

CALIFORNIA COASTAL COMMISSION

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REGULAR CALENDAR
STAFF REPORT AND PRELIMINARY RECOMMENDATION

Application No.: 6-03-33

RECORD PACKET COPY

Applicant: Surfsong Homeowners Association Agent: Bob Trettin

Description: Construction of an approximately 120 ft.-long, 35 ft.-high colored and textured tiedback concrete seawall and approximately 342 linear feet of notch and seacave infills with colored and textured erodible concrete on the public beach below an existing 72 unit condominium complex.

Site: On the beach below 205 – 239 South Helix Avenue, Solana Beach, San Diego County. APN #298-520-01 to 72

Substantive File Documents: City of Solana Beach General Plan and Zoning Ordinance; San Diego County LCP; City of Solana Beach Special Use Permit #17-02-20; "Geotechnical/Geologic Evaluation Bluff Conditions Surfsong Condominiums" by Anthony-Taylor Consultants dated 12/3/01; "Supplemental Third-Party Geotechnical Peer Review, Surfsong Emergency Permit Request" by GeoSoils, Inc., dated 12/9/02; Addendum Response to Third-Party Geotechnical Review" by Anthony-Taylor Consultants dated 11/26/02; "Response to CCC Staff Letter Bluff Failures, Seacaves and Undercutting Surfsong Project" by Anthony-Taylor Consultants, dated 3/7/2003; CDP Nos. 6-99-100/Presnell, et. al, 6-99-103/ Coastal Preservation Association, 6-00-9/Del Mar Beach Club, 6-00-66/Pierce, Monroe, 6-02-84/Scism.

STAFF NOTES:

Summary of Staff's Preliminary Recommendation: Staff is recommending approval of the subject development as the applicant has demonstrated that the existing blufftop condominium structures are in danger from erosion. The subject blufftop site contains 72 condominium units divided into five detached buildings where three of the detached buildings lie within 25 ft. of the bluff edge. Due to a recent bluff collapse and exposure of the clean sand layer below one of the condominium buildings, the applicant's geotechnical representative has performed a slope stability analysis of the overall site and

concluded that three of the blufftop condominium structures are in danger from erosion. Based on the applicant's geotechnical reports, the seawall and seacave/notch infills are all necessary to protect the structures at the top of the bluff. The Commission's staff engineer and geologist have reviewed the applicant's geotechnical assessment and concur with its conclusions.

The proposed development has been conditioned to mitigate its impact on coastal resources such as scenic quality, public access and recreation opportunities, and shoreline sand supply. A special condition has been attached which requires the applicant to acknowledge that should additional stabilization be proposed in the future, the applicant will be required to identify and address the feasibility of all alternative measures which would avoid additional alteration of the natural landform of the public beach or coastal bluffs, and would reduce the risk to the blufftop structures and provide reasonable use of the property. The recommended conditions also require the applicant to pay a beach sand mitigation fee to mitigate the direct and long-term impacts on shoreline sand supply. Other conditions involve the timing of construction, the appearance of the seawall and seacave/notch infills and approval from other agencies.

I. PRELIMINARY STAFF RECOMMENDATION:

The staff recommends the Commission adopt the following resolution:

MOTION: *I move that the Commission approve Coastal Development Permit No. 6-03-33 pursuant to the staff recommendation.*

STAFF RECOMMENDATION OF APPROVAL:

Staff recommends a **YES** vote. Passage of this motion will result in approval of the permit as conditioned and adoption of the following resolution and findings. The motion passes only by affirmative vote of a majority of the Commissioners present.

RESOLUTION TO APPROVE THE PERMIT:

The Commission hereby approves a coastal development permit for the proposed development and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act and will not prejudice the ability of the local government having jurisdiction over the area to prepare a Local Coastal Program conforming to the provisions of Chapter 3. Approval of the permit complies with the California Environmental Quality Act because either 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment, or 2) there are no further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.

II. Standard Conditions.

See attached page.

III. Special Conditions.

The permit is subject to the following conditions:

1. Final Plans. PRIOR TO THE ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit for review and written approval of the Executive Director, final seawall, notch/seacave fill, seacave tiebacks, irrigation and drainage plans in substantial conformance with the submitted plans dated 1/13/03 by Soil Engineering Construction, Inc. with revisions 12/30/02 by Anthony-Taylor Consultants. Said plans shall first be approved by the City of Solana Beach and include the following:

- a. Sufficient detail regarding the construction method and technology utilized for constructing return walls on either end of the seawall so as to gradually blend into the adjacent natural bluff. The return wall shall be designed and constructed to minimize the erosive effects of the approved seawall on the adjacent bluffs.
- b. Sufficient detail regarding the construction method and technology utilized for texturing and coloring the seawall and notch/seacave fills. Said plans shall confirm, and be of sufficient detail to verify, that the seawall and notch/seacave color and texture closely match the adjacent natural bluffs. The plan shall include a color board indicating the color of the fill material.
- c. The seawall shall be located as far landward as possible.
- d. The notch/seacave fill shall conform as closely as possible to the natural contours of the bluff, and shall not protrude beyond the existing "drip-line" (a parallel line extending down from the face of the bluff above the notch).
- e. Any existing permanent irrigation system located within 150 ft. from the bluff edge shall be removed or capped.
- f. All runoff from impervious surfaces on the blufftop lots shall be collected and directed away from the bluff edge towards the street.
- g. Existing accessory improvements (i.e., decks, patios, pool, walls, etc.) located in the geologic setback area on the blufftop site shall be detailed and drawn to scale on the final approved site plan.
- h. During construction of the approved development, disturbance to sand and intertidal areas shall be minimized to the maximum extent feasible. All excavated

beach sand shall be redeposited on the beach. Local sand, cobbles or shoreline rocks shall not be used for backfill or for any other purpose as construction material.

The permittee shall undertake the development in accordance with the approved plans. Any proposed changes to the approved plans shall be reported to the Executive Director. No changes to the plans shall occur without a Coastal Commission approved amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

2. Monitoring Program. PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit to the Executive Director for review and written approval, a plan prepared by a licensed civil or geotechnical engineer for a seawall and seacave/notch area monitoring program which includes the following:

- A. An annual evaluation of the condition and performance of the seawall, seacave/notch fills and seacave tiebacks addressing whether any significant weathering or damage has occurred that would adversely impact the future performance of the structures. This evaluation shall include an assessment of the color and texture of the seawall and erodible infills comparing the appearance of the structures to the surrounding native bluffs.
- B. Current measurements of the distance between each blufftop structure and the bluff edge (as defined by Section 13577 of the California Code of Regulations), and provisions for these measures to be taken annually after completion of construction for the life of the project. The locations for these measurements shall be identified through permanent markers, benchmarks, survey position, written description, or other means so that annual measurements can be taken at the same bluff location and comparisons between years can provide information on bluff retreat.
- C. Provisions for measurements of any differential retreat between the natural bluff face and the seawall and seacave/notch area face, taken at both ends of the seacave/notch fills and seawall and at 20-foot intervals (maximum) along the top of the seawall and seacave/notch fill face, and the bluff face intersection annually after completion of construction for the life of the project. Measurements may be taken through aerial photography. The program shall describe the method by which such measurements shall be taken.
- D. Provisions for submittal of monitoring reports to the Executive Director on June 1 of each year for three years beginning after completion of construction. However, the information required below shall be measured and documented on a yearly basis for the life of the project. Each report shall be prepared by a licensed civil or geotechnical engineer or geologist. The report shall contain the measurements and evaluation required in sections (A) and (B) above. The report shall also summarize all measurements and analyze trends, annual retreat or rate of retreat, and the stability of the overall bluff face, including the upper

bluff area, and the impact of the seawall and notch/seacave fill on the bluffs to either side of the seawall and fill, and shall include suggestions that do not involve the construction of structures on the face of the bluff for correcting any problems. In addition, each report shall contain recommendations, if any, for necessary maintenance, repair, changes or modifications to the project. If the notch/seacave infill or seacave tiebacks are found to extend seaward of the face of the natural bluff by more than six (6) inches in any location, or to extend vertically above the natural bedrock shoer platform by more than two (2) inches in any location, the report shall include alternatives and recommendations to remove or otherwise remedy this condition such that no seaward or vertical extension of the fill or tiebacks will remain.

E. Provisions for submission of a report containing the information identified in section D above at 3 year intervals following the last annual report, for the life of the project. However, reports shall be submitted in the Spring of any year in which the following event occurs:

1. A 20-year storm event
2. An "El Niño" storm event
3. An earthquake of magnitude 5.5 or greater with an epicenter in San Diego County.

Thus reports may be submitted more frequently depending on the occurrence of the above events in any given year.

F. An agreement that the permittee shall apply for a coastal development permit within three months of submission of the report required in subsection D and E above (i.e., by September 1) for any necessary maintenance, repair, changes or modifications to the project recommended by the report that require a coastal development permit.

The permittee shall undertake monitoring in accordance with the approved plan. Any proposed changes to the approved plan shall be reported to the Executive Director. No changes to the plan shall occur without a Coastal Commission approved amendment to this coastal development permit unless the Executive Director determines that no amendment is legally required.

3. Mitigation for Impacts to Sand Supply. **PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT**, the applicant shall provide evidence, in a form and content acceptable to the Executive Director, that a fee of \$44,720.44 has been deposited in an interest bearing account designated by the Executive Director, in-lieu of providing the total amount of sand to replace the sand and beach area that will be lost due to the impacts of the proposed protective structures. All interest earned by the account shall be payable to the account for the purposes stated below.

The developed mitigation plan covers impacts only through the identified 22-year design life of the seawall. No later than 21 years after the issuance of this permit, the permittees or their successor in interest shall apply for and obtain an amendment to this permit that either requires the removal of the seawall within its initial design life or requires mitigation for the effects of the seawall on shoreline sand supply for the expected life of the seawall beyond the initial 22 year design life. If within the initial design life of the seawall the permittees or their successor in interest obtains a coastal development permit or an amendment to this permit to enlarge or reconstruct the seawall or perform repair work that extends the expected life of the seawall, the permittee shall provide mitigation for the effects of the seawall on shoreline sand supply for the expected life of the seawall beyond the initial 22 year design life.

The mitigation plan also covers impacts from the physical placement of the erodible concrete within the notch and seacave areas. If the erodible concrete erodes at a faster rate than the surrounding bluffs such that additional fill is necessary following subsequent approval(s) by the Coastal Commission, the permittee shall submit new calculations for in-lieu sand mitigation for the effects of the new encroachment of seacave or notch infill.

The account shall be used to fund beach sand replenishment efforts by SANDAG, or a Commission-approved alternate entity, in the restoration of the beaches within San Diego County. The funds shall be used solely to implement projects which provide sand to the region's beaches, not to fund operations, maintenance or planning studies. The funds shall be released only upon approval of an appropriate project by the Executive Director of the Coastal Commission. The funds shall be released as provided for in a MOA between SANDAG, or a Commission-approved alternate entity, and the Commission, setting forth terms and conditions to assure that the in-lieu fee will be expended in the manner intended by the Commission. If the MOA is terminated, the Commission may appoint an alternative entity to administer the fund.

4. Storage and Staging Areas/Access Corridors. PRIOR TO THE ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit to the Executive Director for review and written approval, final plans indicating the location of access corridors to the construction site and staging areas. The final plans shall indicate that:

- a. No overnight storage of equipment or materials shall occur on sandy beach or public parking spaces at Fletcher Cove. During the construction stages of the project, the permittee shall not store any construction materials or waste where it will be or could potentially be subject to wave erosion and dispersion. In addition, no machinery shall be placed, stored or otherwise located in the intertidal zone at any time, except for the minimum necessary to construct the notch fill. Construction equipment shall not be washed on the beach or in the Fletcher Cove parking lot.
- b. Access corridors shall be located in a manner that has the least impact on public access to and along the shoreline.

- c. No work shall occur on the beach on weekends, holidays or between Memorial Day weekend and Labor Day of any year.
- d. The applicant shall submit evidence that the approved plans/notes have been incorporated into construction bid documents. The staging site shall be removed and/or restored immediately following completion of the development.

The permittee shall undertake the development in accordance with the approved plans. Any proposed changes to the approved plans shall be reported to the Executive Director. No changes to the plans shall occur without a Coastal Commission approved amendment to this coastal development permit unless the Executive Director determines that no amendment is required.

5. Future Response to Erosion. If in the future the permittee seeks a coastal development permit to construct additional bluff or shoreline protective devices, the permittee shall include in the permit application information concerning alternatives to the proposed bluff or shoreline protection that will eliminate impacts to scenic visual resources, recreation and shoreline processes. Alternatives shall include but not be limited to: relocation of all or portions of the principal structure that are threatened, structural underpinning, and other remedial measures capable of protecting the principal structure and providing reasonable use of the property, without constructing bluff or shoreline stabilization devices. The information concerning these alternatives must be sufficiently detailed to enable the Coastal Commission or the applicable certified local government to evaluate the feasibility of each alternative, and whether each alternative is capable of protecting existing structures that are in danger from erosion. No additional bluff or shoreline protective devices shall be constructed on the adjacent public bluff face above the approved seawall or seacave/notch fills or on the beach in front of the proposed seawall and seacave/notch fills unless the alternatives required above are demonstrated to be infeasible. No shoreline protective devices shall be constructed in order to protect ancillary improvements (patios, decks, fences, landscaping, etc.) located between the principal residential structures and the ocean.

6. Future Maintenance/Debris Removal. Within 15 days of completion of construction of the protective devices, the permittee shall remove all debris deposited on the bluff, beach or in the water as a result of construction of shoreline protective devices. The permittee shall also be responsible for the removal of debris resulting from failure or damage of the shoreline protective devices in the future. In addition, the permittee shall maintain the permitted seawall, tiebacks, seacave/notch fills and seacave tiebacks in its approved state. Maintenance of the seawall and seacave/notch fills shall include maintaining the color, texture and integrity. Any change in the design of the project or future additions/reinforcement of the seawall and seacave/notch fills beyond exempt maintenance as defined in Section 13252 of the California Code of Regulations to restore the structure to its original condition as approved herein, will require a coastal development permit. **However, in all cases, if after inspection, it is apparent that**

repair and maintenance is necessary, including maintenance of the color of the structures to ensure a continued match with the surrounding native bluffs, the permittee shall contact the Executive Director to determine whether a coastal development permit or an amendment to this permit is necessary, and, if necessary, shall subsequently apply for a coastal development permit or permit amendment for the necessary maintenance.

7. Storm Design/As-Built Plans. PRIOR TO THE ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit certification by a registered civil engineer that the proposed seawall is designed to withstand storms comparable to the winter storms of 1982-83.

Within 60 days following completion of the project, the permittee shall submit as-built plans of the approved seawall, seacave/notch infills which include measurements of the distance between the condominium structures and accessory improvements and the bluff edge (as defined by Section 13577 of the California Code of Regulations) taken at 12 or more locations. The locations for these measurements shall be identified through permanent markers, benchmarks, survey position, written description, or other method to allow annual measurements to be taken at the same bluff location and to allow accurate measurement of bluff retreat.

In addition, within 60 days following completion of the project, the permittee shall submit certification by a registered civil engineer, acceptable to the Executive Director, verifying the seawall and seacave/notch infills have been constructed in conformance with the approved plans for the project.

8. U.S. Army Corps of Engineers Permit. PRIOR TO COMMENCEMENT OF CONSTRUCTION, the permittee shall provide to the Executive Director a copy of a U.S. Army Corps of Engineers permit, letter of permission, or evidence that no Corps permit is necessary. Any mitigation measures or other changes to the project required through said permit shall be reported to the Executive Director. Such changes shall not be incorporated into the project until the applicant obtains a Commission approved amendment to this coastal development permit, unless the Executive Director determines that no amendment is legally required.

9. State Lands Commission Approval. PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit to the Executive Director for review and written approval, a written determination from the State Lands Commission that:

- a) No state lands are involved in the development; or
- b) State lands are involved in the development, and all permits required by the State Lands Commission have been obtained; or

c) State lands may be involved in the development, but pending a final determination of state lands involvement, an agreement has been made by the applicant with the State Lands Commission for the project to proceed without prejudice to the determination.

10. Public Rights. By acceptance of this permit, each applicant acknowledges, on behalf of him/herself and his/her successors in interest, that issuance of the permit and construction of the permitted development shall not constitute a waiver of any public rights which may exist on the property.

11. Assumption of Risk, Waiver of Liability and Indemnity Agreement. By acceptance of this permit, the applicant acknowledges and agrees (i) that the site may be subject to hazards from erosion and coastal bluff collapse; (ii) to assume the risks to the applicant and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (iii) to unconditionally waive any claim of damage or liability against the Commission, its officers, agents, and employees for injury or damage from such hazards; and (iv) to indemnify and hold harmless the Commission, its officers, agents, and employees with respect to the Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.

12. Deed Restriction. **PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT**, the applicant shall submit to the Executive Director for review and written approval documentation demonstrating that the landowner has executed and recorded a deed restriction, in a form and content acceptable to the Executive Director: (1) indicating that, pursuant to this permit, the California Coastal Commission has authorized development on the subject property, subject to terms and conditions that restrict the use and enjoyment of that property (hereinafter referred to as the "Standard and Special Conditions"); and (2) imposing all Standard and Special Conditions of this permit as covenants, conditions and restrictions on the use and enjoyment of the Property. The deed restriction shall include a legal description of the applicant's entire parcel or parcels. The deed restriction shall also indicate that, in the event of an extinguishment or termination of the deed restriction for any reason, the terms and conditions of this permit shall continue to restrict the use and enjoyment of the subject property so long as either this permit or the development it authorizes, or any part, modification, or amendment thereof, remains in existence on or with respect to the subject property.

IV. Findings and Declarations.

The Commission finds and declares as follows:

1. Detailed Project Description. The proposed project involves the construction of an approximately 120 ft.-long, 35 ft.-high colored and textured tiedback concrete seawall and approximately 342 linear feet of notch and seacave infills with colored and textured

erodible concrete on the public beach below an existing 72 unit condominium complex. The project involves the fill of three seacaves that incorporate up to 10 tiebacks each in addition to the erodible fill. The applicant also proposes to pay an in-lieu fee to mitigate the adverse impacts on the project on the area's sand supply.

The condominium structures consist of five separate buildings, three of which are located as close as 22 to 25 from the edge of the bluff. The proposed project is located on the beach approximately 300 feet south of Fletcher Cove, the City of Solana Beach's primary beach access point. The City of Solana Beach does not yet have a certified LCP. Therefore, Chapter 3 policies of the Coastal Act is the standard of review.

2. Permit History. In 1974, the Commission approved the construction of the subject condominiums with conditions relating to the creation of a permanent open space area of approximately 0.94 acres on the top of the bluff at the northwest corner of the blufftop (Ref. CDP #F1002/Surfsong). The open space area remains available for public use. No additional coastal development permits have been requested for the subject property since that time.

3. Geologic Conditions and Hazards. Section 30235 of the Coastal Act states, in part:

Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply.

In addition, Section 30253 of the Coastal Act states, in part:

New development shall:

- (1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.
- (2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs...

The proposed project involves the construction of an approximately 120 ft.-long, 35 ft.-high seawall and the fill of an approximately 342-foot long undercut/seacave area on the public beach at the base of privately-owned bluffs with 72 condominiums located at the top of the bluff. The seacave/notch fills would consist of an erodible mixture designed to erode at the same rate as the surrounding bluffs.

As characterized by the geotechnical report submitted by the applicant, the project is required to protect three condominium buildings that are threatened by erosion due

largely to the presence of a "clean sands" lens located between the Torrey Sandstone and Marine Terrace Deposits at approximately elevation 25-35 ft. MSL. The threatened structures are located between 22 and 25 ft. from the edge of the bluff. In August of 2002, the upper bluff below Building #211 experienced an extensive bluff collapse which exposed an approximately 8 ft.-high layer of clean sands on the face of the bluff at approximately elevation 25-32 ft. MSL. To address this collapse, the applicant proposes to construct an approximately 120 ft.-long, 35 ft.-high seawall to arrest erosion at the toe of the bluff as well as to contain the layer of exposed clean sands. Since it is assumed that this same layer of clean sands extends throughout the subject property, the applicant is proposing to inhibit the exposure of the clean sands layer by filling three caves and notch overhangs with colored and textured erodible concrete.

According to the Commission's staff geologist, the clean sand layer consists of a layer of sand with a limited amount of capillary tension and a very minor amount of cohesion, both of which cause the material to erode easily, making this clean sand layer, once exposed, susceptible to wind blown erosion and continued sloughing as the sand dries out and loses the capillary tension that initially held the materials together. Geotechnical reports associated with developments near this site have stated that gentle sea breezes and any other perturbations, such as landing birds or vibrations from low-flying helicopters, can be sufficient triggers of small- or large-volume bluff collapses, since the loss of the clean sands eliminates the support for the overlying, slightly more cemented, terrace deposits.

The presence of this clean sand layer within the bluffs along the Solana Beach shoreline has previously been identified in geotechnical reports submitted in conjunction with seawall, seacave and notch infill projects north of the subject site (ref. CDP #6-99-100/Presnell, et. al, #6-99-103/ Coastal Preservation Association, 6-00-66/Pierce, Monroe and 6-02-84/Scism) as well as south of the subject site (ref. CDP 6-00-9/Del Mar Beach Club). According to the Commission's staff geologist, the typical mechanism of sea cliff retreat along the Solana Beach shoreline involves the slow abrasion and undercutting of the Torrey Sandstone bedrock, which forms the sea cliff at the base of the bluffs, from wave action which becomes more pronounced in periods of storms, high surf and high tides. Other contributing factors to sea cliff retreat include fracturing, jointing, sea cave and overhang collapse and the lack of sand along the shoreline. When the lower sea cliff is undercut sufficiently, it commonly fails in blocks. The weaker terrace deposits are then unsupported, resulting in the collapse of the terrace deposits through circular failures. Such paired, episodic failures eventually result in a reduction in the steepness of the upper bluff, and the landward retreat of the bluff edge. Such retreat may threaten structures at the top of the slope. When failures of the upper bluff have sufficiently reduced the overall gradient of the upper bluff, a period of relative stability ensues, which persists until the lower bluff becomes sufficiently undercut to initiate a block failure once more, triggering a repetition of the entire process.

The mechanism of bluff retreat that occurs in conjunction with the exposure of the clean sand layer is somewhat different than the paired, episodic failure model described above. Because of the cohesionless character of the clean sands, once they are exposed they

continue to slump on an ongoing basis as a result of very small triggers such as traffic vibrations or wind erosion. Continued sloughage results in the further exposure of more clean sand, and ongoing upper bluff collapse. This cycle occurs so quickly (over months or days, rather than years) that the upper bluff may never achieve a stable angle of repose. In 1998, following the exposure of the clean sands layer below 261 Pacific Avenue approximately 9 lots south of the subject site), a section of the bluff collapsed suddenly and without warning, leaving a vertical head scarp 25 feet in height at the top of the bluff. Unless the base of the bluff is afforded shoreline protection, additional bluff failures can further expose the layer of clean sands and result in a potential upper bluff failure and an immediate threat to the structures at the top of the bluff.

The subject geotechnical report indicates that the long-term average sea cliff erosion rate for Solana Beach is approximately 0.2 to 0.4 ft. per year. According to the Commission's staff geologist, the best regional estimate of historical long-term bluff retreat for Solana Beach is from a FEMA-funded study summarized in Benumof and Griggs (1999). These authors report an average long-term retreat rate of 0.27 ft/yr for the Solana Beach area over the period 1932 - 1994. Episodic erosion events such as sea cave or notch overhang collapses, and erosion related to severe winter storms, can lead to short-term bluff retreat rates well above the long-term average. These short-term retreat rates are inherently included in the estimation of the long-term retreat rate for Solana Beach and, therefore, are included in the methodology used for the in-lieu fee sand replenishment calculations.

Although the geotechnical information supplied by the applicant identifies that the historical long-term average erosion rate is between 0.2 to 0.4 ft. per year, the applicant identifies that the subject site has recently experienced erosion that greatly exceeds this long-term average. On January 2, 2002, an approximately 60 ft.-long notch undercut at the toe of the bluff below Building #211 collapsed exposing a clean sands layer. The applicant's geotechnical report identifies that the "collapse centered around Seacave E, and along the fracture/joint associated with the seacave . . ." ("Addendum Response to Third-Party Geotechnical Review" by Anthony-Taylor Consultants dated 11/26/02). The report documents that since the collapse, "the bluff located east of the failure has retreated eastward approximately 12- to 15-ft." Under such conditions, the applicant's geotechnical report estimates the existing site is experiencing an erosion rate of up to 5 ft. per month. In addition, the report identifies that notch overhangs and three seacaves located to the south of the bluff collapse are larger than Seacave "E" area such that the collapse of these notch overhangs or seacaves would have a more dramatic impact than that which occurred on January 2002.

While the existing structures (Buildings #211, 233 and 239) are set back from the bluff edge between 22 and 25 feet, the slope stability analysis performed by the applicant's engineer indicates that further collapse of the upper bluff would undermine the foundations of all three condominium buildings at the top of the bluff. The factor of safety against sliding along the most likely slide plane was estimated to be at approximately 1.15 for Building #211, 1.0 for Building #233, and 1.16 for Building #239. In addition, following lower bluff or seacave collapse, the report identifies the factor of safety against sliding will be reduced to approximately 1.04 for Building #211, 0.97 for

Building #233 and approximately 1.10 for Building #239. (The factor of safety is an indicator of slope stability where a value of 1.5 is the industry-standard value for new development. In theory, failure should occur when the factor of safety drops to 1.0, and no slope should have a factor of safety less than 1.0.) The applicant's geotechnical report asserts that "[b]ased on our site evaluation and analysis, a single event failure at these locations would migrate up-bluff to an extent that the footings of Building 211, 233 and 239 would be undermined." (Ref. "Response to CCC Staff Letter Bluff Failures, Seacaves and Undercutting Surfscrap Project" by Anthony-Taylor Consultants, dated 3/7/2003). The Commission's staff geologist and coastal engineer have reviewed the applicant's information and concur that the existing condominium structures at the top of the bluff are in danger from erosion.

Thus, given the significant bluff collapse that occurred in January 2002, the presence of the clean sand layer, the extreme erodibility of these sands once exposed, and the low factor of safety on the subject bluffs, substantial evidence has been provided to document that the existing primary blufftop structures are in danger from erosion. However, there are a variety of ways in which the threat from erosion could be addressed. Under the policies of the Coastal Act, the project must eliminate or mitigate adverse effects on shoreline sand supply and minimize adverse effects on public access, recreation, and the visual quality of the shoreline.

Alternatives

The applicant's engineer has performed an alternatives analysis to demonstrate that no other feasible alternatives exist to address the threats to the structures at the top of the bluff. The applicant's engineer has identified that removal or relocation of the three threatened, three-story condominium structures is not feasible or practical because of the expense and the lack of available area on the lot to setback the structures so as to not be threatened. Beach nourishment was also identified by the applicant as an infeasible alternative to the proposed project since, according to the applicant's engineer, the undercut and seacaves are projected to fail with or without beach nourishment unless the proposed project is approved. However, the applicant's engineer identifies that following implementation of the proposed seawall, notch and seacave fills, beach nourishment would likely forestall the need for additional armoring along this section of shoreline. In the case of the seawall, the applicant's engineer has also identified that the height of the wall at 35 ft. is the minimum size necessary to protect the toe of the bluff from marine erosion and contain the layer of clean sands which has been determined to be located between 25 ft. and 35 ft. MSL.

The applicant's engineer has also examined the alternative of constructing a 35 ft.-high, 342 ft.-long seawall in place of the proposed fill of the notch overhangs and seacaves along with the proposed 120 ft.-long seawall. This alternative would provide a more formidable form of protection, however, the applicant's engineer identifies that this alternative would be more expensive and may not be necessary if the notch undercut and seacaves are filled with erodible concrete and a year round sand replenishment program occurs in the next 10 years (the estimated lifetime of the erodible fills).

In summary, the exposure of the clean sands layer presents a threat of rapid erosion and bluff collapses that must be addressed by a solution that effectively contains the clean sands and affords protection to the condominiums at the top of the bluff. Given the substantial amount of documented erosion on the site over the last two years, the presence of the clean sands, the extreme erodibility of these sands, and the low factor of safety on the subject bluffs, substantial evidence has been provided to document that the existing primary blufftop structures are in danger from erosion and that the proposed seawall and seacave/notch infills are necessary to protect the structures at the top of the bluff from the danger of erosion. In addition, the above-described alternatives presented by the applicant does not suggest there is a less-environmentally-damaging feasible alternative. The Commission's staff geologist and coastal engineer have reviewed the applicant's geotechnical assessment of the site along with their alternatives analysis and concur with its conclusions and recommendations. Therefore, the Commission finds that the proposed seawall and seacave/notch infills are the least environmentally damaging feasible alternative.

Sand Supply/In Lieu Mitigation Fee

Although construction of a seawall and seacave/notch fills are required to protect the existing principal structures on the site, Section 30235 of the Coastal Act requires that the shoreline protection be designed to eliminate or mitigate adverse impacts on local shoreline sand supply. There are a number of adverse impacts to public resources associated with the construction of shoreline protection on the public beach. The natural shoreline processes referenced in Section 30235, such as the formation and retention of sandy beaches, can be significantly altered by construction of a seawall and seacave/notch fills, since bluff retreat is one of several ways that beach area and beach quality sand is added to the shoreline. This retreat is a natural process resulting from many different factors such as erosion by wave action causing cave formation, enlargement and eventual collapse, saturation of the bluff soil from ground water causing the bluff to slough off and natural bluff deterioration. When a seawall and seacave/notch fills are constructed on the beach at the toe of the bluff, they directly impedes these natural processes.

Some of the effects of a shoreline protective structure on the beach such as scour, end effects and modification to the beach profile are temporary or difficult to distinguish from all the other actions which modify the shoreline. Seawalls also have non-quantifiable effects to the character of the shoreline and visual quality. However, some of the effects which a structure may have on natural shoreline processes can be quantified. Three of the effects from a shoreline protective device which can be quantified are: 1) loss of the beach area on which the structure is located; 2) the long-term loss of beach which will result when the back beach location is fixed on an eroding shoreline; and 3) the amount of material which would have been supplied to the beach if the back beach or bluff were to erode naturally.

As previously described, filling seacaves or notches have some, but not all, of the same impacts as seawalls. Like a seawall, seacaves and notch fills encroach onto the beach when they are constructed. The purpose of the erodible fill is to prevent the collapse of the notch, cave or undercut. Thus the beach area upon which these fills are placed would soon be exposed, usable beach area were it not for the placement of the fill. Thus, the encroachment of the fills, measured from the back of the notch or undercut, to the seaward edge of the fill, is a quantifiable adverse impact that will result from these shore protection devices.

As noted above, the erodible material used in seacaves and notch fills should prevent the catastrophic collapse of the bluff, but will allow the gradual addition of bluff material to the littoral cell as the erodible material retreats landward. The sandy material of the bluff above the erodible fills will contribute to the beach material but at a different pace than it would if the site were left unprotected and the bluffs allowed to erode and/or collapse naturally. Similarly, although seacave fill does not permanently fix the back beach location, by reducing the risk of bluff collapse, it slows the landward movement of the back beach location from what would happen without the erodible fill. Seacave plugs or notch fills tend to be smaller in height and width and thus less visually obtrusive than seawalls; however, they do encroach onto the beach, alter the timing and extent of the natural landform change of the bluffs, and, if not carefully constructed and monitored, can be very conspicuous.

Unlike a seawall, however, seacave/notch fills are generally set into the bluff face and do not protrude beyond the face of the bluff. Because such structures are set within the bluff, the accelerated erosion from increased wave reflection and "edge effects" to adjacent properties associated with seawalls are reduced or avoided. Further, seacave/notch fills do not prevent the erosion of bluff face material onto the beach via subaerial erosion since they do not cover any portion of the upper bluff as a seawall or upper bluff work would. However, the fill will result in the loss of the sand area where the erodible concrete fill will be located. In the past, seacaves were typically filled with a concrete material that did permanently fix the back of beach, similar to a seawall. However, in the last several years, most fill projects have been constructed using a "lean" concrete mixture designed to erode at the same rate as the surrounding bluffs. Thus, the back of the beach is not permanently fixed in place in these instances.

Loss of beach material and loss of beach area are two separate concerns. A beach is the result of both sandy material and a physical area between the water and the back beach. Thus, beach area is not simply a factor of the quantity of sandy beach material. In Solana Beach, published reports document that the shoreline is a shallow bedrock layer covered by a thin veneer of sand. The bedrock layer provides an area for collection of sandy material. The sand material is important to the overall beach experience, but even without the sand, the bedrock layer provides an area for coastal access between the coastal bluff and the ocean. The loss of beach material that will be a direct result of this project can be balanced or mitigated by obtaining similar quality and quantity of sediment from outside the littoral cell and adding this sediment to the littoral cell. There are sources of beach quality sediment that can be drawn upon to obtain new sediment for

the littoral cell. Unfortunately there is not a source of extra beach land that can be used to add new land area to the littoral cell and therefore it is not possible to directly mitigate for the loss of coastal land when shoreline protective devices are required to protect existing development. In this particular case, dedication of an isolated portion of the applicant's blufftop property would not mitigate for potential impacts to public access and recreation associated with the loss of beach land because the blufftop property is not accessible to the public in the same manner as the beach. Instead, beach nourishment is an indirect method to mitigate the loss of coastal land in that it allows us to shift the shore profile seaward and create a new area of dry beach. This will not create new coastal land, but will provide many of the same benefits that will be lost when the beach area is covered by a seawall or "lost" through passive erosion when the back bluff location is fixed.

It is possible to estimate the volume of sand needed to create a given area of dry beach through beach nourishment. The proposed project will result in a loss of 240 sq. ft. of beach due to the long-term physical encroachment of the seawall (based on a 120-foot length and 2 foot width). In addition, there will be 712.8 sq. ft. of beach area [22 years x 120 ft. x .27 erosion rate] that will no longer be formed because the back of the beach will be fixed. This 952.8 sq. ft. of beach area [240+ 712.8] cannot be directly replaced by land, but a comparable area can be built through the one-time placement of 857.52 [952.8 x 0.9] cubic yards of sand on the beach seaward of the seawall as beach nourishment. Further explanation of this calculation is provided below. Thus, the impact of the seawall on beach area can be quantified as 857.52 cubic yards of sand. This estimate is only a "rough approximation" of the impact of the seawall on beach area because a one-time placement of this *volume* of sand cannot result in creation of beach *area* over the long term.

In addition to the impact on beach area, there is the amount of beach material that would have been added to the beach if natural erosion had been allowed to continue at the site, which can be calculated at a volume of 1,601.52 cubic yards. This 1,601.52 cubic yards of sand that would have been added to the littoral cell, plus the 857.52 cubic yards of sand associated with the impact to beach area, totals 2,459.04 cubic yards of sand that are needed to balance the quantifiable impacts from the entire project.

The proposed project will also result in a loss of 1,639 sq. ft. of sand area due to the long-term physical encroachment of the seacave/notch infill. To compensate for the area of sand which will be occupied by the proposed seacave/notch infills the applicant also proposes to pay an in lieu fee to compensate for his area which translates into 1,475.1 cu. yds of sand [1,639 x .9]. Special Condition #3 requires the applicant to deposit an in-lieu fee to fund beach sand replenishment of 3,855.21 cubic yards of sand, as mitigation for impacts of all the proposed shoreline protective devices on beach sand supply and shoreline processes. In the case of the proposed project, the fee calculates to be \$44,720.44 based on 3,855.21 cubic yards [2,380.11 cu. yds. from seawall impact + 1,475.1 cu. yds. from infill impacts] of sand multiplied by the cost of obtaining a cubic yard of sand, as proposed by the applicant's engineer at \$11.60.

The following is the methodology used by Commission staff in developing the in-lieu fee amount. The methodology uses site-specific information provided by the applicant as well as estimates, derived from region-specific criteria, of both the loss of beach material and beach area which could occur over the life the structure, and of the cost to purchase an equivalent amount of beach quality material and to deliver this material to beaches in the project vicinity.

In earlier Commission actions that required payment of an in-lieu fee to mitigate the loss of sand resulting from shoreline devices, the long-term estimated rate of erosion along the Solana Beach shoreline had been estimated to be approximately 0.2 ft./yr. As previously described, the best current estimate for the average long-term bluff retreat for Solana Beach is from a FEMA-funded study reported on in Benumof and Griggs (1999) which estimates the rate to be 0.27 ft./yr.

The following is a description of the methodology. The actual calculations which utilize values that are applicable to the subject sites, and were used as the basis for calculating the estimated range of the mitigation fee, are attached as Exhibit #X to this report.

Fee = (Volume of sand for mitigation) x (unit cost to buy and deliver sand)

$$M = V_t \times C$$

where

M = Mitigation Fee

V_t = Total volume of sand required to replace losses due to the structure, through reduction in material from the bluff, reduction in nearshore area and loss of available beach area (cubic yards).
Derived from calculations provided below.

C = Cost, per cubic yard of sand, of purchasing and transporting beach quality material to the project vicinity (\$ per cubic yard). Derived from the average of three written estimates from sand supply companies within the project vicinity that would be capable of transporting beach quality material to the subject beach, and placing it on the beach or in the near shore area.

$$V_t = V_b + V_w + V_e$$

where

V_b = Volume of beach material that would have been supplied to the beach if natural erosion continued, based on the long-term regional bluff retreat rate, design life of the structure, percent of

beach quality material in the bluff, and bluff geometry (cubic yards). This is equivalent to the long-term reduction in the supply of bluff material to the beach resulting from the structure.

V_w = Volume of sand necessary to replace the beach area that would have been created by the natural landward migration of the beach profile without the seawall, based on the long-term regional bluff retreat rate, and beach and nearshore profiles (cubic yards)

V_e = Volume of sand necessary to replace the area of beach lost due to encroachment by the seawall; based on the seawall design and beach and nearshore profiles (cubic yards)

$$V_b = (S \times W \times L/27) \times [(R h_s) + (h_u/2 \times (R + (R_{cu} - R_{cs})))]$$

where

R = Long-term regional bluff retreat rate (ft./yr.), based on historic erosion, erosion trends, aerial photographs, land surveys, or other accepted techniques. For the Solana Beach area, this regional retreat has been estimated to be 0.27 ft/year. The use of any alternative retreat rates must be documented by the applicant.

L = Design life of armoring without maintenance (yr.) If maintenance is proposed and extends the life of the seawall beyond the initial estimated design life, a revised fee shall be determined through the coastal development permit process.

W = Width of property to be armored (ft.)

h = Total height of armored bluff (ft.)

S = Fraction of beach quality material in the bluff material, based on analysis of bluff material to be provided by the applicant

h_s = Height of the seawall from the base to the top (ft)

h_u = Height of the unprotected upper bluff, from the top of the seawall to the crest of the bluff (ft)

R_{CU} = Predicted rate of retreat of the crest of the bluff, during the period that the seawall would be in place, assuming no seawall were installed (ft/yr). This value can be assumed to be the same as R unless the applicant provides site-specific geotechnical information supporting a different value.

R_{CS} = Predicted rate of retreat of the crest of the bluff, during the period that the seawall would be in place, assuming the seawall has been installed (ft/yr). This value will be assumed to be zero unless the applicant provides site-specific geotechnical information supporting a different value.

NOTE: For conditions where the upper bluff retreat will closely follow the lower bluff, this volume will approach a volume of material equal to the height of the total bluff, the width of the property and a thickness equal to the total bluff retreat that would have occurred if the seawall had not been constructed. For conditions where the upper bluff has retreated significantly and would not be expected to retreat further during the time that the seawall is in place, this volume would approach the volume of material immediately behind the seawall, with a thickness equal to the total bluff retreat that would have occurred if the seawall had not been constructed.

$$V_w = R \times L \times v \times W$$

where

R = Long-term regional bluff retreat rate (ft./yr.), based on historic erosion, erosion trends, aerial photographs, land surveys, or other accepted techniques. For the Solana Beach area, this regional retreat has been estimated to be 0.27 ft/year. The use of any alternative retreat rates must be documented by the applicant.

L = Design life of armoring without maintenance (yr.) If maintenance is proposed and extends the life of the seawall beyond the initial estimated design life, a revised fee shall be determined through the coastal development permit process.

v = Volume of material required, per unit width of beach, to replace or reestablish one foot of beach

seaward of the seawall; based on the vertical distance from the top of the beach berm to the seaward limit of reversible sediment movement (cubic yards/ft of width and ft. of retreat). The value of v is often taken to be 1 cubic yard per square foot of beach. In the report, "Oceanside Littoral Cell Preliminary Sediment Budget Report" (December 1987, part of the Coast of California Storm and Tide Wave Study, Document #87-4), a value for v of 0.9 cubic yards/square foot was suggested. If a vertical distance of 40 feet is used for the range of reversible sediment movement, v would have a value of 1.5 cubic yards/square foot (40 feet x 1 foot x 1 foot / 27 cubic feet per cubic yard). These different approaches yield a range of values for v from 0.9 to 1.5 cubic yards per square foot. The value for v would be valid for a region, and would not vary from one property to the adjoining one. Until further technical information is available for a more exact value of v , any value within the range of 0.9 to 1.5 cubic yards per square foot could be used by the applicant without additional documentation. Values below or above this range would require additional technical support.

$W =$ Width of property to be armored (ft.)

$$V_e = E \times W \times v$$

where

$E =$ Encroachment by seawall, measured from the toe of the bluff or back beach (ft.)

$W =$ Width of property to be armored (ft.)

$v =$ Volume of material required, per unit width of beach, to replace or reestablish one foot of beach seaward of the seawall, as described above;

The San Diego Association of Governments (SANDAG) has adopted the Shoreline Preservation Strategy for the San Diego region and is currently working on techniques toward its implementation. The Strategy considers a full range of shoreline management tactics, but emphasizes beach replenishment to preserve and enhance the environmental quality, recreational capacity, and property protection benefits of the region's shoreline. Funding from a variety of sources will be required to implement the beach replenishment and maintenance programs identified in the SANDAG Strategy. In this particular case, SANDAG has agreed to administer a program which would identify projects which may

be appropriate for support from the beach sand replenishment fund, through input from the Shoreline Erosion Committee which is made up of representatives from all the coastal jurisdictions in San Diego County. The Shoreline Erosion Committee is currently monitoring several large scale projects, both in and out of the coastal zone, they term "opportunistic sand projects", that will generate large quantities of beach quality material suitable for replenishing the region's beaches. The purpose of the account is to aid in the restoration of the beaches within San Diego County. One means to do this would be to provide funds necessary to get such "opportunistic" sources of sand to the shoreline.

The applicant is being required to pay a fee in-lieu of directly depositing the sand on the beach, because the benefit/cost ratio of such an approach would be too low. Many of the adverse effects of the seawall and seacave/notch fill on sand supply will occur gradually. In addition, the adverse effects impact the entire littoral cell but to different degrees in different locations throughout the cell (based upon wave action, submarine canyons, etc.). Therefore, mitigation of the adverse effects on sand supply is most effective if it is part of a larger project that can take advantage of the economies of scale and result in quantities of sand at appropriate locations in the affected littoral cell in which it is located. The funds will be used only to implement projects which benefit the area where the fee was derived, and provide sand to the region's beaches, not to fund operations, maintenance or planning studies. Such a fund will aid in the long-term goal of increasing the sand supply and thereby reduce the need for additional armoring of the shoreline in the future. The fund also will insure available sandy beach for recreational uses. The methodology, as proposed, ensures that the fee is roughly proportional to the impacts to sand supply attributable to the proposed seawall and seacave/notch fills. The methodology provides a means to quantify the sand and beach area that would be available for public use, were it not for the presence of the seawall and seacave/notch fills.

Mitigation for impacts to sand supply are based partially on the estimated 22-year design life of the seawall, therefore, the proposed in-lieu fee sand replenishment plan only mitigates for the initial design life of the seawall. The seawall, however, might outlast its design life. To address the impacts of the seawall on shoreline sand supply that will occur if the seawall lasts for more than its design life, Special Condition #3 requires that the applicant or successor in interest apply for an amendment to the subject permit within 21 years of issuance in order to either remove the proposed seawall or to provide additional mitigation for the additional years of design life that occurs to the seawall. If the applicant or successor in interest enlarges, reconstructs, or performs repairs that extend the design life of the seawall, the applicant or successor in interest will at that time be required to provide mitigation for the additional impacts to shoreline sand supply.

The mitigation for impacts to sand supply are also based on the area occupied by the erodible fill within the notches and seacaves. Since this area is expected to erode at the same rate as the surrounding natural bluffs, the fee is based on its one-time placement not its design life (estimated to be 10 years). If the infills should erode at a rate greater than the natural bluffs, the applicant may potentially request authorization to infill areas that have eroded either seaward or surrounding the infill. If such a request were granted by

the Commission in the future, the applicant at that time could be required to pay an additional in-lieu fee to for the placement of additional fill material on the beach.

It has been argued that regional approaches to shoreline erosion are environmentally preferable to building separate seawalls to protect individual structures. Coastal Act Section 30235, however, requires the Commission to approve shoreline protection for existing structures in danger from erosion when the shoreline protection is designed to eliminate or mitigate effects on local shoreline sand supply. In this particular case, the Commission finds the applicant's structures are faced with an immediate threat from erosion and require protection prior to implementation of a comprehensive regional shoreline erosion strategy.

It also has been argued that the impacts of the seawall on shoreline sand supply, public access, and recreation must be reduced to insignificance. Given that the seawall necessarily fixes the inland extent of the beach on an eroding beach, the adverse effects of the seawall on public access and recreation cannot be completely eliminated. By requiring sand mitigation fees that will fund beach sand replenishment, the Commission is minimizing the adverse effects of the seawall and seacave/notch fills on public access and recreation to the greatest extent feasible.

The above-described impacts on the beach and sand supply have previously been found to result from seawalls and notch/seacave fills in other areas of North County. In March of 1993, the Commission approved CDP #6-93-85/Auerbach, et al for the construction of a seawall fronting six non-continuous properties located in the City of Encinitas north of the subject site. In its finding for approval, the Commission found the proposed shoreline protection would have specific adverse impacts on the beach and sand supply and required mitigation for such impacts as a condition of approval. The Commission made a similar finding for several other seawall developments within Solana Beach including an August 1999 approval (ref. CDP No. 6-99-100/Presnell, et. al) for an approximately 352-foot-long seawall project, a March 2001 approval (ref. CDP No. 6-00-138/Kinzel, Greenberg) for an approximately 100 ft.-long seawall, and most recently a 100 foot-long seawall (ref. CDP No. 6-02-2/Gregg, Santana) all located north of the subject site. The Commission made similar findings in approving a seacave fill (ref. CDP No. 6-00-66/Monroe, Pierce) also north of the subject site in Solana Beach. (Also ref. CDP Nos. 6-93-36-G/Clayton, 6-93-131/Richards, et al, 6-93-136/Favero, 6-95-66/Hann, 6-98-39/Denver/Canter and 6-99-41/Bradley).

In addition to the adverse impacts the seawall and seacave/notch fills will have on the beach as detailed above, the Commission finds that the proposed seawall and seacave/notch fills could also have adverse impacts on adjacent unprotected properties caused by wave reflection, which leads to accelerated erosion. Numerous studies have indicated that when continuous protection is not provided, unprotected adjacent properties can experience a greater retreat rate than would occur if the protective device were not present. This is due primarily to wave reflection off the protective structure and from increased turbulence at the terminus of the seawall. According to James F. Tait and Gary B. Griggs in Beach Response to the Presence of a Seawall (A Comparison of Field

Observations) "[t]he most prominent example of lasting impacts of seawalls on the shore is the creation of end scour via updrift sand impoundment and downdrift wave reflection. Such end scour exposes the back beach, bluff, or dune areas to higher swash energies and wave erosion." As such, as the base of the bluff continues to erode on the unprotected adjacent properties, failure of the bluff is likely. Thus, future failures could "spill over" onto other adjacent unprotected properties, prompting requests for much more substantial and environmentally damaging seawalls to protect the residences. This then starts a "domino" effect of individual requests for protection.

According to information contained in the Planners Handbook (dated March 1993), which is included as Technical Appendix III of the Shoreline Preservation Strategy adopted by the San Diego Association of Governments (SANDAG) on October 10, 1993, "[a] longer return wall will increase the magnitude of the reflected wave energy. On a coast where the shoreline is retreating, there will be strong incentives to extend the length of the return wall landward as adjacent property is eroded, thereby increasing the return wall, and its effects on neighboring property, with time."

The plans for the subject seawall submitted by the applicant do not address the design of the proposed return walls for the seawall or address the how the ends will be designed to mitigate these known effects. Therefore, Special Condition #1 has been attached which requires the submission of revised final plans that reflect the design of the proposed end return walls. The condition requires that the returns incorporate a "feathered" design to gradually blend into the adjacent natural bluffs which will help to reduce the turbulence and wave reflection at the end of the wall that can lead to accelerated erosion of adjacent unprotected bluffs. However, although the proposed seawall must be designed to reduce impacts of the wall on adjacent properties, at best, the impacts can be reduced, but not eliminated. Regardless of whether accelerated erosion will occur on the adjacent unprotected properties, the adjacent bluffs will continue to erode due to the same forces that are causing them to erode currently. As this occurs, more surface area of the feathered edges will be exposed to wave attack leading to increased turbulence and accelerated erosion of the adjacent unprotected bluff. These impacts are particularly problematic in the case of the proposed project, as the seawall will be an isolated structure in a stretch of currently unprotected shoreline north of the proposed seawall.

If the proposed seawall and other proposed structures were damaged in the future (e.g. as a result of wave action, storms, etc.) it could threaten the stability of the site and adjacent properties which could lead to need for more bluff alteration. In addition, damage to the seawall or other proposed structures could adversely affect the beach by resulting in debris on the beach and/or creating a hazard to the public using the beach. Excessive wear of the seawall could result in the loss of or change to the color or texture of the seawall resulting in adverse visual impacts (discussed in more detail in a subsequent section of this report). Therefore, in order to find the proposed shore and bluff protection consistent with the Coastal Act, the Commission finds that the condition of the structures must be maintained in their approved state for the life of the structures. Further, in order to ensure that the permittee and the Commission know when repairs or maintenance are required, the permittee must monitor the condition of the proposed structures annually,

for three years and then at three-year intervals after that, unless a major storm event occurs. The monitoring will ensure that the permittee and the Commission are aware of any damage to or weathering of the shoreline structures and can determine whether repairs or other actions are necessary to maintain the structures in their approved state before damage occurs resulting in the need for potentially more substantial structures. Therefore, Special Condition #2 requires the applicant to submit a monitoring report which evaluates the condition and performance of the seawall, seacave/notch infill and seacave tiebacks and overall site stability, and submit an annual report with recommendations, if any, for necessary maintenance, repair, changes or modifications to the project. In addition, the condition requires the applicant to perform the necessary repairs through the coastal development permit process.

Special Condition #5 requires that feasible alternative measures must be implemented on the applicant's blufftop property in the future, should additional stabilization be required, which would avoid additional alteration of the natural landform of the public beach or coastal bluffs, but would reduce risk to the principle residential structures and provide reasonable use of the property. The condition will ensure that future property owners will be aware that any future proposals for additional shoreline protection, such as additional upper bluff stabilization, will require an alternative analysis. If there are feasible alternatives to shoreline or bluff protection that would have less impact on visual quality, sand supply, or public access, the Commission (or, where applicable, the City of Solana Beach after the effective certification of its Local Coastal Program) can require implementation of those alternatives. The condition also states that no shore or bluff protection shall be permitted for ancillary improvements located within the blufftop setback area (such as decks, patios, etc.). Through this condition, the property owner is required acknowledge the risks inherent in the subject property and acknowledge that there are limits to the structural protective measures that may be permitted on the adjacent public property in order to protect the existing development in its current location.

Special Condition #1 requires the applicant to submit final plans for the project indicating that the seawall and seacave/notch fills conform to the bluff contours, details the design of the return wall and that demonstrate that any existing irrigation systems on the blufftop have been removed, as these would impact the ability of the seawall and the other shoreline protection devices to adequately stabilize the site. Submission of final plans will ensure that overall site conditions which could adversely impact the stability of the bluff have been addressed.

Special Condition #6 notifies the applicant that it is responsible for maintenance of the herein approved shore and bluff protection in their approved state. The condition also indicates that, should it be determined that maintenance of the proposed structures are required in the future, including maintenance of the color and texture, the applicant shall contact the Commission to determine if permits are required.

To assure the proposed shoreline protective devices has been constructed properly, Special Condition #7 has been proposed. This condition requires that, within 60 days of

completion of the project, certification by a registered civil engineer be submitted that verifies the proposed shoreline devices have been constructed in accordance with the approved plans along with a certification that the structures are designed to withstand storms comparable to the winter storms of 1982-83.

Special Conditions #8 requires the applicant to submit a copy of any required permits from the Army Corps of Engineers, to ensure that no additional requirements are placed on the applicant that could require an amendment to this permit.

Due to the inherent risk of shoreline development, Special Condition #11 requires the applicant to waive liability and indemnify the Commission against damages that might result from the proposed shoreline devices or their construction. The risks of the proposed development include that the proposed shoreline devices will not protect against damage to the structures at the top of the bluff from bluff failure and erosion. In addition, the proposed structures themselves may cause damage either to the applicant's property or to neighboring properties by increasing erosion of the bluffs. Such damage may also result from wave action that damages the seawall or seacave/notch infills. Although the Commission has sought to minimize these risks, the risks cannot be eliminated entirely. Given that the applicant has chosen to construct the proposed shoreline devices despite these risks, the applicant must assume the risks. Special Condition #12 requires the applicant to record a deed restriction imposing the conditions of this permit as covenants, conditions and restrictions on the use and enjoyment of the property. Only as conditioned can the proposed project be found consistent with Sections 30235 and 30253 of the Coastal Act.

In summary, the applicant has documented that the existing blufftop primary structures are in danger from erosion and subsequent bluff collapse. The Commission's staff geologist and coastal engineer have reviewed the applicant's geotechnical assessment and concur with its conclusions. As conditioned, there are no other less damaging alternatives available to reduce the risk from bluff erosion. Thus, the Commission is required to approve the proposed protection for residential structures. Since the proposed seawall and seacave/notch fills may contribute to erosion and geologic instability over time on adjacent unprotected properties and also will deplete sand supply, occupy public beach and fix the back of the beach, Special Condition #3 requires the applicant to require pay an in-lieu mitigation fee to offset this impact. Therefore, as conditioned, the Commission finds that the proposed seawall is consistent with Sections 30235 and 30253 of the Coastal Act.

4. Visual Resources. Section 30251 of the Act states, in part:

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

As stated above, the proposed development will occur at the base of coastal bluff and on the public beach. The bluffs adjacent to the subject site generally remain in their natural state including features such as notch overhangs and seacaves. The proposed project will substantially change the natural appearance of this section of shoreline. As such, the potential for adverse impacts on visual resources associated with the proposed development could be significant.

The applicant is proposing to construct an approximately 120-ft. long, 35-ft. high tied-back concrete seawall, and approximately 342 linear feet of seacave/notch infills at the base of an approximately 80 ft. high coastal bluff. To mitigate the visual impacts of the proposed seawall and seacave/notch fills, the applicant proposes to color and texture the seawall and infill material to closely match the natural surrounding bluffs. The visual treatment proposed is similar to the visual treatment approved by the Commission in recent Commission action for other seawalls and seacave infills in Solana Beach (Ref. CDP Nos. 6-99-100/Presnell, et. al, 6-00-66/Monroe, Pierce, 6-00-138/Kinzel, Greenberg, 6-02-2/Gregg, Santina and 6-02-84/Scism).

To address potential adverse visual impact, Special Conditions Nos. 4 and 6 have been attached which require the applicant to monitor and maintain the proposed seawall and seacave/notch infills in their approved state. If during monitoring it is determined that the color or texture of the materials no longer matches the surrounding natural bluff or if portions of the erodible concrete infill or seacave tiebacks extend out from the face of the bluff, the applicant is required to apply for a coastal development permit or amendment to repair and maintain the protective devices in their approved state and remove any portion of the infill that lies on the public beach. In addition, although the applicant proposes to color and texture treat the proposed seawall and seacave/notch infills, specific information regarding the treatment has not been submitted. Therefore, Special Condition #1 requires the submittal of detailed plans, color samples, and information on construction methods and technology for the surface treatment of the seawall and seacave/notch infill. In this way, the Commission can be assured that the proposed seawall and seacave/notch infills will blend with the natural bluffs in the area to the maximum extent feasible.

Therefore, as conditioned, the Commission finds that potential visual impacts associated with the proposed development have been reduced to the maximum extent feasible and the proposed development will include measures to prevent impacts that would significantly degrade the adjacent park and recreation area (beach area). Thus, the project can be found consistent with Sections 30240 and 30251 of the Coastal Act.

5. Public Access/Recreation. Pursuant to Section 30604 (c), the Coastal Act emphasizes the need to protect public recreational opportunities and to provide public access to and along the coast. Section 30210 of the Coastal Act is applicable to the proposed development and states:

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.

In addition, Section 30212 of the Act is applicable and states, in part:

- (a) Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where:
 - (1) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources,
 - (2) adequate access exists nearby....

Additionally, Section 30220 of the Coastal Act provides:

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

The project site is located on a public beach utilized by local residents and visitors for a variety of recreational activities. The site is located approximately 300 feet south of Fletcher Cove, the main public and vehicle beach access ramp in the City of Solana Beach. The proposed seawall and seacave/notch fills will be constructed on sandy beach area. The project will have several adverse impacts on public access.

Although the proposed seawall has been designed to be as narrow as feasible, it will project approximately 2 feet seaward of the toe of the bluff. Although the seaward encroachment of the wall appears at first glance to be minimal, the beach along this area of the coast is narrow and at high tides and winter beach profiles, the public may be forced to walk virtually at the toe of the bluff or the area would be impassable. As such, an encroachment of any amount, including 2 feet for a length of 120 feet onto the sandy beach, reduces the beach area available for public use and is therefore a significant adverse impact. This is particularly true given the existing beach profiles and relatively narrow beach where access is sometimes only available at low tides.

In addition to the above-described direct interference with public access by the proposed seawall, there are a number of indirect effects as well resulting from the seawall and seacave/notch infills. Shoreline processes, and sand supply and beach erosion rates are affected by shoreline structures as described in Section 3 of this report, and thus alter public access and recreational opportunities.

Development along the shoreline which may burden public access in several respects has been approved by the Commission. However, mitigation for any adverse impacts of the development on access and public resources is always required. The Commission's

permit history reflects the experience that development can physically impede public access directly, through construction adjacent to the mean high tide line in areas of narrow beaches, or through the placement or construction of protective devices seawalls, rip-rap, and revetments. Since physical impediments adversely impact public access and create private benefit for the property owners, the Commission has found in such cases (in permit findings of #4-87-161 [Pierce Family Trust and Morgan], #6-87-371 [Van Buskirk], #5-87-576 [Miser and Cooper]) that a public benefit must arise through mitigation conditions in order that the development will be consistent with the access policies of the Coastal Act, as stated in Sections 30210, 30211, and 30212.

The development proposed in this application is the construction of a vertical seawall and seacave/notch fills. Although the proposed seawall and seacave/notch fills adhere closely to the contour of the natural bluff, the seawall will reduce lateral beach access by encroaching onto the beach and all of the proposed structures will have adverse impacts on the natural shoreline processes. In addition, the proposed seacave/notch fill has been designed to erode with the natural bluffs, and thus will not permanently fix the back of the beach. As designed, the fill will not extend beyond the face of the bluff onto sandy beach currently usable by the public. However, as the Commission has seen in other approved "erodible" fills, the fill material does not always perform as designed such that without maintenance some seacave/notch fills may eventually lie on the public beach (Ref. CPD No. 6-02-85/City of Solana Beach) and inhibit public access. Therefore, Special Condition #2 requires that applicant monitor the site over the lifetime of the project to assure that the fill material does not extend beyond the face of the bluff more than 6 inches. In addition, Special Condition #2 requires the applicant to apply for a Coastal Development Permit or Permit Amendment in a timely manner to remove those portions of the fill material that extends out from the face of the bluff onto the public beach. As condition, public access can be protected to the maximum extent feasible.

As stated elsewhere in these findings, Section 30235 of the Act allows for the use of such shoreline protective devices where it is required to protect existing development and where it has been designed to mitigate adverse impacts upon shoreline sand supply. In order to mitigate the known adverse impacts, the Commission has in the past required an offer of dedication of lateral public access in order to balance the burden placed on the public with a public benefit. In this particular case, the beach is in public ownership and will remain as such. Therefore, a dedication of lateral public access is not an available mitigation option. However, Special Condition #3, discussed in a previous section of the staff report, requires the applicant to provide mitigation for adverse impacts on beach and sand area resulting from placement of the proposed seawall and seacave/notch fills, which will also serve to mitigate the impact of the loss of beach access caused by the seawall. The mitigation will be an in-lieu fee which will be utilized for beach replenishment projects within San Diego County.

Much of the beach is accessible in this area only at lower tides, and thus, the protection of a few feet of beach along the toe of the bluff is still important. This stretch of beach has historically been used by the public for access and recreation purposes. Special Condition #10 acknowledges that the issuance of this permit does not waive the public

rights that exist on the property. The seawall may be located on State Lands property, and as such, Special Condition #9 requires the applicant to obtain any necessary permits or permission from the State Lands Commission to perform the work.

In addition, the use of the beach or public parking areas for staging of construction materials and equipment can also impact the public's ability to gain access to the beach. While the applicant has not submitted a construction staging and material storage plan for the subject development, it is likely that beach access to the site will occur via Fletcher Cove which is located approximately 300 feet north of the subject site. In other developments for shoreline protection along this stretch of Solana Beach shoreline, the Commission has authorized the temporary placement of steel-tracked construction equipment (which cannot traverse asphalt streets) upland of the Fletcher Cove access ramp, in an area which is not currently used for parking. In addition, the Commission has previously authorized the use of parking spaces in an existing City-owned parking lot across the street from Fletcher Cove known as the "Distillery Lot" (for its previous use) for staging and storage of equipment during construction. This free, City-owned parking area is within easy walking distance of Fletcher Cove and is currently available to any beach users or patrons of the several small commercial facilities surrounding the lot. However, it is also the only off-street, open area in the vicinity of Fletcher Cove which can accommodate the type of equipment and vehicles required to construct the proposed project, other than Fletcher Cove itself. In addition, the City of Solana Beach has in the past indicated that the lot is used only minimally, and thus has an excess capacity which can be allocated to staging and storage for the project, with only a minimal impact to beach uses.

Special Condition #4 prohibits the applicant from storing vehicles on the beach overnight, using any public parking spaces within Fletcher Cove overnight for staging and storage of equipment, and prohibits washing or cleaning construction equipment on the beach or in the parking lot. The condition also prohibits construction on the sandy beach during weekends and holidays between Memorial Day to Labor Day of any year.

With Special Conditions assuring maximum public access, addressing sand supply and authorization from the State Lands Commission, impacts to the public will be minimized to the greatest extent feasible. Thus, as conditioned, the Commission finds the project consistent with the public access and recreation policies of the Coastal Act.

6. Local Coastal Planning. Section 30604(a) also requires that a coastal development permit shall be issued only if the Commission finds that the permitted development will not prejudice the ability of the local government to prepare a Local Coastal Program (LCP) in conformity with the provisions of Chapter 3 of the Coastal Act. In this case, such a finding can be made.

The subject site was previously in the County of San Diego jurisdiction, but is now within the boundaries of the City of Solana Beach. The City is preparing and plans to submit a new LCP for the area to the Commission for review. Because of the incorporation of the City, the County of San Diego's LCP was never effectively certified.

However, the issues regarding protection of coastal resources in the area have been addressed by the Commission in its review of the San Diego County LUP and Implementing Ordinances.

The City of Solana Beach has prepared a draft LCP. In preparation of its LCP, the City of Solana Beach is faced with many of the same issues as the City of Encinitas, located immediately north of Solana Beach, whose LCP was certified by the Commission in March 1995. The City of Encinitas' LCP includes the intent to prepare a comprehensive plan to address the coastal bluff recession and shoreline erosion problems in the City. The plan will include at a minimum, bluff top setback requirements for new development and redevelopment; alternatives to shore/bluff protection such as beach sand replenishment, removal of threatened portions of a residence or the entire residence or underpinning existing structures; addressing bluff stability and the need for protective measures over the entire bluff (lower, mid and upper); impacts of shoreline structures on beach and sand area as well as mitigation for such impacts; impacts for groundwater and irrigation on bluff stability and visual impacts of necessary/required protective structures.

The City of Solana Beach LCP should also address these items in the context of a comprehensive approach to management of shoreline resources. As shoreline erosion along the coast rarely affects just one individual property, it is imperative that a regional wide solution to the shoreline erosion problem be addressed and solutions developed to protect the beaches. Combined with the decrease of sandy supply from coastal rivers and creeks and armoring of the coast, beaches will continue to erode without being replenished. This will, in turn, decrease the public's ability to access and recreate on the shoreline.

In the case of the proposed project, site specific geotechnical evidence has been submitted indicating that the existing structures at the top of the bluff are in danger. The Commission feels strongly that approval of the proposed project should not send a signal that there is no need to address a range of alternatives to armoring for existing development. Planning for comprehensive protective measures should include a combination of approaches including limits on future bluff development, ground and surface water controls, and beach replenishment. Although the erosion potential on the subject site is such that action must be taken promptly, decisions regarding future shoreline protection should be done through a comprehensive planning effort that analyzes the impact of such a decision on the entire City shoreline.

The location of the proposed seawall and seacave/notch infills is designated for Open Space Recreation in the City of Solana Beach Zoning Ordinance and General Plan, and was also designated for open space uses under the County LCP. As conditioned, the subject development is consistent with these requirements. Based on the above findings, the proposed development is consistent with the Chapter 3 policies of the Coastal Act in that the need for the shoreline protective devices has been documented and its adverse impacts on beach sand supply and on adjacent unprotected properties will be mitigated.

Therefore, the Commission finds the proposed development, as conditioned, is consistent with the Chapter 3 policies of the Coastal Act, and will not prejudice the ability of the City of Solana Beach to complete a certifiable local coastal program. However, these issues of shoreline planning will need to be addressed in a comprehensive manner in the future through the City's LCP certification process

7. Consistency with the California Environmental Quality Act (CEQA).

Section 13096 of the Commission's Code of Regulations requires Commission approval of Coastal Development Permits to be supported by a finding showing the permit, as conditioned, to be consistent with any applicable requirements of the California Environmental Quality Act (CEQA). Section 21080.5(d)(2)(A) of CEQA prohibits a proposed development from being approved if there are feasible alternatives or feasible mitigation measures available which would substantially lessen any significant adverse effect which the activity may have on the environment.

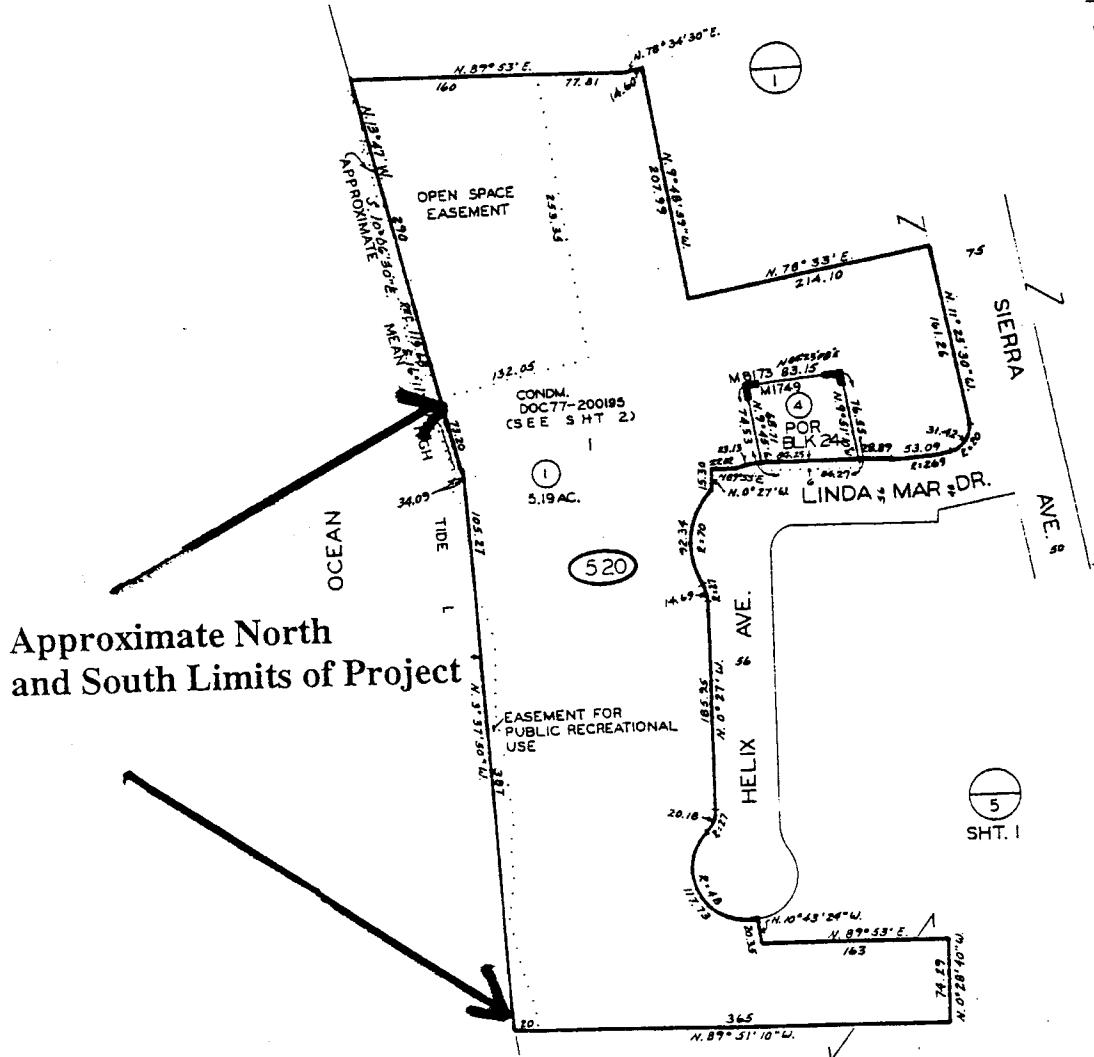
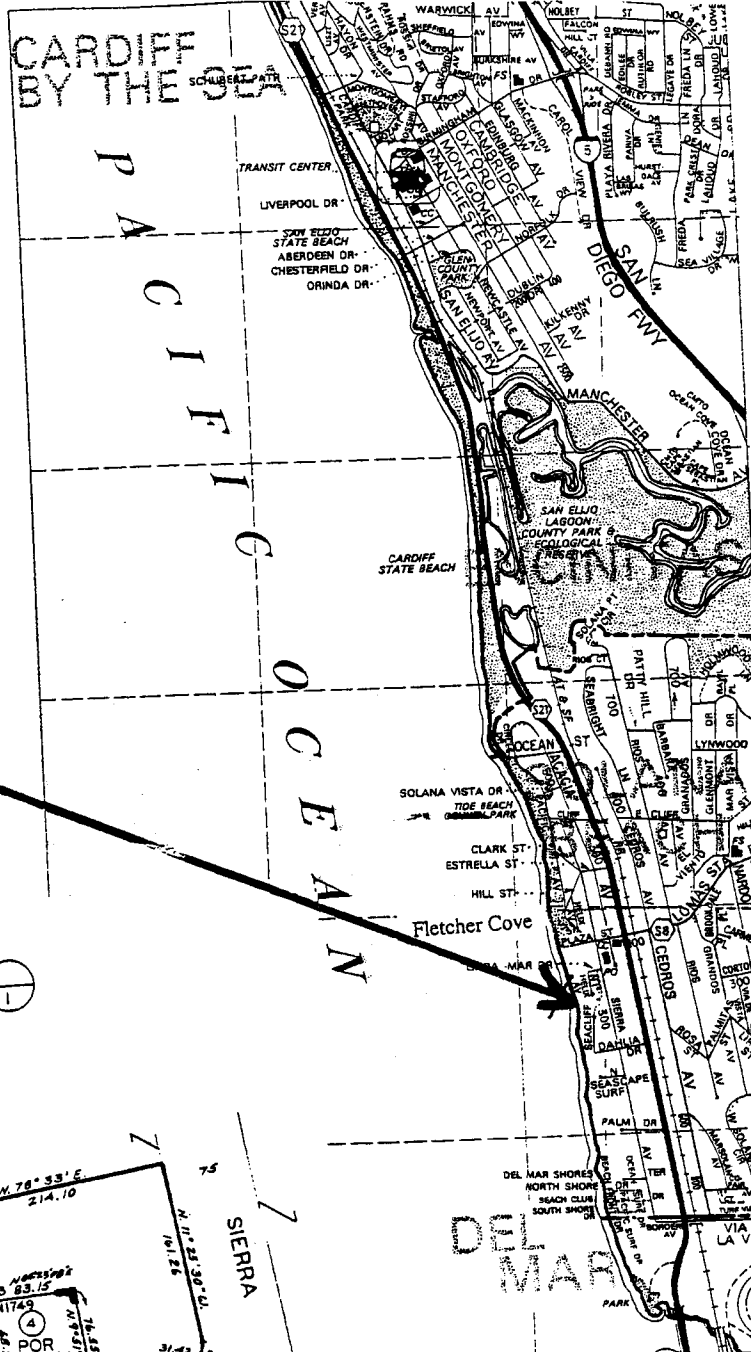
The proposed project has been conditioned in order to be found consistent with the geologic stability, visual quality, and public access policies of the Coastal Act. Mitigation measures, including conditions addressing payment of an in-lieu fee for impacts to sand supply, construction techniques consistent with the geotechnical report, the color of construction materials and timing of construction will minimize all adverse environmental impacts. As conditioned, there are no feasible alternatives or feasible mitigation measures available which would substantially lessen any significant adverse impact which the activity may have on the environment. Therefore, the Commission finds that the proposed project is the least environmentally-damaging feasible alternative and is consistent with the requirements of the Coastal Act to conform to CEQA.

STANDARD CONDITIONS:

1. Notice of Receipt and Acknowledgment. The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.
2. Expiration. If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.
3. Interpretation. Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.
4. Assignment. The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

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

(G:\San Diego\Reports\2003\6-03-033 Surfsong Final Stf Rpt.doc)



Approximate North and South Limits of Project

EXHIBIT NO. 1
APPLICATION NO.
6-03-33
Location Map
California Coastal Commission

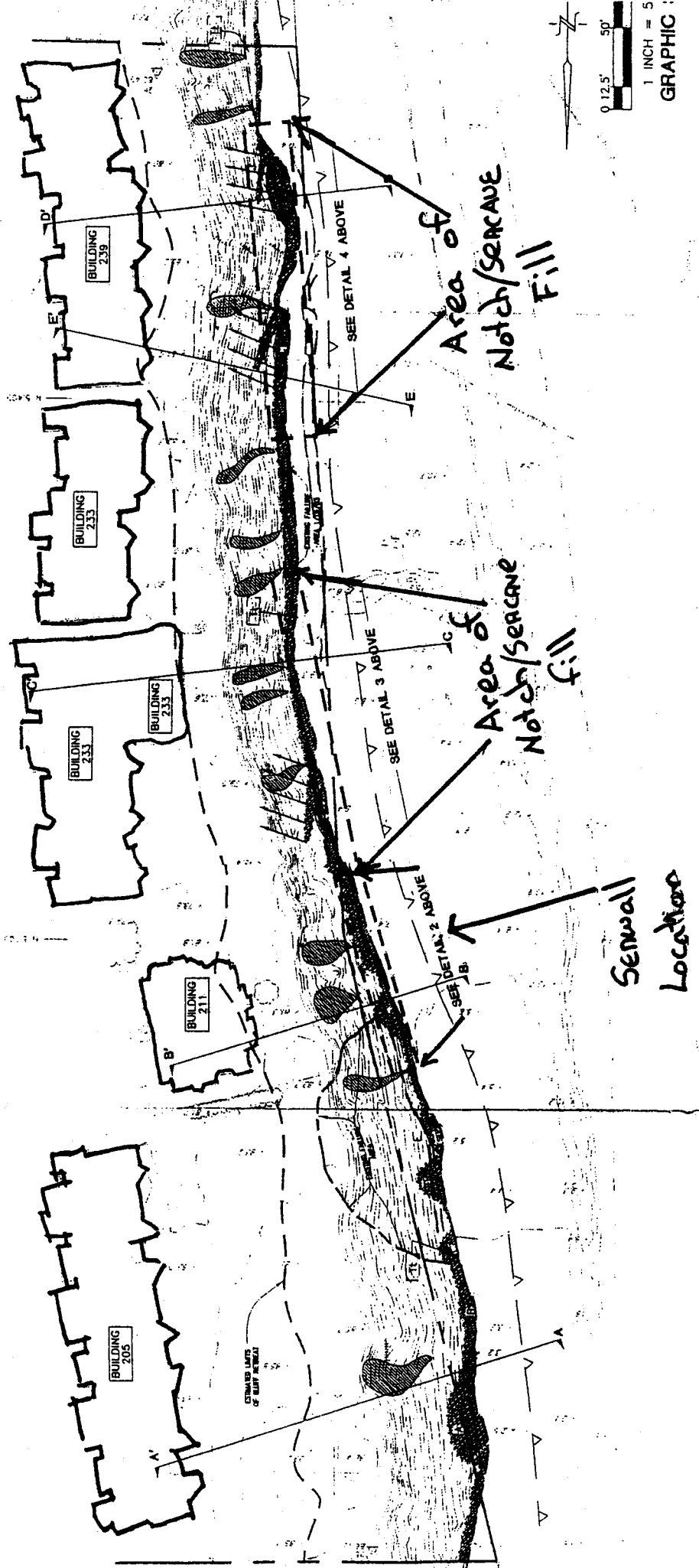



EXHIBIT NO. 2
APPLICATION NO.
6-03-33
Site Plan
 California Coastal Commission

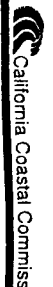
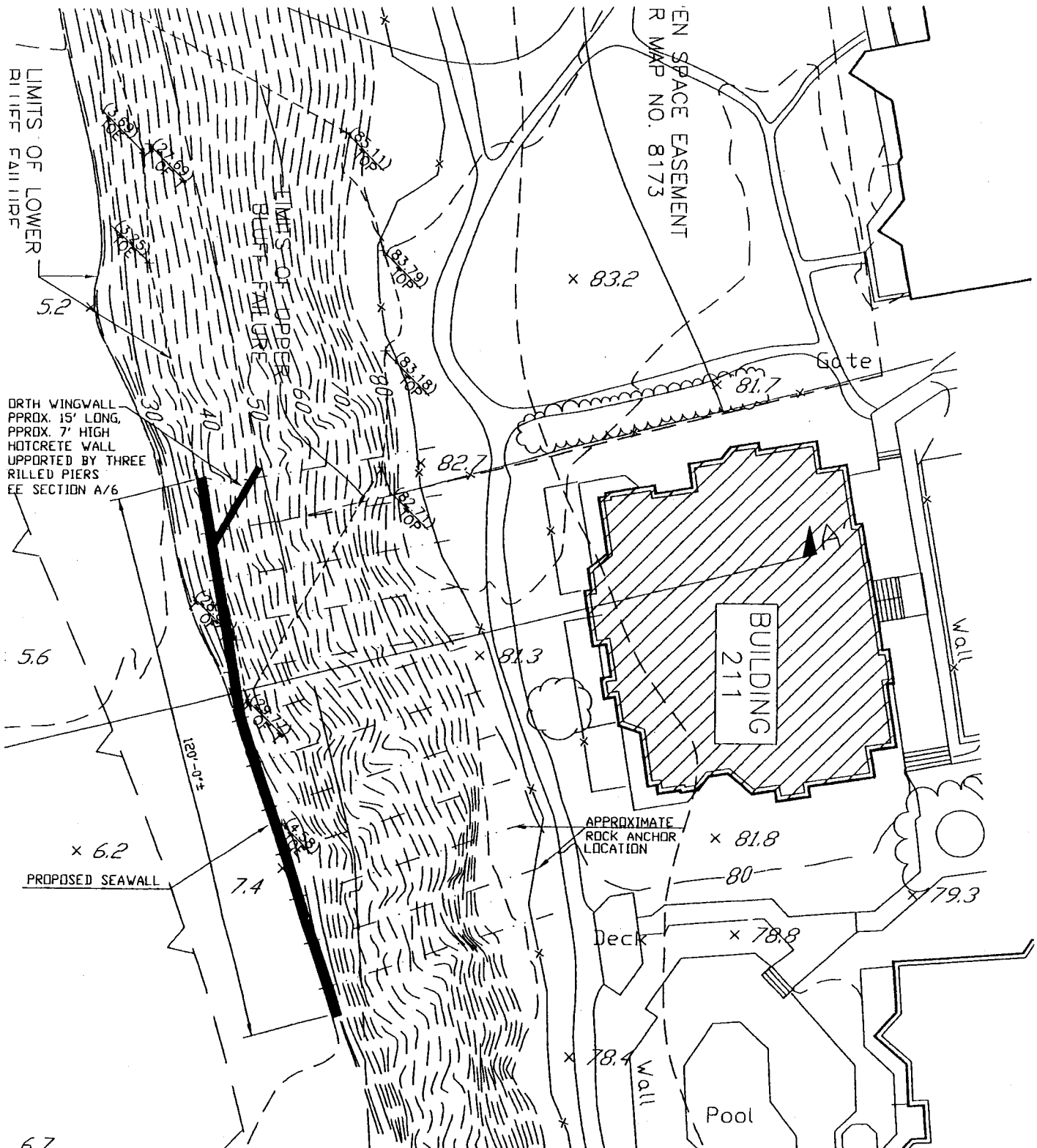
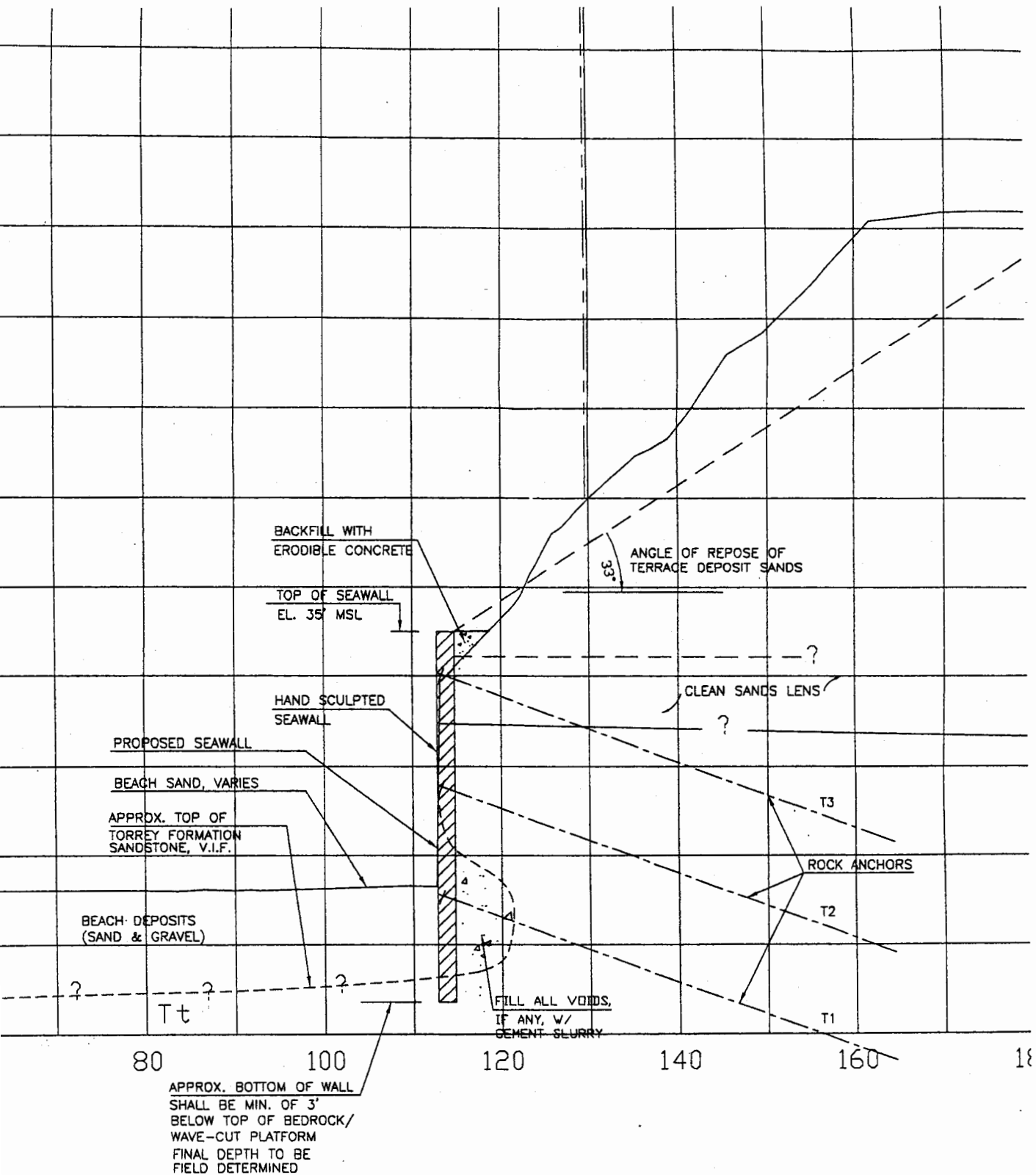



EXHIBIT NO. 3
 APPLICATION NO
6-03-33
 Seawall Site Plan



PROFILE SECTION A-A'

SCALE: 1"=10'

EXHIBIT NO. 4
APPLICATION NO.
6-03-33
Seawall Cross Section
 California Coastal Commission

SAND MITIGATION FEE WORKSHEET

Surfsong Condominiums
Solana Beach
June 19, 2003

RECEIVED

JUN 19 2003

CALIFORNIA
 COASTAL COMMISSION
 SAN DIEGO COAST DISTRICT

Part I: 120' Seawall

W = 120
 E = 2
 v = .9
 R = 0.27 ft.
 L = 22 yr.

Ae = W x E Ae = 120 x 2 Ae = 240
 Ve = Ae x v Ve = 240 x .9 Ve = 216

Aw = R x L x W Aw = 0.27 x 22 x 120 Aw = 712.8
 Vw = Aw x v Vw = 712.8 x .9 Vw = 641.52

S = .74
 Hs = .35
 Hu = .47
 Rcu = 0.27 ft.
 Rcs = 0

$$Vb = (S \times W \times L) \times [(R \times hs) + (1/2hu \times (R + (Rcu - Rcs)))] / 27$$

$$(S \times W \times L) = (.74 \times 120 \times 22) = 1,953.60$$

$$\begin{aligned} & \{(R \times hs) + (1/2hu \times (R + (Rcu - Rcs)))\} \\ & 9.45 \quad + (23.5 \times (.27 + .27)) \\ & 9.45 + \quad (12.69) \end{aligned}$$


$$Vb = (1,953.60 \times 22.14) / 27$$

$$Vb = 1,601.52$$

$$Vt = Vb + Vw + Ve \quad Vt = 1,601.52 + 641.52 + 216$$

$$Vt = 2,459.04$$

$$M = Vt \times C^{**}$$

EXHIBIT NO. 5
APPLICATION NO.
6-03-33
In Lieu Fee Calculations
 California Coastal Commission

-2-

$$V_t = 2,459.04$$

The project engineer has noted that, for the north 60 lineal feet of the seawall, the following sand materials have already been deposited on the beach as a result of failure:

The Torrey formation extends to a height of 27', the seawall will have a height of 35'. For the 8' height difference, encompassing the sand formation, the bluff has failed back a minimum of 6' (much more in some areas), for a length of 60 lineal feet.

To obtain the amount of sand that has already been deposited on the beach and will, therefore, not be prevented from reaching the beach as a result of the seawall construction, we have utilized the following formula:

l= length of area = 60'
 d= depth of area = 6'
 h= height from top of torrey formation materials (27') to top of wall (35') = 8'
 S= fraction of beach quality material = .74 (we are using this accepted number, even though the area in question primarily consists of the clean sand lense, which has a higher percentage of beach quality material)

Formula: $(l \times d \times h) / 27 \times S =$ Amount of beach quantity sand that should be excluded from the standard formula because it has already been lost.

$$(60 \times 6 \times 8) / 27 = 106.66$$

$$106.66 \times .74 = 78.93$$

$$V_t(\text{amended}) = V_t \text{ less } 78.93$$

$$V_t(\text{amended}) = 2,380.11 \quad V_t \times C = M$$

$$C = \$11.60^{**}$$

$$M = \$27,609.28$$

-3-

Part II: Infill of undercuts and seacaves

Seacave H: Ae= 152 sq. ft.

Seacave I & J: Ae= 213 sq. ft.

Detail 3 Undercut Area: Ae= 642sq. ft.

Detail 4 Undercut Area: Ae= 632 sq. ft.

$$Ve = Ae \times v$$

$$Ve = 1639 \times .9$$

$$Ve = 1,475.1$$

$$M = 1,475.1 \times \$11.60^{**}$$

$$M = \$ 17,111.16$$

SAND MITIGATION WORKSHEET TOTALS:

Part I: M= \$27,609.28

Part II: M= \$17,111.16

Total Sand Mitigation Fee: \$44,720.44**** The accepted low bid, from Mesa Construction Projects, Inc., has been provided.**

