CALIFORNIA COASTAL COMMISSION
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Th 17a

Filed: 11/8/06
180th Day: 5/7/07
Staff: Meg Vaughn-LB
Staff Report: 4/19/07
Hearing Date: 5/9-11/07
Commission Action:

STAFF REPORT: PERMIT AMENDMENT

AMENDMENT APPLICATION No.: **5-03-078-A1**

APPLICANT: **Greg & Anne Buchanan**

AGENT: **Greg Reid, CSA Consulting Engineers**

PROJECT LOCATION: 16822 Baruna Lane, Huntington Beach, Orange County.

DESCRIPTION OF PROJECT PREVIOUSLY APPROVED: Installation of 5/8 inch thick plastic sheet pile adjacent to the outside facing of the existing bulkhead. The plastic sheet pile reinforcement is to extend across the 50 foot width of the property.

DESCRIPTION OF AMENDMENT: Replace previously proposed/approved material for use in bulkhead repair. The previously approved material for the sheetpile panels and panel interlocks was high density polyethylene (HDPE). The material now proposed is vinyl ester resin. Also proposed is a revision to the bulkhead maintenance and monitoring special condition so that is will be consistent with the special condition recently approved by Commission for other similar projects in the same vicinity.

LOCAL APPROVALS RECEIVED: City of Huntington Beach Approval in Concept, 2/24/03.

SUBSTANTIVE FILE DOCUMENTS: Coastal Development Permits 5-06-436, 5-06-437, 5-06-438, & 5-06-439 (Tetra Tech, et al); The Effective Use of Permeation Barriers in Marine Composites to Prevent Blistering, and, A 15-Year Study of the Effective Use of Permeation Barriers in Marine Composites to Prevent Corrosion and Blistering; Part 2, Evaluation of Physical Properties, both by David J. Herzong and Paul P. Burrell of Interplastic Corporation; City of Huntington Beach certified LCP (used as guidance only in this area of original certification).

SUMMARY OF STAFF RECOMMENDATION: Staff is recommending approval of the amendment as proposed which will result in 1) sheet pile panels and interlocks comprised of vinyl ester resin rather than HDPE plastic, and, 2) a revised bulkhead monitoring special condition that is consistent with the Commission's most recent action regarding monitoring plastic sheetpile used for bulkhead repair projects in Huntington Harbour.

PROCEDURAL NOTE

The Commission's regulations provide for referral of permit amendment requests to the Commission if:

1) The Executive Director determines that the proposed amendment is a material change,

2) Objection is made to the Executive Director's determination of immateriality, or

3) The proposed amendment affects conditions required for the purpose of protecting a coastal resource or coastal access.

If the applicant or objector so requests, the Commission shall make an independent determination as to whether the proposed amendment is material. 14 Cal. Admin. Code 13166.

The proposed amendment was determined to be material because it affects conditions required for the purpose of protecting a coastal resource. Staff is recommending approval of the proposed changes to the special condition because protection of coastal resources (the marine environment of Huntington Harbour) will not be effected.

I. STAFF RECOMMENDATION:

MOTION: ***I move that the Commission approve the proposed amendment to Coastal Development Permit No. 5-03-078 pursuant to the staff recommendation.***

STAFF RECOMMENDATION OF APPROVAL:

Staff recommends a **YES** vote. Passage of this motion will result in approval of the amendment 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 A PERMIT AMENDMENT:

The Commission hereby approves the coastal development permit amendment on the ground that the development as amended and subject to conditions, 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 amendment 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 amended development on the environment, or 2) there are no feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the amended development on the environment.

II. STANDARD CONDITIONS:

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

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

3. 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.

III. SPECIAL CONDITIONS

A. Conditions Imposed Under Original

Unless specifically altered by this amendment, all regular and special conditions attached to Coastal Development Permit No. 5-03-078 remain in effect, with the following exception; To the extent development specifications in any plans approved by the Executive Director pursuant to this amendment are inconsistent with specifications listed in any plans approved prior to this amendment, compliance with which was required by the existing permit conditions, those requirements for compliance with those prior plans are hereby modified as necessary, but only as necessary, to require compliance with the new plans. In addition, all standard and special conditions imposed under Coastal Development Permit No. 5-03-078 that could apply equally to this amendment, are so applied.

B. Replace Previously Imposed Special Condition No. 1 (Bulkhead Maintenance) with the following Special Condition:

1. Bulkhead Monitoring Plan

Previously imposed Special Condition No. 1 (Bulkhead Maintenance) shall be replaced with the following special condition:

A. The permittees shall maintain the bulkhead reinforcement in good condition throughout the life of the development. **PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT**, the applicants shall submit a Monitoring Plan, for the review

and approval of the Executive Director. The permittees, and their successors in interest shall be responsible for carrying out all provisions of the approved Monitoring Plan for as long as the bulkhead reinforcement remains in place. The monitoring plan, at a minimum, shall provide for:

1. Regular inspections by a qualified person familiar with bulkhead structures who is able to document via photos and provide written descriptions based on personal observation of whether any portion of the sheetpile has become exposed, and if so, whether any cracks, breaks or deterioration have occurred. These inspections shall be performed at least every 2 years.

    a. The inspections shall examine the exposed portions of the bulkhead reinforcement (to the mud line) for signs of weakness or possible failure, including, but not limited to cracking, bending, splitting, splintering, or flaking. All weak or potential failure areas should be marked on an as-built plan of the bulkhead reinforcement, and there should be photographs and text to explain the nature and extent of each weakness.

    b. If deterioration is observed pursuant to subsections A.1.a and A.1.b above, then the sheetpile/bulkhead shall be inspected by a qualified, licensed engineer. Based on a thorough inspection, the engineer shall draw conclusions and make recommendations regarding the continued stability of the bulkhead and any measures necessary to arrest and/or repair deterioration of the plastic or other construction materials. The engineer's conclusions and recommendations shall be forwarded to the Executive Director of the Coastal Commission.

B. Inspection reports shall be prepared and conveyed to the Executive Director within 30 days of the inspection work. These reports shall provide information on and photographs from the date of the inspection, the name and qualifications of the person performing the inspection, and an overall assessment of the continued integrity of the bulkhead reinforcement. If the inspection identifies any areas where the bulkhead reinforcement has been damaged, the report shall identify alternatives to remedy the damage.

C. In the event that any sections of the bulkhead reinforcement are damaged or flaking, the permittees shall notify the Commission within 10 days; and in such event, within 30 days of such notification, submit to the Commission a complete application for any coastal development permit amendment, or new permit, necessary for the repair or replacement of the bulkhead reinforcement.

IV. FINDINGS AND DECLARATIONS:

The Commission hereby finds and declares:

A. AMENDMENT PROJECT DESCRIPTION

In its action on the original permit, the Commission approved repair of the existing bulkhead consisting of installation of 5/8 inch thick high density polyethylene (HDPE) plastic sheet pile adjacent to the outside facing of the existing bulkhead. The approved sheet pile reinforcement will extend along the 50 foot width of the property. The current amendment requests two changes to the approved permit. First, the material composition of the sheetpile panels and interlocks that connect the sheetpile panels is proposed to be changed from the original design material of high density polyethylene (HDPE) to vinyl ester resin. The applicant is proposing the change in material "to improve the structural capacity and long-term durability of the panel design." Second, the applicant is requesting that the bulkhead monitoring special condition be revised such that it is the same as the bulkhead monitoring special condition recently approved for similar projects in Huntington Harbour (5-06-436, Lady, et al; and, 5-06-438, Daniels, et al). The current bulkhead monitoring special condition requires that monitoring be done by a licensed engineer, at least every two years for the first 12 years and then at least every year thereafter. The proposed special condition would require monitoring at least every two years for the life of the project, and would allow the initial inspection to be performed by a person familiar with bulkhead structures who is able to document via photos and provide written descriptions based on personal observation, rather than by a licensed engineer. The proposed amendment would require inspection by a licensed engineer when distress is observed in bi-annual monitoring.

The Commission approved the original permit subject to eight special conditions: 1) a requirement to monitor the plastic sheetpile; 2) consideration of alternatives in the future; 3) a requirement that the applicant conform with specific construction responsibilities to avoid impacts upon water quality and marine resources; 4) a requirement that the applicant prepare a survey to confirm the absence of Caulerpa taxifolia in the project area; 5) a requirement to conduct pre- and post-construction eelgrass surveys, and if any unanticipated eelgrass impacts occur those impacts be mitigated; 6) a requirement to mitigate impacts to soft bottom habitat; 7) acknowledgement that this coastal development permit does not waive any public rights which may exist on the property; and 8) that the applicant submit written documentation of the legal ability to undertake the development. All of these special conditions remain in effect, except that Special Condition No. 1 will be modified as described herein.

The subject site is located at 16822 Baruna Lane, on Davenport Island, in Huntington Harbour in the City of Huntington Beach. The nearest public access in the area is at a pocket park located across the channel from the subject site, adjacent to the Davenport Drive bridge, and also at Sunset County Beach located approximately ½ mile to the southwest.

The City has a certified Local Coastal Program. However, because the proposed development is located seaward of the mean high tide line (seaward of the existing bulkhead), the project falls within the Commission's retained permit jurisdiction.

B. Marine Habitat

Section 30230 of the Coastal Act states:

> *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.*

Section 30231 of the Coastal Act states:

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

Huntington Harbour is hydrologically connected to Anaheim Bay National Wildlife Refuge to the north and Bolsa Chica Ecological Reserve to the south. Coastal Act Section 30230 requires that marine resources be maintained, enhanced, and where feasible, restored and provides special protection to areas and species of special biological or economic significance. Coastal Act Section 30231 further requires that the biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health be maintained and, where feasible, restored. The Commission considers Anaheim Bay National Wildlife Refuge and Bolsa Chica Ecological Reserve to be unique and important coastal wetlands and finds that any development proposed within the connected Huntington Harbour must be undertaken in such a manner to avoid impacts that would significantly degrade the biological productivity and quality of these connected coastal waters and wetlands. Furthermore, the waters of Huntington Harbour are used extensively for boating, and to a lesser degree fishing. Thus, it is important that the proposed project protect the health of recreational users of these waters consistent with Section 30231.

The proposed amendment requests a change in the type of plastic to be used for the sheetpile panels and interlocks for the approved bulkhead repair. The applicant proposes a change from HDPE plastic to vinyl ester resin. The Commission's concerns with plastic tend to fall into two categories. The first is the question of whether chemicals from the plastic leach into the marine waters and environment. The second is the issue of plastic

debris breaking off of structures placed in marine waters and circulating in marine waters indefinitely.

The applicant's representative has submitted information[1] that indicates that the proposed vinyl ester resin is very corrosion resistant and does not degrade like other polymers. The information submitted further states that tests assessing vinyl ester resin have indicated that the vinyl ester had very little loss of properties after 15 years of immersion in ambient water. The studies concluded that "Overall, the vinyl ester resin was rated the best in performance in the wet and dry environments, which was expected due to the polymers corrosion resistance and excellent performance in the marine market for the past 17 years."

The applicant's engineering consultant, regarding the results of the studies cited above, states: "These studies evaluated the long-term stability of various composites. Vinyl ester was found to be the most stable with no blistering (cracking) after 15 years of being immersed in water at ambient temperatures and temperatures of up to 150 degrees Fahrenheit. These studies also found that vinyl ester remained stable and was not broken down, solublized, or leached out as some of the other composites did, which indicates that the vinyl ester did not degrade and emit chemicals into the environment. These findings support the determination that replacement of the HDPE interlock with vinyl ester to create a uniform material composition for the panels will result in a more stable and long lasting product. [Note: The consultant was under the impression that the Commission had already approved the vinyl ester resin for the panels in its original approval of the sheetpile bulkhead repair. However, the Commission's original action on the underlying permit approved HDPE as the material for the sheetpile panels. Nevertheless, the basis for supporting the change in material for the interlocks described by the applicant's engineering consultant, applies as well to the change in material for the panels.]

Based on these studies, the proposed vinyl ester resin appears to be stable and would not be expected to create adverse impacts on the marine environment due to leaching. However, the studies cited above were conducted in fresh, not salt, water. The proposed use will be in salt water. However, neither staff nor the applicant has been able to discover any studies that assess the proposed material's viability in salt water. As has been the case in previous actions on various types of plastics in the marine environment, it appears that further study is necessary.

Beyond the information referred to above, very little literature exists on the components of plastic leaching into the marine environment. The majority of literature available regarding plastic in the marine environment addresses the issue of plastic debris. Two papers generally addressing leaching were identified: "A Brief Analysis of Organic Pollutants Sorbed to Pre and Post- Production Plastic Particles from the Los Angeles and San Gabriel River Watersheds", by C.J.Moore, G. L. Lattin, A. F. Zellers, Algalita Marine Research Foundation; and, "Plastics in the Marine Environment: A Technical Perspective,

[1] The Effective Use of Permeation Barriers in Marine Composites to Prevent Blistering, and, A 15-Year Study of the Effective Use of Permeation Barriers in Marine Composites to Prevent Corrosion and Blistering; Part 2, Evaluation of Physical Properties, both by David J. Herzong and Paul P. Burrell of Interplastic Corporation.

by Tony L. Andrady PhD, Center for Engineering Technology. Both papers are "white papers" from the "Plastic Debris Rivers to Sea" 2005 Conference (September 7-9, 2005, held in Redondo Beach, Calif.). The main conclusion of both the papers cited above is that very few studies have been conducted regarding the effects of plastic leaching in the marine environment. Both papers support the need for future studies on the issue. This supports the imposition of a special condition requiring consideration of alternatives to the plastic, should environmentally superior alternatives be identified in the future.

With regard to the question of leaching, the currently available scientific evidence points to the likelihood that leaching of chemicals is minimal and not likely to have a significant effect on marine resources and the biological productivity and quality of coastal waters necessary to maintain optimum populations of marine organisms and for the protection of human health. Based on current scientific evidence, it appears that leaching does not create adverse impacts on marine resources. However, scientific opinion is constantly evolving. It is possible that new information may become available in the future that reaches a different conclusion. In order to be most protective of marine resources, the Commission has found in past actions that it can only approve the long-term use of plastic in the marine environment if the applicant agrees to submit a permit amendment or a new permit application in the event new information becomes available indicating that plastic does have significant adverse impacts on marine resources. The Commission could only find the proposed change of materials consistent with Sections 30230 and 30231 when the project also includes the requirement that, should newer scientific evidence become available at some point in the future indicating the use of vinyl ester is not acceptable, the applicant agrees to submit an amendment or new permit application to address the new information and incorporate appropriate changes to the project to minimize or eliminate the adverse impacts on the marine environment. A special condition with such a requirement has already been imposed on the subject project in the Commission's approval of the underlying coastal development permit. Nothing in this amendment changes that special condition. Therefore, the Commission finds that the proposed amendment, as conditioned, is consistent with Coastal Act Sections 30230 and 30231 which require that the marine environment be protected.

In recent years the Commission has allowed projects that use plastic in the marine environment only when there is an assurance that the projects will include monitoring of the plastic to assess its condition over time. The Commission imposed such a condition in approving the underlying coastal development permit. That special condition required that all monitoring be conducted by a licensed engineer and that the inspections occur at least every two years for the first twelve years and at least every year thereafter. However, more recently (5-06-436, Lady, et al, and 5-06-438, Daniels, et al) the Commission has found that monitoring conducted by a "qualified person familiar with bulkhead structures who is able to document via photos and provide written descriptions" to be adequate to assure protection of the marine environment. The more recent special condition requires that if deterioration is observed pursuant to the required inspections, then inspection by a licensed engineer is required. Also in the more recent bulkhead repair approvals, the Commission has found that inspections at least every two years would suffice to assure protection of the marine environment. The applicant's request for changes to the previously imposed bulkhead monitoring special condition is consistent with the

Commission's most recent action on very similar bulkhead repair permits. The more recent bulkhead repair permits are also located within Huntington Harbour.

In approving coastal development permit 5-06-436 and 5-06-438 the Commission found:

> *"Monitoring the sheetpile would not require that the buried sheetpile be exposed, but rather confirm whether the sheetpile is indeed still buried. The monitoring would not necessarily have to be performed by an engineer, but rather by anyone able to document via photos and personal observation, whether any portion of the sheetpile has become exposed, and if so, whether any cracks, breaks or deterioration have occurred. If deterioration were observed then the appropriately licensed professional would need to become involved."*

As amended, the special condition will still assure consistency with Sections 30230 and 30231 of the Coastal Act with regard to protection of the marine environment. Therefore, the Commission finds that the proposed amendment, as conditioned, is consistent with Sections 30230 and 30231 of the Coastal Act.

C. Local Coastal Program

Coastal Act section 30604(a) states that, prior to certification of a local coastal program ("LCP"), a coastal development permit or permit amendment can only be issued upon a finding that the proposed development is in conformity with Chapter 3 of the Act and that the permitted development will not prejudice the ability of the local government to prepare an LCP that is in conformity with Chapter 3. An LCP for the City of Huntington Beach was effectively certified in March 1985 and subsequently updated. However, the proposed development is occurring within an area of the Commission's original permit jurisdiction, due to the project location seaward of the mean high tide line. Consequently, the standard of review is the Coastal Act and the City's LCP is used only as guidance. As conditioned, the proposed development as amended is consistent with Chapter 3 of the Coastal Act and with the certified LCP for the area.

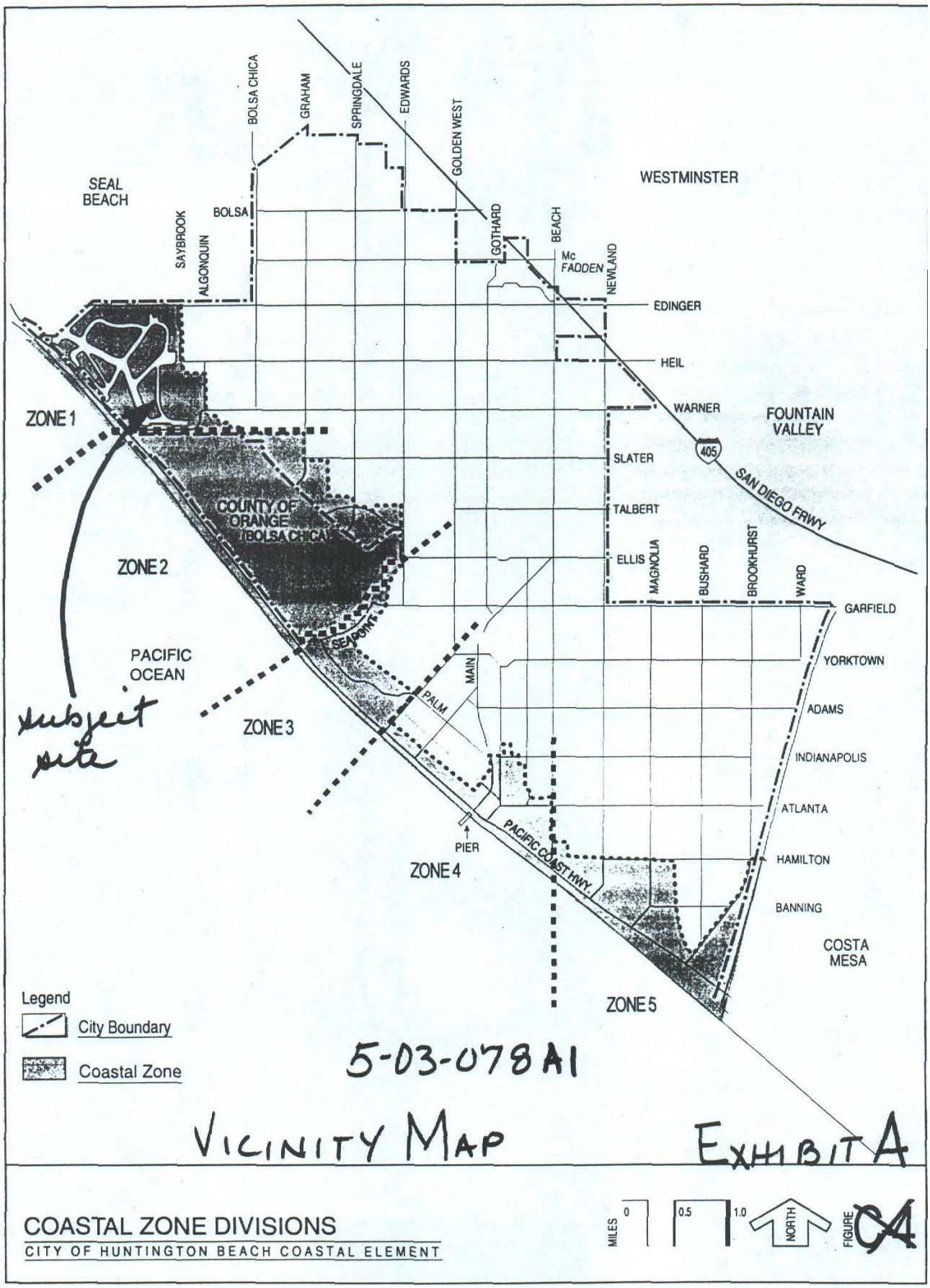
D. California Environmental Quality Act

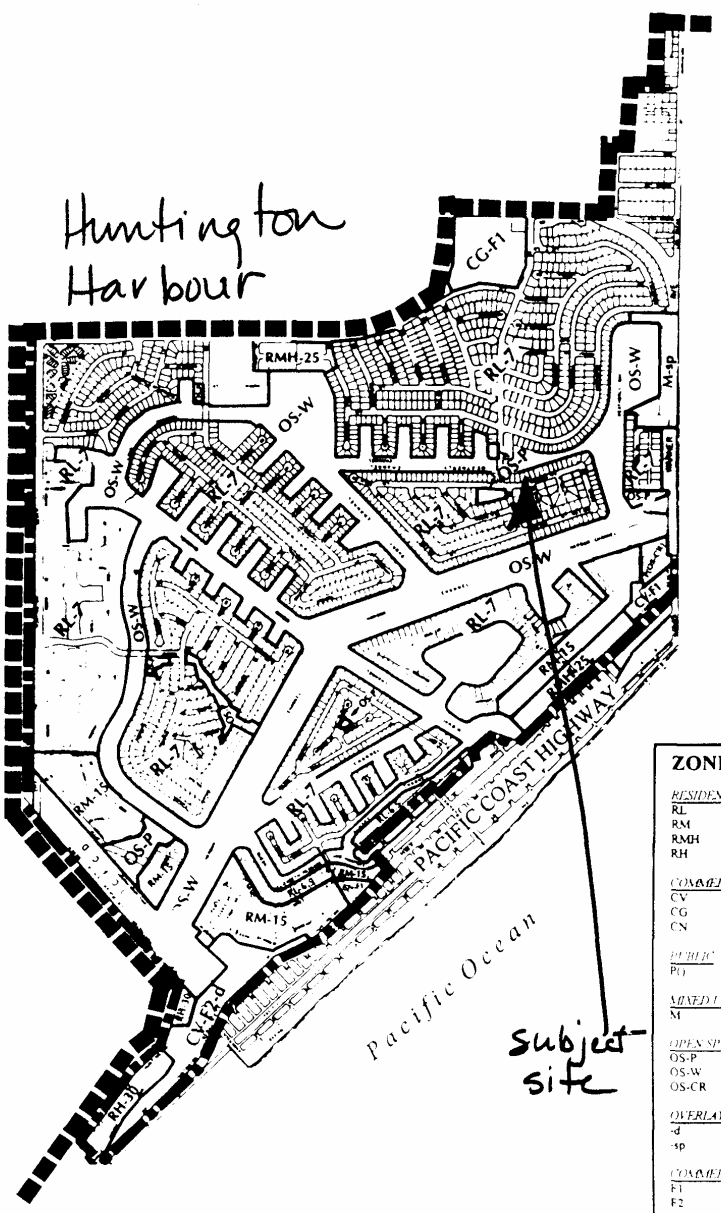
Section 13096 Title 14 of the California Code of Regulations requires Commission approval of a coastal development permit application to be supported by a finding showing the application, as conditioned by any conditions of approval, to be consistent with any applicable requirements of the California 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 City of Huntington Beach is the lead agency for purposes of CEQA. In addition to any mitigation measures the City may impose in that capacity, the Coastal Commission adopts additional mitigation measures, found below, to ensure that the proposed project will conform with the requirements of the Coastal Act.

The proposed project amendment, as conditioned, has been found consistent with the Chapter 3 policies of the Coastal Act. As conditioned, there are no feasible alternatives or feasible mitigation measures available which would substantially lessen any significant adverse effect which the activity may have on the environment. Therefore, the Commission finds that the proposed project amendment, as conditioned to mitigate the identified impacts, is the least environmentally damaging feasible alternative and can be found consistent with the requirements of the Coastal Act to conform to CEQA.

The project is located in an existing harbor in an urbanized area. Development already exists on the subject site. The project site does not contain any known sensitive marine resources, therefore the impacts arising from the proposed project will be minimal. In addition, the proposed development has been conditioned to assure the proposed project is consistent with the resource protection policies of the Coastal Act. The conditions also serve to mitigate significant adverse impacts under CEQA. The conditions, including those imposed under the original permit as modified by this amendment are: 1) a requirement to monitor the plastic sheetpile; 2) consideration of alternatives in the future; 3) a requirement that the applicant conform with specific construction responsibilities to avoid impacts upon water quality and marine resources; 4) a requirement that the applicant prepare a survey to confirm the absence of Caulerpa taxifolia in the project area; 5) a requirement to conduct pre- and post-construction eelgrass surveys, and if any unanticipated eelgrass impacts occur those impacts be mitigated; 6) a requirement to mitigate impacts to soft bottom habitat; and 7) acknowledgement that this coastal development permit does not waive any public rights which may exist on the property. There are no other feasible alternatives or mitigation measures available which will lessen any significant adverse impact the activity would have on the environment. Therefore, the Commission finds that the proposed project, as conditioned, can be found consistent with the requirements of CEQA.


SEAL BEACH
BOLSA CHICA
GRAHAM
SPRINGDALE
EDWARDS
GOLDEN WEST
WESTMINSTER
BOLSA
SAYBROOK
ALGONQUIN
GOTHARD
BEACH
Mc FADDEN
NEWLAND
EDINGER
HEIL
WARNER
FOUNTAIN VALLEY
405
SAN DIEGO FRWY
SLATER
TALBERT
ELLIS
MAGNOLIA
BUSHARD
BROOKHURST
WARD
GARFIELD
YORKTOWN
ADAMS
INDIANAPOLIS
ATLANTA
HAMILTON
BANNING
COSTA MESA
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
COUNTY OF ORANGE (BOLSA CHICA)
SEAPORT
PACIFIC OCEAN
MAIN
PALM
PIER
PACIFIC COAST HWY.
subject site
Legend
City Boundary
Coastal Zone
5-03-078 A1
VICINITY MAP
EXHIBIT A
COASTAL ZONE DIVISIONS
CITY OF HUNTINGTON BEACH COASTAL ELEMENT
MILES
0
0.5
1.0
NORTH
FIGURE C4



Zone 2

ZONE 1 LEGEND

RESIDENTIAL

RL	RESIDENTIAL LOW DENSITY
RM	RESIDENTIAL MEDIUM DENSITY
RMH	RESIDENTIAL MEDIM HIGH DENSITY
RH	RESIDENTIAL HIGH DENSITY

COMMERCIAL

CV	COMMERCIAL VISITOR
CG	COMMERCIAL GENERAL
CN	COMMERCIAL NEIGHBORHOOD

PUBLIC

PU	PUBLIC (underlying designation)

MIXED USE

M	MIXED USE

OPEN SPACE

OS-P	PARK
OS-W	WATER RECREATION
OS-CR	COMMERCIAL RECREATION

OVERLAY

-d	DESIGN OVERLAY
-sp	SPECIFIC PLAN OVERLAY

COMMERCIAL, INDUSTRIAL, MIXED USE DENSITY SCHEDULE

F1	0.35
F2	0.5

COASTAL ZONE BOUNDARY

HUNTINGTON BEACH CITY LIMITS

5-03-078 A1

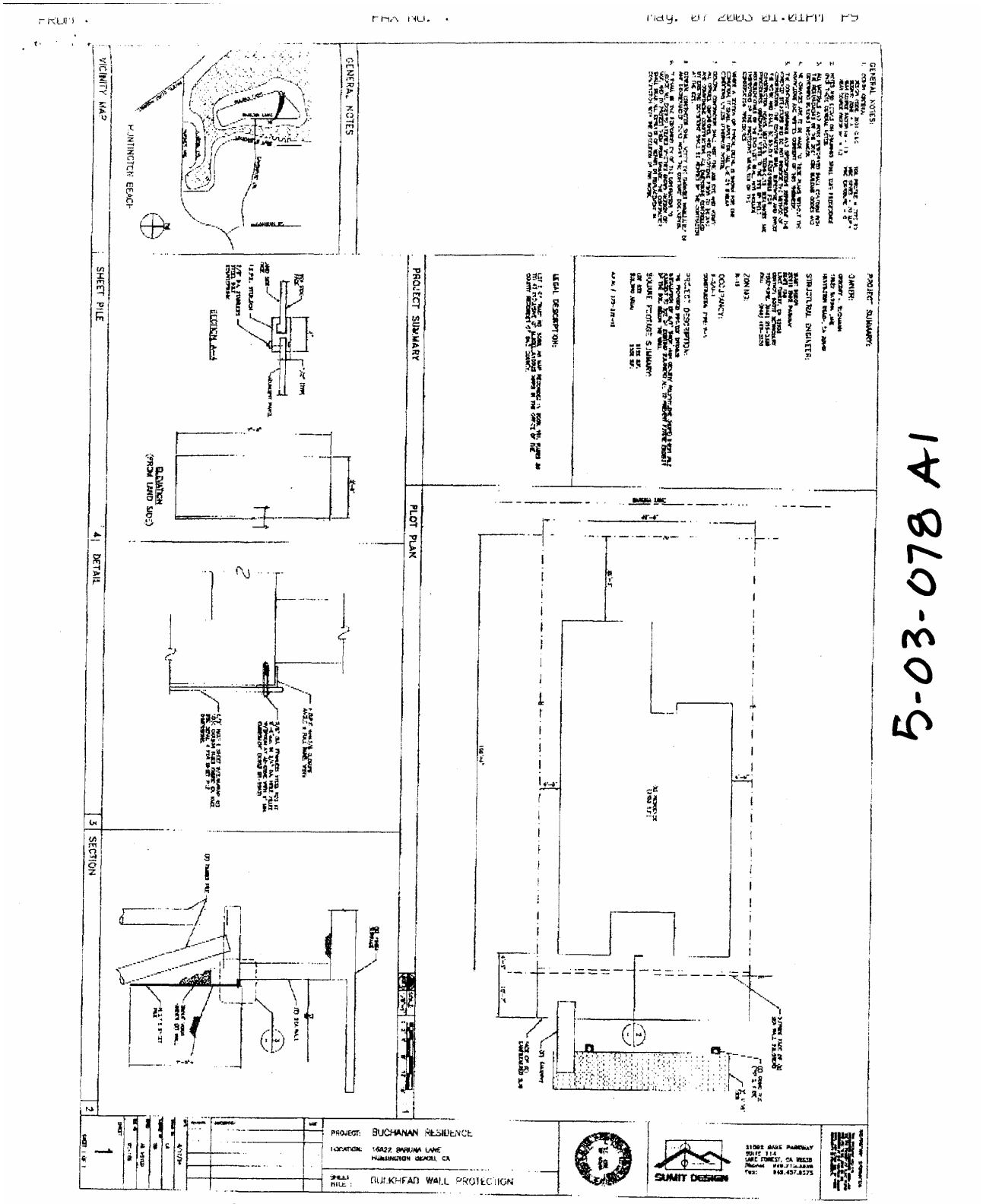
A2

HUNTINGTON BEACH COASTAL ZONE
ZONE 1 LAND USE PLAN

CITY OF HUNTINGTON BEACH COASTAL ELEMENT

NORTH

FIGURE C-



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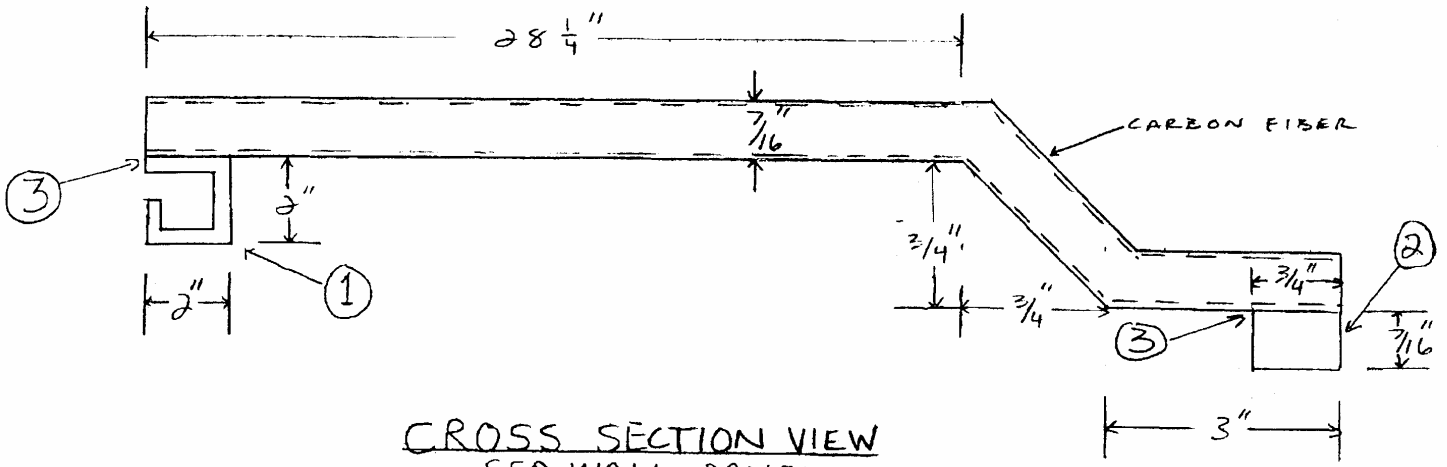
Project Plans

Exhibit B

5-03-078A Ex. B2

MANUFACTURING NOTES

1. FEMALE INTERLOCK WILL BE PROVIDED BY BUSO
2. FABRICATE MALE INTERLOCK
3. ATTACH INTERLOCK SECTIONS @ SPECIFIED LOCATIONS.



CROSS SECTION VIEW
SEA WALL PANEL

BUSO CONSTRUCTORS, INC
SEAWALL DESIGN

ATTACHMENT 1
PAGE 1

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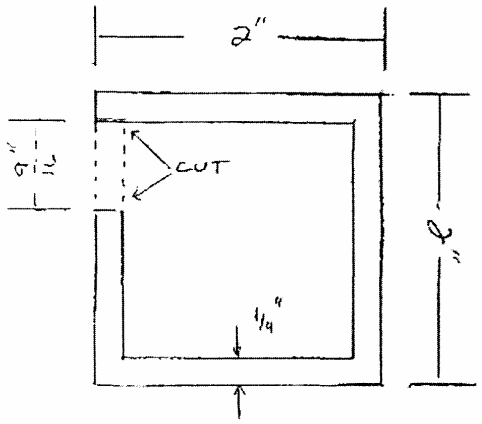


CROSS SECTION VIEW
FEMALE INTERLOCK

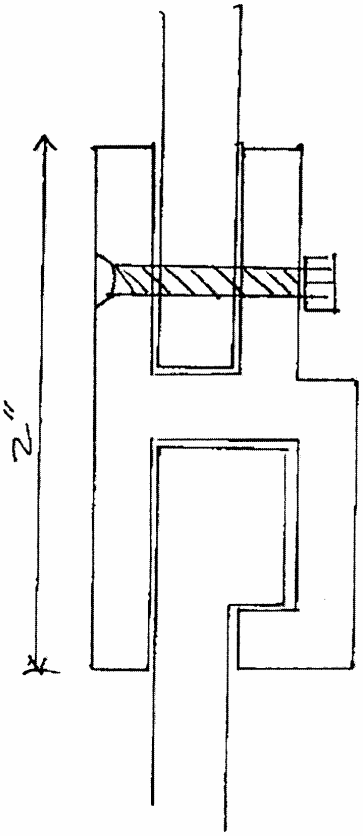
NOTES:

STRUCTURAL SHAPE
MANUFACTORED BY
STRONGWELL.
EXTREN® SERIES
WITH VINYL ESTER RESIN

BUSO CONSTRUCTORS, INC
SEAWALL DESIGN

PAGE 4

Original Design



1) HDPE THICKNESS IS EITHER 3/8 OR 1/2"

2) LUG ON FIBER PANEL IS FIBER GLASS ONLY AND IS EITHER INSTALLED DURING PANEL MANUFACTURING OR EPOXIED LATER

3) INTERLOCK WILL HAVE 1/16" CLEARANCE

CARBON FIBER INTERLOCK

CRETE BUCHANAN

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