.

6.5.10 Land Divisions Access Requirements
(LCP) (a) Require all private roads used for either primary or secondary access to be maintained through road maintenance agreements and /or associations or through a County Service Area.

Start here and continue through General Plan LCP
http://www.sccoplanning.com/pdf/policy/chapter6.pdf

Santa Cruz County Code

14.01.414 Waterfront access--Acceptance--Time limit.

In the case of any subdivision fronting upon the ocean coastline or bay shoreline, the offer of dedication of public access route or routes from public access route or routes from public highways to land below the ordinary high water mark must be accepted within three years after the approval of the final map or parcel map; in the case of any subdivision fronting upon any access route or routes from public highways to the bank of the waterway, river or stream and the public easement along a portion of the bank of the waterway, river or stream must be accepted within three years after the approval of the final map or parcel map; in the case of any subdivision fronting upon any lake or reservoir which is owned in part or entirely by any public agency including the state, the offer of dedication of public route or routes from public highways to any water of such lake or reservoir must be accepted within five years after the approval of the final map or parcel map; all other offers of dedication may be accepted at any time. (Ord. 2093, 2/3/75)

14.01.425 Coastline.

(a) The Board of Supervisors, the Planning Commission, the Planning Director, or the County Surveyor shall not approve the tentative parcel or final map of any subdivision fronting upon the coastline or shoreline which subdivision does not provide or have available reasonable public access by fee or easement from public highways to land below the ordinary highwater mark on any ocean coastline or bay shoreline within or at a reasonable distance from the subdivision.
Any public access route or routes provided by the subdivider shall be expressly designated

on the tentative and final map or parcel map, and such maps shall expressly designate the governmental entity to which such route or routes are dedicated.

(c) In making the determination of what shall be reasonable public access, the following shall be considered:

1. That access may be by highway, foot trail, horse trail, or any other means of travel.
2. The size of the subdivision.
3. The type of coastline or shoreline and the various appropriate recreational, educational, and scientific uses, including, but not limited to, diving, sunbathing, surfing, walking, swimming, fishing, beachcombing, taking of shellfish, and scientific exploration.
4. The likelihood of trespass on private property and reasonable means of avoiding such trespasses.

(d) Nothing in this section shall require the Board of Supervisors, the Planning Commission, the Planning Director, or the County Surveyor to disapprove a tentative, parcel or final map solely on the basis that the reasonable public access otherwise required by this section is not provided through or across the subdivision itself, if it is found such reasonable public access is otherwise available within a reasonable distance from the subdivision. Any such finding shall be set forth on the face of the tentative, final, or parcel map.

(e) The provisions of this section shall not apply to the final map or parcel map of any subdivision in full compliance with the conditions of approval of tentative map approved prior to March 1, 1975.

(f) The provisions of this section shall not apply to the final map or parcel map of any subdivision in full compliance with the approved planned unit development which has been approved by the county prior to December 31, 1968. The exclusion provided by this paragraph shall be in addition to the exclusion provided by paragraph (e) above.

(g) Nothing in this section shall be construed as requiring the subdivider to improve any access route or routes which are primarily for the benefit of non-residents of the subdivision area.

(h) Any access route or routes provided by the subdivider pursuant to this section may be conveyed or transferred to any state or local agency by the governmental entity to which such route or routes have been dedicated, at any future time, by mutual consent of such governmental entity and the particular state or local agency. Such conveyance or transfer shall be recorded by the recipient state or local agency in the Office of the Recorder. (Ord. 2093, 2/3/75; 2800, 10/30/79; Ord. 4243,

Environmental and Resource Protection

Text for the following not included to save space:

16.10.040 Definitions.

16.10.050 Requirements for geologic assessment.

16.10.060 Assessment and report preparation and review.

16.10.070 Permit conditions.

16.10.075 Foundation design requirements in geologic hazard areas.

16.10.080 Project density limitations.

Grading Regulations

16.20.050 Exemptions.

The following work is exempt from the provisions of this chapter; however, it remains subject to the Riparian Corridor Protection Ordinance (Chapter 16.30), the County Environmental Review Regulations (Chapter 16.01), the Erosion Control Ordinance (Chapter 16.22), the Geological Hazard Ordinance (Chapter 16.10), the Sensitive Habitat Protection Ordinance (Chapter 16.32), and the County Native American Cultural Sites Ordinance (Chapter 16.40). The following work may also be subject to other requirements imposed in county and state law.

(a) Excavations. An excavation which does not exceed 100 cubic yards and which does not create a cut slope greater than five feet in depth.

(b) Fills. A fill containing earth material only which is less than two feet in depth, is placed on natural terrain which has a slope flatter than five horizontal to one vertical, does not exceed 100 cubic yards on any one site, does not alter or obstruct a drainage course, and will not be used for structural support.

16.20.090 Environmental review.

Applications for grading approvals shall be submitted to the Environmental Coordinator pursuant to Santa Cruz County Environmental Review Regulations. (Ord. 2500, 11/8/77; 3321, 11/23/82; 3599, 11/6/84)

Erosion Control:

16.22.050 Project design.

The density and design of new development shall be planned to be consistent with the characteristics and constraints of the site:

(a) Structures on slopes that would normally require major grading shall utilize pole, step, or other foundations that do not require major grading.

(b) New lots shall not be created which will:

1. Require new access roads and driveways to cross slopes exceeding 30 percent; or
2. Require cuts and fills greater than ten feet in height for distances greater than 50 feet or 10 percent of the new roadway length, whichever is greater.

16.22.070 Runoff control.

Runoff from activities subject to a building permit, parcel approval or development permit shall be properly controlled to prevent erosion. The following measures shall be used for runoff control, and shall be adequate to control runoff from a ten-year storm:

(a) On soils having high permeability (more than two inches/hour), all runoff in excess of predevelopment levels shall be retained on the site. This may be accomplished through the use of infiltration basins, percolation pits or trenches, or other suitable means. This requirement may be waived where the Planning Director determines that high groundwater, slope stability problems, etc., would inhibit or be aggravated by onsite retention, or where retention will provide no benefits for groundwater recharge or erosion control.

(b) On projects where onsite percolation is not feasible, all runoff should be detained or dispersed over nonerodible vegetated surfaces so that the runoff rate does not exceed the predevelopment level. Onsite detention may be required by the Planning Director where excessive runoff would contribute to downstream erosion or flooding. Any policies and regulations for any drainage zones where the project is located will also apply.

(c) Any concentrated runoff which cannot be effectively dispersed without causing erosion, shall be carried in nonerodible channels or conduits to the nearest drainage course designated for such purpose by the Planning Director or to on-site percolation devices.

Where water will be discharged to natural ground or channels, appropriate energy dissipators shall be installed to prevent erosion at the point of discharge.
(d) Runoff from disturbed areas shall be detained or filtered by berms, vegetated filter stips, catch basins, or other means as necessary to prevent the escape of sediment from the disturbed area.
(e) No earth or organic material shall be deposited or placed where it may be directly carried into a stream, marsh, slough, lagoon, or body of standing water. (Ord. 2982, 9/2/80; 3337, 11/23/82; 3439, 8/23/83)

<u>Interested Parties:</u>

Cathleen Galas
Doug Deaver
Marilyn Cantlay
Mike Abbett
Rich Gula
Vikki Erickson

CALIFORNIA COASTAL COMMISSION
CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060-4508
VOICE (831) 427-4863 FAX (831) 427-4877

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT

Please Review Attached Appeal Information Sheet Prior To Completing This Form.

SECTION I. Appellant(s)

Name: Fay Levinson
Mailing Address: 650 Hidden Beach Way
City: Aptos, Ca. Zip Code: 95003 Phone: 688-9041

SECTION II. Decision Being Appealed

1. Name of local/port government: Santa Cruz County Zoning Administration

2. Brief description of development being appealed: APN 043-131-15 & 34 08-022
3 No Situs House Developments on 043-131-15 & 34 08-0223
Bluff near 660 Bay View Dr, Aptos 043-131-15 & 34 08-0226

3. Development's location (street address, assessor's parcel no., cross street, etc.):
660 BayView Dr, Aptos - Parcels above

4. Description of decision being appealed (check one.):

☐ Approval; no special conditions
☒ Approval with special conditions:
☐ Denial

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DEC 0 9 2008
CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST AREA

Note: For jurisdictions with a total LCP, denial decisions by a local government cannot be appealed unless the development is a major energy or public works project. Denial decisions by port governments are not appealable.

TO BE COMPLETED BY COMMISSION:	
APPEAL NO:	A-3-SCO-09-001 A-3-SCO-09-002 A-3-SCO-09-003
DATE FILED:	January 8, 2009
DISTRICT:	Central Coast

5. Decision being appealed was made by (check one):

- ☒ Planning Director/Zoning Administrator
- ☐ City Council/Board of Supervisors
- ☐ Planning Commission
- ☐ Other

6. Date of local government's decision: 12-05-08

7. Local government's file number (if any): ______

SECTION III. Identification of Other Interested Persons

Give the names and addresses of the following parties. (Use additional paper as necessary.)

a. Name and mailing address of permit applicant:

b. Names and mailing addresses as available of those who testified (either verbally or in writing) at the city/county/port hearing(s). Include other parties which you know to be interested and should receive notice of this appeal.

(1) William Comfort
774 Bay View Dr., Aptos 95003

(2)

(3)

(4)

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 3)

SECTION IV. Reasons Supporting This Appeal

PLEASE NOTE:

- Appeals of local government coastal permit decisions are limited by a variety of factors and requirements of the Coastal Act. Please review the appeal information sheet for assistance in completing this section.
- State briefly **your reasons for this appeal.** Include a summary description of Local Coastal Program, Land Use Plan, or Port Master Plan policies and requirements in which you believe the project is inconsistent and the reasons the decision warrants a new hearing. (Use additional paper as necessary.)
- This need not be a complete or exhaustive statement of your reasons of appeal; however, there must be sufficient discussion for staff to determine that the appeal is allowed by law. The appellant, subsequent to filing the appeal, may submit additional information to the staff and/or Commission to support the appeal request.

See my attached letter.

The bluff being proposed for development is currently in the prime viewshed from Hidden Beach and remain the only large parcel without development. The cliffs erode annually; water erosion is significant. The mass of housing proposed is inconsistent with neighborhood compatibility as well as a significant impact on the public viewshed from the beach.

We are asking for a scaled-down (one-story only) version or no development. If housing is to be considered, further geologic investigation needs review as the bluff and cliff erodes annually. In addition, drainage into the arroyo would impact the Hidden Beach trail, in existence for over 50 years, prescriptive rights. It could impact the County Water treatment plant as well.

The open space presently is significant and is being compromised by development of massive homes, probably non-owner occupied

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 4)

SECTION V. Certification

The information and facts stated above are correct to the best of my/our knowledge.

[signature]

Signature of Appellant(s) or Authorized Agent

Date: 12-08-08

Note: If signed by agent, appellant(s) must also sign below.

Section VI. Agent Authorization

I/We hereby authorize ______________________________
to act as my/our representative and to bind me/us in all matters concerning this appeal.

____
Signature of Appellant(s)

Date: ______________________________

CCC Exhibit 5
(page 17 **of** 18 **pages)**

fay and joe

From: "fay and joe" <fayjoe1@comcast.net>
To: <codecompliance@co.santa-cruz.ca.us>
Cc: <ellen.pirie@co.santa-cruz.ca.us>
Sent: Sunday, November 30, 2008 3:54 PM
Attach: ATT00051.htm
Subject: Zoning Administrator Hearing, Dec. 5, APN 043-131-15 7 34; 043-161--39-40; 054-621-04

This letter is in reference to the Zoning Administrator Hearing on Dec. 5 re. the above listed no situs APN numbers. If this has reached the incorrect Planning Dept. office, please forward to the correct office prior to Dec. 5. Thank you.

The three APNs being considered on the bluff above Hidden Beach, which has been designated as a public beach and is in the process of transfer to the County, if built as proposed and shown in the photographs in the public reports, will greatly impact the public viewshed from the south of Hidden Beach as well as the viewshed for those walking along the bluff area below. The proposed homes are all very large, especially the 5547 sq. ft. Frank residence and do not fit in with neighborhood compatibility.

I have several concerns in addition to the above: (1) setback from the bluff; (2) drainage; (3) appropriate vegetation to shield the homes; (4) cliff stability; and (5) runoff from winter storms.

The drainage as proposed could impact the stability of the bluff/cliff. Currently the instability of the bluff is evidenced every winter by water/storm damage to the bluff. Drainage into the arroyo which abuts the Hidden Beach Public Access Trail next to the property, is certainly an unacceptable method of drainage and could impact the Sanitation Dept. facility, but also public access to Hidden Beach.

Winter runoff the area is significant as evidenced each winter along the public access trail and the lower areas of the bluff which abuts the public beach.

While I realize that the County of Santa Cruz may approve some for of development along the bluff, issues of viewshed, drainage, and neighborhood compatibility must be addressed. In addition, the concept of scaling down these three homes to one story developments may, with proper shielding vegetation, help protect the viewshed from the South and along the bluff area as the public access this beach.

My personal preference would be to maintain the bluff as it is: one of the only significant open spaces in the area. I would prefer no homes on the bluff. If development does occur, scaling the houses down to a smaller form, and certainly on only ONE level, might help retain the beauty of this pristine open space. Once developed, we lose the openness of this parcel as it currently exists. Keeping it open with no development would be a way to preserve the environment for generations to come.

Thank you for considering my comments at the Dec. 5 hearing.

Sincerely,

Fay Levinson
650 Hidden Beach Way
Aptos, Ca. 59003

CCC Exhibit 5
(page 18 **of** 18 **pages)**

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, GOVERNOR

CALIFORNIA COASTAL COMMISSION
45 FREMONT, SUITE 2000
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18 June 2009

GEOTECHNICAL REVIEW MEMORANDUM

To: Susan Craig, Coastal Program Analyst
From: Mark Johnsson, Staff Geologist
Re: Appeals A-3-SCO-08-029, A-3-SCO-08-042, A-3-SCO-09-001, A-3-SCO-09-002, A-3-SCO-09-003 (Trousdale, Frank)

In connection with the above-referenced appeals, I have reviewed the following documents:

G.E. Weber Geologic Consultant, 2009, "Projecting future sea-level rise: What is a reasonable estimate for the next century?" 8 p. report dated 24 February 2009 and signed by G.E. Weber (CEG 1495).

Pacific Crest Engineering, 2009, "Response to California Coastal Commission comments, Trousdale residence, A.P.N. 043-161-57, 660 Bayview Drive, Rio del Mar, Santa Cruz County, California", 18 p. Geotechnical Report dated 26 February 2009 and signed by E.M. Mitchell (GE 2718).

Pacific Crest Engineering, 2009, "Response to California Coastal Commission comments, Lands of Frank, Bayview Drive, A.P.N. 043-161-51, -40, -39, Rio del Mar, Santa Cruz County, California", 27 p. Geotechnical Report dated 26 February 2009 and signed by E.M. Mitchell (GE 2718).

Zinn Geology, 2009, "Supplemental analysis in response to California Coastal Commission comments, Bayview Drive, Aptos, California, County of Santa Cruz APN 043-161-57 and 043-161-50", 9 p. letter report to Kelley and Cindy Trousdale dated 26 February 2009 and signed by E.N. Zinn (CEG 2139).

Zinn Geology, 2009, "Supplemental analysis in response to California Coastal Commission comments, Parcels southeast of Bayview Drive, Aptos, California, County of Santa Cruz APN's 043-161-51, -40, & -39", 9 p. letter report to Neil Frank dated 26 February 2009 and signed by E.N. Zinn (CEG 2139).

As is apparent from their titles, these reports were written in response to questions that I raised in an earlier review of geotechnical reports related to the proposed development of these parcels. Specifically, a request was made to evaluate future coastal erosion and bluff retreat to be expected on these parcels over the 100-year design life of the proposed development taking into account anticipated acceleration of the current rate of sea level rise. Further, I requested refined quantitative slope stability analyses that would supplement earlier analyses which I felt were too restrictive of potential failure mechanisms.

Future Sea Level Rise

The report by Weber, referenced above, is an evaluation of the amount of sea level rise that may occur over the next century. The report references much of the recent literature on sea level rise, and emphasizes estimates by the Intergovernmental Panel on Climate Change (2007) that range between 9 and 87 cm of sea level rise (with 90% confidence limits on the range 18-60 cm) by the year 2100. Weber states that "These ranges are generally consistent with the findings of other workers (Rahmsdorf [sic], 2007; Cayan et al., 2006)." Weber then goes on to emphasize the uncertainty in predicting future sea level rise, particularly pointing out uncertainty discussed in papers by Jevrejeva, Moore and Grinsted (2008), Church and White (2006), and Jevrejeva et al. (2008). Citing such uncertainty, he concludes that the least conservative estimate for sea-level rise should apply to single family residences (such as the proposed development), while "critical facilities" should assume a more conservative amount of sea-level rise. Weber concludes that for the proposed development

> "a reasonable assumption for sea level rise in the next century, to be applied to geologic hazard and risk analysis for single family residences is ... equal to or greater than the total sea level rise in the 20th century and consistent with the rate of rise (acceleration) over the past 20-30 years. This number would lie someplace between 300-340 mm, approximately 11 to 13 inches."

I note that this amount of sea level rise is at the low end of what most researchers are now predicting for sea level rise over the next century. Indeed, as reported in a New York Times editorial (21 February 2009), the assumptions behind the 2007 IPCC estimates already appear to be outdated.

Commission staff has recently been recommending that analysis for the effects of sea level rise take a "sensitivity analysis" approach; assuming a minimum rate of 3 feet per century and a maximum of 6 feet per century. This recommendation is based on staff's research into the recent literature. The Commission recently adopted such an approach in an amendment to the City of Crescent City Local Coastal Plan, and it is staff's recommendation that this approach be adopted into future Local Coastal Programs as they are revised.

The rationale for this approach is explained in the findings for the City of Crescent City LCP Amendment No. CRC-MAJ-1-09:

> Sea level rise is an important consideration for the planning and design of projects in coastal settings. Such changes in sea level will exacerbate the frequency and intensity of wave energy received at shoreline sites, including both storm surge and tsunamis, resulting in accelerated coastal erosion and flooding in such locales. There are many useful records of historic sea level change, but little certainty about how these trends will change with possible large increases in atmospheric greenhouse gas emissions and air temperatures. Notwithstanding the controversy and uncertainties about future global or local sea levels, guidance on how to address sea level rise in planning and permitting process is evolving as new information on climate change and related oceanic responses become available.
>
> The Commission, like many others permitting agencies, have undertaken past assessments of sea level rise effects using the principal of "uniformitarianism" as guidance — that natural processes such as erosion, deposition, and sea level changes occur at relatively uniform rates over time

rather than in episodic or sudden catastrophic events. As a result, future ocean surface elevations have been extrapolated from current levels using historical rates of sea level rise measured over the last century. For much of the California coast, this equates to a rate of about eight inches per 100 years. Rates of up to one foot per century have typically been used to account for regional variation and to provide for some degree of uncertainty in the form of a safety factor. This rate of rise is then further adjusted upward or downward as needed depending upon other factors, such as localized subsidence or tectonic uplift

...

Most climate models now project that the historic trends for sea level rise, or even a 50% increase over historic trends, will be at the very low end of possible future sea level rise by 2100. Satellite observations of global sea level have shown sea level changes since 1993 to be almost twice as large as the changes observed by tide gauge records over the past century. Recent observations from the polar regions show rapid loss of some large ice sheets and increases in the discharge of glacial melt. The 2007 Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) notes that sea level could rise by 7 to 23 inches from 1990 to 2100, provided there is no accelerated loss of ice from Greenland and West Antarctica.[1] Sea level rise could be even higher if there is a rapid loss of ice in these two key regions.

The IPCC's findings were expanded to incorporate some increase in sea level rise by accelerated ice melt through a 2007 report prepared by Dr. Stefan Rahmstorf of the Potsdam Institute for Climate Impact Research (hereinafter "Rahmstorf Report"). This report has become the central reference point for much of recent sea level rise planning. The Rahmstorf Report developed a quasi-empirical relationship between historic temperature and sea level change. Using the temperature changes projected for the various IPCC scenarios, and assuming that the historic relationship between temperature and sea level would continue into the future, he projected that by 2100 sea level could be between 20 inches and 55 inches (0.5 to 1.4 meters) higher than the 1990 levels (for a rate of 0.18 to 0.5 inches/year). These projections for future sea level rise anticipate that the increase in sea level from 1990 to 2050 will be from about 8 inches to 17 inches (for a rate of 0.13 to 0.28 inches/year); from 1990 to 2075, the increase in sea level would be from about 13 inches to 31 inches (for a rate of 0.15 to 0.36 inches/year) and that the most rapid change in sea level will occur toward the end of the 21st century. Most recent sea level rise projections show the same trend as the projections by Rahmstorf — that as the time period increases the rate of rise increases and that the second half of the 21st century can be expected to have a more rapid rise in sea level than the first half.

Several recent studies have projected future sea level to rise as much as 4.6 feet from 1990 to 2100. For example, in California, the Independent Science Board (ISB) for the Delta Vision Plan has used the Rahmstorf Report projections in recommending that for projects in the San Francisco Delta, a rise of 0.8 to 1.3 feet by 2050 and 1.7 to 4.6 feet by 2100 be used for planning purposes.[2] This report also recommends that major projects use the higher values to be conservative, and that some projects might even consider sea level projections beyond the year 2100 time period. The ISB also recommends "developing a system that can not only withstand a design sea level rise, but also minimizes damages and loss of life for low-probability events or unforeseen circumstances that exceed design standards. Finally the board recommends the specific incorporation of the potential for higher-than-expected sea level rise rates into long term infrastructure planning and design."

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1 The IPCC is a scientific intergovernmental body established by the World Meteorological Organization (WMO) and the United Nations Environmental Programme to provide the decision-makers and others interested in climate change with an objective source of information about climate change; http://www.ipcc.ch/ipccreports/assessments-reports.htm

2 Independent Science Board, 2007. Sea Level Rise and Delta Planning, Letter Report from Jeffrey Mount to Michael Healey, September 6, 2007, CALFED Bay-Delta Program: http://deltavision.ca.gov/BlueRibbonTaskForce/Sept2007/Handouts/Item_9.pdf

The Rahmstorf Report was also used in the California Climate Action Team's Climate Change Scenarios for estimating the likely changes range for sea level rise by 2100.[3] Another recent draft report, prepared by Philip Williams and Associates and the Pacific Institute for the Ocean Protection Council, the California Energy Commission's Public Interest Energy Research (PIER) Climate Change Research Program, and other agencies also identifies impacts from rising sea level, especially as relate to areas vulnerable to future coastal erosion and flooding.[4] This report used the Rahmstorf Report as the basis to examine the flooding consequences of both a 40-inch and a 55-inch centurial rise in sea level, and the erosion consequences of a 55-inch rise in sea level.

On November 14, 2008, Governor Schwarzenegger issued Executive Order S-13-08, directing various state agencies to undertake various studies and assessments toward developing strategies and promulgating development review guidelines for addressing the effects of sea level rise and other climate change impacts along the California coastline.[5] Consistent with the executive order, at its June 4, 2009 meeting the governing board of the Coastal Conservancy will consider the adoption of interim sea level rise rates: (a) 16 inches (40 cm) by 2050; and (b) 55 inches (140 cm) by 2100 for use in reviewing the vulnerability of projects it funds [adopted 4 June 2009]. These rates are based on the PEIR climate scenarios. If adopted, these criteria would be utilized until the study being conducted by the National Academy of Sciences regarding sea level rise, requested by a consortium of state resource and coastal management agencies pursuant to the executive order, is completed.

Concurrently, in the Netherlands, where flooding and rising sea level have been national concerns for many years, the Dutch Cabinet-appointed Deltacommissie has recommended that all flood protection projects consider a regional sea level rise (including local subsidence) of 2.1 to 4.2 ft by 2100 and of 6.6 to 13 ft. by 2200.[6] Again, the Rahmstorf Report was used by the Delta Committee as a basis in developing their findings and recommendations.

Given the general convergence of agreement over the observed and measured geodetic changes world wide in ocean elevations over the last several decades, most of the scientific community has ceased debating the question of whether sea level will rise several feet higher than it is today, but is instead only questioning the time period over which this rise will occur. However, as the conditions causing sea level rise continue to change rapidly, prognostications of sea level rise are similarly in flux. As a result of this dynamism, anticipated amounts and rates of sea level rise used in project reviews today may be either lower or higher than those that will be utilized ten years from now. This degree of uncertainty will continue until sufficient feedback data inputs are obtained to allow for a clear trend to be discerned from what is now only a complex and highly variable set of model outputs. Accordingly, in the interest of moving forward from the debate over specific rates and amounts of rise to a point where the effects of sea level rise greater than those previously assumed in the past may be considered, one approach is to undertake an analysis on the development project and site to ascertain the point when significant changes to project stability would result based on a series or a range of sea level rise amounts. The analysis would be structured to use a variety of sea level rise projections, ranging from the relatively gradual rates of

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3 Cayan et al. 2009. Draft Paper: Climate Change Scenarios and Sea Level Estimates for the California 2008 Climate Change Scenarios Assessment; CEC-500-2009-014-D, 62 pages; http://www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF

4 Heberger, et al. 2009. Draft Paper: The Impacts of Sea Level Rise on the California Coast; California Climate Change Center, California Energy Commission; CEC-500-2009-024-D, March 2009, 99 pages; http://www.pacinst.org/reports/sea_level_rise/index.htm

5 Office of the Governor of the State of California, 2008. Executive Order S-13-08; http://gov.ca.gov/index.php?/print-version/executive-order/11036/

6 Delta Committee of the Kingdom of the Netherlands, 2008. Working Together with Water: A Living Land Builds for its Future, Findings of the Deltacommissie, 2nd Ed. November 2008; http://www.deltacommissie.com/en/advies

rise indicated by the IPCC and Rahmstorf models, to scenarios involving far more rapid rates of sea level rise based upon accelerated glacial and polar sea and shelf inputs.

For example, for the most typical development projects along the coast (i.e., residential or commercial), consideration of a two to three foot rise in level rise over 100 years could be assumed to represent the minimum rate of change for design purposes. However, in the interest of investigating adaptive, flexible design options, sensitivity testing should also include assessing the consequences of sea level rise at three to five times greater rates, namely five to six feet per century, for critical facilities or development with a long expected project life. The purpose of this analysis is to determine, if there is some "tipping point" at which a given design would rapidly become less stable, and to evaluate what would be the consequences of crossing such a threshold. This type of analysis would make the property owner aware of the limitations, if any, of the initial project design early in the planning process. Depending upon the design life of the development, the economic and technical feasibility of incorporating more protective features, and levels of risk acceptance, the project proponent could propose, or the permitting agency may require, that greater flexibility be provided in the design and siting of the development, or other mitigation be identified, to accommodate the higher rates of sea level rise.

This sea level range approach would allow accelerated rates of sea level rise to be considered in the analysis of projects. Such evaluations provide some flexibility with regard to the uncertainty concerning sea level rise, providing an approach to analyze project in the face of uncertainty that would not involve the imposition of mandatory design standards based upon future sea level elevations that may not actually be realized, and allowing flexibility in the acceptable amount of sea level rise for specific projects and for the best available scientific information at the time of review. Given the nonobligatory and adaptive nature of this approach to hazards avoidance and minimization, as necessitated by such scientific uncertainty, it will remain important to include new information on sea level trends and climate change as iterative data is developed and vetted by the scientific community. Accordingly, any adopted design or siting standards that may be applied to development projects should be re-examined periodically to ensure the standard is consistent with current estimates in the literature before being reapplied to a subsequent project.

Regardless of its particular rate, over time elevated sea level will have a significant influence on the frequency and intensity of coastal flooding and erosion. Accordingly, rising sea level needs to be considered to assure that full consistency with Section 30253 can be attained in the review and approval of new development in shoreline areas.

Staff has always recommended consideration of sea level rise when evaluating future erosion rates. Until recently, this has been done only qualitatively and was based on historic trends in sea level rise. Given our evolving understanding of the mechanisms of sea level rise, staff is now recommending an upward revision of the rate of sea level rise, to a minimum of 3 ft/century.

Coastal bluff retreat

The reports by Zinn Geology use the recommended sea level rise figure from the Weber report to estimate the amount of coastal bluff retreat to be expected over the next century at the subject sites. Given the discrepancy between the Weber value of sea level rise and the value recommended by staff, it is not surprising that the amount of upper bluff retreat estimated in these reports differs than what I estimate below.

The Zinn reports assume that in order for the proposed structures to be threatened, the beach fronting the coastal bluff would need to be removed by coastal erosion or drowned by rising sea level; then the colluvial wedge at the base of the bluff would need to be eroded; and finally the coastal bluff would need to be eroded until a vertical projection of the base of the bluff would intersect the buildings' foundations. Working backwards from the latter condition, and assuming a bedrock erosion rate of 1 to 2 feet per year, the reports estimate that buildings sited as proposed would be threatened in 120.5 to 176 years (for the Trousdale parcels) and 107 to 161.5 to years (for the Frank parcels).

There are several assumptions built into this analysis with which I disagree. Most important is the assumption that the buildings will be threatened by *upper* bluff retreat at the same time as the bedrock has been eroded to a point vertically beneath the buildings' foundations. The bluffs at these locations, like most areas in coastal California, are not vertical. According to the cross sections in the Zinn reports, the entire bluff, including the colluvial wedge mantling its base, has an overall angle of approximately 48 degrees from the vertical; the inferred angle of the bedrock and marine terrace deposits beneath the colluvial wedge is approximately 30 degrees from the vertical. The bluffs are not vertical because of a combination of subaerial erosion processes and the fact that the bluff materials have insufficient strength to stand vertically. Accordingly, the upper bluff edge will intersect the building foundation long before the toe of the bluff lies vertically beneath them.

Second, the buildings will be "threatened" long before the upper bluff edge actually intersects the foundations. The LCP requires that stability be assured for the 100-year economic life of the development. The industry standard definition of stability for natural and artificial slopes is generally taken as a factor of safety against sliding of 1.5; that is, the forces tending to resist slope movement (essentially the strength of the bluff materials) must exceed the forces tending to initiate slope movement (essentially, the weight of the bluff materials as projected onto the most likely slide plane) by 50%. As discussed below, the point at which this level of stability is achieved is some distance landward of the bluff edge

Finally, this "working backward" approach does not account for the episodicity of coastal bluff erosion. Although there currently is a colluvial wedge mantling the site, reducing the rate of erosion of the toe of the bluff, its gradual removal will result in increased instability of the upper bluff, likely leading to catastrophic failure during which the bluff will retreat far faster than the 1 to 2 feet per year long term average cited in the report.

In my opinion, it is far preferable to evaluate the movement of the upper bluff edge through time and, taking account the distance from the upper bluff edge that a factor of safety of 1.5 is achieved, evaluate setbacks with respect to the upper bluff edge.

Slope Stability

During an initial assessment of slope stability of these properties, Pacific Crest Engineering assumed a particular failure surface based on "the project geologist's understanding and experience with bluff failures along this area of coastline." Unlike typical slope stability analyses, a minimum factor of safety of all potential failure modes was not determined. The factor of safety calculated for these assumed failure surfaces ranged from 2.54 (for the Frank parcels) to1.89 (for the Trousdale parcels). These are much higher factors of safety than typically reported for coastal bluffs of this height and inclination. Indeed, a failure of the upper bluff on the southernmost Frank parcel that occurred in late February or early March 2009 (see attached photos, taken 4 March 2009) demonstrates that these bluffs have no such unusually high factors of safety. A bluff failure indicates that, at that location and time, the forces driving the slide exceed the resisting forces; that is, the factor of safety has dropped below 1.0.

Accordingly, I asked the project geotechnical engineer to 1) provide justification for the soil strength parameters used and; 2) calculate the minimum factor of safety for a circular failure surface through these materials. The two referenced Pacific Crest Engineering reports were subsequently prepared. Supporting material was provided for the soil strength parameters, with which I concur. However, only a circular failure of the upper bluff terrace deposits was calculated. While this is the most likely type of failure, it would have been useful to also have examined the global stability of the entire bluff.

The results of these slope stability analyses indicate that a factor of safety of 1.5 is reached about 18 feet landward of the bluff edge on the Trousdale parcels. A pseudostatic analysis showed that the 1.1 factor of safety line is seaward of this point, indicating that the static condition is determinative for stability. On the Frank parcels, no static factor of safety was calculated for the coastal bluff; but the 1.1 factor of safety line for the pseudostatic condition was found to be about 8 feet landward of the bluff edge. On two different cross sections of the arroyo-facing slope on the Frank parcels, static factors of safety were 1.6 to 2.2, indicating that the bluffs are stable at their current configurations.

Regional studies by the U.S. Geological Survey and the California Energy Commission

A 2007 report released by the U.S. Geological Survey, as part of its National Assessment of Shoreline Change used historic T-sheets and 1997 LIDAR data to evaluate the long-term bluff erosion rate along the cliffed portion of the California coast. For this stretch of the coast, erosion rates were generally 0.2-0.3m (0.66-0.98 ft)/yr. These numbers are consistent with those previously reported (as, for example, in Griggs et al. (2005) "Living with the Changing California Coast," and are consistent with those used by the applicants.

In March 2009 the California Energy Commission released a report prepared by the Pacific Institute with the help of Phillip Williams and Associates that evaluated the impacts of future sea level rise on the California coast. Citing sea-level rise forecasts developed at the Scripps Institute of Technology of 1.0 and 1.4meters by 2100 (for low- and moderate-greenhouse-gas-emissions scenarios, respectively), it evaluated the effects of sea level rise on the area inundated by a 100-year storm event and on increased dune and bluff erosion rates. A key product was a set of hazard maps showing the area inundated by the 100-year storm event today and in the year 2100, and the zone at high risk from coastal erosion by the year 2100. The erosion high hazard zone was calculated by prorating the historic bluff retreat rate (taken from the 2007 USGS study) by the increased amount of time that the base of the bluff would be subjected to wave attack under the 1.4 meter sea level rise scenario.

For the subject sites, the erosion high hazard area on these maps lies approximately 112 feet from the current bluff edge.

Staff Recommendation for 100-year bluff top setback

The USGS National Assessment of Shoreline Change (2007) reports long-term erosion rates of 0.2-0.3m (0.66-0.98 ft)/yr for this stretch of coastline. Using the higher value (to make some allowance for potential increase in the historic rate due to, for example, accelerated sea level rise), this would predict about 98 feet of bluff top recession over the course of the next 100 years.

The applicant, when pressed, presented slope stability analyses indicating that, for a circular failure of the upper terrace deposits, a static factor of safety of 1.5 is attained about 18 feet landward of the present bluff edge. A factor of safety of 1.1 for a pseudostactic (earthquake analysis) lies seaward of this, making the static factor of safety determinative for a stability setback.

Following the method outlined in Johnsson (2005); the staff recommended setback would thus be 116 feet. Note that this value does not explicitly include increases in bluff retreat rate due to sea level rise; however, the conservative use of the upper end of observed historic long-term bluff retreat rates serves as a proxy. This value is, indeed, in close agreement with the erosion high hazard area mapped in the Pacific Institute report.

Because the slopes on the arroyo side of the Frank parcels exceed a 1.5 factor of safety (static) and 1.1 (pseudostatic), and because they are seldom subject to wave attack, a much smaller setback is necessary. Ideally, long-term bluff retreat data could provide guidance as to the amount of bluff retreat expected due to stream and subaerial erosion over the next 100 years, but these data have not been provided. Nevertheless, my own judgment is that the 25-foot setback recommended by the applicant's consultants should be sufficient.

I hope that this review is helpful. Please do not hesitate to contact me with any further questions.

Sincerely,

Mark Johnsson, Ph.D., CEG, CHG
Staff Geologist

Changing Climate Numbers

New York Times
February 21, 2009

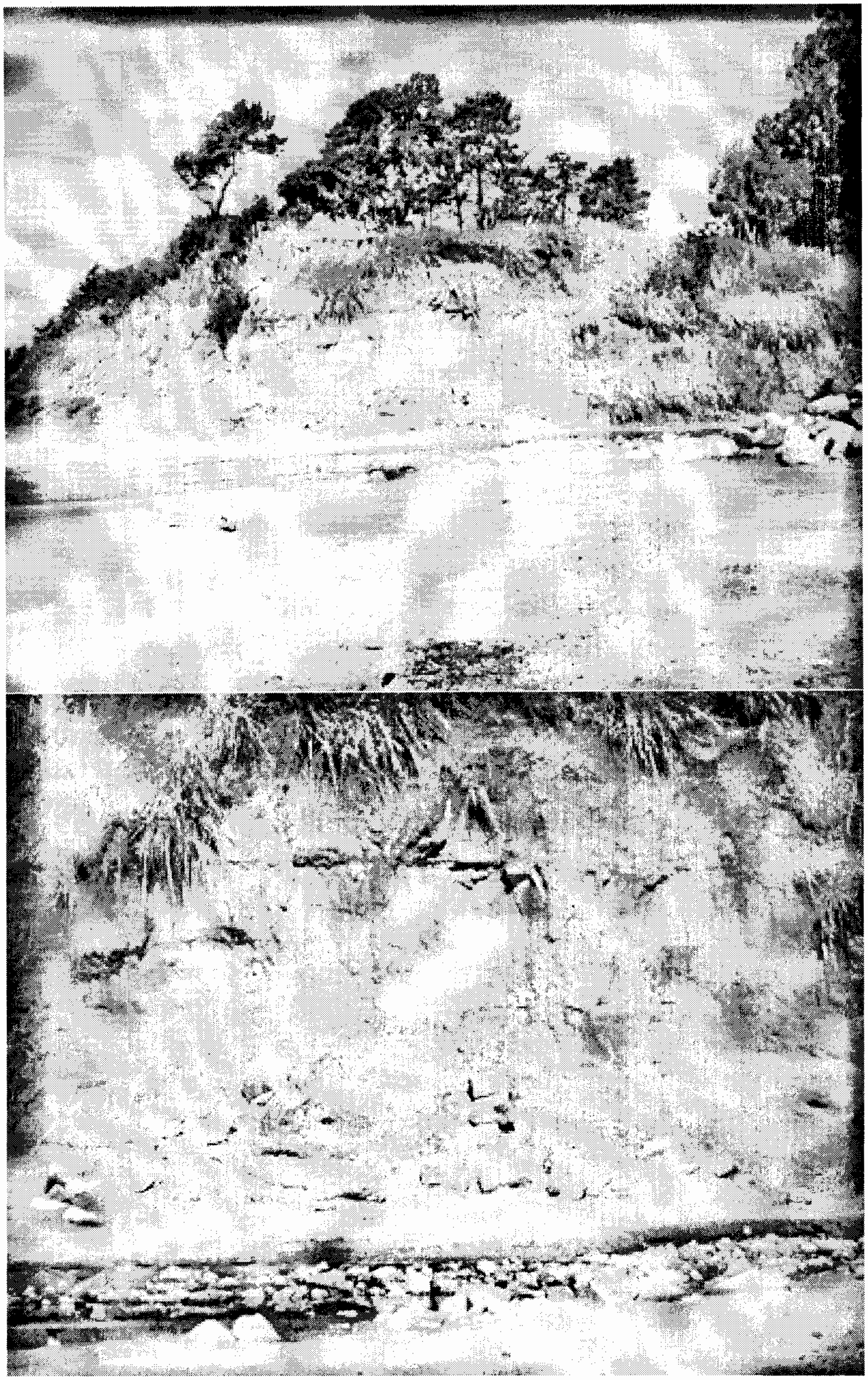
In 2007, the Intergovernmental Panel on Climate Change released its fourth assessment report, summarizing evidence collected and weighed by scientists around the world. At the time, it was the best estimate of where the planet was, climatically speaking, and where it was likely to be going, and the news the report offered was daunting.

There was unequivocal evidence of a warming climate, with human activity the dominant cause. The panel warned that further warming could have devastating consequences for societies around the world, including rising seas and widespread drought.

The 2007 assessment established a base line of expectation, but it is already looking outdated. From all over the globe, in bits and pieces, data are accumulating that suggest we may have already left behind the world of possibilities portrayed in the panel's report. Sea ice has melted more quickly than expected. And, according to a recent report from the United States Geological Survey, sea levels in 2100 could increase by more than double the 1.5 feet rise projected by the Intergovernmental Panel on Climate Change (it chose not to add in water from eroding ice sheets because they remain poorly understood). Add to that the hard reality that carbon dioxide is a long-lived gas, and the picture of global warming is both volatile and forbidding.

The authors of the climate-change panel's report knew that events could overtake their findings. A fifth assessment is currently under way. And while the worldwide recession might provide a slight breather, population pressures and energy demands are likely to drive emissions inexorably higher without a major shift to new energy sources.

It is imperative, of course, that the Obama administration — and every other government around the world — keep abreast of the changing data. What is equally imperative is that the governments tailor any prescriptions to the possibility of more ominous news in the future.



Recent bluff failure on APN 043-161-51; photos taken 4 Mar 2009

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Projecting Future Sea-level Rise:
What is a Reasonable Estimate for the Next Century?

Introduction

This report presents a brief discussion of recently published scientific literature regarding the magnitude of sea-level rise that is expected to occur over the next 100 years. The premise that sea-level is going to continue to rise is based on: 1) the slow warming of the earth over the past several hundred years as we emerged from the Little Ice Age; 2) the clearly measurable historic rise of sea level during that time period; and 3) the projections that the earth will continue to warm over the next 100 years. The driving force in the rise of sea-level is "global warming" which warms the earth's oceans and atmosphere.

This slow increase in temperature results in two processes that contribute to the rise of sea-level. These are:

1) Thermal expansion of ocean water which leads to a greater volume of water.
2) Melting of glacial ice and ice sheets which increases the mass of the oceans by adding water.

If the earth's atmosphere and oceans continue to warm, both thermal expansion and glacial melt will continue and sea-level will continue to rise. Consequently predictions of sea-level rise must take into account projections of anticipated global warming and how this may affect the two processes noted above. I believe it should be clearly stated that this analysis is based on the following premises: First, global temperature is presently increasing and has been increasing for the past several hundred years. Second, evidence from both tide gauges and more recently from satellite studies indicates that sea level has been slowly rising over the past two centuries (Jevereva et al., 2008; Church and others 2008; Cayan et al, 2006; and Cabanes, et al, 2001).

Unfortunately, what are not clear are the rates of change in both the warming of the atmosphere and the oceans; and the relationship between these rates of change and the volume of CO_2 in the atmosphere. Therefore, all projections of the total amount of sea-level rise that will occur over the next century are based on interpretations and/or assumptions of how rates of global warming, thermal expansion of the oceans, and mass increase of the oceans from melting glaciers will change over time.

Projections of Sea-level Rise

There is considerable uncertainty in how global warming affects melting of alpine glaciers, the Greenland and Antarctic ice sheets, and the thermal expansion of the oceans; and how these in turn affect sea-level. The wide range in the estimates of how much sea-level will rise in the next century is shown in Figure 6 of Church and others (2008). Their graph is reproduced as Figure 1 of this report, which shows the projected sea-level rise for the 21st century.

Note that the IPCC (International Panel on Climate Change) projections with 90% confidence limits project somewhere between 18 to 60 centimeters (7 inches to 2 feet) of sea-level rise by 2100. The outermost lines on the graph, those that *include an allowance for additional land-ice uncertainty,* range from 9 centimeters (about 4 inches) of sea-level rise to as much as 0.875 meters (34 inches – about 3 feet). These ranges are generally consistent with the findings of other workers (Rahmsdorf, 2007; Cayan et al, 2006). In general most projections of sea-level rise contain caveats regarding what could possibly occur. These usually take the form of stating that sea-level rise in the next century could be considerably higher than the models predict.

Although there is general agreement among researchers as to the range of sea-level rise over the next century, there is also agreemeent that problems and inconsistencies are present in their analysis. A desire for more and better data pervades all of the publications cited in this report. Some of the problems and inconsistencies that shed doubt on the robustness of the projections are discussed below, from several relevant recent articles.

Jevrejeva, Moore and Grinsted, 2008: ***Relative importance of mass and volume changes to glacial sea level rise.*** Journal of Geophysical Research

In this study the authors examine the relationship between global sea level rise, thermal expansion of sea water due to warming, and increased mass related to melting of glacial ice and ice sheets. The goal of the study is to determine the role of each of these mechanisms in the rise of sea level over a period of 47 years (1955-2003). The results of the study are:

1. The average rate of sea-level rise as measured from tide gauges was 1.6 mm/year. (6.2 inches per hundred years)
2. The average rate of sea-level rise due to thermal expansion was 0.41 mm/year (26% of global sea-level rise). (1.6 inches per hundred years)
3. The average rate of sea-level rise due to increased mass from melting ice was 0.75 mm/year (47% of global sea-level rise). (2.9 inches per hundred years)
4. **This leaves 0.44 mm/year of sea-level rise (27%) not adequately explained. (1.7 inches per hundred years)**

The authors discuss the unexplained residual and conclude that to some extent it could be accounted for by a variety of changes in continental water storage as snow pack, soil moisture and ground water – which could range between 0.1 and 0.25 mm/year. However, it is probable that the unexplained residual is even greater than 27%. From page 5:

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"It has also been suggested recently (Gouretski and Koltermann, 2007) that due to instrument related biases the global ocean heat content might be overestimated by Levitus et al. (2005). That would lead to the reduction of 25% in the sea-level rise contribution from ocean heat content, increasing unexplained residuals."

In summation, this study clearly indicates it is impossible at present to fully explain the existing sea-level rise in light of what we know about ocean heat content and ocean volume changes due to mass increases.

Church and White, 2006: *A 20th century acceleration in global sea-level rise.* Geophysical Research Letters

The authors state that an acceleration in sea-level rise is present in tide gauge data for the 20th century. The reconstruction indicates that between 1870 and the end of 2004 the total sea-level rise is 195 mm – an average rate of 1.44 mm/year. For the 20th century the rise is about 160 mm, a rate of 1.7 mm/year. However, they note a clear change in the rate of sea-level rise at about 1930, and by fitting liner regressions to the lines come up with a result *"...implying an acceleration of 0.017 ± 0.007 mm/ year/ year (95%)."*

They conclude that if the acceleration is maintained through the 21st century, sea-level in 2100 would be 310 ± 30 mm higher than in 1990. Once again this is generally consistent with other projections of sea-level over the 21st century. This is because they assume a constant rate of acceleration. However, the authors also point out that the acceleration in the 20th century was not uniform over time but variable. Periods of more rapid sea-level rise appear to be related to periods of low volcanic activity (with about a 20-year lag). For example, the 1930s through 1960s acceleration occurred during a period of little volcanic activity. Contrastingly, the volcanic eruptions of Mt. Agung (1963), El Chichon (1982) and Mt. Pinatubo (1991) were all followed by short periods of reduction in global mean sea-level or in the rate of rise. They suggest that the volcanic eruptions may explain why little acceleration of sea-level rise has been observed over the second half of the 20th century.

Jevrejeva, Moore, Grinsted and Woodworth, 2008: *Recent global sea level acceleration started over 200 years ago?* Geophysical Research Letters

The authors present a reconstruction of global sea-level since 1700 in an attempt to determine when the acceleration started and to understand how it changed through the past 300 years. They conclude that *"...global sea level acceleration up to the present has been about 0.01 mm/yr² and appears to have started at the end of the 18th century."* They also point out that the time variable trend suggests that there are periods of slow and fast sea level rise including a 60-year variability that appears to be global. The causative mechanism for this cycle is not well understood. Refer to Figure 2 of this report which is reproduced from Figure 3 of the article. The 60-65 year cycle is clearly visible in the bottom half of the figure.

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They note that the fastest sea-level rise during the 20th century was between 1920-50 and appears to have been a combination of the peaking of the 60-65 year cycle and a period of low volcanic activity.

The authors conclude that sea-level rose 28 cm (about 11 inches) between 1700-2000; and that a simple extrapolation of their data leads to a 34 cm (13 inches) sea-level rise between 1990 and 2090. This is consistent with the projections shown in Figure 1 of this report. However, the authors note that this projection (34 cm) is probably too low and that sea-level will probably rise faster, once again reflecting uncertainty in what might or will happen.

Discussion and Conclusions

The difficult portion of this review follows. We must now make a decision on: What is a reasonable rate of sea-level rise to utilize in performing coastal geologic hazard and risk analyses for proposed single-family residential development?

The recent scientific literature clearly indicates that there are some apparently significant uncertainties in respect to predicting how fast sea-level will rise. These uncertainties include, but are not limited to the following:

1. The relationship between the volume of CO_2 in the atmosphere and the rate of change in the warming of the atmosphere and the oceans is not well understood or quantified.

2. Attempts to explain the existing sea-level rise in light of what we know about volumetric increase of the ocean due to ocean heat content and ocean volume changes due to mass increases are clearly inaccurate. As much as 25% and probably more of the volumetric change cannot be explained.

3. Rates of sea-level rise vary greatly through time. Researchers see a 60-65 year cycle in the rate of sea-level rise, which again is not easily explained or clearly understood. In addition there is good evidence that the rate of change can be significantly changed depending upon the frequency of large volcanic eruptions.

Other uncertainties also exist, but those stated above are sufficient to cast some doubt on the estimates of global sea-level rise during the next century. Despite the uncertainties there appears to be agreement among researchers in respect to the "best estimates for sea-level rise in the coming century." Most of the projections fall within the envelope presented as Figure 1 of this report – from the IPCC 2001 report, with updated AR4 IPCC projections. This graph indicates that sea-level will most likely rise somewhere between 18 to 60 centimeters (7 inches to 2 feet) by 2100. It also includes an allowance for additional land-ice uncertainty, which increases the range from 9 centimeters (about 4 inches) of sea-level rise to as much as 0.875 meters (34 inches – about 3 feet), almost an order of magnitude difference.

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It seems reasonable to deal with the uncertainty that exists in projected sea-level rise in the same way the definition of "active fault" is used in geologic hazard evaluation. The definition varies in respect to the nature of the construction; in that critical facilities must use a more conservative definition of "active fault" than single family residences.

The amount of sea–level rise that should be planned for in next century should be based on the nature of the proposed construction and a future sea-level rise that can be reasonably well-defined. Consequently, the least conservative estimate for sea-level rise should apply to single family residences, while facilities with a lower acceptable risk threshold, such as "critical facilities" should have to assume a more conservative amount of sea-level rise. Clearly, critical facilities such as government infrastructure, highways, port facilities, hospitals, fire stations, etc. should have to assume the most conservative estimates (the highest estimates) of sea level rise.

Based on the range shown in Figure 1, I suggest that a reasonable assumption for sea level rise in the next century, to be applied to geological hazard and risk analyses for single family residences, is as follows:

It should be equal to or greater than the total sea level rise in the 20th century and consistent with the rate of rise (acceleration) over the past 20-30 years. This number would lie someplace between 300-340 mm, approximately 11 to 13 inches.

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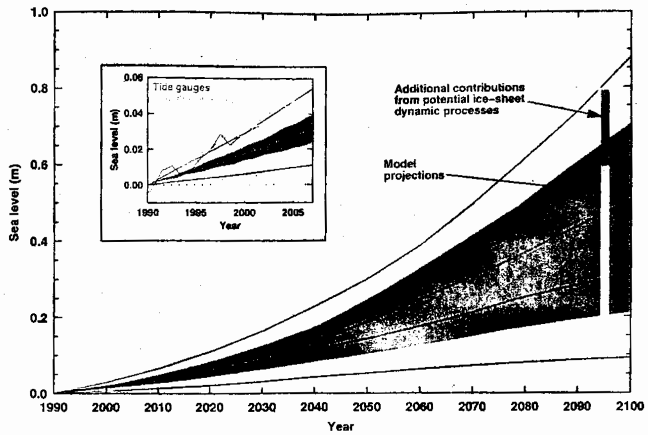

Fig. 6 Projected sea-level rise for the 21st century. The projected range of global-averaged sea-level rise from the IPCC (2001) assessment report for the period 1990–2100 is shown by the *lines* and *shading* (the *dark shading* is the model average envelope for all SRES greenhouse gas scenarios, the *light shading* is the envelope for all models and all SRES scenarios, and the *outer lines* include an allowance for an additional land-ice uncertainty). The updated AR4 IPCC projections (90% confidence limits, made in 2007 are shown by the *bars* plotted at 2095, the *magenta bar* is the range of model projections and the *red bar* is the extended range to allow for the potential but poorly quantified additional contribution from a dynamic response of the Greenland and Antarctic ice sheets to global warming. Note that the IPCC AR4 states that "larger values cannot be excluded, but understanding of these effects is too limited to assess their likelihood or provide a best estimate or an upper bound for sea-level rise." The *inset* shows the 2001 projection compared with the observed rate estimated from tide gauges (*blue*) and satellite altimeters (*orange*) (based on Church et al. 2001; Meehl et al. 2007; Rahmstorf et al. 2007)

Figure 1. At left is Figure 6, reproduced from Church and others (2008)

Figure 2. At right is Figure 3, reproduced from Jevejeva, Moore, Grinsted and Woodworth (2008).

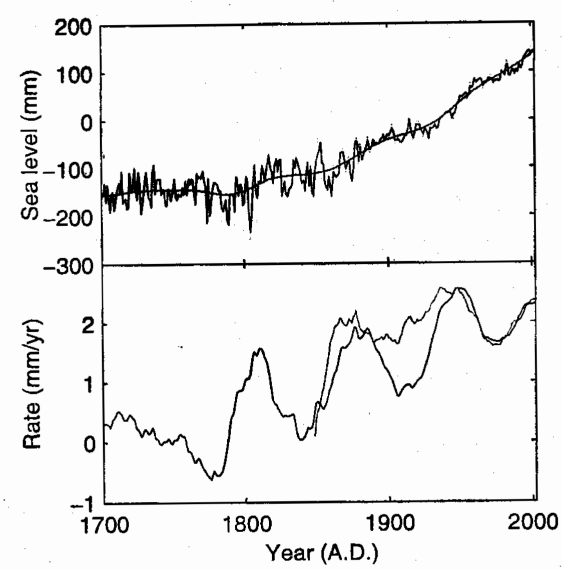

Figure 3. (top) Time series of yearly global sea level and time variable trend detected by method based on MC-SSA with 30year windows, grey shading represents (top) the standard errors. (bottom) The evolution of the rate of the trend (black line) since 1700. Blue line corresponds to the rate of North East Atlantic regional sea level rise since 1850.

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December 15, 2009

Ms. Susan Craig
Coastal Planner
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060

RECEIVED
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CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST AREA

Re: Appeal Numbers A-3SCO-09-001, - 002, - 003 (Frank)

Dear Ms Craig:

I have been asked by the applicant in the above-referenced appeals, Donald Neil Frank, to submit this analysis of the rate of coastal bluff retreat at Hidden Beach which is the site of his proposed project. This letter responds in part to certain issues raised by Dr. Mark Johnsson's Geotechnical Review Memorandum dated June 18, 2009. The analysis and conclusions in this letter apply as well to the site of the proposed project of Mr. and Mrs. Trousdale.

In particular, this letter addresses the geologic setting at the subject site, the process of erosion modification on coastal bluffs, and the site-specific erosional history at the project site. My analysis and conclusions are based on my professional qualifications and 39 years professional and personal studies of coastal processes and observations of coastal bluff erosion along the Santa Cruz, San Mateo, and Monterey County coastlines. A resume of my professional qualifications, education and experience is attached for your reference. I have lived and worked in Santa Cruz County for the past 39 years, and among my professional positions I have served as the County Geologist for the Santa Cruz County Planning and Environmental Health Departments, and served on an occasional basis in the same manner for San Benito and San Luis Obispo Counties. In addition I have been on the faculty of the Earth Sciences Department at the University of California, Santa Cruz for over 20 years as a lecturer teaching field geology, geomorphology and engineering geology.

The attached PowerPoint presents photographic evidence of the erosional history of the sea cliff at Hidden Beach, which fronts the subject property. The photos clearly show that there has been no wave erosion at the base of the sea cliff over the last 30 – 39 years. They also show that over the past 39 years there have been only two clear episodes of exceedingly minor bluff retreat. One of these episodes is referred to by Dr. Johnsson on page 7 in his Memorandum. If one closely examines the photographs in the Power Point it is clear that the referenced failure consisted of 2 or 3 blocks of soil, vegetation and terrace sands that fell out of the face of the cliff. These types of failures are typical of what occurs on abandoned sea cliffs (refer to Figures 1 & 2 in the Power Point). The triggering mechanism of failures of this sort are typically related to the growth of vegetation (root wedging, added weight, wind pressure on plants), seismic shaking, shrink-swell of clays in the soil and localized over-saturation by water. These sorts of failures are not "slides" as typically defined by geologists and engineers. They should not be used as criteria for determining the parameters used in quantitative slope stability analyses for the site. To do so would be inappropriate.

The photos also show that the estimates of rates of cliff retreat published in U.S.G.S. Open-File Report 2007-1133, (by Hapke and Reid, 2007) are erroneous for this specific site, as are the estimated rates of retreat in Living With the Changing California Coast (Griggs, Patsch and Savoy, 2005). Both of these publications are broad regional surveys and should not be used for the determination of coastal bluff retreat rates at a specific site.

Historic photos – the past 29 years:

The photos in the Power Point Presentation are from my relatively large personal collection of geologic and coastal photographs of the central California coastline taken over the past 39 years. In the early 1970's when I began studying the coastal geology of this area it became obvious that "time series of photographs" would be a valuable tool for studying coastal erosion. Fortuitously, during the past 39 years I have taken photographs of the sea cliff at Hidden Beach. These photos, including several taken following the large oceanic storms of the early 1980's, are the basis of the PowerPoint presentation.

To avoid confusing the reader it is important to clearly define the terms that I will use in this discussion. Please refer to Figure 1.

1. In "Stage 1" the *base of the erosional sea cliff* is at the intersection of the sea cliff formed by wave erosion and the "wave cut" ocean floor. Between New Brighton Beach and Pajaro Dunes this base of the cliff is covered by a colluvial wedge (aka talus pile) as shown in "Stage 2." When the base of the erosional sea cliff is buried by a colluvial wedge it becomes an *"abandoned sea cliff"* because active wave erosion has ceased.

2. *Sea cliff.* This is a generic term for a cliff at the edge of the ocean that was created by wave erosion. However, the term by itself does not imply present day activity, and the original cliff may have been modified by any of a variety of geologic processes. The geologic processes that operate on an abandoned sea cliff are known as **sub–aerial erosional processes**, because they occur in the air, not in the ocean. These include soil and rock falls, landslides, erosion by running water, root wedging, etc.

Figure 2 presents the three stages that typically occur as a sea cliff is abandoned by the ocean. <u>Note two aspects of the geologic processes:</u> 1. During a "relative drop" in sea level wave erosion ceases. 2. Once the sea cliff has been abandoned (not subjected to wave attack) sub-aerial erosion continues to modify the cliff face. The retreat of the top of the cliff is originally rapid but then decreases through time. As the slope angle of the sea cliff decrease through time the **rate of retreat of the top of the sea cliff slows**. Consequently, the rate of cliff retreat at the top of the cliff **is not constant**, but continually decreasing.

When wave erosion no longer cuts into the base of the cliff, sub-aerial weathering and erosion become the dominant geologic processes operating on the cliff face. The upper portion of the cliff slowly fails and falls down slope to the base of the cliff. The top of the cliff slowly "lays back" while at the same time the base of the cliff becomes progressively buried by the material that has eroded and sloughed from the top of the cliff. This reduces the steepness of the slope as the material eroding from the upper half of the cliff buries the lower half.

In the presentation of sequential photographs (Figures 3 – 9) the colored arrows point to identical locations on the face of the sea cliff. The most informative comparisons are those in which the photographs taken in 1980 are compared with photos taken in 2007 and 2009 (Figures 4 & 5). The photo comparisons clearly confirm the following interpretations:

1. The outermost edge of the colluvial wedge (talus) at the base of the sea cliff has experienced only very minor wave erosion over the past 29 years (refer to comparative photos – Figures 10 & 11). The bulk of the colluvial wedge (greater than 95%) has not been eroded during this time period. The base of the old "abandoned" sea-cliff remains buried under the colluvial wedge and has never been touched by wave erosion during the past 39 years.

2. The exposed portion of the cliff face above the colluvial wedge (talus) has experienced only minor sloughing and earth falls. These typically occur during large storm events and/or earthquakes but can occur randomly. This process of minor sloughing (earth falls and small rock falls) creating a colluvial wedge that is burying the lower sea cliff is consistent with the erosional modification that occurs along all "abandoned" sea cliffs as indicated in Figure 2.

3. The sea cliff at Hidden Beach is "abandoned" (and indeed the coastline from New Brighton Beach to about Sunset Beach) is characterized by an abandoned sea cliff, the base of which has not been touched by wave erosion for the past 39 years based on my personal observations. There is strong evidence that the cliff has probably not been touched by wave erosion for a much longer time period.

Aerial Photographs – the past 80 years, & historic maps – the past 150 years:

Interpretation of vertical aerial photographs, beginning with the 1928 and the 1930s photographs and ending with photos taken in the past 10 years, reveal no evidence that the base of the abandoned sea cliff at the subject property has been touched by wave erosion over the past 81 years. In addition a comparison of aerial photographs and modern maps with the 1860s shoreline maps prepared by the U.S. Coastal Survey suggests very strongly that there has been little if any erosion in the past 160 years. However, the 1860s maps are difficult to register with modern maps and aerial photographs; which makes it difficult to draw firm conclusions as to what actually happened between the 1860s and about 1930. However, the relatively low slope of the face of the cliff and the colluvial wedge themselves are strong evidence that these cliffs have not been subjected to wave attack for a very long period of time.

The storms of January 1983

During 39 years of walking Santa Cruz County beaches there is only one year in which I witnessed almost complete removal of the beach between New Brighton Beach and Sunset Beach (which encompasses the subject property) by wave erosion during major storms. During late January and early February of 1983 a series of large oceanic storms pounded the coastline. Large storm waves superimposed on high tides and a storm surge temporarily stripped sand off the beaches and eroded small scarps into the "toes" of the colluvial wedges at the base of the sea cliffs. It is probable that the storm surge associated with several of these large storms during an El Nino year raised relative sea-level several feet, suggesting very strongly that the base of the coastal bluff along this stretch of coastline is generally above the level of wave attack. This in turn suggests that erosion at the base of the cliff will not occur on a regular basis until sea-level rises several feet.

Figure 10 presents two photos of the extent of the erosion immediately south of Via Gaviota. Note that the waves have only eroded into the toe of the colluvial wedge, and have not eroded the base of the abandoned sea cliff. Figure 11 is taken north of Via Gaviota showing the beach in front of the subject property. The colluvial wedge is barely eroded. This is the thinnest beach that I have personally observed in this area over the past 39 years. Figure 12 shows the beach fronting the subject property in November 2000.

The same storms severely damaged homes along Via Gaviota and at Pajaro Dunes (Figure13) and elsewhere along the northern Monterey Bay shoreline. The homes at Pajaro Dunes which are built at the upwind edge of an active dune field on the active beach were severely damaged. Yet a short distance north at Sunset Beach (Figure 13) the waves created only a small scarp in the colluvial wedge at the base of the sea cliff. At Hidden Beach which fronts the subject property, the same storms stripped sand off of the beach exposing the risers for the sewer line, but only slightly eroded into the toe of the colluvial wedge at the base of the cliff (Figure 11).

The storms of 1983 provide an excellent illustration of the difference in exposure to wave attack that is present on the active beach versus the toe of the sea cliff. They also clearly demonstrated that the beach between New Brighton and Pajaro Dunes lies at the base of an abandoned sea cliff.

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Summation:

To summarize, there is no evidence of erosion at the base of the sea cliff in the past 29 years based on my photographs, and 39 years based on my personal observations. In addition, vertical aerial photographs taken between 1928 and 2006 indicate that it is highly probable that there has been no erosion at the base of the cliff for the past 80 years. The toe of the colluvial wedge has been nicked by wave erosion on at least one occasion but the old erosional sea cliff has not been touched by erosion. Even though there is no wave erosion occurring at the base of the cliff the sea cliff continues to slowly erode through a variety of natural "slope processes" which consist of a slow retreat of the top of cliff and burial of the base of the cliff by colluvium.

I recognize that Dr. Johnsson did not have this site-specific information at his disposal when forming his initial conclusions, but rather was relying on the general surveys referenced above. It is a well-accepted scientific practice, however, that site-specific data and conditions are the superior and preferred means of assessing coastal erosion. In this instance the site specific information is comprehensive and was sampled over a lengthy time interval with a significant number of episodes.

These site-specific observations and the photos constitute a direct contradiction to the analysis and conclusions drawn by Dr. Johnsson. On page 8 of his Memorandum he states:

> *The USGS National Assessment of Shoreline Change (2007) reports long-term erosion rates of 0.2-0.3 meters (0.66 – 0.98 ft)/yr for this stretch of coastline. ...this would predict 98 feet of bluff top recession over the course of the next 100 years."*

However, this analysis is clearly incorrect. This can be demonstrated by using the erosion rates presented in the USGS OFR to calculate the amount of erosion that should have occurred at the subject property between 1970 and 2009. Using the published rates of 0.2-0.3 m/yr (0.66 – 0.99 ft/yr) it is clear that between 1970 and 2009 the **coastal bluff at Hidden Beach should have retreated between 26 and 38 feet**. However, there has been no measurable retreat. A simple look at the photographs tells the story - there has been no erosion. Thus Dr. Johnsson's analysis and use of the rates published in OFR 2007 - 1133 are not applicable to this site. In addition, if Dr. Johnsson is correct, then the entire coastline, from the subject property south to Sunset Beach, should have retreated a similar amount: 26-38 feet. There is no evidence that this has happened. Thus, Dr. Johnsson's analysis is clearly incorrect.

Based on both photographic evidence and my personal observations over the past 39 years it is clear that the sea cliff in front of the subject property is truly "abandoned." It has not been attacked by wave action during my 39 years of observation and aerial photos indicate that it has not experienced erosion for approximately 80 years. In addition the presence of a large colluvial wedge at the base of the coastal bluff indicates that the bluff is not routinely subjected to wave erosion, and may not have experienced any substantial wave erosion over the past 150 years.

These observations and conclusions also affect any attempts to predict the effects of sea level rise at the subject property. The only stripping of the beach occurred in an El Nino year during large storms associated with a storm surge of at least several feet. This clearly indicates that the sea cliff will not be subjected to routine yearly wave attack until the relative mean sea level has raised a similar amount. Consequently, any analysis of the effects of sea level rise on coastal cliff retreat rates in the area of Hidden Beach cannot rely on the generally simplistic assumptions that are presently the basis of most attempts to predict where the shoreline will be at the start of the 22nd century.

If you have any questions regarding these materials, my observations and conclusions please contact me.

Sincerely,

Gerald E. Weber

Gerald E. Weber, Ph.D.
R.G. #714
C.E.G. #1495

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cc: Neil Frank
Erik Zinn
Thomas H. Jamison, Esq.
Cove Britton
Susan McCabe

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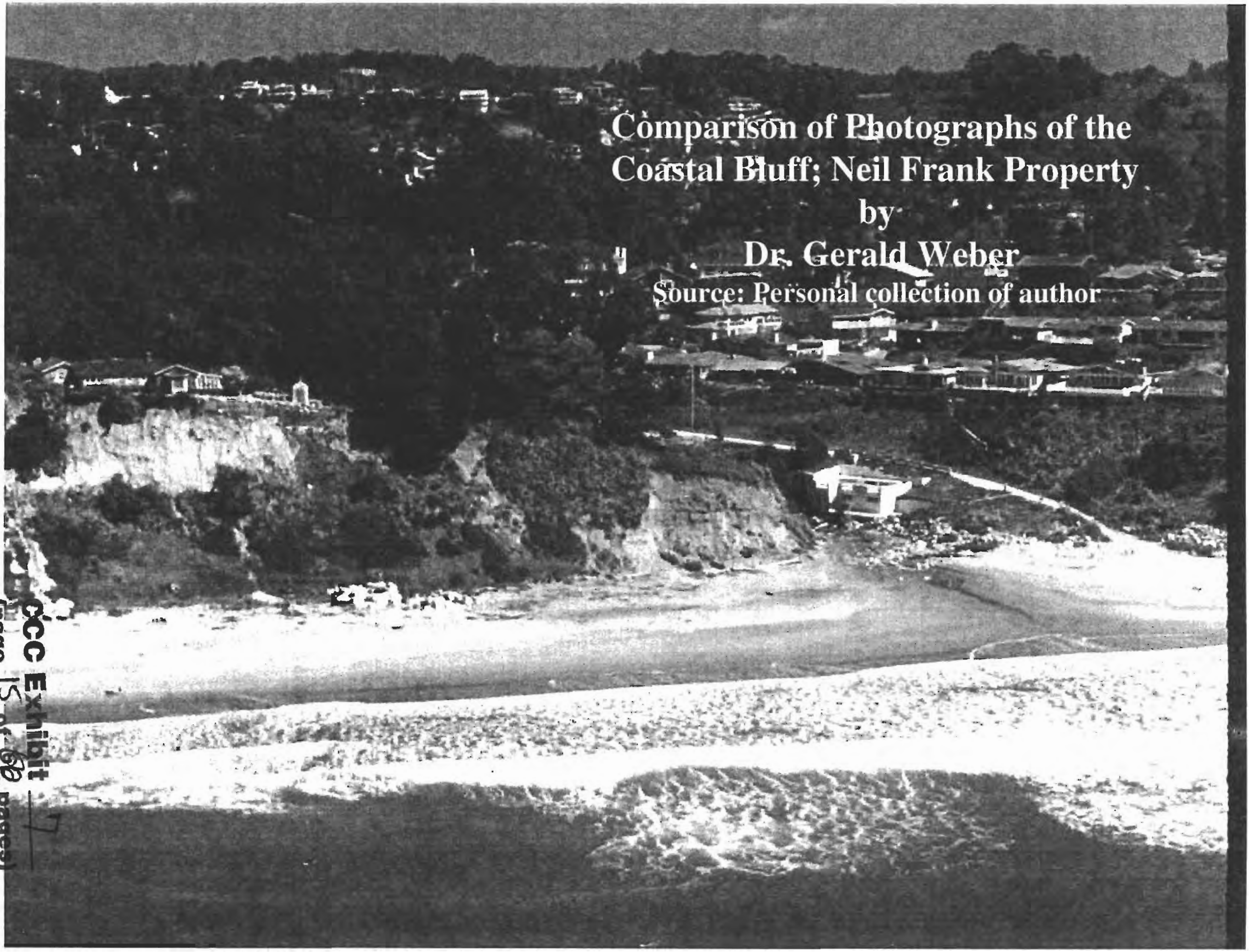
Comparison of Photographs of the
Coastal Bluff; Neil Frank Property
by
Dr. Gerald Weber
Source: Personal collection of author

Figure 1. Abandonment of the Erosional Sea Cliff

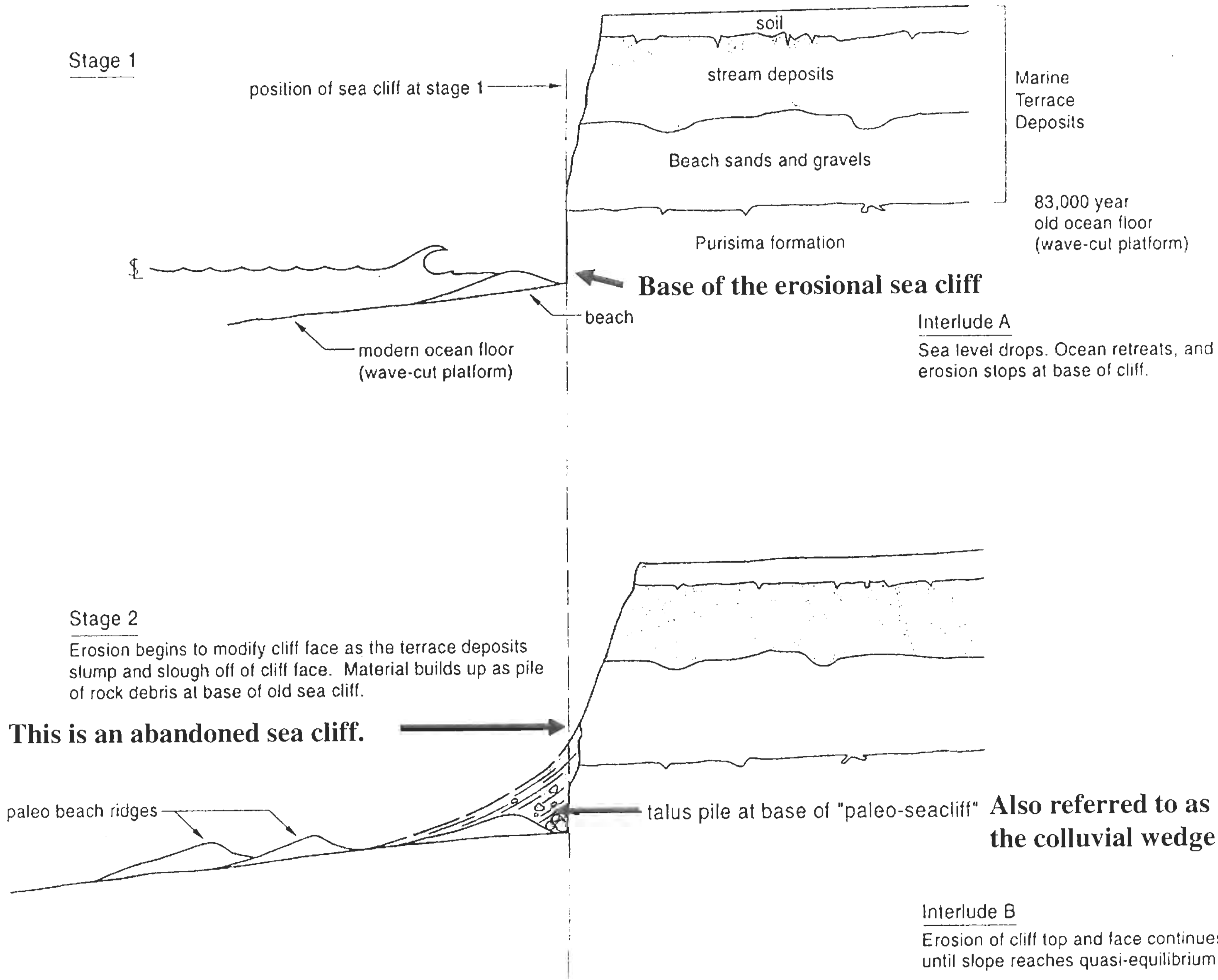

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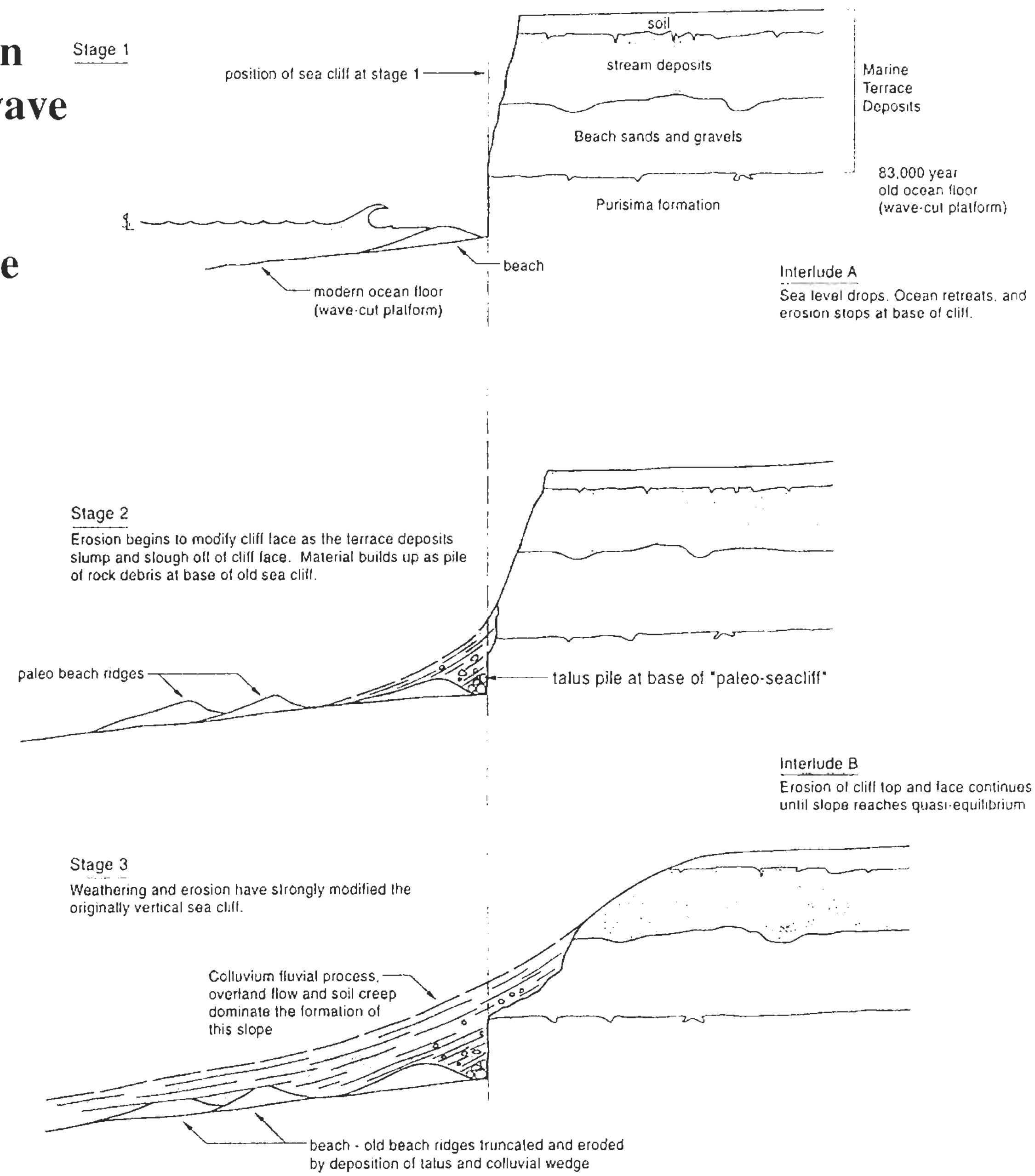
Figure 2. Erosional modification of an abandoned sea cliff. No wave erosion at base, accompanied by a slow build up of colluvium which has been derived from the top of the sea cliff.



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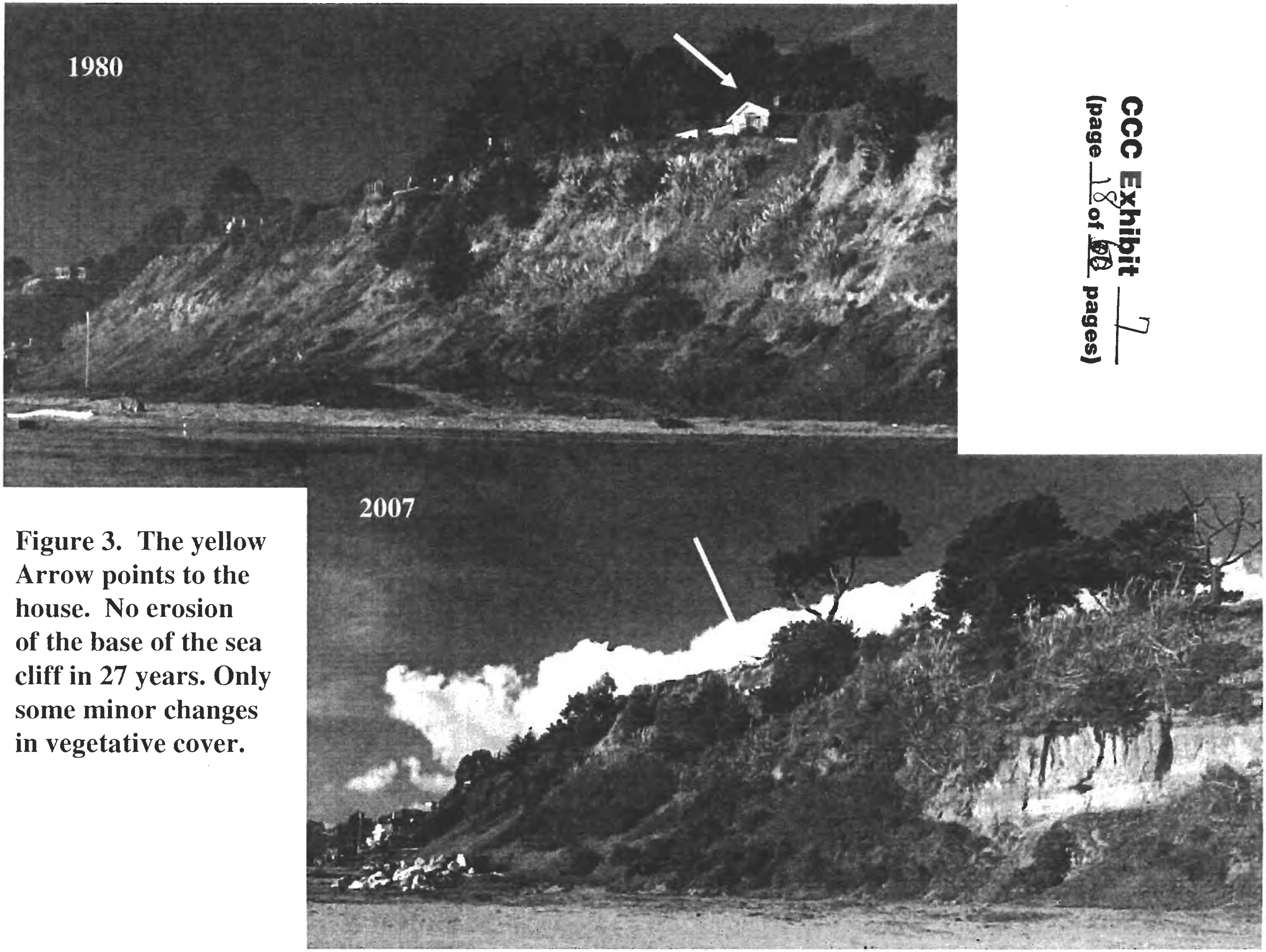

Figure 3. The yellow Arrow points to the house. No erosion of the base of the sea cliff in 27 years. Only some minor changes in vegetative cover.

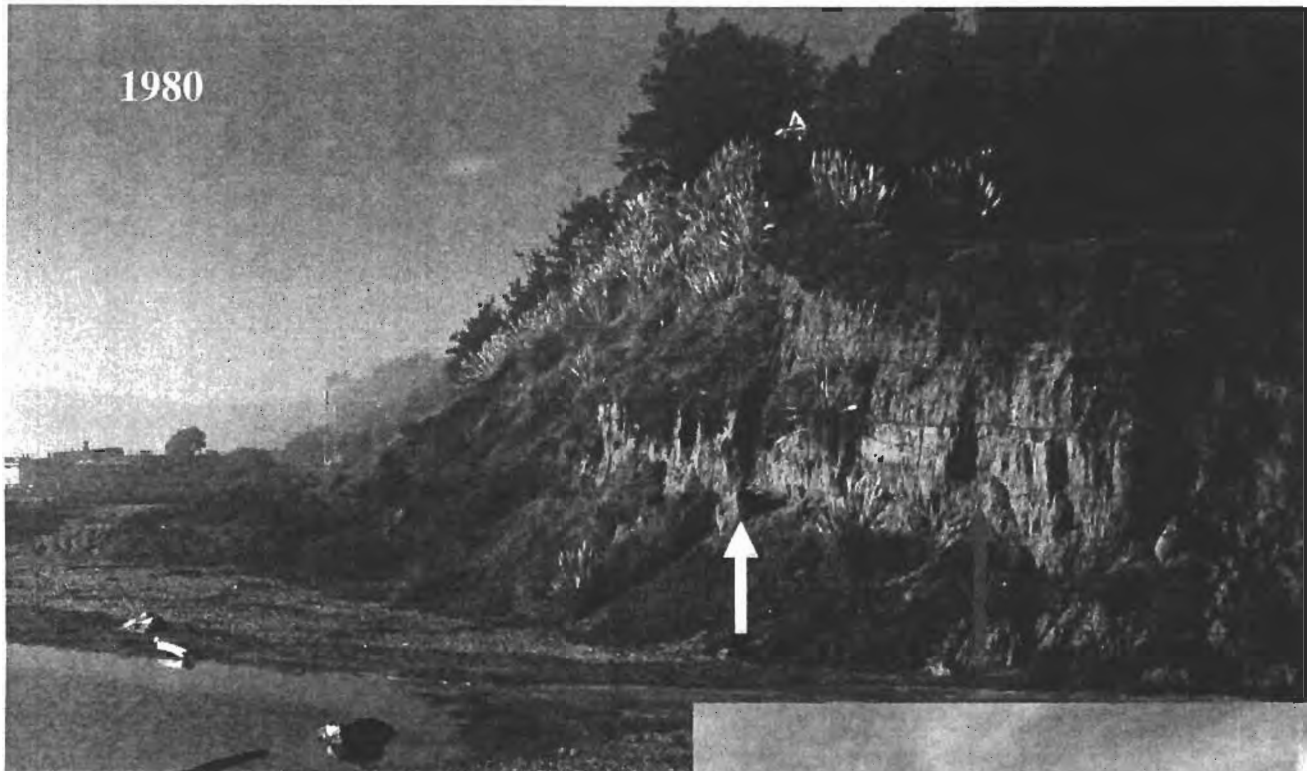

Figure 4. Nearly 30 years and no significant erosional change. Possibly a foot or two of soil and terrace deposits have sloughed off of the top of the sea cliff.

The arrows indicate the same points on the cliff face.

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Figure 5. Again, nearly 30 years and no significant erosional change. The bare talus slope has slightly increased in size and the bare area (red stars – 2009 photo) are sites of small recent soil failures off of the cliff face. There has been no erosion at the base of the sea cliff.

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Figure 6. Very little change in 2 years. It appears 2 small soil blocks have fallen (red stars). These apparently are the erosional changes alluded to by Mark Johnsson in his memorandum.

The blue arrows point the same spot in both photos.

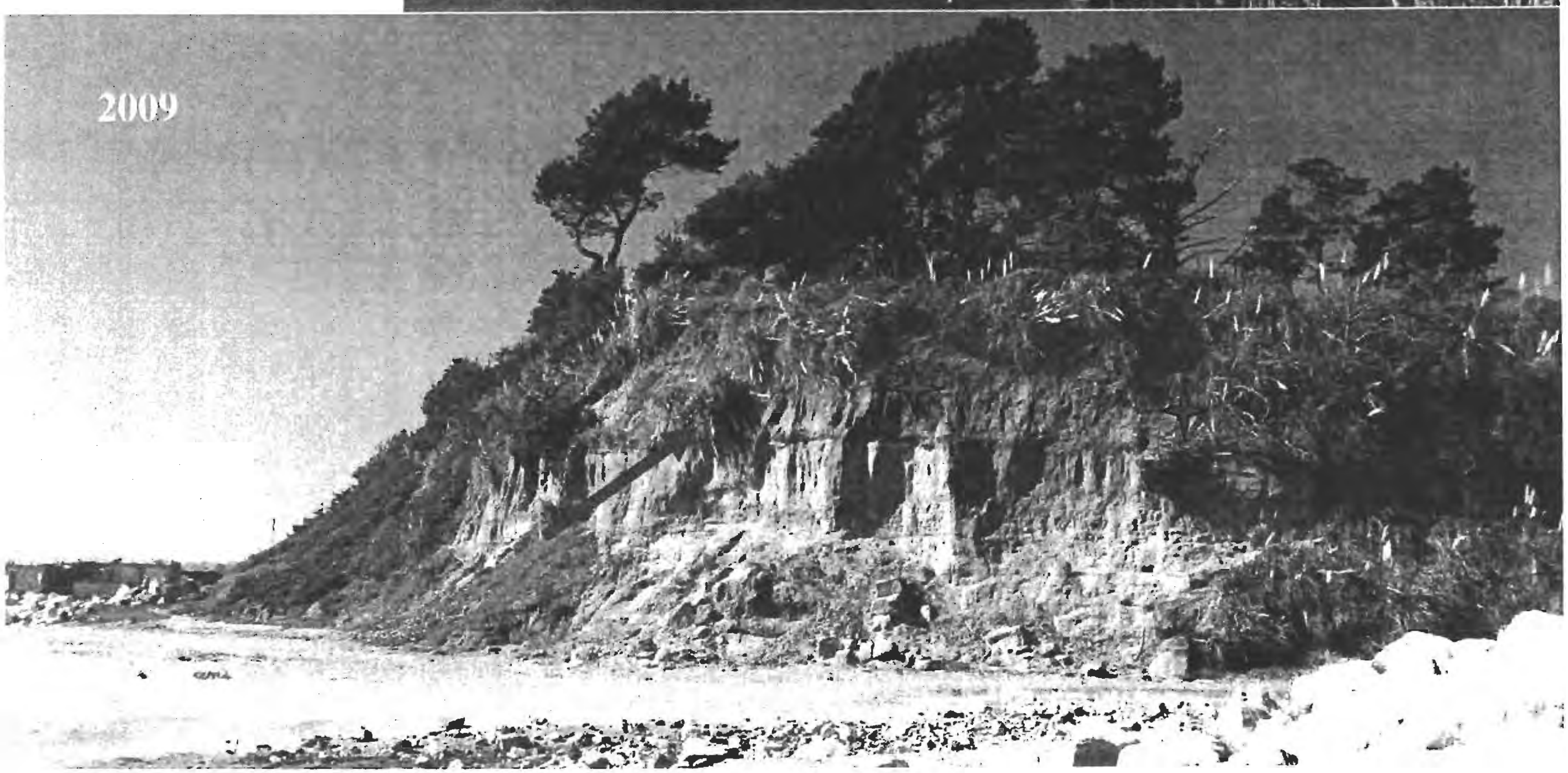

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Figure 7: Aerial obliques of the subject property.

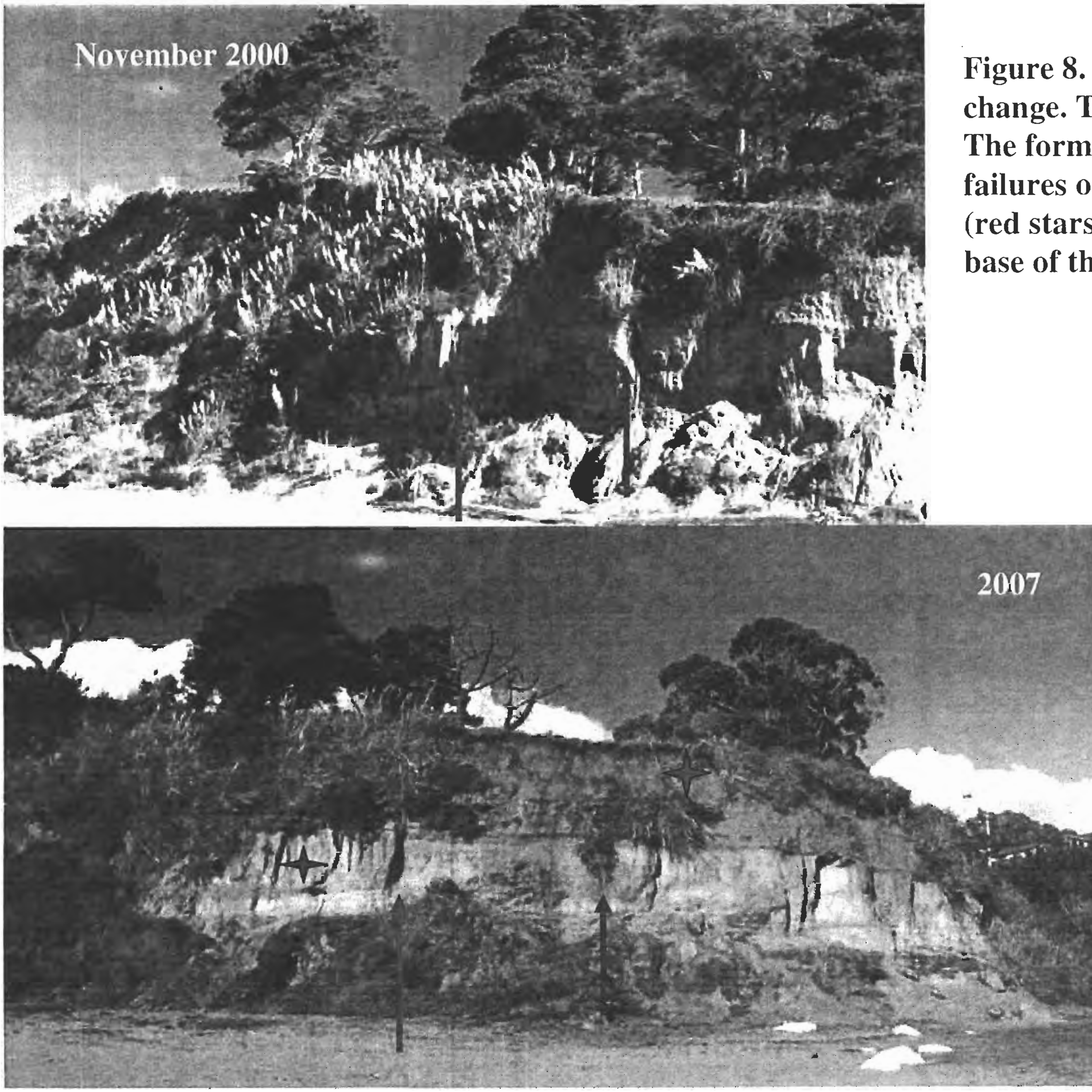

Figure 8. Seven years of change. The only change is The formation of minor failures off the upper cliff face (red stars). No erosion at the base of the cliff.

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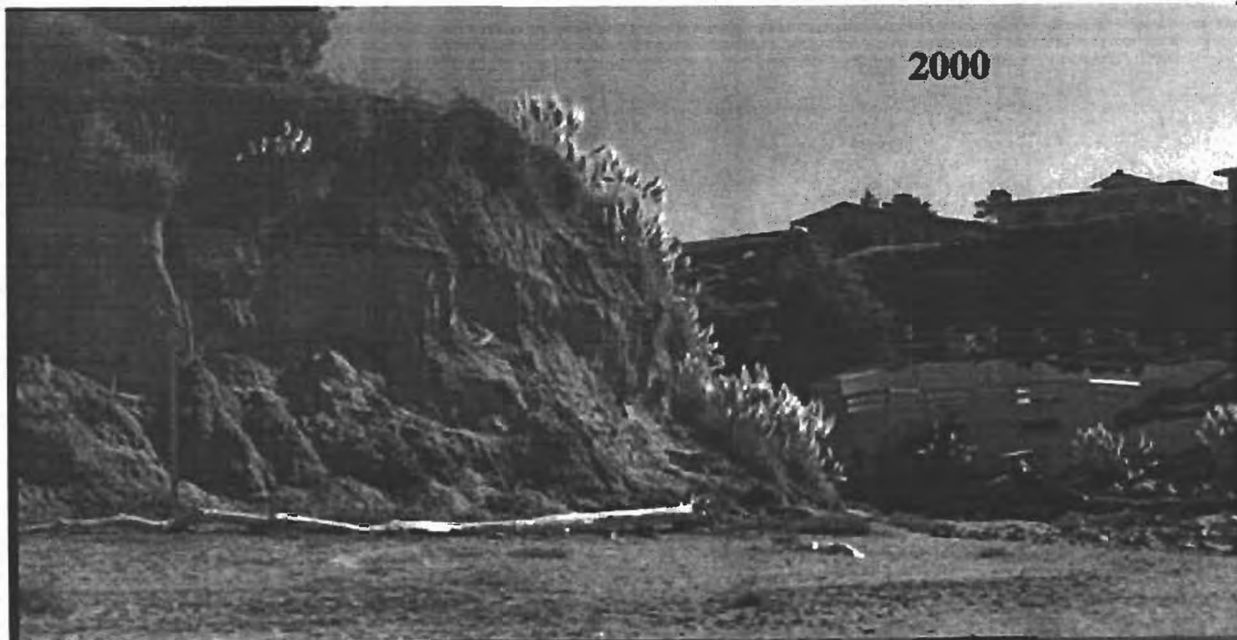

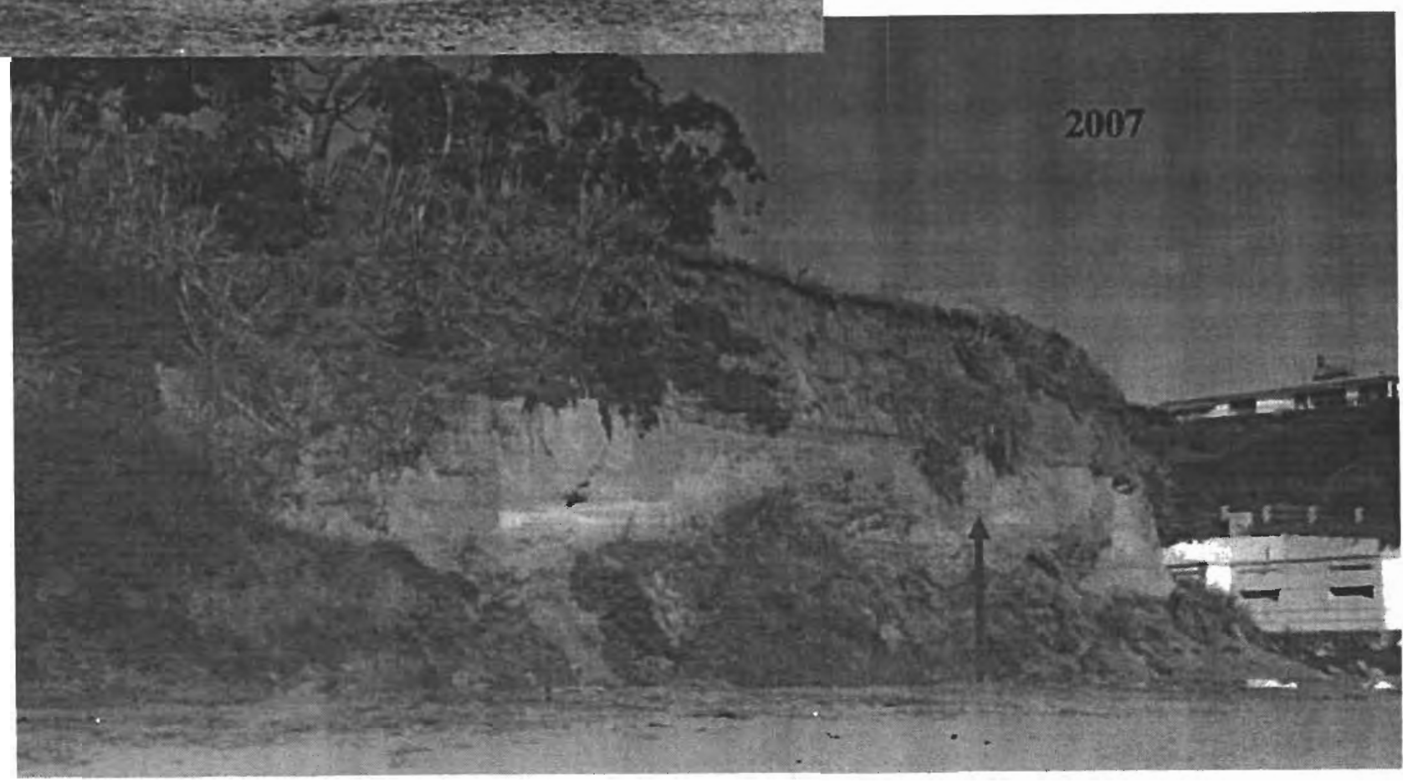

Figure 9. These photos were taken at the same time as in Figure 8. No evidence of wave erosion at the base of cliff.

Figure 10. Two photos taken of the same area south of Via Gaviota. There has been only slight erosion of toe of colluvial wedge at base of the sea cliff. Note that the storm has stripped The beach and nipped into the toe of the colluvial wedge. This is the maximum amount of erosion I have observed in this area over the past 39 years. Note the base of the erosional sea cliff, which is buried, has not been touched by erosion. This lack of erosion during the largest storm in 40 + years supports my contention that the base of the sea cliff is above the reach of normal wave attack.

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Figure 11. Wave erosion at subject properties – January 23, 1983. The only time the beach has been stripped in the past 39 years. Evidence that the base of the erosional sea cliff is above the level of wave attack.

Figure 12. Beach in front of the subject properties, November 2000. Same location as in figure 11. Note the growth of vegetation out onto the upper beach, a sign that this area is generally not within the reach of the waves.

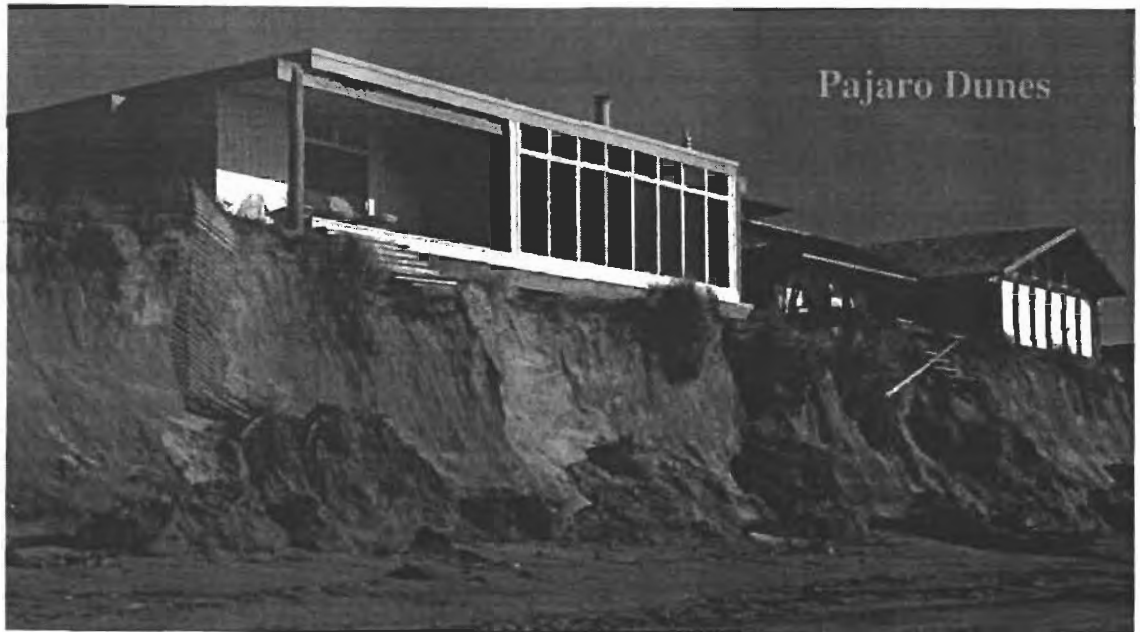

Figure 13. Two examples of erosion associated with the 1983 storm.

At Sunset Beach (north of Pajaro Dunes) the colluvial wedge was eroded, but the waves did not erode base of the abandoned erosional sea cliff.

At Pajaro Dunes the storm eroded *active dune sands (very soft and easily eroded*) that were recently deposited on the beach face. These homes were built on the active beach as opposed to the top of the sea cliff. This is the result.

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February 2, 2010

Ms. Susan Craig, Coastal Planner
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060

Re: Appeal Numbers A-3SCO-09-001, - 002, - 003 (Frank)

Subject: Projections of Sea-level Rise in the 21st century:

Dear Ms. Craig:

Introduction

In my letter to you of December 15, 2009, I explained the site-specific erosion and bluff top retreat rates at the site of the Frank projects at Hidden Beach which are the subject of the above appeals. In that letter it was explained that the specific conditions prevailing at this site, based on observations and data that are comprehensive, differed considerably from the data that Dr. Mark Johnsson utilized in his Geotechnical Review Memorandum dated June 18, 2009. Dr. Johnsson did not have the benefit of all of this comprehensive data in forming his initial recommendations. However, two things are clear from his Memorandum as well as his article and the other papers he cites on bluff top retreat. First, erosion conditions and rates can vary significantly by site location, so it is always site-specific data that is both preferred and the most reliable in evaluating erosion/bluff top retreat at any given site. Second, the data that we have on erosion and bluff top retreat at Hidden Beach is comprehensive, and that data as well as our use of it is consistent with the protocol set forth by Dr. Johnsson himself in his paper on coastal bluff setbacks; principally, it extends over a lengthy period of time (well over the 50 years recommended by Dr. Johnsson), and includes several episodic events. Indeed, it was the intent to follow that protocol, to the extent it comports with accepted professional geological standards, in evaluating the Frank site.

This letter report now addresses certain issues related to future sea level rise raised in Dr. Johnsson's Geotechnical Review Memorandum. In his Memorandum Dr. Johnsson presents the view of the California Coastal Commission that sea level will rise 3 feet (one meter) in the next century. This number is stated as a minimum; and he suggests that sea level could rise in excess of 4 feet. It appears that this number is to be taken into account in determining erosion rates and the "setback distance" for construction on the subject properties.

In assessing the possible effects of an assumed value for sea level rise, as pointed out above, one must first put it into context with the **site-specific conditions** on the properties. Consequently, the effect of sea level rise on these properties must be evaluated in the light of the specific geologic conditions of these properties.

The following analysis of the effects of sea-level rise is based on the site-specific conditions and not upon regional or generic studies. Of particular significance is the elevation of the toe of the colluvial wedge in respect to sea level and the height at which coastal erosion may be initiated.

Site-Specific Geologic Conditions

Historic Coastal Erosion

Photographic Evidence: As indicated in my letter of December 15, 2009, both the photographic evidence and my personal observations over the past 40 years indicate that the cliff in front of the subject property is an "abandoned sea cliff." It has not been attacked by wave action during my 40 years of observation.

Analysis of historic vertical aerial photographs (beginning with the 1928 flight) extends this period of "non erosion" to 80 years. There is no indication of erosion of the sea cliff at the subject properties between 1928 and the present. The large colluvial wedge at the base of the abandoned sea cliff is present in both the 1928 and the 1931 photographs. This period of "non erosion" can be extended even further. Comparison of the aerial photographs with the maps produced by the first coastal surveys performed in the mid 1800's also show no indication of cliff erosion. I want to make it clear that because of the large time gaps between sequential aerial photographs; and the difficulty of comparing them with the mid 1880's maps; it is impossible to be 100% certain that minor amounts of erosion of the toe of the colluvial wedge did not occur in the 1800's. Regardless, one can use these sources to conclude that there has been little, if any, erosion of the toe of the colluvial wedge during the past 80 years, and probable that no significant erosion has occurred for the past 150 years.

The Colluvial Wedge: The conclusion stated above is supported by a second line of reasoning – the presence of the colluvial wedge itself at the base of the sea cliff. The large colluvial wedge at the base of the cliff is present on all aerial photographs, and appears to be present on the mid 1800's maps. This colluvial wedge presently has a slope angle of about 30 – 40 degrees, and there is no discernable difference in slope between the 1980 and the 2009 photographs. The shape and size of the wedge is essentially unchanged by 40 years of sub-aerial erosion and deposition on the wedge. This clearly indicates that sub-aerial erosion is degrading the sea cliff very slowly, and that the top of sea cliff is retreating at an extremely slow rate. The presence of a well developed colluvial wedge on the 1928 and 1931 aerial photographs is clear evidence that this is the same colluvial wedge that is present today. We know this has to be true because of the limitations of the deposition rates on the formation of these wedges. This obviates any other conclusion.

Hypothetically, if one assumes that the colluvial wedge which is present on the 1928-31 aerial photographs was completely eroded away by a series of large storms in the late 1930's, then the wedge we see today would have to have been deposited between the late 1930's and 1970 – a little over 35 years - and then experienced no noticeable change for the next 40 years. This is not possible. The colluvial wedge has to have been there for well over 80 years. This in turn indicates that the colluvial wedge had to begin forming many years before 1928. This supports the conclusion that it is highly probable that the coastline has not experienced significant erosion since the mid 1800's.

On January 23, 2010 I visited the Hidden Beach area to assess the condition of the sea cliff following the recent series of storms. These storms were associated with the present El Nino, had occurred during a period of neap tides when the daily high tide was between 5.1 and 5.5 feet, and had significant wave height of approximately 15 ± feet. The toe of the colluvial wedge had not been eroded.

Tectonic Uplift: the 1989 Loma Prieta Earthquake

During the Loma Prieta earthquake along the San Andreas Fault Zone the area west of the fault moved northwest and up, while the area east of the fault moved southward and down (Plafker and Galloway, eds. 1989; and Anderson, R. S., 1990). In both papers the maps showing uplift are based on data obtained from laser geodometer (geodolite) and GPS measurements made within days of the earthquake. The Plafker and Galloway article shows between 8 – 9 inches of uplift, while Anderson shows about 35 centimeters (10.2 inches) of uplift during the earthquake. More recently (Burgmann, and others 1994, Figure 12) a model of recent Santa Cruz Mountains deformation was created using fission track ages and geodetic data. The model suggests that uplift at the subject properties was about 200 millimeters (approximately 8 inches). Although these studies all show uplift in the range of 7-10 inches, other studies suggest it may be less. For example, Arnadottir and Segal (1994) using a variety of geodetic data indicate an uplift of about 10 centimeters (about 4 inches) at the subject properties.

The effect of the uplift of the mainland relative to sea level during the 1989 earthquake places the toe of the colluvial wedge higher above sea level than the colluvial wedge was in 1989. This provides an even greater margin of safety in regard to wave erosion than was present in 1983 – the only year in the last 39 years during which wave action eroded the beach back to the toe of the colluvial wedge.

The above referenced data can be used to project the effect of this uplift on the potential for future erosion at the subject properties. Here are four possible interpretations, using two different sea level curves. These are the IPPC 2007 projections which range from 18 cm to 90 cm (7 inches – 35 inches); and the Rahmstorf 2007 projections which range from 60 cm to 145 cm (2 feet to 4 ¾ feet).

Using the **IPCC 2007** model of projected global sea level we can assess the effect of the tectonic uplift resulting from this single event as follows:

1. Assume that uplift at the site was 9 inches (229 mm), and use the middle of the range of "model projections" - 380 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2065 as they had in 1989. This suggests that the toe of the colluvial wedge will not be subjected to erosion until well after the middle of the 21st century.

2. Assume that uplift at the site was 9 inches (229 mm), and use the maximum projected sea level rise – 900 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2040 ± as they had in 1989. This suggests that the toe of the colluvial wedge will not be subjected to erosion until about the middle of the 21st century.

3. Assume that uplift at the site was 4 inches (102 mm), and use the middle of the range of "model projections" – 380 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2033 ± as they had in 1989.

4. Assume that uplift at the site was 4 inches (102 mm), and use the maximum projected sea level rise – 900 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2016 ± as they had in 1989.

Using the **Rahmstorf 2007** model of projected sea level (p. 31 of Cayan et al, 2009):

1. Assume that uplift at the site was 9 inches (229 mm); and use the middle of the range of projections – 1000 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2037± as they had in 1989. This suggests that the toe of the colluvial wedge will not be subjected to erosion until 25 – 30 years in the future.

2. Assume that uplift at the site was 9 inches (229 mm), and use the maximum projected sea level rise – 1400 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2030 ± as they had in 1989.

3. Assume that uplift at the site was 4 inches (102 mm), and use the middle of the range of projections – 1000 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2022 ± as they had in 1989.

4. Assume that uplift at the site was 4 inches (102 mm), and use the maximum projected sea level rise – 1400 mm by 2100: Then the properties in question will have the same relationship to sea level in the year 2014 ± as they had in 1989.

Discussion: I want to emphasize that these projections reflect **only the effect of the uplift of the coastline during the Loma Prieta earthquake**. It projects when the properties will have the same relationship to sea level as they had in 1989. Although there is some uncertainty regarding the exact amount of uplift that occurred, it is clear that the toe of the colluvial wedge will be higher above sea level than it was in 1989 for a minimum of 4 years and a maximum of 55 years.

El Nino Caused Elevations in Sea Level

During the 1980's and 90's the central California coastline was subjected to two major El Ninos in which sea level was raised well above average. The colluvial wedge at the site was not subjected to erosion during these El Ninos. This provides information as to the height sea level must rise in order to initiate erosion of the colluvial wedge. I emphasize that this methodology has been recommended previously by other researchers. A paper in the *Proceedings of the Coastal Zone 07* (Ewing, L., 2007) suggests the following (italics are mine):

> "Some steps toward examination of the coastal responses to a rapid rise in sea level are *(1) using current or historic surrogate conditions, such as El Ninos, floods, tsunamis, or subsidence, as qualitative models of future shoreline change*; (2) assessing sea level adaptability of various natural and constructed coastal features; *(3) determining the sea conditions which would exceed the adaptive capacity of various coastal features*; and (4) examining the implications for current coastal management efforts."

The 1982-83 El Nino: The Fort Point tide gauge shows that during the 1982-83 El Nino sea level was temporally elevated **9 inches above** the "present day sea level." This elevation of 9 inches is related to the El Nino oscillation and does not include the wind induced storm surge. Beach erosion during this El Nino occurred during several exceedingly large storms associated with high tides and a storm surge of several feet. Despite this the toe of the colluvial wedge at the subject site was barely nipped by wave erosion.

The 1997-98 El Nino: The Fort Point tide gauge shows that during the 1997-98 El Nino sea level was temporarily elevated **11.5 inches above** the "present day sea level." Again this does not include the wind induced storm surge. The total effect of all factors associated with a major storm system (high tides, high waves, El Nino, storm surge) can elevate sea level a large amount. Cayan et al (2009, p. 13) state that during one of the storms in February 1998 all of the factors that affect sea level coincided to raise sea level by up to 5 feet (1.5 meters) above normal in San Francisco Bay. I am of the opinion that it would be inappropriate to transfer this number directly to the outer coast; but it is reasonable to infer that during this El Nino sea level was probably raised several feet (3 feet at a minimum) at Hidden Beach. During this storm there was no erosion at the toe of the colluvial wedge at the subject properties.

Discussion – Tectonics and El Ninos

The only historic stripping of the beach in front of the subject properties during the past 40 years (personal observation) occurred in the 1982-83 El Nino year during large storms associated with a storm surge of at least several feet added on top of a high tide and a sea level that was already elevated 9 inches (by the El Nino) in respect to today's mean sea level. If one adds to this 9 inch elevation to the 2 -7 inches of relative uplift associated with the Loma Prieta earthquake, and add the fact that the erosion occurred at the highest tides of the year on top of a storm surge; it is clear that the beach was barely eroded by storm waves at a relative sea level that was more than 3 feet above the present level.

How Much Must Sea Level Rise to Initiate Erosion of the Colluvial Wedge?

Site Specific Erosion: The sea cliff fronting the subject property is clearly above the level of wave attack. The same appears to be true for the entire length of coastline between New Brighton Beach and Sunset Beach. I have personally observed that there has been no erosion of the sea cliff over the past 40 years. Historic vertical aerial photos indicate there has been no erosion over the past 80 years, and comparison of these photos with the mid 1800's coastal surveys suggests that there has been little if any erosion over the past 150 years. The reason for this is not known. There are a minimum of three hypotheses that could explain this anomalous condition. None can be either proven or rejected.

What is clear is that even under conditions where sea level was 3 feet higher than at present, during large storms with significant wave heights of 7 meters (23 feet) and during periods of high tide, there was no erosion of the toe of the colluvial wedge. Clearly, sea level must rise 3 feet (or more) before it will be high enough to begin to erode the toe of the colluvial wedge on more than an occasional basis. Using the two sea level curves used earlier we can approximate when this will happen for sea level elevations of 2 ft (609 mm), 2 ½ feet (762 mm) and 3 feet (914 mm).

Using the most radical projection (highest) of **Rahmstorf 2007,** those levels would be reached on about 2061, 2070 and 2077 respectively.

Using the highest projection of the **IPCC 2007,** those levels would be reached on about 2078, 2090 and 2100 respectively

Consequently, using the highest projections of sea level from both sets of projections, I anticipate that we will not see the initiation of erosion of the toe of the colluvial wedge at the subject properties until well after mid century. Considering all of the uncertainties and assumptions involved in the construction of the computer models used to predict both global warming and sea level rise, and the exceedingly short time period on which these projections have been based, it is likely that there will be no erosion of the toe of the colluvial wedge until around 2090.

In summation, it is clear that a close examination of the site specific geologic conditions reveals a geologic setting for the coastal bluff that is quite different than that portrayed in USGS Open-File Report 2007-1133 (Hapke, and Reid, 2007). It is important to point out that the Hapke and Reid paper is a generalized approach to evaluating trends in erosion for the entire California coastline. It was not intended to be used in site-specific evaluations. As is clearly stated in Hapke and Reid (2007, p. 2) under **Use of Data**:

> *"The results and products prepared by the USGS* ***are not intended for comprehensive detailed site specific analysis of cliff retreat,*** *nor are they intended to replace any official sources of cliff erosion information identified by local or state government agencies, or other federal entities that are used for regulatory purposes."*
>
> ***"The results are not intended for predicting future cliff edge positions*** *or future rates of cliff retreat."*

The toe of the colluvial wedge has barely been touched by erosion in the past 40 years. It is highly probable that the toe has not been eroded by waves over the past 80 years; and indeed may not have been touched by erosion for 150 years. It is also clear that the toe of the colluvial wedge is elevated a minimum of 2 ½ feet above the level of wave attack; and that a sea level rise of over 3 feet will be needed to place the subject properties in a position where the toe of the colluvial wedge will be subject to routine wave erosion. This will most likely occur late in the 21st century.

Planning Issues

Projections of Sea Level Rise

As stated in my earlier response (March, 2009) regarding projections of sea level rise, there is a great deal of uncertainty in these projections. The projections are typically calculated from computer generated global coupled ocean-atmosphere general circulation models (GCMs). These models are driven by scenarios of future greenhouse gas concentrations that are in turn determined by such variables as future population, the level of economic activity and wealth along with other variables. In addition, computer projections on the total amount of sea-level rise during the next century will be based in part on interpretations and/or assumptions of how rates of global warming, thermal expansion of the oceans, and mass increase of the oceans from melting glaciers will change over time.

One of the great uncertainties lies in the rate of change of sea level rise. At present scientists do not have an adequate understanding of the rate of change in the warming of the atmosphere and the oceans, and their relationship to the rate of change in the volume of CO_2 in the atmosphere. Examples of recent studies that reflect the uncertainty include:

1) Jevrejeva, Moore and Grinsted, 2008: ***Relative importance of mass and volume changes to glacial sea level rise.*** Journal of Geophysical Research

In this study the authors examine the relationship between global sea level rise, thermal expansion of sea water due to warming, and increased mass related to melting of glacial ice and ice sheets. The authors found that despite their efforts they could not explain where 27 % of the water added to the ocean came from. Glacial melt water and thermal expansion of the oceans could only account for 77% of the additional water. This clearly indicates it is impossible at present to fully explain the existing sea-level rise in light of what we know about ocean heat content, ocean volume changes due to mass increases, and the amount of glacial meltwater. If it is not possible to determine what the relative components are that contribute to observed sea level rise over the past decades and century, it raises serious doubts about the validity of projections of sea level rise in the future.

2) Jevrejeva, Moore, Grinsted and Woodworth, 2008: *Recent global sea level acceleration started over 200 years ago?* Geophysical Research Letters

The authors present a reconstruction of global sea-level since 1700 in an attempt to determine when the acceleration started and to understand how it changed through the past 300 years. They conclude that *"...global sea level acceleration up to the present has been about 0.01 mm/yr^2 and appears to have started at the end of the 18th century."* However, they note that there are periods of slow and fast sea level rise including a 60-year variability that appears to be global. The causative mechanism for this cycle is not understood. They also point out the importance of random events such as large volcanic eruptions that cool the earth. They conclude that an extrapolation of the data between 1700 - 2000 indicates there will be a 34 cm (13 inches) sea-level rise between 1990 and 2090. However, the authors note that this projection (34 cm) is probably too low and that sea-level will probably rise faster, once again reflecting uncertainty in what might or will happen.

3) Flick, R. E., and Ewing, L. C., 2009: *Sand volume needs of Southern California beaches as a function of future sea-level rise rates.* Shore & Beach, Vol. 77, No. 4, pp. 36-45
The authors deal primarily with a deficiency in sand in the littoral drift systems along the Southern California coastline. However, they discuss both Past Sea-Level Rise and Possible Future Sea-Level Rise near the end of the article. In respect to past sea-level rise they point out that while west coast tide gauges typically show about 20 centimeters of rise over the past 100 years , the "*...tide gauge data from La Jolla suggest that local sea-level off southern California rose much more slowly or may actually have dropped slightly, since about 1980. The reason for this is not known; it may relate to influences from the Pacific Decadal Oscillation."*

In regard to future sea-level rise, they state, page 40: *"Few geophysical phenomena can be accurately predicted, including sea level rise."* They continue by stating that projections can be made and scenarios created using a general understanding of principles and processes and projecting these into the future. These scenarios can then be modified over time. They also point out: *"Each approach requires certain assumptions, which can only be refined as time goes on and observations become available."* And yet again, the authors clearly state that great uncertainties exist in the prediction of sea level rise in the next century.

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Discussion: Sea-level has been rising slowly since the end of the "Little Ice Age." The Fort Point tide level gauge shows approximately 8 inches (203 mm) of sea level rise over the past century. In addition a slow acceleration in the rate of sea level rise has been identified from global studies. However, neither the amount of sea level rise nor the acceleration of sea level rise has been constant throughout the oceans of the world (Fletcher, 2009; Jevrejeva, et al 2008). In particular, the causes of the changes in the rate of sea level rise are not understood. Although some processes (i.e. large volcanic eruptions, as ice-calving - ice-sheet dynamic processes) that can affect sea level have been identified, there are others which have not been neither identified nor adequately quantified. Consequently, any projection of sea level rise over the coming 90-100 years must be regarded as highly speculative.

Regardless, the projected rise of sea level for the period ending 2100 (based on a review of articles listed in the Bibliography) can be summarized as follows:

1. The majority of the projections lie between about 40 cm (16 inches) and 60-80 cm (24 – 32 inches).

2. The highest projections are from Pfeffer, Harper & O'Neel (2008), who project a rise of between 0.8 meters (32 inches) and 2.0 meters (79 inches – 6.6 feet).. They include a component for ice-sheet calving.

3. The IPCC (2007) predicts a rise between about 20 cm (8 inches) and 70 cm (27 inches); but include a projection including ice sheet dynamic processes the indicates a sea level rise of about 90 cm (36 inches).

Many of the projections contain the caveat that larger values cannot be excluded.

This leaves us with projections that range from a low of 20 centimeters to a high of 200 centimeters – a ten fold difference. This by itself demonstrates the tremendous amount of uncertainty incorporated in any projections of sea level rise. The requirement for the use of a 3-4 foot rise in sea level in estimating erosion at the site is clearly at the high end of an extremely wide spread of predicted values.

Conclusions

Historic Erosion: Historic photographs clearly show that the subject properties lie at the top of an abandoned sea cliff fronted by a broad beach; and that it has not been subjected to wave erosion for the past 40 years. They also show that the top of the sea cliff has retreated a very small amount over this time period. In addition, the large colluvial wedge that forms the face of the abandoned sea cliff has been untouched by wave erosion over this time period. In the winter of 1982-83 large storms with 15-20 foot waves, on top of a storm surge, on top of high tides, occurring during an El Nino year when sea-level was raised about 9 inches, stripped the beach back to the toe of the colluvial wedge. During the El Nino year of 1997-98 with a sea level elevation or 11 ½ inches (due to El Nino) there was no erosion of the toe of the colluvial wedge.

Vertical aerial photographs from 1928 and the early 1930's of the subject area show that the sea cliff has a broad, well developed colluvial wedge at its base, very much like today. There is no evidence of erosion of the colluvial wedge on the historic aerial photographs. From this we can conclude that there has been no erosion of the colluvial wedge for the past 80 years. The absence of erosion can be extrapolated back to about the mid 1800's when the first coastal maps were prepared by the United States Coastal Survey. It appears that the coastline is unchanged in this area and that a colluvial wedge is present at the base of the cliff. Consequently this section of coastline has probably not been subjected to significant amounts of erosion (if any) for the past 150 years or so. The exact reason for this is not known, but these facts are known and documented.

El Ninos and Storms: During the past 40 years the coastline has been subjected to several El Ninos (1982-83 & 1997-98) during which relative sea level was raised between 9 – 11 inches in respect to what mean sea level is today. During the 1982-83 El Nino (9 inch rise in relative sea level) the coast was subjected to series of very large storms during the months of January and February. These storms rode into the coastline on top of high tides and a storm surge with 20-25 foot waves. During these storms the beach at the subject property was stripped out to the toe of the colluvial wedge, but the wedge was not cut back by the storm waves. I estimate that sea level during these storms was a minimum of 3 feet higher than the present day mean sea level – and may have been considerably more.

The 1997-98 El Nino raised sea level about 11 inches in respect to today's mean sea level and did not erode the toe of the colluvial wedge, and there was less overall impact to the coastline in general than in 1982-83. This may be because the storms were not as severe as in 1982-83.

Loma Prieta Earthquake: The 1989 Loma Prieta earthquake raised the southwestern side of the Santa Cruz Mountains in respect to the northeast side. The coastline at the subject properties was raised between 2 and 7 inches in respect to today's mean sea level.

Predicted Sea Level Rise and Cliff Erosion: Using this information it is reasonable to conclude that even a rise in sea level of 2 ½ to 3 feet will not result in erosion of the colluvial wedge at the subject property. Since storms surges such as occurred in 1982-83 are relatively rare events, it is highly probable that it will take over 3 feet of sea level rise to initiate erosion at the base of the sea cliff. This will most likely occur some time between sometime between 2070 and 2090. That erosion, when and if it occurs, will be intermittent. It will not occur on a yearly basis until well after 2100.

This analysis of the site specific geologic and oceanographic conditions at the subject properties suggests that the pending rise in sea level will probably not initiate erosion at the toe of the colluvial wedge for at least 60 years. Consequently, I suggest that any analysis of sea cliff erosion should use as a starting point for "sea cliff" erosion the year 2075 as the worst possible scenario.

Projections of Sea Level Rise: Review of the scientific literature on climate change and sea level rise reveals that there is a great amount of uncertainty in the prediction of these processes. The computer models are approximations at best, at this time. Climate has been slowly warming and sea level has slowly risen over the last century, but there is great uncertainty as to what will occur in the future. Computer models used to project climate change and sea level rise all suffer from a lack of certainty because of the complexities of the systems and the relationship between these two systems. Over the next 10 – 20 years, as the data base expands, these models will be improved and the predictions will become more reliable. As Neils Bohr once said; "Prediction is very difficult, especially if it's about the future."

Summation: The subject properties lie at the top of an abandoned sea cliff that has not experienced active wave erosion for a long time – perhaps 100-150 years. When one considers the absence of erosion on these properties, the occurrence of tectonic uplift, the absence of erosion during El Nino elevated sea levels, and the absence of erosion during exceedingly large storms associated with storm surges, it is clear that the area is elevated above the level of present day wave erosion by at least 3 feet, and probably more. When this information is plotted on the IPCC and Rahmstorf projected sea level curves it is clear that wave erosion will not be routinely occurring at the base of the colluvial wedge until after 2070 and perhaps not until after 2100.

If you have any questions regarding these materials, my observations and conclusions please contact me.

Sincerely,

Gerald E. Weber

Gerald E. Weber, Ph.D.
R.G. #714
C.E.G. #1495

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26 February 2009 Job #2006009-G-SC

Neil Frank
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Re: Supplemental analysis in response to California Coastal Commission comments
Parcels southeast of Bayview Drive
Aptos, California
County of Santa Cruz APN's 043-161-51, -40, & -39

Dear Mr. Frank:

Our firm is pleased to respond to your request for supplemental analysis of the long term bluff retreat for the above-listed parcels. The work summarized in this letter is in direct response to comments issued by the California Coastal Commission [CCC] Geologist, Dr. Mark Johnsson. Dr. Johnsson has requested that we revisit our analysis completed in August 2006, in light of recently published papers on projected sea-level rise over the next century. Dr. Johnsson has asked us to substantiate our 100-year long term coastal bluff retreat setback for your project in light of the CCC"s concern that sea level will continue to rise at an accelerated rate within the next 100 years. The following sections summarize our analysis.

OVERVIEW OF PREDICTING FUTURE UPPER COASTAL BLUFF RETREAT

The primary process that drives the retreat of the sea cliff in the Monterey Bay is hydraulic impact and scour from wave action. The sea cliff fronting the subject property appears to have been largely untouched by wave action since at least 1939. Ironically the top of the coastal bluff has continued to lay back through the process of erosion and shallow landsliding, resulting in the build up of a wedge of sediments in front of the bluff, herein referred to as a "colluvial wedge". The toe of the bluff, which includes the colluvial wedge, actually appears to be aggrading (moving seaward) overall through time. We are aware of only one coastal storm event in the last 70 years that has touched the colluvial wedge, a large oceanic storm piled upon a very high tide in early January 1983, which resulted in a small scarplet being cut into the toe of the colluvial

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wedge, where the colluvial wedge contacts the beach sand. The wedge has since refreshed itself and continues to grow seaward as the top of the bluff continues to lay back.

In order to calculate a future shoreline angle (where the coastal bluff intersects the wave cut platform abraded by the ocean) location for rising sea levels for this project, a geologist will need to consider the following parameters: sea-level rise and position, the rate at which the specific rising sea level will remove or drown the broad beach that fronts the bluff at a given sea-level rise rate, the rate at which the colluvial wedge will erode and retreat for a given sea-level rise rate, and finally the rate at which the sandstone bedrock that underlies the site and forms the sea cliff will erode and retreat for a given sea-level rise rate. The answer for this four variable equation would be the ultimate position of the coastal bluff for whatever time period is stipulated. The following subsections discuss each of these parameters and what might be a reasonable assumption for each parameter.

It is important to note that there are other parameters that could potentially be inserted into the bluff retreat equation, such as frequency and intensity of future storms. Even if we could accurately predict the future changes in such parameters, they are less likely to affect the long term retreat rate of the bluff then the aforementioned four primary parameters.

Sea Level Rise

Dr. Gerald E. Weber has written an entire letter on this topic for this project, available under separate cover. His synthesis of this topic and how it applies to this project is far more exhaustive than what we have presented below. The reader should refer to Dr. Weber's letter, which will be submitted under separate cover with this letter, for a much more detailed discussion of this topic.

The study of climate and sea level changes has become a hot scientific topic in the last 5 years, as evidenced by the number of peer-reviewed journal papers issued on the topic. We specifically reviewed the following papers for our supplemental analysis: Ekstrom et al., 2006; Domingues et al., 2008; Church and White, 2006; Church et al., 2008; Cayan et al., 2006; Cabanes et al., 2001; Vaughan et al., 2007; Rahmstorf, 2007; Pfeffer et al., 2008; Overpeck et al., 2006; Joughin et al., 2008; Jevrejeva et al., 2008a; Jevrejeva et al., 2008b; Collins and Sitar, in press..

All of the papers assume that the sea level will continue to rise because: 1. geological evidence clearly indicates that the earth has overall been slowly warming since the last sea-level low stand approximately 18,000 years, including the emergence from the Little Ice Age in the late 1700's-early 1800's.; 2. recorded historic sea levels clearly reflect a continuing rising sea level; 3. the processes driving global warming will continue into the foreseeable future; 4. the current warming trend is thought to be directly related to anthropogenic contributions to CO_2 concentrations. Hence, since sea level has been slowly rising as the earth slowly warms, this will continue in response to rising CO_2 levels. This continuing slow increase in temperature results in two processes that contribute to the rise of sea-level: 1. thermal expansion (heating) of the ocean and 2. increase in mass due the addition of water from the melting of glacial ice and polar ice sheets.

The unifying theme in these peer reviewed articles is that there is a direct relationship between rates of atmospheric warming, oceanic warming, and atmospheric CO_2 concentration, even though this connection is poorly understood. Consequently, researchers have had to make tacit assumptions as to how these variables interact in order to calculate projected sea levels and the rates at which the sea level will rise. It is important to note how profoundly important these assumptions are to the outcome of the researchers sea level predictions. If any of these unproven assumptions are incorrect, the predicted sea-level rise will be incorrect.

The papers listed at the beginning of this section, as well as the results published by the International Panel on Climate Change (IPCC) indicated that projected sea level rise is somewhere between 7 inches to 2 feet by 2100. An added uncertainty sea level rise factor between 4 inches and 34 inches has been added to account for their poor understanding of the volume of ice that currently exists on the continents.

In our opinion, the most reasonable approach for dealing with something as uncertain as projected sea-level rise should mirror the approach used in characterizing the hazard and risk for a given project with respect to the uncertainties present in calculating seismic shaking forces for a structure. The presumptive criteria utilized for assessing the acceptable risk is directly tied to occupancy and use of the structure being constructed. In that example, facilities such as hospitals are designed for higher seismic shaking values than single-family residences, since the hospitals have greater exposure to potential injuries and deaths and therefore a lower acceptable risk threshold than residences.

Based on the aforementioned information, and the excellent summary presented by Dr. Gerald E. Weber in his letter, it is my opinion that a reasonable assumption for sea-level rise in the next century to be applied to analyses for single-family residences should be equal to or greater than the total sea level rise in the 20^{th} century and consistent with the rate of rise over the past 20-30 years. This number would lie someplace between approximately 11 to 13 inches. Hence, we have utilized an assumed sea-level rise of about one foot for the next 100 years for this supplemental analysis.

Removal and/or Drowning of the Broad Beach Fronting the Subject Property

The width of the broad beach fronting the subject property is defined as the distance from the toe of the colluvial wedge to the high tide line at any given time.. This distance has been and will continue to be highly variable. The single instance in which the beach was almost completely removed by storm waves was in early January 1983. Typically the beach ranges in widths up to well over 300 feet. The average value (based on interpretation of historic aerial photographs) over the last 70 years is approximately 300 feet. Although minor differences in width are common, we were unable to discern a clear trend toward either a thinner or wider beach . The minor variations noted in beach width are clearly the result of seasonal changes (summer berm versus winter berm) in beach mass and width and the intensity and frequency of oceanic storms prior to the date of the photographs.

The back beach in front of the subject property is currently 10 feet above mean sea level (see the attached cross section – Plate 1). This area has only been eroded by waves once within the last 70 years (January 1983), during a large storm combined with a storm surge piled upon a very high tide. Since then the beach has built back out to its' average width. It is difficult to predict how many tens of years it will take to **permanently** remove the beach so that wave action can routinely impinge on the base of the colluvial wedge. Additionally, it appears there is no standard of care, no published statute, no ordinance or published peer-reviewed paper that presents a clear formula for the direct relationship between the rate of sea level rise and the rate at which the shoreline on a broad beach will advance landward.

Because of the lack of information in respect to this parameter, we must assume a value. Consequently, for this analysis we have assumed that it will take approximately 50 years,(corresponding to a sea level rise of 6-inches) for the permanent removal of the existing broad beach during the winter season.. This value is within the estimates for the IPCC (2001) assessment and AR4 updated projections (refer to Church et al., 2008, Figure 6). When one considers that this beach has only been removed once over the past 70 + years it is difficult to rationalize that a 6-inch rise in sea level would lead to a complete and permanent removal of the winter beach. However, in order to deal with a hypothetical process we need to assume a number that is far in excess of what we feel is probably valid. Therefore this is an ultra conservative analysis that would place the shoreline at the toe of the colluvial wedge 50 years from today.

Colluvial Wedge Retreat Rate

The same dilemma of lack of published data and formulas relates to the rate at which the colluvial wedge will retreat, if it is routinely attacked by wave erosion on a yearly or bi-yearly basis. We presume that the rate would be fairly high, considering the fact that the colluvial wedge is composed of unconsolidated sediments, roughly similar in composition to the underlying beach sand.

If one assumes a future shoreline angle elevation of one foot below mean sea level, the aggregate thickness of colluvium that needs to be removed before the bedrock is reached is approximately 10 feet.

Considering the lack of information for this parameter, we once again will have to assume a rate, so for this analysis we have assumed it would take approximately 3 years for the sea level to rise to the point high enough to advance the shoreline to the contact between the bedrock and the colluvial wedge.

Sea Cliff Retreat Rate

Published and unpublished average long term bluff retreat rates for the sea cliff up shore (northwest) of the subject site range from nil to upwards of 2 feet, depending upon the stratigraphy and structure of the bedrock and the orientation of the coastline. There are no published long term rates for sea cliff retreat by wave erosion anywhere near the site because the coastal bluff in this area has been protected by a broad beach (from New Brighton Beach State Park - up coast and northwest of the site - to Sunset Beach – down coast and southeast of the site) for 70+ years. Any bluff retreat rates for this stretch of sea cliff are basically rates that record the retreat of the top of the bluff due to rainfall erosion, drainage erosion, rock falls and shallow landslides - all terrestrial processes. Considering the geological setting, we have conservatively assumed that if the ocean ever forms a shoreline angle within the underlying Purisima Formation sandstone bedrock, it will do so at about one foot below mean sea level and will erode the shoreline angle back at an average annual rate of about one to two feet per year.

We have no reason to believe that the above listed assumed annual average bluff retreat rate values are too low or too high. Collins and Sitar (in press) attempted to quantify another way to deal with quantifying coastal bluff erosion, but their paper addresses a stretch of coastline along the Pacifica, California area that is underlain by entirely different earth materials. Additionally, it is important to note that if the sea level rise rate significantly exceeds the rate at which the shoreline angle can be abraded into the bedrock and advanced landward, there is every chance that the retreat rate might stabilize or slow down due to deeper water conditions in front of the shoreline angle (i.e. a drowned shore line angle). In any event, it is best to use predictable and reproducible rates for comparable geological conditions, where available, instead of creating fictitiously assumed rates.

WHAT DO WE DO WITH THESE PARAMETERS?

If the retreat rate for each component was rigid and simplified, the calculation would be easy to do. Unfortunately, as noted, we are very unsure of how quickly the broad beach will disappear and then how rapidly the colluvial wedge will be removed if sea level rises about one foot within the next 100 years. Hence, we feel it is reasonable to work backwards from the imminent failure of the residence, and deal with the envelope of uncertainty from the contact between the colluvial wedge and bedrock seaward toward the modern day shoreline.

In order to do this, we need to set the stage for imminent failure of the proposed residence. Assuming a vertical bluff that has just exposed the piers for the residence, which is presumptively built right upon the edge of our envelope, with a shoreline angle at about one foot below mean sea level, we note from our cross section that there is approximately 108 ½ feet of bedrock seaward of this point. If we assume a bedrock/bluff retreat rate of 1 foot per year, then it would take 108 ½ years for the proposed residence to become endangered after the bedrock is breeched by the rising sea. If we assume a bedrock/bluff retreat rate of 2 feet per year, then it would about 54 years for the proposed residence to become endangered after the bedrock is breeched by the rising sea.

If the bedrock retreat rate is one foot per year, then the proposed residence is obviously set back far enough to fulfill the intent of the Local Coastal Plan of a stipulated 100-year design life. Nonetheless, to carry out the calculation, we would then add 3 years for the removal of the colluvial wedge and 50 years for the removal of the beach resulting in a hypothetical lifetime of 161 ½ years.

Using a similar tally for a bedrock retreat rate of 2 feet per year (i.e. bedrock+colluvial wedge+beach = 54 years + 3 years + 50 years) results in a lower value of 107 years for the hypothetical lifetime.

CONCLUSIONS

The above analysis clearly shows that the proposed residences continue to be geologically feasible and that they conform to the intent of the Local Coastal Plan. The calculated life of the residences with respect to hypothetical bluff retreat lies between 107 and 161 ½ years, even after assuming a reasonable sea-level rise of one foot or more for the next 100-years and assigning conservative assumptions for loss of the broad beach, loss of the colluvial wedge and abrasion of the sandstone bedrock. We stand behind our original conclusions and recommendations issued in 2006 - the residences constructed within our stipulated envelope are geologically feasible.

It is important to note that we have performed this research at the behest of the California Coastal Commission Geologist, Dr. Mark Johnsson. To our knowledge, none of the work outlined in this letter adheres to standard of care for coastal geology investigations in Santa Cruz County or in any approved ordinances, prescriptive codes or statutes. We have assembled a plausible geological model for what we consider to be a reasonable assumption for a future sea level rise rate. There is no end of possibilities and ways to model this situation, if the geologist is almost completely unconstrained by data or calculations, as is the case here. As noted in the above sections, the only rate that appears to be even remotely constrained by data is the retreat of the Purisima Formation bedrock, located well up coast of the subject property. Considering the inherent uncertainty in all of the work done to date by the researchers, there is no reason to pursue this matter any further for this project and continue to debate the merits of all the different

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assumptions that one could conceivably make. To continue this pursuit any further would only unnecessarily forestall the issuance of the permit for the project, without furthering our understanding of the geology of the site, which has been determined to be suitable for the proposed development.

Sincerely

Zinn Geology

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Attachment: Plate 1 - Cross Section Used For Bluff Retreat Calculation

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February 26, 2009 Project No. 0630-SZ70-D63

Mr. Neil Frank
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Subject: **Response To California Coastal Commission Comments**
Lands of Frank
Bayview Drive
A.P.N. 043-161-51, -40 and -39
Rio Del Mar, Santa Cruz County, CA

Reference: **Review of Geotechnical and Geologic Investigation Reports**
Dr. Mark Johnsson, California Coastal Commission, dated November 10, 2008

Dear Mr. Frank,

As requested, we have reviewed the comments expressed by Dr. Mark Johnsson of the California Coastal Commission. Our response is based upon those comments, as well as discussions with Dr. Johnsson and Susan Craig during a meeting at their office on January 6, 2009. We offer the following response:

Comment #1
The minimum factor of safety of all potential failure modes was not determined. Instead, an assumed failure surface was specified and its factor of safety calculated. This is not standard practice and does not assure that the specified surface is, indeed the most likely failure surface."

As outlined in our geotechnical report, long-term bluff retreat rates were calculated on the basis of the project geologist's understanding and experience with bluff failures along this area of coastline. Such failures inherently included all the geological processes (erosion, landsliding, co-seismic failures, etc.) which could conceivably contribute to retreat of the bluff over the next 100 years. The purpose of our slope stability analysis was to quantify a worse-case failure surface using this analytical process and demonstrate consistency with observed slope failures, particularly those triggered by seismic shaking. In our opinion the most likely failure surface was adequately demonstrated using this approach and was consistent with numerous observations along the coastal bluffs.

Nevertheless, Dr. Johnsson asked us to perform additional slope stability analysis in accordance with the procedures outlined in the 16 January 2003 memorandum, titled "Establishing Setbacks from Coastal Bluffs". In general, the procedures outlined in this document require demonstrating a static safety factor of 1.5 or greater assuming circular failure surfaces through generally homogeneous materials.

The recommended setback is then determined on the basis of this failure plane, or a failure plane demonstrating a 1.1 safety factor with a horizontal seismic coefficient of 0.15g, whichever lies furthest landward. The results of our analysis are enclosed with this letter and demonstrate that, although the approach is not in our opinion a realistic model for coastal bluff landslide analysis, the recommended setback as outlined in the geologic and geotechnical reports lies landward of these postulated failure planes and remains appropriate from a geotechnical standpoint.

The results of our analysis suggest that retreat of the terrace deposit materials may encounter portions of the foundation piers for the seaward edge of the residence near the end of the structure's design life. The portion of the pier extending into bedrock will not be exposed however, suggesting continued support or mitigation measures that would not require the need for a coastal protection structure.

Comment #2
"No data are presented in support of the assumed shear strength parameters used in the analysis. Indeed the friction angle assumed for the Purisima Formation is unusually high"

As discussed with Dr. Johnsson, the following is a tabulated summary of shear strength values that have been obtained from laboratory testing of samples from this and adjacent properties (starting with the property furthest to the northwest and proceeding down coast):

Property Location	Reported By	Sample Depth	Cohesion	Phi Angle
Terrace Deposit Materials:				
A.P.N. 043-161-52	Steven Raas & Associates	5'	1420 psf	35°
(650 Bayview Drive)		10'	790 psf	40°
		15	1230 psf	30°
		20	710 psf	45°
A.P.N. 043-161-08	Steven Raas & Associates	5'	2150 psf	36°
(656 Bayview Drive)		16'	985 psf	42°
A.P.N. 043-161-57	Pacific Crest Engineering	6'	0 psf	39°
(660 Bayview Drive)		16'	0 psf	38°
A.P.N. 043-161-58	Pacific Crest Engineering	2'	0 psf	31°
A.P.N. 043-161-39	Pacific Crest Engineering	12'	700 psf	45°
	Haro, Kasunich & Associates	5'	880 psf	45°
		13'	100 psf	50°
		21'	300 psf	40°
A.P.N. 043-161-40	Pacific Crest Engineering	23'	175 psf	43°
A.P.N. 043-161-51	Haro, Kasunich & Associates	17'	0 psf	38°
Average Strength Values:			***630 psf***	***40°***

Purisima Formation Bedrock:

A.P.N. 043-161-52 (650 Bayview Drive)	Steven Raas & Associates	35'	1670 psf	37°
A.P.N. 043-161-08 (656 Bayview Drive)	Steven Raas & Associates	26'	1115 psf	33°
A.P.N. 043-161-58	Pacific Crest Engineering	27'	275 psf	45°
A.P.N. 043-161-51	Haro, Kasunich & Associates	29'	410 psf	34°
	Pacific Crest Engineering	22'	1150 psf	61°
		27	500 psf	48°
Average Strength Values:			***850 psf***	***43°***

As can be seen from the laboratory test results presented above, the soil stratigraphy is highly variable within the marine and fluvial terrace deposit materials, with resulting variations in laboratory-derived soil strength parameters. Our review of laboratory test results from this site and the adjacent properties up and down-coast confirm a wide variation in shear strength properties within the soils that overlie bedrock contact.

The slope profile was modeled using three predominant soil/rock types. Direct shear testing of soil samples within the wedge of marine and fluvial terrace deposits overlying the bedrock at this site indicate that cohesion appears to be the dominating strength component within the upper ten feet, with a more frictional component dominating the underlying sand strata to the bedrock contact. The strength values were conservatively selected and fall within the range of test results outlined above.

Comment #3
"The statement that "we do not expect failure geometries to encroach beyond the boundary [as specified by Zinn] and onto the building envelopes within the next 100 years" is not supported by facts or calculations."

Our 2006 analysis presented our interpretation of worse-case failure geometries and demonstrated that they would occur within the recommended structural setback outlined by the project geologist. Observed and calculated failure planes along these coastal bluffs suggest failures occurring at angles of about 35 degrees from horizontal, both statically and seismically. The increase in calculated safety factors therefore does not support failure geometries flatter than 35 degrees that could encroach beyond the recommended setback.

We appreciate the opportunity to be of service. If you have any questions, please contact our office. We can be reached at (831) 722-9446.

Sincerely,

PACIFIC CREST ENGINEERING INC.

Elizabeth M. Mitchell, G.E.
Associate Geotechnical Engineer
GE 2718
Expires 12/31/08

REGISTERED PROFESSIONAL ENGINEER · ELIZABETH MAE BAHNS MITCHELL · No. GE2718 · Exp. 12/31/10 · GEOTECHNICAL · STATE OF CALIFORNIA

Copies: 1 to Client
5 to Matson-Britton Architects
1 to Zinn Geology
1 to Dr. Gerald Weber

Enclosure: Quantitative Slope Stability Analysis

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July 3, 2009

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VIA EMAIL AND REGULAR MAIL

Susan Craig
Dan Carl
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060

RECEIVED
JUL 07 2009
CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST AREA

Re: Appeal Numbers A-3-SCO-09-001, -002, -003 (Frank)

Dear Susan and Dan:

I wanted to summarize in this letter my understanding of the salient points of geologic information and standards that have been disseminated in the various reports, counterreports, critiques, etc. for Neil Frank's project. In summarizing this information, this is in part my own attempt at trying to comprehend the information and grasp its significance from a practical standpoint. I am not a geologist so I am sure I may miss something, but it seems worth the effort to try to make some sense out of the points from a lay standpoint and try to understand how three professional geologists could reach such a dramatically different conclusion on the bluff setback.

Initially, as to the standard utilized by the Coastal Commission in measuring coastal erosion and establishing setbacks based thereon, I have read twice now in recent Coastal Commission reports[1] that the standard for gauging future coastal erosion is the historical coastal erosion rate; accelerating sea level rise is not a factor that is calculated into the future rate because of the numerous uncertainties and indeed considerable disagreement over what that amount might be. This Commission policy is made clear in the Monterey Bay Shores Appeal Staff Report dated April 24, 2009, in which it is stated at page 47:

> "There is no single, widely-accepted methodology for explicitly including sea level rise into projections of future bluff retreat. Rather, the Commission's practice in the past has been to base the recommended setback on the highest historic bluff retreat rate for [sic] in order to minimize the risk of coastal erosion hazards, and not to assume a specific amount

[1] Monterey Bay Shores Appeal Staff Report dated April 24, 2009, and the Staff Report for the Crescent City LCP Amendment cited in Dr. Johnsson's June 18, 2009 Geotechnical Review Memorandum on the Frank project.

> of retreat to the effects from sea level rise. This approach is particularly compelling given the uncertainty in sea level rise projections, including that associated with the potential melting of ice sheets and glaciers."[2]

Reviewing the geologic information submitted on the Frank project, we have Erik Zinn, the project geologist from Santa Cruz County, and Dr. Gerald Weber, a consulting geologist who was formerly the Santa Cruz County Geologist and is presently Lecturer Emeritus, Earth and Planetary Sciences Department, at the University of California, Santa Cruz. Mr. Zinn reviewed stereopair aerial photographs dating back to 1928 which were site-specific to the project location at Hidden Beach, and determined that the historic erosion rate at the site over almost 80 years varied from 0.27 to 0.30 feet per year on the beach bluffs and 0.05 feet per year on the along the arroyo bluff. Bluff top recession setbacks for the structures over a 100 year period were established accordingly at a minimum of 25 feet (as required by the Santa Cruz County LCP) up to 30 feet.

Dr. Weber was given the assignment of independently reviewing Mr. Zinn's report to critique its accuracy and conclusions in light of his own knowledge and experience. Dr. Weber concurred with Mr. Zinn's conclusions; in fact Dr. Weber concluded that Mr. Zinn's projected future rate was a very conservative estimate of the future bluff top recession at this location.

A couple of important conditions at this site were discussed in Mr. Zinn's report. One factor noted was that the base of the bluff of the Frank site has experienced no erosion at all since 1939. Another factor is that Hidden Beach is extremely wide, such that it is rare and only during the severest of coastal storms that wave run up ever reaches the base of the bluff. With no erosion occurring at the base of the bluff, the bluff top erosion will occur only as the angle of the bluff "lays back" to reach what I would call an angle of repose. This angle of repose was calculated and the erosion/setback rate was based upon it. Dr. Weber concurred in these conclusions and observations based on his own experience, and in fact explained that he believed that future bluff top retreat could well be less than in the past because (as I understand it) the base of the bluff was not eroding and the bluff angle had already "laid back" to some degree.

Mr. Zinn also noted that among the circumstances of which he could not take account were any future <u>accelerated increases</u> in ongoing sea level rise and any <u>increasing</u> intensity of

[2] In the recent Geotechnical Review Memorandum (June 18, 2009) provided by Dr. Johnsson on the Frank project, Dr. Johnsson states "Staff has always recommended consideration of sea level rise when evaluating future erosion rates. Until recently, this has been done only qualitatively and was based on historic trends in sea level rise. Given our evolving understanding of the mechanisms of sea level rise, staff is now recommending an upward revision of the rate of sea level rise, to a minimum of 3 ft/century." Yet this is only a recommendation of staff, and to our knowledge it has not yet been adopted as a policy or rule by the Commission, particularly on the order of 3 feet which is extremely high given the "uncertainty concerning sea level rise" repeatedly cited by Dr. Johnsson. And it is entirely inappropriate to apply this new "staff recommendation", if indeed it is one, to a small residential project such as the Frank project, which would effectively prohibit the project in a location where similarly-situated bluff top owners have been allowed to build for years.

coastal storms, because they were simply subject to too many variables and too uncertain to predict. As I understand it, however, a sea level rise of at least 8 inches is already imputed into the future erosion rate (because the historic rate includes 8 inches of sea level rise that occurred over the past 100 years), as well as the effects of intense coastal storms which are documented to have occurred over the past 80 years. So the future erosion rate, being based on the historic erosion rate, already includes some amount of sea level rise and the effects of a certain amount of intense coastal storms.

On the other hand, Dr. Mark Johnsson in his Geotechnical Review Memorandum of June 18, 2009 reaches a dramatically different conclusion on the appropriate bluff top recession setback. But prior to reaching the point in his memorandum (as well as the Monterey Bay Shores report) where Dr. Johnsson states what he is adopting as his recommended setback based on "observed historic long-term bluff retreat rates", he recites that he has requested the applicants in each case to go through what I believe he refers to as a "sensitivity" analysis of sea level rise. This involves requiring the geologists to extrapolate and fold into the projections of future coastal erosion various scenarios of accelerated sea level rise. This produces a series of increasingly severe projections of coastal erosion and therefore presumed setback requirements, without explicitly ever stating that these are being relied on or required. Why this exercise is insisted upon escapes me, because in the end all that is required in terms of a setback is the highest historical coastal erosion rate, which Dr. Johnsson picks, more or less as a "safety factor" to account for an accelerated rise in sea level which may (or may not) occur.

For the Frank project, in the end Dr. Johnsson selects the USGS National Assessment of Shoreline Change (2007) long-term erosion rates, which he reports as 0.2 – 0.3 meters (0.66 – 0.98 feet) per year "for this stretch of coastline". He then chooses the highest value, which is three times higher than Mr. Zinn's site-specific rate. What " this stretch of coastline" refers to is not the defined or described, nor is the support for Dr. Johnsson's quoted rate apparent from the USGS Study[3]. Dr. Johnsson then establishes the setback at the bluff top recession over the course of the next 100 hundred years (which is correct under the Santa Cruz County LCP), but

[3] I have reviewed the 2007 USGS Study and I cannot find that the erosion rates reported by Dr. Johnsson are cited in the Study. The Study reports an average erosion rate for all of the Monterey Bay shoreline at 0.4 meters per year, but this includes the very high erosion rates in southern Monterey Bay at Sand City and Marina. No specific erosion rates are cited in the text for Hidden Beach or indeed even the Santa Cruz/northern Monterey Bay shoreline. Figure 23 is a graph chart showing erosion rates at various locations from Davenport to Sand City, which is somewhat crude and imprecise. From it one could easily conclude that the erosion rate at Hidden Beach is – 0 –. The problem is compounded by Dr. Johnsson's lack of definition of "this stretch of coastline;" the results from location to location vary dramatically, indicating (I believe) that there is no substitute for a site-specific evaluation.

Further on this point, I cannot find anywhere in his Review Memorandum that Dr. Johnsson actually critiques or disagrees with Mr. Zinn's established site-specific erosion rates. All he critiques is Mr. Zinn's analysis of accelerated sea level rise. Mr. Zinn calculated the site-specific erosion rate from stereopair aerial photographs dating back to 1928, which are readily available for Dr. Johnsson's own review. Nor does Dr. Johnsson comment on or account for the particular unusual circumstances at Hidden Beach, discussed by Mr. Zinn, that militate against a higher erosion rate.

having taken the highest value of the erosion rate for "this stretch of coastline" and then adding a safety factor for stability (which I frankly do not comprehend) and then "following the method outlined in Johnsson (2005)", which method is not described, Dr. Johnsson comes up with a recommended set back of 116 feet for the beach bluff top lots, which of course is considerably greater than the depth of any of the lots and would preclude any development at all.

To me this is perplexing and surprising, because Santa Cruz County and the cities within Santa Cruz County and the Coastal Commission itself have for years approved development on the bluff top (and even on the beach) with far less of a setback, with findings that such development is consistent with the policies of the Coastal Act and the Santa Cruz County LCP. Mr. Zinn tells me that Dr. Johnsson's approach has never been taken before in analyzing Santa Cruz bluff top projects for single family residences. Indeed, as recently as 2008 and 2009, two bluff top developments were approved which had far lesser setbacks than that designated by Dr. Johnsson.[4] With Dr. Johnsson's conclusions, however, it appears that in no less than 100 hundred years (and likely much sooner, perhaps 25 years) the amount of "this stretch of coastline" will have the line of houses along the beach inundated, and many of the houses on the bluff top having collapsed on top them or onto the beach.

Some of the maps and data cited by Dr. Johnsson predict a disaster of gargantuan proportions, yet those maps apparently do not even trust themselves. The Pacific Institute maps on which Dr. Johnsson relies indicate on the maps themselves that they are not to be relied upon to assess <u>actual</u> coastal hazards.[5] But, in any event, even if they were, the conclusions would have tremendous implications for the public health and safety, not to speak of precluding any further development on the Santa Cruz County coast. The implications would be such that all houses presently along the bluff line on "this stretch of coastline" will shortly be a public hazard to the persons who inhabit them, and prudence would indicate that evacuation plans should be developed soon.

Distilling the essence of these reports, and to summarize my understanding.

1. The Coastal Commission does not impute an accelerated increase in sea level rise in its calculations of future erosion rates to establish development setbacks, but only historic erosion rates.

2. In establishing the historic erosion rate for the Frank project, Dr. Johnsson did not use a site-specific historic erosion rate but an erosion rate with varying values for a stretch of coastline that is not defined and is not site-specific, and took the highest erosion rate.

[4] These were A-3-SCO-06-006 (Willmot) approved by the Commission in 2008, and Appeal A-3-SCO-09-019, for which the Commission found No Substantial Issue on June 10, 2009.

[5] The maps state: "This work shall not be used to assess actual coastal hazards...." A similar caution is found on page 2 of the 2007 USGS Study which states in pertinent part that "The results...are not intended for comprehensive detailed site specific analysis of cliff retreat..."

3. Mr. Zinn calculated a site-specific historic erosion rate based on stereopair aerial photographs specifically applicable to this beach and site, which was concurred in by Dr. Weber based upon his independent review and evaluation and his experience with the Santa Cruz County coastline in a position of responsibility.

4. Mr. Zinn cited specific factors that explained the historic erosion rate and minimized the risk of future higher erosion rates, including the breadth of the beach and the fact that the base of the bluff has shown no erosion over the past 75 years.

5. Permits approved regularly along the Santa Cruz County bluff tops over the years under the Coastal Act have not assumed a position or calculated an erosion rate or setback line anywhere approaching what Dr. Johnsson has come up with for the Frank project.

6. As a consequence, Dr. Johnsson's review and recommendations are not an appropriate basis for analyzing this project or for applying to this project.

I look forward to communicating with you further on this topic so we can, hopefully, dispense with this as an issue in the appeal.

Very truly yours,

FENTON & KELLER
A Professional Corporation

Thomas H. Jamison

Thomas H. Jamison

THJ:tob

cc: Neil Frank
Cove Britton
Susan McCabe
Erik Zinn
Dr. Gerald Weber

SETTLEMENT AGREEMENT
AND
GENERAL MUTUAL RELEASE

This Settlement Agreement and General Mutual Release (hereinafter "Agreement") is made by and between Howell and McNeil Development, LLC, a California limited liability company, and Los Gatos-Saratoga Development and Investments, LLC, a California limited liability company (collectively, "Owners"), and State of California ex rel. California Coastal Commission ("State").

Recitals

A. Howell and McNeil Development, LLC, owns the real property commonly known as APNs 43-161-41, -18 & -44 in Santa Cruz County, a legal description of which is attached hereto as Exhibit A (the "Beach Parcel").

B. Los Gatos-Saratoga Development & Investment, LLC, owns the real property commonly known as APNs 54-191-57 and 43-131-34, a legal description of which is attached hereto as Exhibit B (the "Southern Parcel").

C. Disputes have arisen between the parties concerning public rights in and to the Beach Parcel and the Southern Parcel, as set forth in Action Number CV 143286 filed in the Superior Court, County of Santa Cruz, State of California (the "Action"). The parties desire to settle all disputes between them concerning public rights in and to the Beach Parcel and the Southern Parcel and development of such parcels, all as set forth below.

Agreement

NOW, THEREFORE, in consideration of the mutual covenants and agreements contained herein, the parties agree as follows:

1. **Conveyance of Property**: Owners shall retain the real property described in the legal description attached hereto as Exhibit C (consisting of a single lot located at the north-eastern end of the Beach Parcel, being 60-feet wide and 140-feet long, plus a portion of Beach Drive (the "Retained Parcel"). Subject to satisfaction of the conditions precedent described in Paragraph 2, below, Owners shall record an Offer to Dedicate to the State, or to any public entity designated by the State, fee title, free of any liens or encumbrances, to all of the Southern Parcel and all of the Beach Parcel excepting the Retained Parcel (the property to be conveyed shall be referred to as the "Conveyed Land"). The Offer to Dedicate shall be irrevocable for a period of ten years from the date of its recordation and shall state that it is offered in consideration of settlement of the dispute between the parties regarding the public rights in and to the Beach Parcel and the Southern Parcel, as set forth in the Action. The Offer to Dedicate shall be recorded within ten (10) days of final issuance, following any applicable appeal period, of any and all necessary building and development permits (including rezoning, General Plan/Local Coastal Plan amendments, and/or variances, if necessary) required to be obtained from the County of Santa Cruz or State, or any agency

of the State, for construction of a single family residence on the Retained Parcel, meeting the specifications set forth in Paragraph 2.

A map depicting the Parcels described in this agreement is attached hereto as Exhibit D for illustrative purposes.

2. Specifications for Development on Retained Parcel: Owners' obligation to offer for dedication the Conveyed Land shall be contingent on final issuance of all necessary building and development permits (including a rezoning, General Plan/Local Coastal Plan amendments and/or variances, if necessary) authorizing construction of a single family residence on the Retained Parcel with the following specifications: the dwelling shall be 3 levels with a garage and non-habitable storage space on the ground level; the entire structure shall have a minimum of 2,500 and a maximum of 3,500 square feet of habitable floor area (as defined by Section 13.10.700-H of the Santa Cruz County Code) excluding deck and balcony areas; the residence shall not exceed thirty (30) feet in height, as building height is defined by the County of Santa Cruz on the date that this Agreement is fully executed; the residence, excluding the access road, shall result in no more than forty percent (40%) lot coverage of the Retained Parcel; the residence shall comply with all FEMA requirements for construction in an area subject to flooding; and the access road and driveway for the dwelling shall be via a driveway extending from Beach Drive, which shall be no longer than the minimum extension necessary for access to the residence. There shall be no extension of the existing seawall, or additional rip rap, or revetments beyond those existing on the date

of this Agreement other than the minimum extension necessary to protect the driveway serving the residence; the residence shall be set back a minimum of eight (8) feet from the southeasterly boundary of the parcel. The development permits shall include those conditions that are generally consistent with the conditions imposed on other developments that have been approved along Beach Drive since the enactment of FEMA requirements.

3. <u>**Dismissal of Lawsuit**</u>: Within ten (10) days of the recordation of the Offer to Dedicate described in Paragraph 1, above, State shall dismiss with prejudice the Action.

4. <u>**Appeal of Development Permits**</u>: State shall not initiate on its own behalf, nor shall any Coastal Commissioner or Coastal Commission staff person initiate, any administrative appeal to the Coastal Commission or any judicial challenge to development permits or building permits issued by the County of Santa Cruz related to development of the Retained Property unless the development permits or building permits issued by the County of Santa Cruz are inconsistent with the specifications set forth in Paragraph 2, above. If any third party files an administrative appeal to the Coastal Commission or a judicial challenge to any of the development permits or building permits issued for the development of the Retained Parcel consistent with the specifications set forth in Paragraph 2, above, Owners shall be entitled to defend such appeal or judicial challenge. If Owners are not successful in defending any such appeal or challenge, this Agreement shall terminate, and all action taken hereunder shall be rescinded, unless the parties otherwise agree in writing. The restrictions in this Paragraph shall not apply to any development approved by the County of Santa Cruz

that is inconsistent with the specifications set forth in Paragraph 2 of this Agreement. This Agreement, and the restrictions in this Paragraph, shall only apply to the initial development of a single-family residence on the Retained Parcel as set forth in Paragraph 2 of this Agreement. This Agreement does not apply to future development on the Retained Parcel following construction of the single-family residence and does not apply to any future development on the private driveway extending from Beach Drive described in Paragraph 2 of this Agreement.

5. __Restriction on Conveyed Land__: The Conveyed Land shall, upon execution of this agreement, remain as open space land for public recreational use, with no new structures or improvements constructed or placed on the land. This restriction shall be included in the Offer to Dedicate and in its acceptance. Owners agree that they will not interfere with public recreational use of the Conveyed Land pending final decisions on their application for development of a single family residence on the Retained Parcel.

6. __Release by State__: State, on behalf of itself, and its agencies, commissions, boards, departments, officers, directors, appointees, and employees, hereby releases and forever discharges Owners, and any and all of Owners' members, officers, directors and employees, from any and all causes of action, claims, demands, rights, damages, costs, suits, contracts, agreements, promises, liability claims, (hereinafter collectively referred to as "Claims") which State now has or may hereafter have against Owners arising out of, based upon, or relating to the facts alleged in the Action.

7. **Owners' Release**: Owners, on behalf of themselves and their members, officers, directors and employees, hereby release and forever discharge State and any and all of its agencies, commissions, boards, officers, directors, appointees, and employees, from any and all causes of action, claims, demands, rights, damages, costs, suits, contracts, agreements, promises, liability claims, (hereinafter collectively referred to as "Claims") which Owners now have or may hereafter have against State arising out of, based upon, or relating to the facts alleged in the Action.

8. **Section 1542 Waiver**: The parties to the Agreement fully understand and hereby relinquish and waive any and all rights conferred upon them by the provision of Section 1542 of the Civil Code of the State of California which reads as follows:

> A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor.

9. **Binding Effect**: This Agreement and each and all of the representations, warranties, and covenants of the parties hereto are binding upon the successors, assigns, heirs, and representatives of the parties and each and all of their respective successors, assigns, heirs and representatives.

10. **Voluntary Execution**: The parties have read and understand this Agreement and warrant and represent that this Agreement is executed voluntarily and without duress and undue influence on the part of or on behalf of any party hereto. The parties hereby acknowledge that they have been represented in negotiations and in the preparation of this

Agreement by counsel of their own choice, that they have read this Agreement and have had it fully explained to them by counsel, and that they are fully aware of the contents of this Agreement and of the legal effect of each and every provision hereof.

11. **Entire Agreement**: This Agreement contains the sole and entire agreement and understanding of the parties with respect to the entire subject matter hereof, and any and all prior discussions, negotiations, commitments, or understandings related thereto, if any, are merged in this Agreement. No representations, oral or otherwise, express or implied, other than those contained herein, have been made by any party. No other agreements not specifically referred to herein, oral or otherwise, shall be deemed to exist or to bind any of the parties.

12. **Waiver**: No provision of this Agreement may be waived unless in writing signed by all parties. Waiver of any one provision shall not be deemed to be a waiver of any other provision. This Agreement may be modified or amended only by written agreement executed by all of the parties hereto.

13. **California Law**: This Agreement shall be deemed to have been entered into in the State of California. All questions concerning the validity, interpretation, or performance of any of its terms or provisions, or any rights or obligations of the parties hereto shall be given by and resolved in accordance with the laws of the State of California in effect at the date of execution of this Agreement.

14. Counterparts: The parties agree that this Agreement may be signed in counterparts.

15. No Admission: The parties acknowledge that this settlement is not an admission by either party of any wrongdoing or any of the allegations of the Complaint in the Action in any manner. This settlement is a settlement of a disputed claim. The parties shall pay their own fees and costs in the pending action.

16. Headings: The headings in this Agreement shall be for reference purposes only, and shall have no legal effect.

IN WITNESS WHEREOF, this Agreement is executed by the parties hereto on the dates indicated below.

Dated: 6-4-03

Howell & McNeil Development, LLC
A California limited liability company

By: [signature]
Its: Member
Timothy G. McNeil

Los Gatos-Saratoga Development
And Investments, LLC
A California limited liability company

By: Timothy G. McNeil [signature]

Dated: 6/16/03

State of California ex rel. California
Coastal Commission

By: Peter Douglas
Its: ______

CCC Exhibit 8
(page 8 of 8 pages)

APPLICABLE COASTAL ACT PUBLIC ACCESS AND RECREATION POLICIES

30210: *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 the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.*

30211: *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.*

30212.5: *Wherever appropriate and feasible, public facilities, including parking areas or facilities, shall be distributed throughout an area so as to mitigate against the impacts, social and otherwise, of overcrowding or overuse by the public of any single area.*

30213 (in relevant part): *Lower cost visitor and recreational facilities shall be protected, encouraged, and, where feasible, provided. Developments providing public recreational opportunities are preferred.*

30214: ***(a)*** *The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following: (1) topographic and geologic site characteristics. (2) The capacity of the site to sustain use and at what level of intensity. (3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses. (4) The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic values of the area by providing for the collection of litter.* ***(b)*** *It is the intent of the Legislature that the public access policies of this article be carried out in a reasonable manner that considers the equities and that balances the rights of the individual property owner with the public's constitutional right of access pursuant to Section 4 of Article X of the California Constitution. Nothing in this section or any amendment thereto shall be construed as a limitation on the rights guaranteed to the public under Section 4 of Article X of the California Constitution.*
(c) *In carrying out the public access policies of this article, the commission and any other responsible public agency shall consider and encourage the utilization of innovative access management techniques, including, but not limited to, agreements with private organizations which would minimize management costs and encourage the use of volunteer programs.*

30220: *Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.*

30221: *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.*

30223: *Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.*

30240 (b): *Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

Applicable Santa Cruz County LCP Policies and Implementation Plan Standards

LCP VISUAL RESOURCE OBJECTIVES

Objective 5.10a Protection of Visual Resources
(LCP) To identify, protect and restore the aesthetic values of visual resources.

Objective 5.10b New Development in Visual Resource Areas
(LCP) To ensure that new development is appropriately designed and constructed to have minimal to no adverse impact upon identified visual resources.

LCP VISUAL RESOURCE POLICIES AND IP STANDARDS

5.10.1 Designation of Visual Resources
(LCP) Designate on the General Plan and LCP Resources Maps and define visual resources as areas having regional public importance for their natural beauty or rural agricultural character. Include the following areas when mapping visual resources: vistas from designated scenic roads, Coastal Special Scenic Areas, and unique hydrologic, geologic and paleontologic features identified in Section 5.9.

5.10.2 Development Within Visual Resource Areas
(LCP) Recognize that visual resources of Santa Cruz County possess diverse characteristics and that the resources worthy of protection may include, but are not limited to, ocean views, agricultural fields, wooded forests, open meadows, and mountain hillside views. Require projects to be evaluated against the context of their unique environment and regulate structure height, setbacks and design to protect these resources consistent with the objectives and policies of this section. Require discretionary review for all development within the visual resource area of Highway One, outside of the Urban/Rural boundary, as designated on the GP/LCP Visual Resources Map and apply the design criteria of Section 13.20.130 of the County's zoning ordinance to such development.

5.10.3 Protection of Public Vistas
(LCP) Protect significant public vistas as described in policy 5.10.2 from all publicly used roads and vista points by minimizing disruption of landform and aesthetic character caused by grading operations, timber harvests, utility wires and poles, signs, inappropriate landscaping and structure design. Provide necessary landscaping to screen development which is unavoidably sited within these vistas. (See policy 5.10.11.)

5.10.6 Preserving Ocean Vistas
(LCP) Where public ocean vistas exist, require that these vistas be retained to the maximum extent possible as a condition of approval for any new development.

5.10.7 Open Beaches and Bluff-tops
(LCP) Prohibit the placement of new permanent structures which would be visible from a public beach, except where allowed on existing parcels of record, or for shoreline protection and for public beach access. Use the following criteria for allowed structures:
(a) Allow infill structures (typically residences on existing lots of record) where compatible with the pattern of existing development.
(b) Require shoreline protection and access structures to use natural materials and finishes to blend with the character of the area and integrate with the landform.

IP Section 13.20.130(b)(1)
Entire Coastal Zone. The following Design Criteria shall apply to projects sited anywhere in the coastal zone: 1. Visual Compatibility. All new development shall be sited, designed and landscaped to be visually compatible and integrated with the character of surrounding neighborhoods or areas.

IP Section 13.20.130(d)
Beach Viewsheds. The following Design Criteria shall apply to all projects located on blufftops and visible from beaches. 1. Blufftop Development. Blufftop development and landscaping (e.g., decks, patios, structures, trees, shrubs, etc.) in rural areas shall be set back from the bluff edge a sufficient distance to be out of sight from the shoreline, or if infeasible, not visually intrusive. In urban areas of the viewshed, site development shall conform to (c) 2 and 3 above.

IP Sections 13.20.130(c)(2)(3)
2. Site Planning. Development shall be sited and designed to fit the physical setting carefully so that its presence is subordinate to the natural character of the site, maintaining the natural features (streams, major drainage, mature trees, dominant vegetative communities). Screening and landscaping suitable to the site shall be used to soften the visual impact of development in the viewshed.
3. Building Design. Structures shall be designed to fit the topography of the site with minimal cutting, grading, or filling for construction. Pitched, rather than flat roofs, which are surfaced with non-reflective materials except for solar energy devices shall be encouraged. Natural materials and colors which blend with the vegetative cover of the site shall be used, or if the structure is located in an existing cluster of buildings, colors and materials shall repeat or harmonize with those in the cluster.

LCP GEOLOGICAL HAZARDS POLICIES

6.2.10 Site Development to Minimize Hazards
(LCP) Require all developments to be sited and designed to avoid or minimize hazards as determined by the geologic hazards assessment or geologic and engineering investigations.

6.2.11 Geologic Hazards Assessment in Coastal Hazard Areas
(LCP) Require a geologic hazards assessment or full geologic report for all development activities within coastal hazard areas, including all development activity within 100- feet of a coastal bluff. Other technical reports may be required if significant potential hazards are identified by the hazards assessment.

6.2.12 Setbacks from Coastal Bluffs
(LCP) All development activities, including those which are cantilevered, and non-habitable structures for which a building permit is required, shall be set back a minimum of 25 feet from the top edge of the bluff. A setback greater than 25 feet may be required based on conditions on and adjoining the site. The setback shall be sufficient to provide a stable building site over the 100- year

lifetime of the structure, as determined through geologic and/or soil engineering reports. The determination of the minimum 100 year setback shall be based on the existing site conditions and shall not take into consideration the effect of any proposed shoreline or coastal bluff protection measures.

6.2.15 New Development on Existing Lots of Record

(LCP) Allow development activities in areas subject to storm wave inundation or beach or bluff erosion on existing lots of record, within existing developed neighborhoods, under the following circumstances:

(a) A technical report (including a geologic hazards assessment, engineering geology report and/or soil engineering report) demonstrates that the potential hazard can be mitigated over the 100-year lifetime of the structure. Mitigations can include, but are not limited to, building setbacks, elevation of the structure, and foundation design;

(b) Mitigation of the potential hazard is not dependent on shoreline or coastal bluff protection structures, except on lots where both adjacent parcels are already similarly protected; and

(c) The owner records a Declaration of Geologic Hazards on the property deed that describes the potential hazard and the level of geologic and/or geotechnical investigation conducted.

6.2.16 Structural Shoreline Protection Measures (in relevant part)

(LCP) Limit structural shoreline protection measures to structures which protect existing structures from a significant threat, vacant lots which through lack of protection threaten adjacent developed lots, public works, public beaches, or coastal dependent uses.

6.2.19 Drainage and Landscape Plans

(LCP) Require drainage and landscape plans recognizing potential hazards on and off site to be approved by the County Geologist prior to the approval of development in the coastal hazard areas. Require that approved drainage and landscape development not contribute to offsite impacts and that the defined storm drain system or Best Management Practices be utilized where feasible. The applicant shall be responsible for the costs of repairing and/or restoring any off-site impacts.

6.4.3 Development on or Adjacent to Coastal Bluffs and Beaches

(LCP) Allow development in areas immediately adjacent to coastal bluffs and beaches only if a geologist determines that wave action, storm swell and tsunami inundation are not a hazard to the proposed development or that such hazard can be adequately mitigated. Such determination shall be made by the County Geologist, or a certified engineering geologist may conduct this review at applicant's choice and expense. Apply Coastal Bluffs and Beaches policies.

APPLICABLE LCP IMPLEMENTATION PLAN STANDARDS RE: HAZARDS

Section 16.10.070(e) Slope Stability.

1. Location: All development activities shall be located away from potentially unstable areas as identified through the geologic hazards assessment, full geologic report, soils report or other environmental or technical assessment.

2. Creation of New Parcels: Allow the creation of new parcels in areas with potential slope instability as identified through a geologic hazards assessment, full geologic report, soils report or other environmental or technical assessment only under the following circumstances: (i) New building sites, roadways, and driveways shall not be permitted on or across slopes exceeding thirty (30) percent grade. (ii) A full geologic report and any other appropriate technical report shall demonstrate that each proposed parcel contains at least one building site and access which are not subject to significant slope instability hazards, and that public utilities and facilities such as sewer,

gas, electrical and water systems can be located and constructed to minimize landslide damage and not cause a health hazard. (iii) New building sites shall not be permitted which would require the construction of engineered protective structures such as retaining walls, diversion walls, debris walls or slough walls designed to mitigate potential slope instability problems such as debris flows, slumps or other types of landslides.

3. Drainage: Drainage plans designed to direct runoff away from unstable areas (as identified from the geologic hazards assessment or other technical report) shall be required. Such plans shall be reviewed and approved by the County Geologist.

16.10.070(h) Coastal Bluffs and Beaches.
1. Criteria in Areas Subject to Coastal Bluff Erosion: Projects in areas subject to coastal bluff erosion shall meet the following criteria: (i) for all development and for non-habitable structures, demonstration of the stability of the site, in its current, pre-development application condition, for a minimum of 100 years as determined by either a geologic hazards assessment or a full geologic report. (ii) for all development, including that which is cantilevered, and for non-habitable structures, a minimum setback shall be established at least 25 feet from the top edge of the coastal bluff, or alternatively, the distance necessary to provide a stable building site over a 100-year lifetime of the structure, whichever is greater. (iii) the determination of the minimum setback shall be based on the existing site conditions and shall not take into consideration the effect of any proposed protection measures, such as shoreline protection structures, retaining walls, or deep piers. (iv) foundation replacement and/or foundation upgrades that meet the definition of development per Section 16.10.040(s) and pursuant to Section 16.10.040(r), shall meet the setback described in Section 16.10.070(h)(1), except that an exception to the setback requirement may be granted for existing structures that are wholly or partially within the setback, if the Planning Director determines that: a) the area of the structure that is within the setback does not exceed 25% of the total area of the structure, OR b) the structure cannot be relocated to meet the setback because of inadequate parcel size. (v) additions, including second story and cantilevered additions, shall comply with the minimum 25 foot and 100 year setback. (vi) The developer and/or the subdivider of a parcel or parcels in an area subject to geologic hazards shall be required, as a condition of development approval and building permit approval, to record a Declaration of Geologic Hazards with the County Recorder. The Declaration shall include a description of the hazards on the parcel and the level of geologic and/or geotechnical investigation conducted. (vii) approval of drainage and landscape plans for the site by the County Geologist. (viii) service transmission lines and utility facilities are prohibited unless they are necessary to serve existing residences. (ix) All other required local, state and federal permits shall be obtained.

16.10.070(h)(3)(i) Shoreline Protection.
3. Shoreline protection structures shall be governed by the following: (i) Shoreline protection structures shall only be allowed on parcels where both adjacent parcels are already similarly protected, or where necessary to protect existing structures from a significant threat, or on vacant parcels which, through lack of protection threaten adjacent developed lots, or to protect public works, public beaches, and coastal dependent uses.

16.22.070 Runoff control.
Runoff from activities subject to a building permit, parcel approval or development permit shall be properly controlled to prevent erosion. The following measures shall be used for runoff control, and shall be adequate to control runoff from a ten-year storm:

(a) On soils having high permeability (more than two inches/hour), all runoff in excess of predevelopment levels shall be retained on the site. This may be accomplished through the use of infiltration basins, percolation pits or trenches, or other suitable means. This requirement may be waived where the Planning Director determines that high groundwater, slope stability problems, etc., would inhibit or be aggravated by onsite retention, or where retention will provide no benefits for groundwater recharge or erosion control.

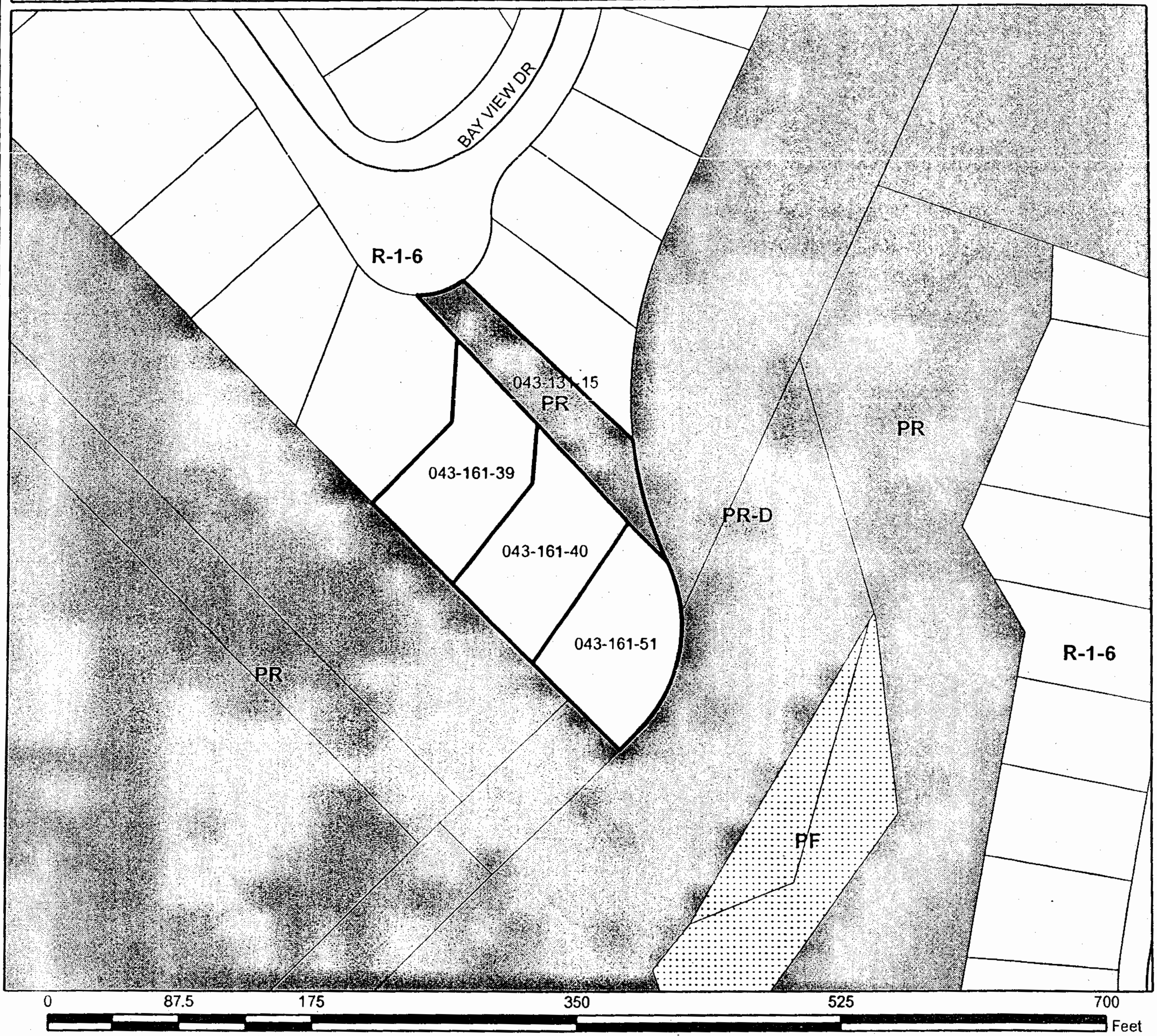
(b) On projects where onsite percolation is not feasible, all runoff should be detained or dispersed over nonerodible vegetated surfaces so that the runoff rate does not exceed the predevelopment level. Onsite detention may be required by the Planning Director where excessive runoff would contribute to downstream erosion or flooding. Any policies and regulations for any drainage zones where the project is located will also apply.

(c) Any concentrated runoff which cannot be effectively dispersed without causing erosion, shall be carried in nonerodible channels or conduits to the nearest drainage course designated for such purpose by the Planning Director or to on-site percolation devices. Where water will be discharged to natural ground or channels, appropriate energy dissipators shall be installed to prevent erosion at the point of discharge.

(d) Runoff from disturbed areas shall be detained or filtered by berms, vegetated filter stips, catch basins, or other means as necessary to prevent the escape of sediment from the disturbed area.

(e) No earth or organic material shall be deposited or placed where it may be directly carried into a stream, marsh, slough, lagoon, or body of standing water.

Zoning Map



LEGEND

- APN: 043-161-39
- APN: 043-161-51
- APN: 043-161-40
- APN: 043-131-15
- Assessors Parcels
- Streets
- RESIDENTIAL-SINGLE FAMILY
- PARK
- PUBLIC FACILITY

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(page 1 **of** 2 **pages)**

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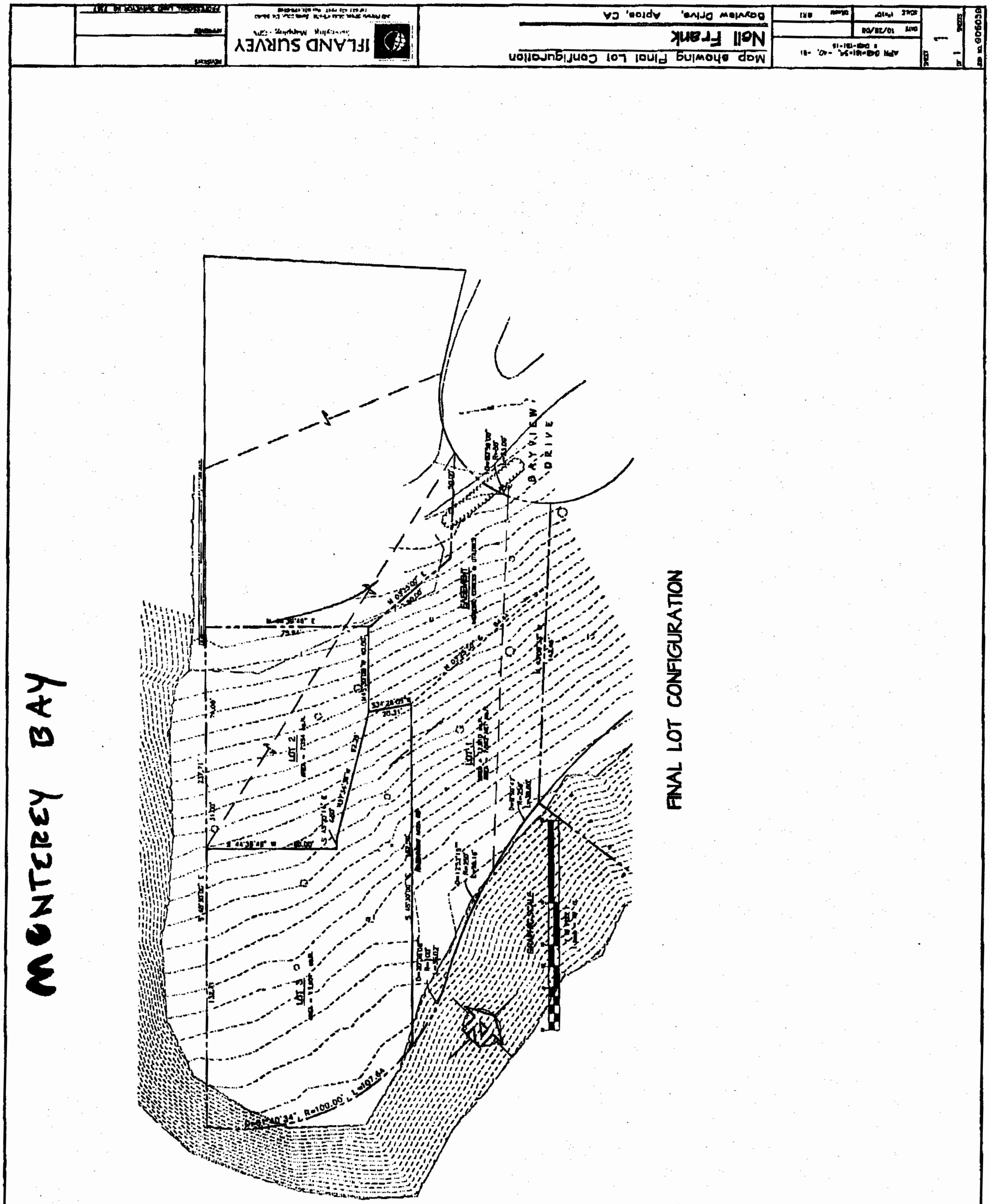
Map created by
County of Santa Cruz
Planning Department
August 2007

EXHIBIT E



ARROYO

CCC Exhibit 10
(page 2 **of** 2 **pages)**

EXHIBIT A

Proposed Bluff Top Development At Hidden Beach

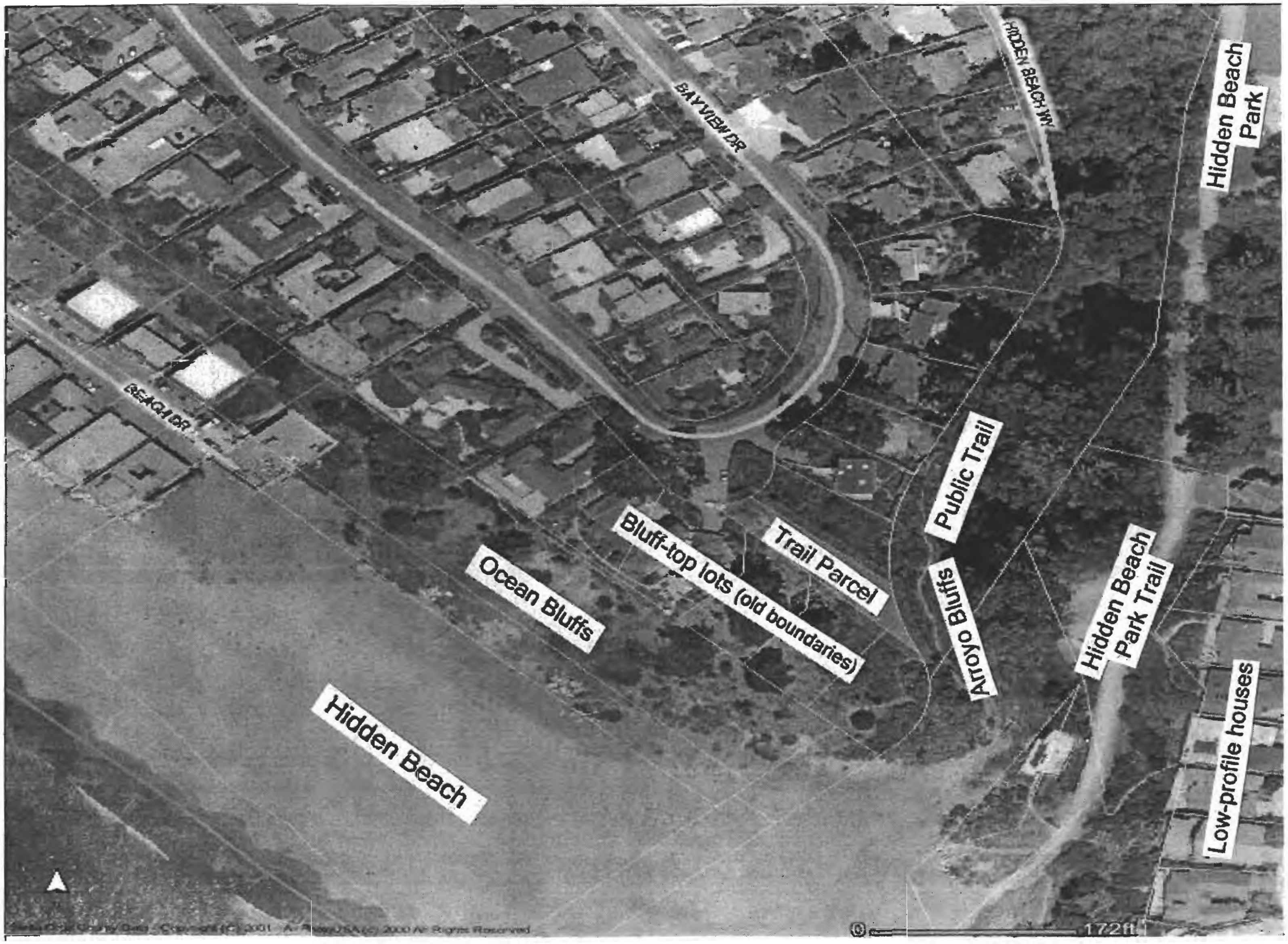
Located between Seascape and Rio del Mar

By Bill Comfort

Five huge two-story structures are proposed to be built above Hidden Beach

- One gracious single-story structure is proposed to be replaced by five hotel-like structures.
- Four of the proposed structures are distributed along the Hidden Beach ocean bluff, and a fifth structure is bordered by the Hidden Beach arroyo bluff.
  - All bluffs are natural, with the exception of the currently failing retaining wall over a small fraction of the ocean bluff.
- All proposed structures are near maximum possible floor area and height with near minimum bluff setbacks of approximately 25 feet.

Overview of Hidden Beach



CCC Exhibit 12
(page 3 of 22 pages)

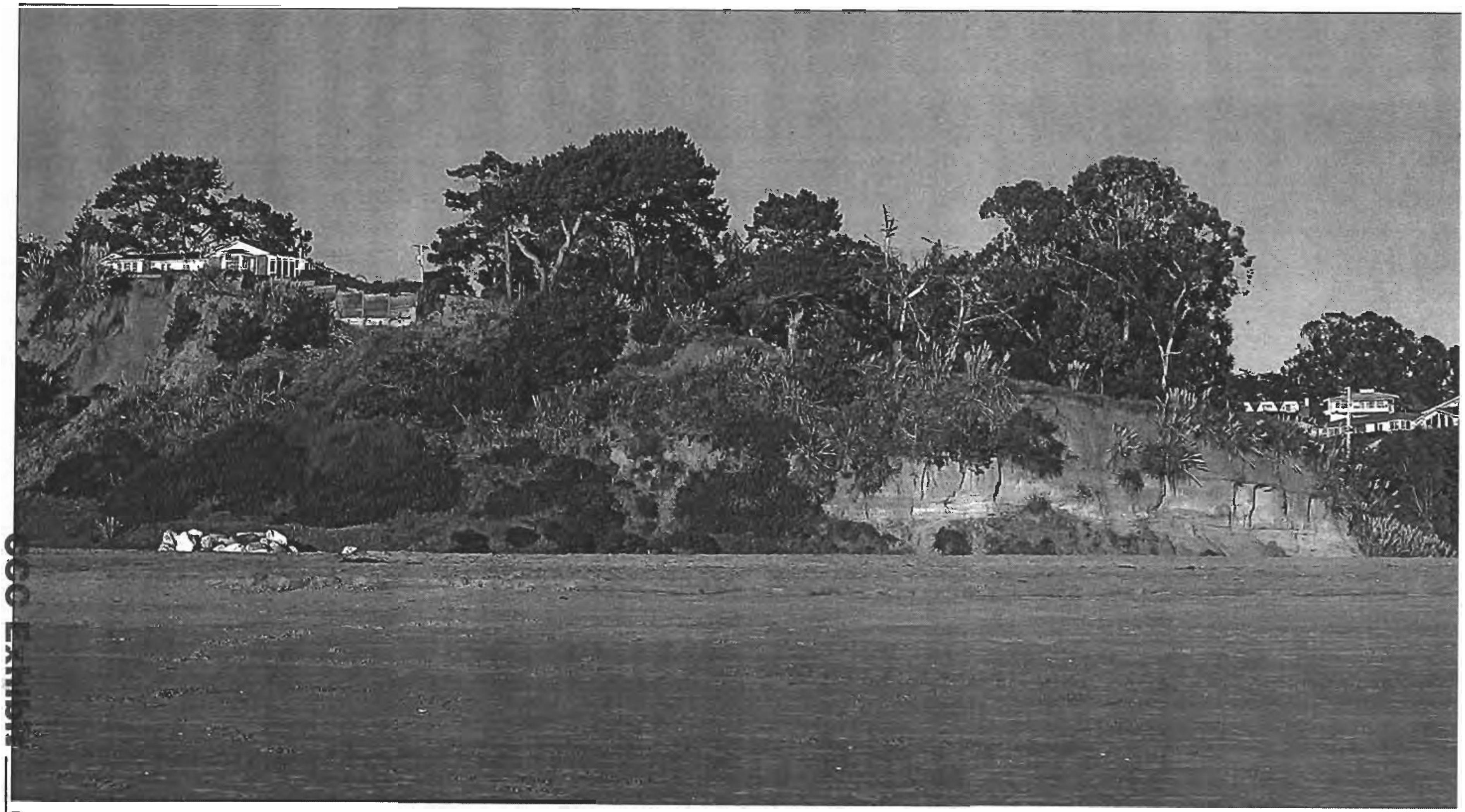
The Hidden Beach bluffs are unique in this area

- This is the only ocean bluff where beach sand meets the bluff between Seacliff and Seascape.
  - All other areas are obscured by structures, roads, or parking lots.
- The arroyo bluff supports a trail used by many locals, and affords a protected area which includes a sandy-cove beach

Overview of Hidden Beach from beach toward bluffs

CCC Exhibit 12
(page 5 of 22 pages)

View of the bluff (*and current single story house, left*) from Hidden Beach



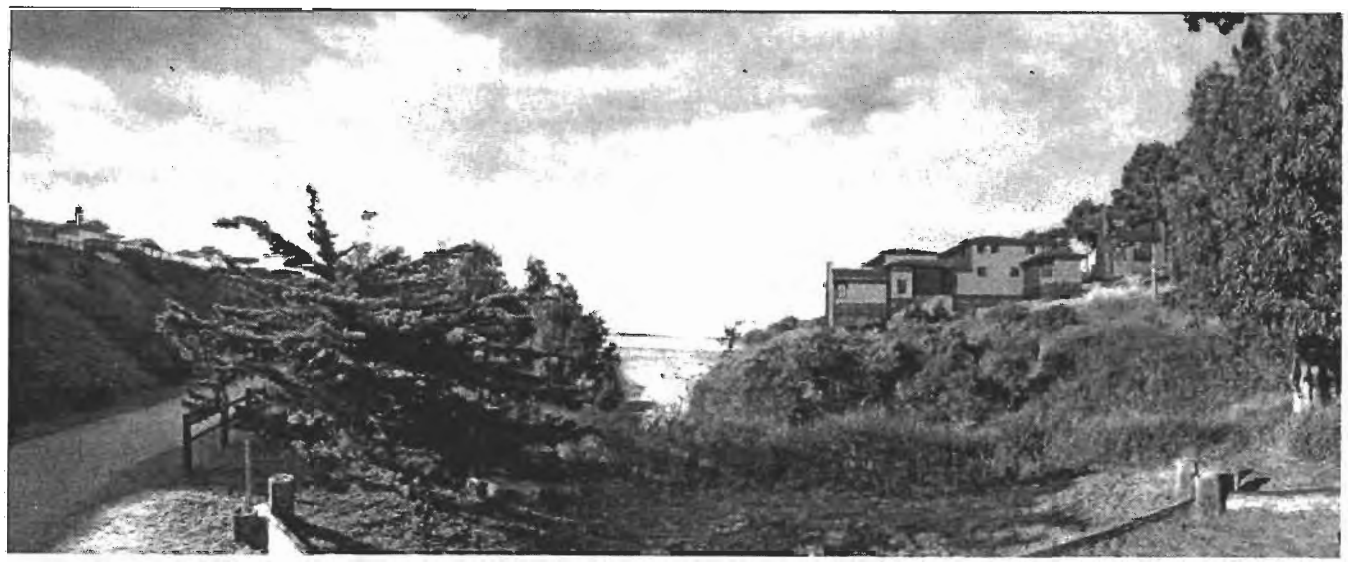
The current beach view shed includes nearly all low-profile bluff-top houses

- Seascape houses near the beach and across the arroyo from the proposed development are low-profile; single-story from the street
  - Some have second levels below the street level
  - Low-profile reduces impact on beach view shed
- The house proposed to be replaced is single story
- There is only one two-story house above Hidden Beach near the Beach Drive border
  - This house is larger than proposed houses, but less intrusive because of larger set-back and gracious design

Public View Shed Issues

- Public beach view shed will be dominated by four huge two-story structures.
- Proposed minimum bluff set-backs for these large structures increases their dominance of the public beach view shed.
- Existing retaining wall is in disrepair, and very visible from the public beach, detracting from the beauty of the natural bluffs.
- Two of the structures bounded by the arroyo bluff would dominate the view toward the beach from Hidden Beach Park trail to Hidden Beach.

View from Hidden Beach Park trail: before & after proposed development



CCC Exhibit 12
(page 9 of 22 pages)

CCC Exhibit 12
(page 10 of 22 pages)

Hidden Beach Park trail to beach affords view of natural bluff top

- Views of bluff top will be obliterated by proposed development
- Three of the five two-story houses will occupy this space

...bit 4
... pages)

Bluff Fragility Issues

- Ocean bluffs have been demonstrated to be fragile
  - Experience of General Hart's house during Loma Prieta earthquake demonstrates the fragility of the bluffs in the area
  - Experience on the Assar structure in which three houses below were red-tagged because of a slippage and soil ejection during the Assar construction
  - A landslide was produced on the property simply by over-watering.
  - New retaining walls will likely be required in the future which would further degrade the natural beauty of the bluffs and public viewshed
  - Significant sloughing of the arroyo bluffs on the property proposed for development have occurred during winter storms.
- Minimum setbacks of structures from the bluff increase the risk of further damage to the bluff:
  - Earthquake and unforeseen geologic conditions (General Hart)
  - Rising sea-levels have not been accounted for in bluff recession estimates for proposed development(s)
  - Both the ocean and the arroyo bluffs are subject to erosion by winter waves and wind and outflow from the creek that separates Seascape and Rio del Mar

Wave action and creek runoff flows erode the ocean- and arroyo-bluffs

- Waves and runoff have caused erosion and land-slides along the arroyo bluffs and over the public trail (left)

- Driftwood logs provide evidence of wave action: 14 feet above sea level and more than 300 feet from the ocean

CCC Exhibit 12
(page 12 of 22 pages)

Over-watering damage on the left, failing retaining wall on the right

Drainage issues are risks to both ocean and arroyo bluffs

- Drainage for several of the lots is directed into property that is and will be owned by other parties
- Drainage into the arroyo risks washouts of existing trails along the arroyo
  - Trails have been damaged in the past
  - Proposed angle drilling to accommodate drainage pose further risks to already fragile public trail

Beach Access Issues

- The trail parcel for public access is being subsumed by the changes in lot lines.
- The trail parcel is the only direct beach access available for homes along the ocean bluff
- Long-time residents remember the trail to the beach from Bay View
- Historical aerial photographs show a trail from Bay View Drive to the beach on the trail parcel
- Trail deviations have occurred because of sloughing of arroyo bluffs and subsequent poison oak regrowth

Mitigation of the damage to beach and arroyo bluffs and view sheds

- Increase set-backs from the bluffs
  - Account for sea-level rise in keeping with Governor's Executive Order S-13-08
  - Reduce the overbearing dominance of the proposed structures
  - Reduce the probability of bluff damage and requisite retaining walls to protect structures in future
- Require single-story structures in this critical area.
  - Single-story and low-profile houses line the arroyo and ocean bluffs near the beach on the Seascape side of the arroyo
  - A single-story house is adjacent to the proposed development.
- Disallow future retaining walls on these parcels; if bluff retreat threatens structures, move or remove the structures.

Photographs and Measurements of Wave Intrusion on Hidden Beach

William J. Comfort III

Summary

I have assembled photographs showing wave action and beach coverage during a storm in the Winter of 1994-95. In addition, I have deduced wave action from debris in the arroyo above the beach. The photographs and results are presented herein.

Storm Photographs

I photographed wave action and beach coverage several years ago (Winter of 1994-95) during a storm. Please note that these photographs were not taken at the peak of the storm. Figures 1 through 6 were taken within 1/2 hour of one another.

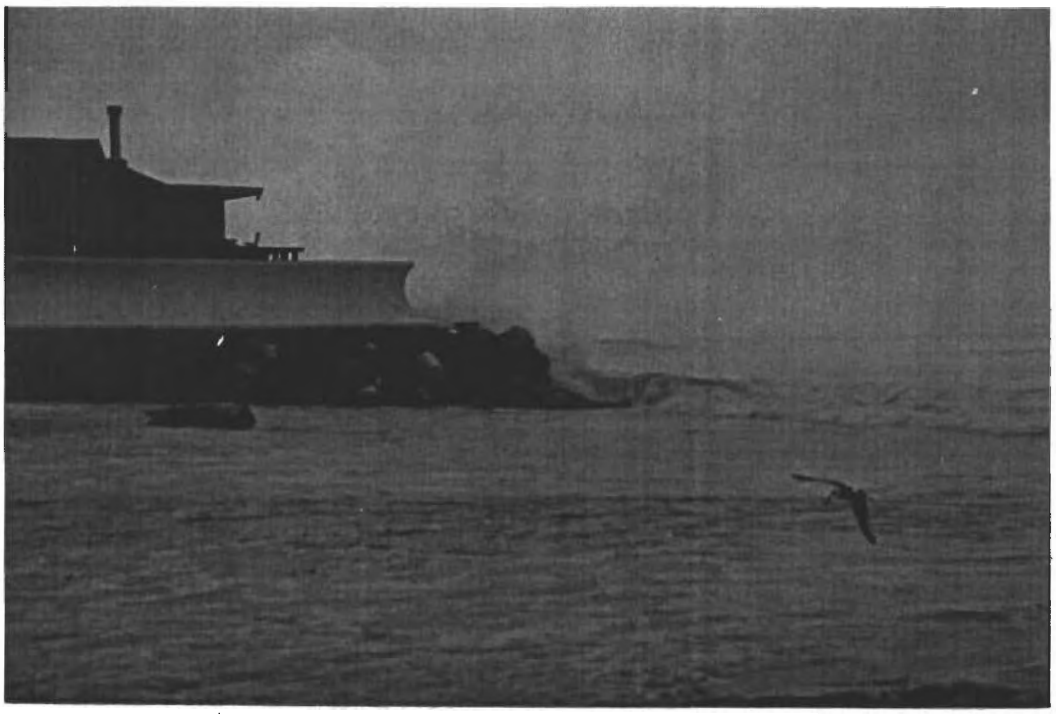


Figure 1: Photographed from high ground opposite the sewer pumping plant, looking toward the existing seawall. Note the beach coverage and the wave hitting the seawall. During storms it is not unusual to find that seaweed and debris litter the walkway on the seawall, above the rip-rap.

Figure 2: Photographed from a rock, surrounded at that moment by the sea, looking toward the cliff facing the ocean and immediately across the stream-mouth from the sewer pumping plant. This is the widest part of Hidden Beach. Note the seaweed that has been brought up by previous, larger intrusions that day.

Figs. 3 & 4: Photographed from the mouth of the stream looking west (toward Capitola) along the bluff behind the widest part of Hidden Beach. Note the seaweed and debris.

The Photographs in the next sequence were taken on 7/25/01 at approximately 10:00 AM. The tide level was approximately 0.0. Using a hand-held sighting level I estimated the height of the debris in the arroyo from which wave-action levels can be deduced. My measurements indicate an elevation change of 14 feet from the tide level to the height of the debris in the arroyo.

Figure 7: Photographed from the path across from the sewer pumping plant, looking toward the sewer pumping plant along the arroyo (and stream bed).

Figure 5: Taken from the path across from the sewer pumping plant, looking into the arroyo. Note the seaweed far up in the arroyo. Note also that the stream very small, indicating that runoff is minimal. Figures 1 through 4 cannot be attributed to a swollen stream.

Figure 6: Taken from the base of the mouth of the stream looking into the arroyo.

Figure 8: Photographed into the arroyo from the stream bed. Note the logs and debris. Comparing this with Figure 6 (which is not taken from the identical point, but a position very nearby), there is a significant increase in the amount of debris in the arroyo compared to 1995. There are tons of material here that have been brought in by the sea. This past winter (2001) I witnessed a 30 foot log being tossed like a toothpick as the stream became a torrent and waves interacted with it during a storm.

Summary and Conclusion

There is clear evidence that waves reach the cliffs and push debris well into the arroyo (some 14 feet above sea level). Though some of the debris may be attributed to trimming of local trees, the majority of the wood in the arroyo had to have come in from the ocean. This provides a benchmark for the wave action during storms.

CCC Exhibit 11
(page 1 **of** 1 **pages)**

EXHIBIT A