YC: DC

PLANNING DEPARTMENT
CITY HALL
170 SANTA MARIA AVE.
PACIFICA, CALIF. 94404

PACIFICA QUARRY

RECLAMATION PLAN

AUGUST 1996

PLANNING DEPT
FILE COPY 1 of 2

City of Pacifica

APPROVED

☐ CED ☐ PLANNING COMMISSION ☒ CITY COUNCIL

☒ *Subject to Conditions of Approval &/or as noted on plans*

V.S. — (Staff Signature)

10/28/96 — (Approval Date)

NO CHANGES ALLOWED WITHOUT PRIOR APPROVAL OF THE PLANNING DEPARTMENT

See Letter of Approval dated 10/29/96

Prepared For
William F. Bottoms and Mary A. Bottoms, Trustees
Bottoms Family 1989 Trust

Prepared by
Malcolm Carpenter Associates, City and Regional Planners
1190 El Camino Real, Colma, CA (415) 985-2590

RECEIVED
AUG 28 1996
CITY OF PACIFICA
COMMUNITY AND ECONOMIC
DEVELOPMENT DEPARTMENT

PACIFICA QUARRY

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1.000 INTRODUCTION AND SUMMARY

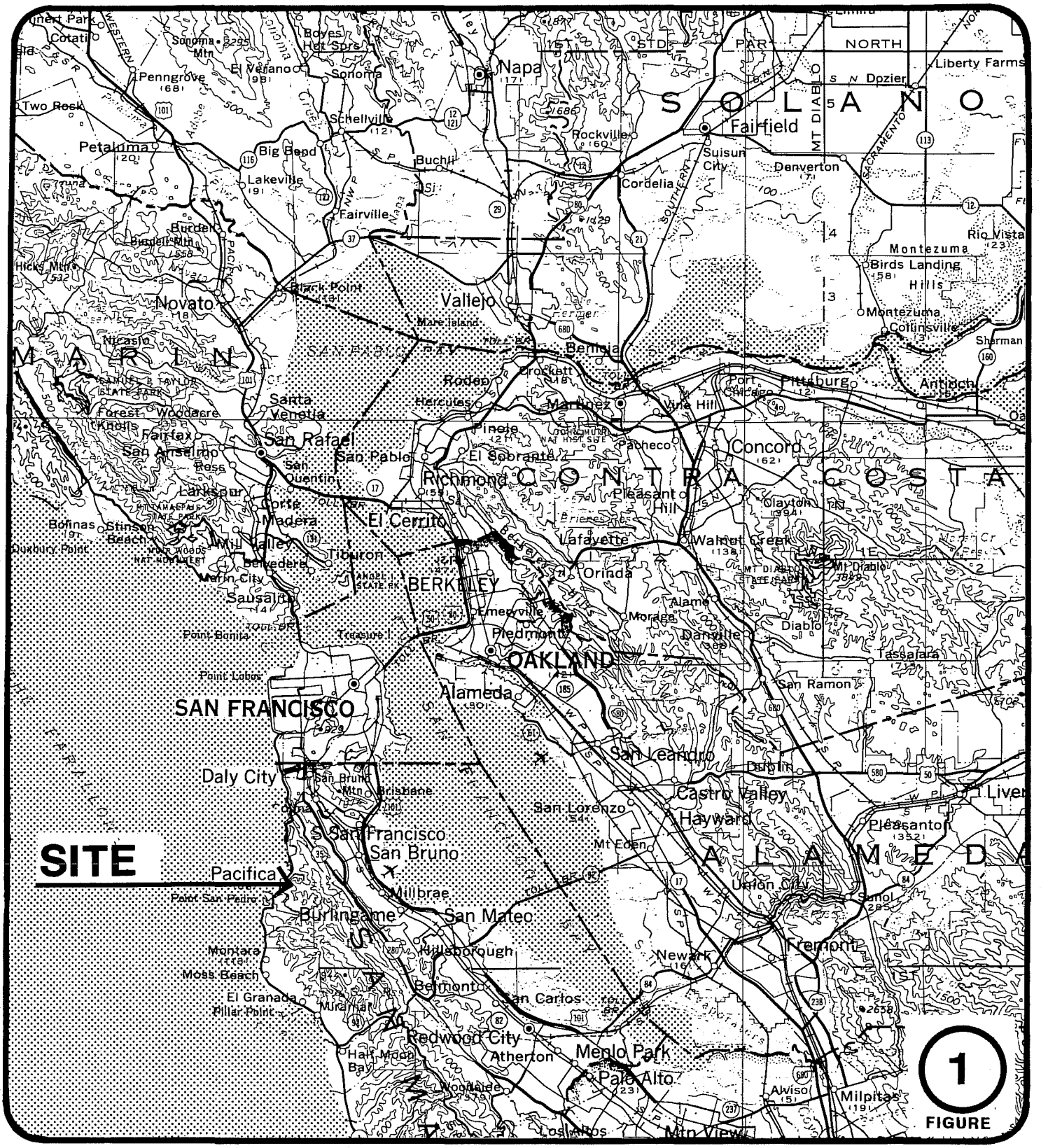
1.100 PROJECT DESCRIPTION

This Reclamation Plan is prepared pursuant to the State Mining and Reclamation Act of 1975, as amended, and the City of Pacifica Mining and Reclamation Ordinance.

The Plan describes a side hill, open pit mine from which limestone, greenstone, shale and chert has been harvested, crushed, screened and sold for construction purposes. The Plan comprises final grading, drainage and revegetation measures. Reclamation work will leave the site in a condition that is safe, stable and readily adaptable to alternate land uses. The owner proposes to sell some rock material while reclamation work is in progress to eliminate the large rip-rap boulders stockpiled in the Flats and left from earlier quarrying.

1.200 GENERAL DATA CONCERNING THE PACIFICA QUARRY

A.	Mineral Property:	Pacific Quarry
B.	Owner of Surface Rights:	William F. Bottoms and Mary A. Bottoms, Trustees Bottoms Family 1989 Trust 61 Laurel Lane El Sobrante, CA 94803 (510) 222-0886
C.	Owner of Mineral Rights:	same as above
D.	Agent for Plan Process:	Malcolm C. Carpenter, AICP 1190 El Camino Real Colma, CA 94014 (415) 985-2590



1

FIGURE

REGIONAL LOCATION

0 4 8

Map Scale in Miles

NORTH

SOURCE: USGS

1.300 QUARRY LOCATION

The Pacifica Quarry is located on the San Mateo County coast in an area bounded by Rockaway Beach to the south, Mori Point Ridge to the north, Highway 1 to the east and the Pacific Ocean to the west. See Exhibits 1 and 2.

1.400 ENVIRONMENTAL DOCUMENTATION AND PERMIT AUTHORITY

Quarry Products, Inc. operated the Pacifica Quarry until February 1987 pursuant to City of Pacifica Use Permit Conditions and in accordance with an existing, certified Environmental Impact Report. The final recontouring of quarried slopes, along with drainage and revegetation measures described in this document, represent final mitigation of quarry related impacts. The delay in implementing reclamation has been approved by the City of Pacifica.

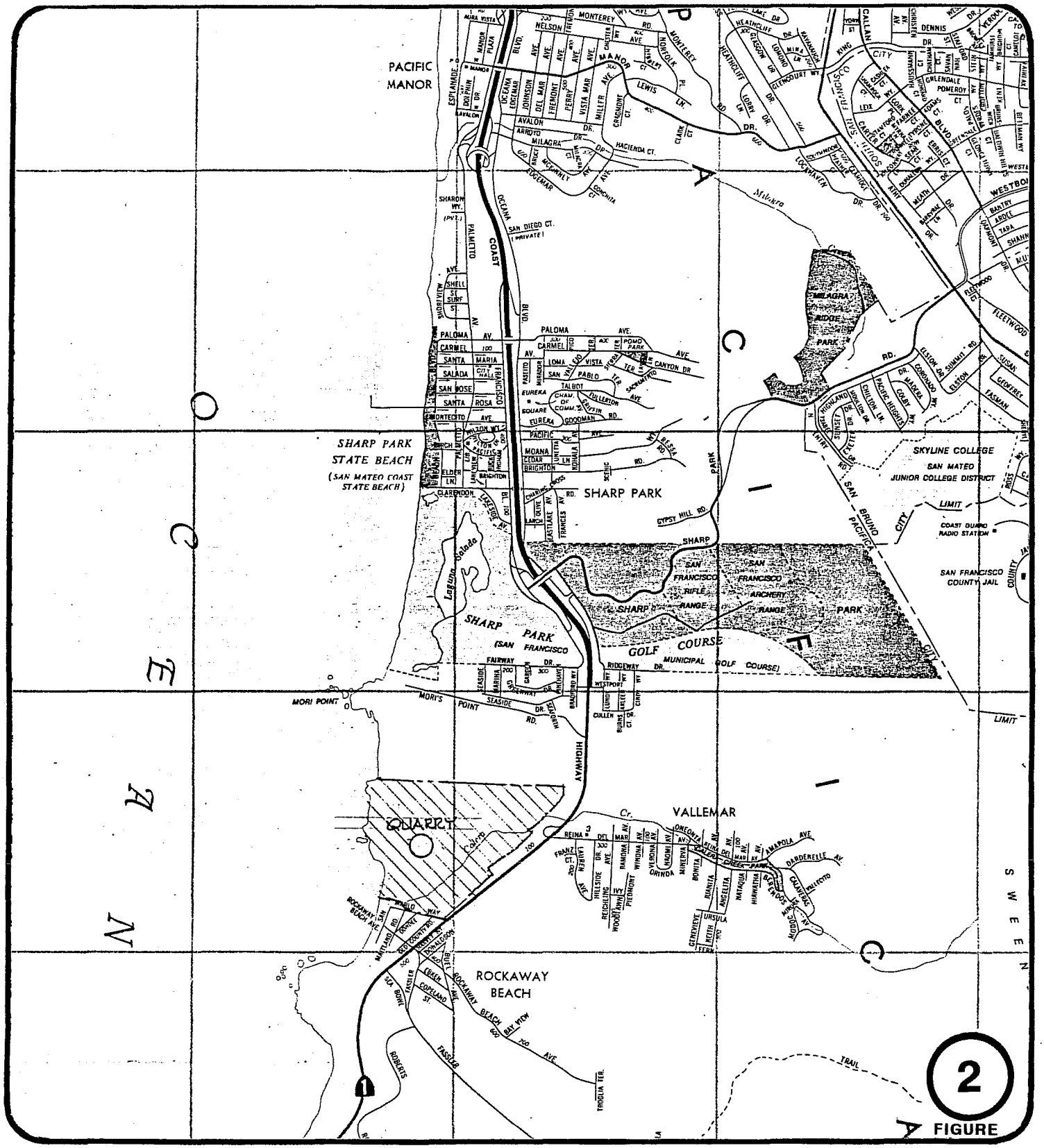
Reclamation, as defined in the Public Resources Code (Section 2733), is the combined process of land treatment that minimizes water degradation, air pollution, damage to aquatic or wildlife habitat, flooding, erosion and other adverse effects from surface mining so that mined lands are left in a usable condition which is readily adaptable to alternate land uses and create no danger to public health and safety. Reclamation activities, therefore, are viewed as corrective to the physical and visual disturbances resulting from past quarry activity. Reclamation work does not constitute a development project but rather is viewed as the rehabilitation of an existing facility.

The Reclamation Plan for the Pacifica Quarry identifies the existing, disturbed condition of the quarry site and the various reclamation activities designed to treat adverse physical and visual conditions. It also describes the secondary effects of the reclamation work, which could result in noise, dust and truck impacts, along with the mitigation measures that will be employed to reduce the potential impacts to a level where they are not considered significant.

1.410 Protection of Wildlife and Habitat

The quarry site is a degraded landscape dominated by weedy, non-native plant species. The main Mori Point ridge, northerly of the area designated for reclamation work, contains native and introduced grasses and forbes and some coyote bush (Baccharis pilularis), California sagebrush (Artemesia californica) and lupine (Lupinus arboreus) typical of coastal scrub plant communities. These are included in the revegetation plan. A test plot was planted near the top of the hill north of the Maintenance Road and all species are surviving. The outer edge of the reclamation work area will be staked prior to beginning work so that bordering vegetation is not damage. No significant wildlife occupies the reclamation work area because of the degraded nature of the site. Work to be performed by the City of Pacifica in the Creek Work Area, southerly of the quarry reclamation work area involves wetland restoration. This will complement the quarry reclamation work. A slope condition will border the Creek Work Area when quarry reclamation work is complete, thereby

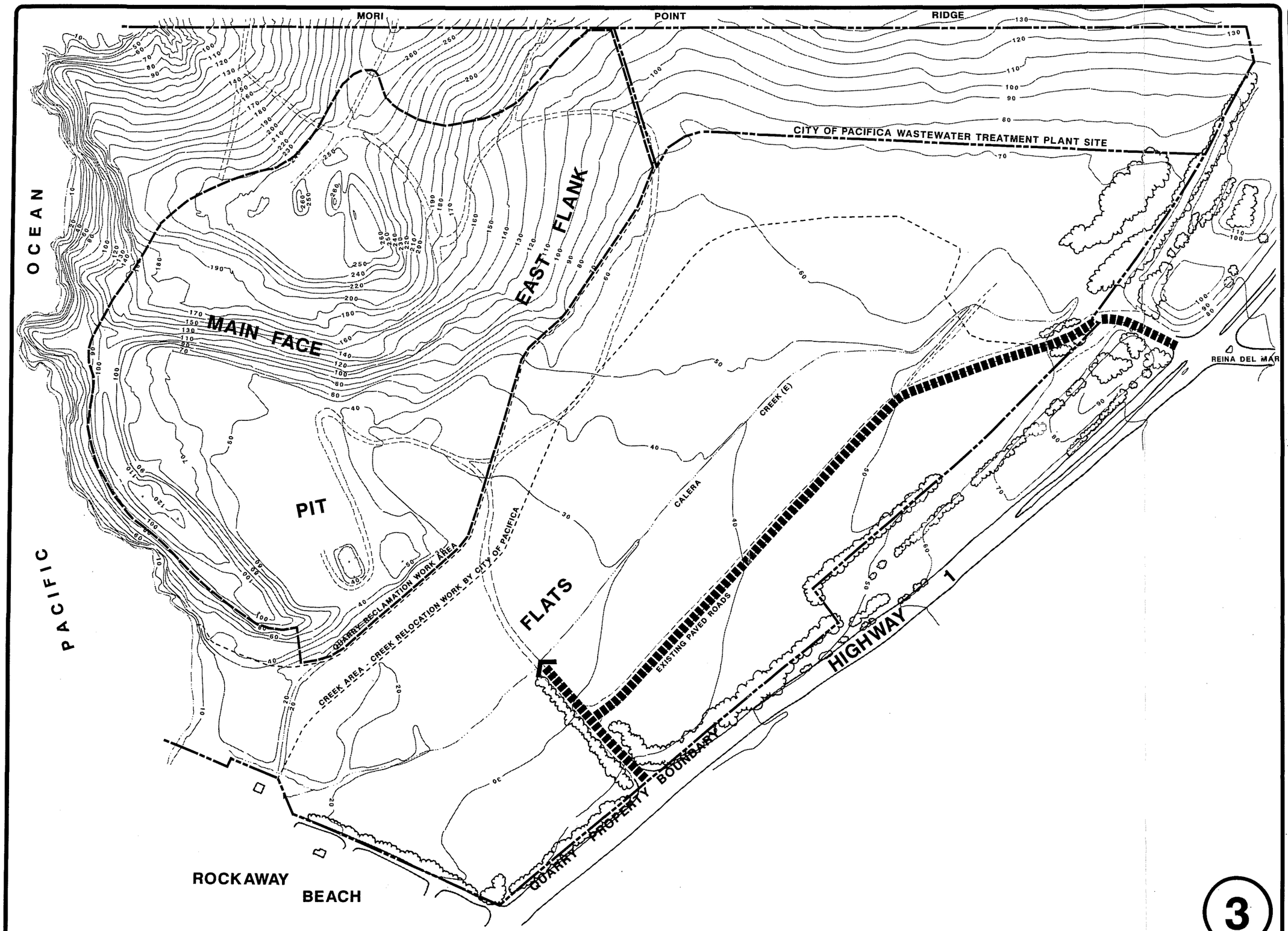
minimizing the potential for trespass from the reclaimed quarry site into the Creek Work Area. A single creek crossing will be built as part of the City sponsored creek realignment. See Section 2.100 for more information.



2

FIGURE

LOCAL SETTING



PACIFICA QUARRY RECLAMATION

SITE PLAN

3
FIGURE

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-3780

TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9048

0 100 200
MAP SCALE IN FEET

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 968-2580

12/85

2.000 CHARACTERISTICS OF THE SURFACE MINING OPERATION

2.100 AREA AFFECTED BY THE QUARRY OPERATION

Two parcels of land make up the quarry property. These are identified as San Mateo County Assessors Parcels 018-150-050 and 018-150-070 which together comprise about 117 acres. A third parcel, measuring about 12 acres, that is part of the land generally referred to as the quarry property, is in the process of being sold to the City of Pacifica for a new wastewater treatment plant. It is shown on the Site Plan, Figure 3. Of the total 105 acres that will still belong to the Bottoms Family Trust, about 34 acres has been disturbed by the past mining activities and is now subject to reclamation.

Figure 3 shows the overall property boundary, the parcel being acquired by the City, the area where reclamation work will be performed and the various names given to parts of the quarry property to facilitate discussion of reclamation. The 34 acres subject to reclamation is compromised of the Main Face (about 9 acres), the Quarry Pit (about 14 acres) and the East Flank (about 11 acres). The remainder of the quarry property, not subject to reclamation, includes the surrounding hillsides and the gently sloping fields south and east of the quarry pit, referred to as the Flats, which contain the current alignment of Calera Creek.

Figure 3 also identifies an area referred to as the Creek Work Area. This is an area of about 17 acres that the Bottoms Family Trust will donate to the City of Pacifica in connection with the City's wastewater treatment facility. City work in the donated area will include rerouting Calera Creek through the Creek Work Area, developing riparian habitat along the realigned creek corridor and constructing a crossing from the Flats to the Main Face. City work in the Flats will include filling the current creek channel and regrading the Flats. Final contours for grading work within the Creek Work Area and in the Flats is shown on the Final Grading Plan, Figure 7, but the grading work in these areas is not part of the quarry reclamation work.

2.200 ACCESS ROUTE TO THE QUARRY

Pacifica Quarry is reached from State Highway 1 (Cabrillo Highway) by traveling westward from the signalized intersection at Reina del Mar Avenue. The access route is shown on Figure 3.

An alternate, unnamed access driveway exists about one-third mile south of the signalized intersection. For traffic safety this access is only suitable for use by vehicles traveling southbound on Highway 1.

2.300 DATE QUARRY OPERATION BEGAN

Pacifica Quarry is one of the oldest quarries in California. Early records indicate that the lime pits at Rockaway Beach furnished whitewash for the San Francisco Presidio in the late 1700s and that limestone was used for building foundations near the Sanchez Adobe in

Pacifica. Substantial mining began about 1907 and a series of mining companies worked the site over the years. Quarry Products, Inc. took over operation of the Pacifica Quarry at the end of 1975 and operated it until the beginning of 1987.

2.400 TERMINATION DATE

Reclamation work will begin as soon as permits have been secured. All of the work, except final revegetation and continuing maintenance, is expected to be completed within two years.

2.500 OPERATION SCHEDULE

Reclamation work will be performed during week days (M-F) between 7:00 A.M. and 5:00 P.M. No work will be done on weekends.

2.600 GEOLOGY OF THE QUARRY PROPERTY

2.610 Available Geotechnical Studies

Peter Kaldveer and Associates, Geoscience Consultants, conducted geotechnical investigations of the quarry property in 1980, 1983 and 1988. Copies of these reports are included in Appendices F through H. The background information contained in these reports is useful for understanding the geology of the site, however the final grading plans were changed and many of the specific recommendations no longer apply. A new grading concept was developed in 1991. Treadwell and Associates, Consulting Engineers and Scientists, prepared a supplemental geotechnical investigation to address the 1991 Reclamation Plan that was eventually approved by the City of Pacifica. The Final Grading Plan has now been modified again to reflect work being done by the City of Pacifica in conjunction with its wastewater treatment plant and to reflect current thinking by the quarry property owner. Accordingly, a supplement to the 1991 report has been prepared by Treadwell and Rollo, Environmental Geotechnical Consultants, and is included as an appendix to the Reclamation Plan.

Three changes have occurred since 1991 as described below.

1. The 1991 Plan contemplated constructing a buttress fill at the toe of the East Flank slope to stabilize some loose fill and historic landslide deposits found at that location. The 1996 plan will result in removing all of the unconsolidated material, recompacting part of it in place and using part of it to fill the quarry pit.

   The excavation of the East Flank will also cut into the toe of an active landslide on-site and a dormant landslide that extends onto the adjacent property. Treadwell and Rollo's 1996 Supplemental Geotechnical Report calls for detailed mapping of the area during excavation and, if necessary, the installation of an earth buttress with drainage. (Appendix E-1).

2. Work was done to widen Highway One in the vicinity of the quarry property. Excess earth materials was used to partially fill the quarry pit. Filling was done consistent with the 1991 Reclamation Plan. The as-built ground contours and subdrain improvements are shown on the base maps used for the 1996 revised Reclamation Plan.

3. The City of Pacifica is purchasing a 12 acre wastewater treatment plant site and has defined a Creek Work Area effectively limiting the easterly edge of the area subject to quarry reclamation. Improvements within the Creek Work Area, as described in Section 2.100, will be done by the City of Pacifica. One exception will be a small area at the base of the East Flank where removal of landslide debris and recompaction of fill will extend into the Creek Work Area. The extent of this work is shown on Section A-A, Figure 8a.

2.620 General Geology of the Quarry Vicinity

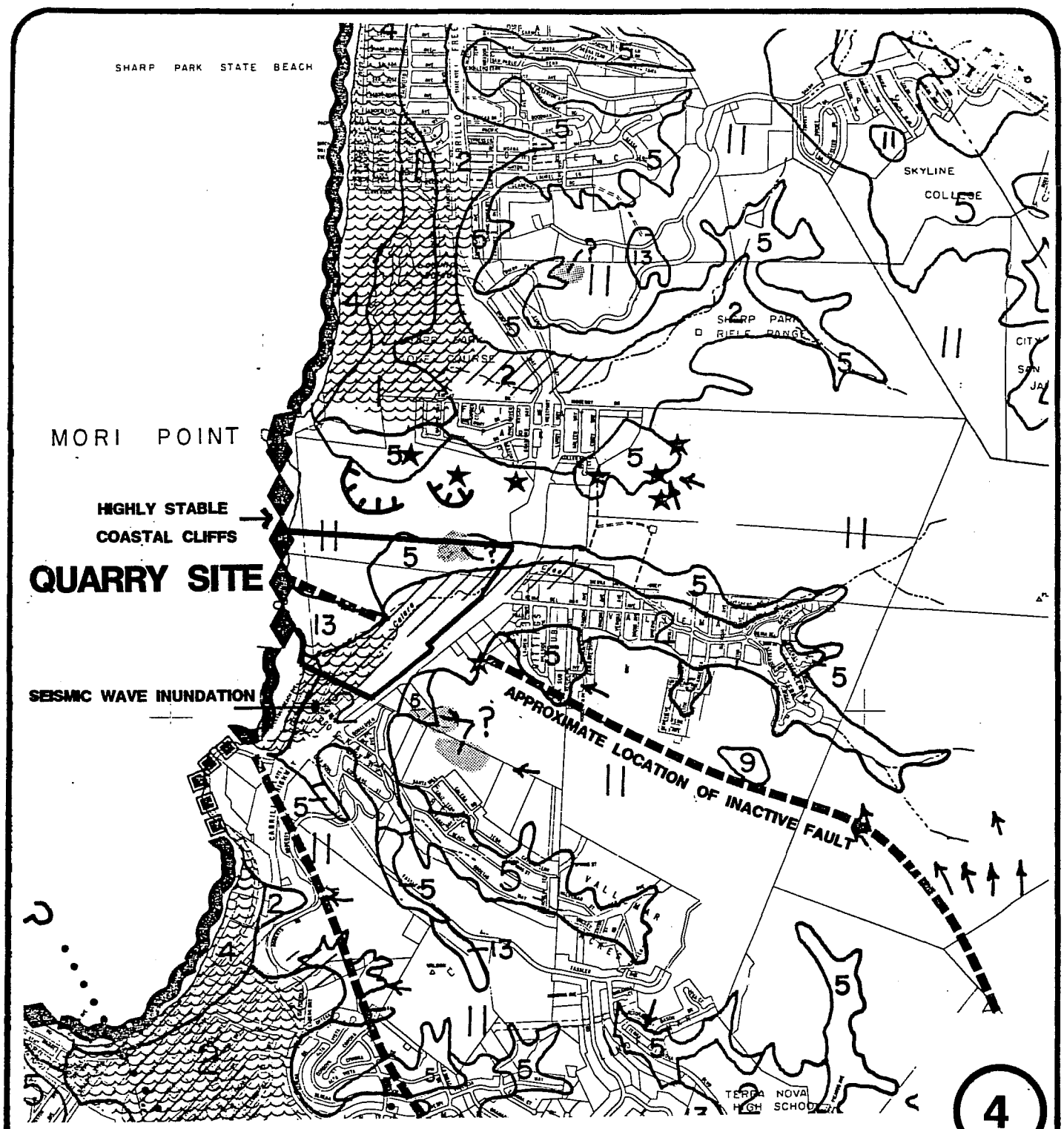
Pacific Quarry is centered on a limestone deposit located near the seacliffs in the south facing flank of the east-west trending hills that separate the Sharp Park and Rockaway Beach Districts of Pacifica. Bedrock north of the quarry and above the limestone is greenstone, an altered volcanic rock. The limestone and greenstone are identified as part of the Franciscan formation of Jurassic to Cretaceous age; 70-190 million years old. The steeply dipping attitude of the bedding planes indicate that the bedrock has been strongly folded. A thin mantle of soil composed of weathered rock overlies the unexposed bedrock and varies in thickness from several inches at the hilltops to as much as nine feet at the toe of the slopes.

The west side of the quarry abuts the Pacific Ocean. A ridge of rock, extending south approximately 1,000 feet from the quarry face, separates the quarry Pit from the ocean. This rock is comprised of hard limestone material. The rate of seacliff retreat in the greenstone and limestone bluffs in the site vicinity has been studied and determined to be less than 0.5 feet per year, historically.

2.630 Detailed Geology of the Quarry

Site specific geologic conditions are reproduced in Figure 5 (Figure 3 from Kaldveer's 1983 report) and are detailed in the various geotechnical reports included as Appendices to this Reclamation Plan. An up-to-date Geotechnical Supplement has been prepared by Treadwell & Rollo, Environmental & Geotechnical Consultants, and is included as Appendix E.

The following descriptions refer to the various part of the quarry identified in the Site Plan, Figure 3. Most notable is the Main Face where quarrying has been focused. Calera limestone, the mineral deposit of most importance, comprises the lower slope extending from about elevation 40 at the back of the Pit, to about elevation 130 at mid-slope. Bedrock north and above the limestone is greenstone, an altered volcanic rock. The limestone bedding



GEOLOGY MAP

0 2000

MAP SCALE IN FEET

NORTH

PERTINENT SYMBOLS

2 ALLUVIAL FAN

5 COLLUVIUM

11 GREENSTONE

13 LIMESTONE

SOURCE: SAN MATEO COUNTY

strikes northeasterly and the greenstone bedding strikes northwesterly. Consequently the existing slopes are considered stable. The proposed grading will improve stability and reduce erosion.

A mid-slope shear zone, extending from about elevation 130 to elevation 180, separates the limestone and greenstone. Its extension to the east also separates the Main Face from the East Flank of the quarry. In addition to pockets of limestone and greenstone are found shale, loose fill and a mix of unconsolidated rock simply identified as melange. The mid-slope shear zone is considered a zone of weakness necessitating construction of a 12 foot wide bench above and an 18 foot wide bench below the shear zone in the final slope.

Fill to a depth of five feet or more covers the top of the ridge of rock separating the quarry Pit from the Pacific Ocean. Loose fill also covers much of the East Flank. All loose fill will be removed from these areas as part of the final reclamation effort.

On the basis of historical aerial photographs, it is believed that a portion of the East Flank is underlain by an ancient landslide. Fill material has been placed on the East Flank over the years during quarry operations. The unconsolidated fill shows signs of downslope creep, and the weight of fill could contribute to eventual instability of the ancient landslide. The proposed cut on the East Flank will remove both the recent fill material and the ancient landslide. Removal of all of the landslide material will be performed during grading operations.

2.700 TOTAL QUANTITY OF EARTH MATERIALS TO BE MOVED

Final recontouring of the quarry area will involve cutting and filling an estimated 807,200 cubic yards of earth material. Phase I includes 541,400 cubic yards and Phase II about 265,800 cubic yards

2.800 MAXIMUM DEPTH OF CUT

Earth moving in accordance with the Final Grading Plan will extend from the 270 foot elevation to about the 30 foot elevation. Depth of cut from existing ground surface varies by location from a few feet to as much as 55 feet. Representative sections are shown in Figure 8.

DETAILED GEOLOGY

FIGURE 5

PETER KALDVEER AND ASSOCIATES, INC. Consulting Geotechnical Engineers	SITE PLAN		
	QUARRY RECLAMATION PROJECT Pacifica, California		
	PROJECT NO.	DATE	Figure
	K800-1	August 1985	

3.000 RECLAMATION PHASING

3.100 PHASING CONCEPT

Reclamation work is phased to result in early visual improvement. The various technical steps are designed so that grading, drainage and revegetation work occurs in the proper sequence and are additive so that work in one phase does not have to be modified or redone in later phases. Each of the phases are described below and discussed in more detail beginning in Section 3.400.

Phase I Grading and Drainage work consists of lowering the westerly bluff to elevation 85 and reshaping the Main Face and East Flank. This work is located generally west and north of the Maintenance Road shown on the Final Grading Plan, Figure 7. Fill generated by this work will be placed in the Quarry Pit. Phase I Grading and Drainage work is followed immediately by Phase I Revegetation which will result in reclamation of the more highly visible, upper slopes being completed early in the process.

Phase II Grading and Drainage work focuses on the removal of loose fill and landslide deposits from the East Flank located generally east of the Maintenance Road. Fill will be placed in the Quarry Pit, to complete Pad A, and below the Maintenance Road, forming Pad B. Phase II Revegetation consists of completing the revegetation work on the lower slopes. No stockpiles or waste piles will remain on the property at the completion of Revegetation Phase II.

The Final Grading Plan, Figure 7, represents the final reclaimed configuration of the site. The final configuration is further illustrated by the Reclamation Renderings, Figures 6a, 6b and 6c.

3.110 Marketing Component

Large rip-rap boulders remaining from the former quarry operation are stockpiled in the Flats south and east of the Quarry Pit. The cumulative quantity is estimated to be about 20,000 cubic yards. The owner intends to sell all of the boulders while reclamation work is underway and heavy equipment is on site to move and load them.

3.200 PROGRESS MONITORING

Verifiable bench marks for the purposes of reclamation monitoring shall be the completion of grading cuts shown for each grading phase. Work related to grading will include construction of keys and buttresses, if they are warranted, prior to placement of fill and the installation of surface ditches and drainage culverts. Verifiable bench marks for the purpose of revegetation monitoring shall be achievement of cover and diversity specified in the reclamation standards, Section 5.000.

3.300 SEASONAL DELAY BETWEEN GRADING AND REVEGETATION PHASES

Grading phases will be completed during the dry season which typically extends from about April 15 to October 15. Revegetation work is scheduled during Fall and Winter months to take advantage of natural moisture. Native plants will be used and no irrigation is proposed.

3.400 SITE PREPARATION

3.401 Weed Removal. Prior to each grading phase the area to be graded will be stripped of weeds so that the material being used for fill is clean and capable of being properly compacted.

3.402 Scarification. The top six to eight inches of the ground surface in the Quarry Pit area will be scarified prior to proceeding with the placement of additional fill.

3.403 Maintenance Road. The Maintenance Road shown in the Final Grading plan will be rough graded from the Main Face, across the East Flank, to the top of the hill to provide access to the principal work areas. It will be used during reclamation work and will remain following reclamation for slope maintenance and access to the top of the hill.

3.500 PHASE I: DETAILED DESCRIPTION

Phase I Grading and Drainage work involves lowering the westerly bluff to elevation 85 and reshaping the Main Face and upper part of the East Flank. This work is located generally west and north of the Maintenance Road shown on the Final Grading Plan, Figure 7. The existing, oversteepened condition of the Main Face will be remedied by creating a new top of slope located north of the current top and reconstructing a final 2:1 gradient for the Main Face. Midslope benches required for slope stability, safety and drainage will be limited to one 12 foot wide bench at elevation 180 and one 18 foot wide bench at elevation 120 in accordance with a mandate from the City of Pacifica to construct a natural, non-benched appearance. Unstable conditions related to the upper slopes of the East Flank will be remedied by removing loose fill and ancient landslide deposits. Final grading north of the Maintenance Road will vary from 2:1 to 4:1 with no slope steeper than 2:1 gradient. Interim erosion and sediment control features include construction of a temporary sediment basin on Pad A and the installation of silt fencing and placement of straw bales to intercept silt and protect drainage inlets. Revegetation work involves establishment of ground cover, for slope erosion control, and, woody vegetation to replicate the pattern of naturally occurring vegetation in the area. Phase I work is detailed below and is delineated on the Grading Sections, Figure 8.

3.501 Subdrain. Extend the outlet for the subdrain located beneath Pad A in a southerly direction for positive drainage (approximately 50 feet - 6" perforated pipe).

3.502 Keyway. Install an undrained stepped keyway mid-slope below Pad A and a drained keyway to anchor new fill to be placed in the Quarry Pit.

3.503 Quarry Pit. Remove vegetation and scarify the top six to eight inches of existing fill in the Quarry Pit. Place compacted, engineered fill in the Quarry Pit as it is generated. Compaction shall meet specifications of the project Soils Engineer.

3.504 Westerly Bluff. Remove loose, unstable fill material from the bluff located westerly of the Quarry Pit. Lower the bluff to elevation 85. Place fill in the Quarry Pit.

3.505 Main Face/East Flank Grading. Remove the cone shaped promontories from the top of the hill. Grade the Main Face and East Flank above the Maintenance Road starting at the top of the hill. Construct slopes and install benches as specified by the Project Geotechnical Engineer. Place fill in the Quarry Pit.

3.506 Drainage. Construct concrete lined ditches along the upper part of the Maintenance Road (approximately 520 feet). Construct earth swale at the top of the hill (approximately 550 feet). Install concrete lined ditches on the Main Face benches (approximately 1,960 feet). Install two inlets and culvert to carry runoff from the Main Face benches (approximately 205 feet - 12" rcp). Install earth swale along the west edge of Pad A (approximately 920 feet). Install concrete lined ditches on the Pad A south slope benches (approximately 1,480 feet). Install two inlets and culvert to carry runoff from the south slope benches of Pad A (approximately, 110 feet - 12" rcp). Install an undrained stepped keyway mid-slope below Pad A (approximately 280 feet), and a drained keyway at the toe of Pad A (approximately 820 feet).

3.507 Maintenance Road. Finish grade the maintenance road from about elevation 150 to the top of the hill and install a durable surface of crushed rock.

3.508 Resoiling. Utilize fill from the East Flank for resoiling at the top of the hill. Rip the ground surface to a depth of 24 inches to avoid compaction before adding soil. Resoiling shall be done as soon as the final grade is established.

3.509 Interim Erosion Control. Install silt fencing and straw bales at locations shown on the Interim Erosion Control Plan, Figure 10, to intercept sediment and to protect drain inlets. Install temporary sediment basin on Pad A.

3.510 Revegetation. Hydroseed the top of the hill, the Main Face, the East Flank generally west and north of the Maintenance Road and the front face of Pad A between October 15 and November 15 to achieve 50 percent mulch cover. Hand plant coastal scrub species in groupings and at locations shown on the Revegetation Plan, Figure 12, between December 15 and February 15.

Phase I Summary (All quantities are approximate)

Grading

Cut:	541,400 cubic yards
Fill	541,400 cubic yard

Drainage and Erosion Control	
6" Subdrain Extension	50 feet
6" Perf. Subdrain	820 feet
Lined Ditches	3,960 feet
Earth Swale	1,470 feet
12" rcp Culvert	360 feet
Inlet Structures	4
Inlet Protection	4
Silt Fence	3,830 feet
Sediment basin (70X95)	1
15" cmp outlet	190 feet

Revegetation	
Top of Hill	1.2 acres
Main Face	8.8 acres
Pad A Face	2.9 acres
Upper East Flank	1.1 acres
Subtotal	14.0 acres

3.600 PHASE II: DETAILED DESCRIPTION

Phase II Grading and Drainage work focuses on the removal of loose fill and ancient landslide deposits from the East Flank. Material removed from the East Flank area will be used to complete the filling of the Quarry Pit (Pad A) and a small part of Pad B. Phase II earthwork also includes an estimated 100,000 cubic yards of poor quality material, located below the finished slope, that will have to be excavated and recompacted to achieve a stable base for the East Flank slope and Pad B. The work area is located generally east and north of the Maintenance Road shown on the Final Grading plan, Figure 7.

Midslope benches required for slope stability and drainage will be limited to one 12 foot wide bench at elevation 115 and one at elevation 95. Interim erosion and sediment control features include construction of a temporary sediment basin on Pad B and the installation of silt fencing and placement of straw bales to intercept silt and protect drainage inlets. Revegetation work involves establishment of ground cover, for slope erosion control, and, woody vegetation to replicate the pattern of naturally occurring vegetation in the area. Phase II work is detailed below and is delineated on the Grading Sections, Figure 8.

3.601 Keyway. Install a drained keyway to anchor new fill to be placed at Pad B.

3.602 East Flank. Remove all loose fill and ancient landslide debris to competent base. Construct final slope, slope benches and Pad B with compacted, engineered fill as directed by the project Soils and Geotechnical Engineer. Place excess fill in the Quarry Pit (Pad A).

3.603 Maintenance Road. Finish grade the maintenance road from about elevation 150 to the bottom of the hill and install a durable surface of crushed rock.

3.604 Resoiling. Utilize fill from the East Flank for resoiling of the top of Pad A and the top of Pad B. Rip the top surface to a depth of 24 inches to avoid compaction before adding soil. Resoiling shall be done as the final grade is established.

3.605 Drainage. Construct concrete lined ditches on the East Flank benches (approximately 1,520 feet). Install earth swale at the back of and the front top edge of Pad B (approximately 1,110 feet). Install five inlets and culvert to drain Pad B (approximately 720 feet - 12" rcp; 235 feet - 15" rcp). Construct earth swale at the back of Pad A and along the front edge of Pad A (approximately 1,700 feet). Install six inlets and culvert to drain Pad A (approximately 240 feet - 12" rcp; 240 feet - 15" rcp; 300 feet - 18" rcp; 555 feet - 24" rcp). Install concrete lined ditch along the lower part of the Maintenance Road (approximately 540 feet). Install four inlets and culvert to drain the lower part of the Maintenance Road (approximately 420 feet - 12" rcp; 100 feet - 15" rcp).

3.606 Interim Erosion Control. Install silt fencing and straw bales at locations shown on the Interim Erosion Control Plan, Figure 10, to intercept sediment and to protect drain inlets. Install temporary sediment basin on Pad B.

3.607 Revegetation. Hydroseed the East Flank slopes, front face of Pad B and the tops of Pads A and B between October 15 and November 15 to achieve 50 percent mulch cover. Hand plant coastal scrub species in groupings and at locations shown on the Revegetation Plan, Figure 12, between December 15 and February 15.

Phase II Summary (All quantities are approximate)

Grading	
Cut:	165,800 cubic yards
Fill	165,800 cubic yards
Excavate and Recompact	100,000 cubic yards
Drainage and Erosion	
6" Perf. Subdrain	700 feet
Lined Ditches	2,060 feet
Earth Swale	2,860 feet
12" rcp Culvert	1,380 feet
15 " rcp Culvert	575 feet
18" rcp Culvert	300 feet
24" rcp Culvert	555 feet
Inlet Structures	15
Inlet Protection	15
Silt Fence	2,140 feet
Sediment Basin (90X135)	1
15" cmp outlet	150 feet

3.700 POST RECLAMATION AND MONITORING

Reclamation work will be maintained for a period of three years. Maintenance includes repair of any slope failures and removal of fallen rock debris, cleaning and repair of drainage facilities, reseeding of bare ground and replacement of dead plants.

3.800 POST RECLAMATION RESPONSIBILITIES

After the three year post reclamation monitoring and maintenance time period has passed, the interim erosion and sediment control facilities will remain in place until the site is developed. The quarry owner or subsequent property owners, if the land is sold, will be responsible for maintaining the erosion and sediment control facilities (i.e., silt fence, hay bales, and sediment basins) until the site is developed. When the property is being prepared for development the temporary sediment basins will be over-excavated to firm material and then filled.

3.900 FINANCIAL ASSURANCE OF PERFORMANCE

The owners of the quarry will provide financial assurances in the amount of $706,169 to ensure performance of their obligations to reclaim the quarry. The total will be covered by a Certificate of Deposit made payable to the City of Pacifica and the California Department of Conservation.

4.000 ULTIMATE SITE CONDITION

Final graded configuration of the quarry site is shown on the Final Grading and Drainage Plan, Exhibit 12. Photos showing the existing site condition (January 1996) and renderings showing the anticipated final condition are included as Exhibits 6A, 6B and 6C.

When reclamation work is completed the quarry slopes will have been regraded to meet City of Pacifica standards in accordance with recommendations of the project Geotechnical Engineer. Final slopes will have an inclination of 2:1 with intermediate benches to catch loose rock and improve drainage. Loose fill and unstable, landslide prone material will be removed from all areas. Loose fill will be removed from the bluff west of the Quarry Pit and the bluff will be lowered to elevation 85. A gradual sloping pad will be constructed to elevation 85 above the former Quarry Pit (Pad A). A second (Pad B) will be constructed to elevation 75 at the base of the East Flank utilizing compacted, engineered fill generated by grading work necessary to stabilize the quarry slopes. Except for temporary access and minor filling to match City plans, the limit of work will be the Creek Work Area shown on the Final Grading Plan.

An access road will be retained crossing Calera Creek and leading from the Flats, across the East Flank to the top of the Main Face. Drainage facilities at the top of the hill, on intermediate benches, in the access road and at the base of the hill will carry run off and control erosion.

All final slopes will be rounded at horizontal transition to existing slopes and at the transition between flat and sloped areas to minimize an engineered appearance. All graded areas will be reseeded with grassland species. Slopes will receive a combination of grassland species and hand planted groupings of coastal scrub seedlings to approximate the existing vegetation pattern on adjacent hillsides.

4.100 POTENTIAL USES OF THE MINED LAND FOLLOWING RECLAMATION

A Redevelopment District has been established in the Rockaway Beach area including the quarry property. The Rockaway Beach Specific Plan, adopted in 1986, identifies the quarry as suitable for visitor commercial, business commercial, open space, recreational and residential uses. A provision of the Pacifica Local Coastal Land Use Plan allows the property owner to consider residential use for a portion of the property, however residential uses may be subject to approval of a public vote.

4.200 EFFECT OF RECLAMATION ON FUTURE MINING

Geologic maps indicate that the slope behind the Main Face of the quarry contains limestone and greenstone, both of which have value as a mineral resource. These slopes and all of the Mori Point Ridge to the north have been designated a Regionally Significant Construction Aggregate Area by the State Mining and Geology Board. The Final Reclamation Plan for the Pacifica Quarry describes a final land configuration which approximates a natural

contour and contemplates the conversion of the land to commercial and residential uses. No additional mining is proposed.

4.300 ULTIMATE SITE APPEARANCE

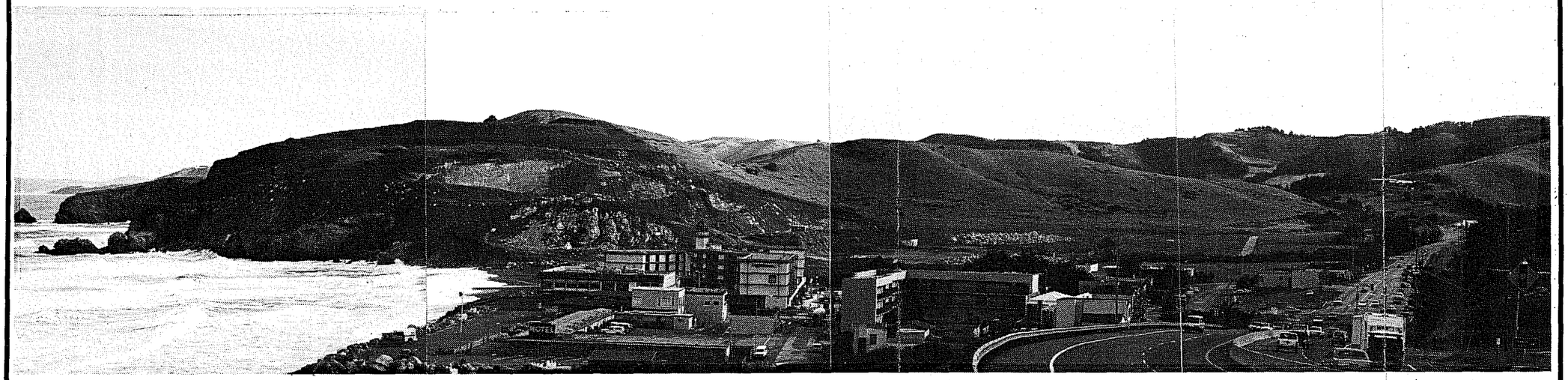
One of the most important aspects of the reclamation effort in Pacifica is to improve the visual appearance of the site when viewed from major public vantage points. Key viewpoints were selected in consultation with City staff. The main emphasis on visual improvement is described below for each viewpoint and shown in Exhibits 6A, 6B and 6C.

4.301 Highway One Looking North, This viewpoint is seen by all those traveling north on Highway One, including daily trips by many people who live in the Linda Mar District. The main focus will be to eliminate the odd looking cone shaped peaks left from earlier quarry work at the top of the Main Face, to regrade the Main Face and East Flank at a 2:1 gradient to better match surrounding slopes and to revegetate the graded areas, thereby reducing the contrasting coloration resulting from exposed limestone, greenstone and shale.

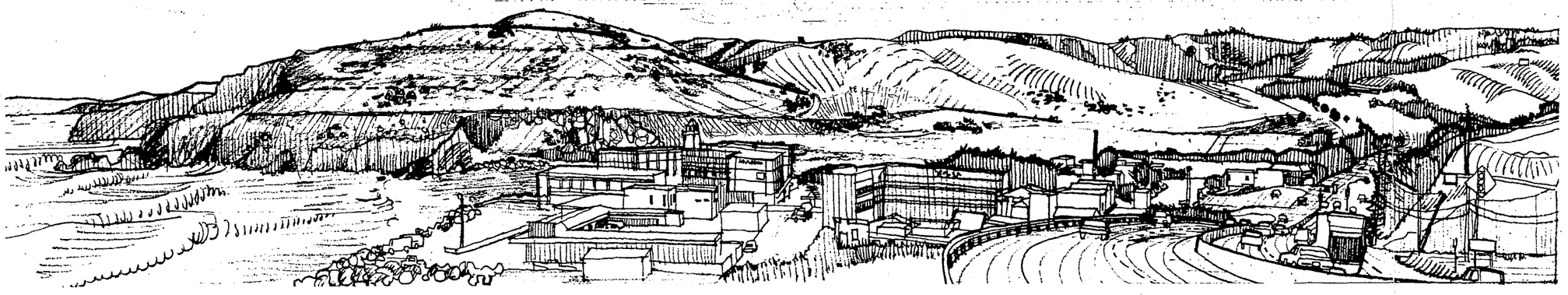
4.302 Highway One Looking Southwest. This viewpoint is seen by motorists traveling southbound on Highway One. Although partially obscured by roadside vegetation the Main Face can be seen in profile. The main focus will be to eliminate the steep quarried slopes and to create a more gradual 2:1 slope so that the profile looks more consistent with surrounding hillside.

4.303 Rockaway Beach Looking North. This viewpoint is seen from the foot of Rockaway Beach Avenue where many visitors to Pacifica come to look at the ocean and rugged ocean cliffs. The main focus will be to retain the existing, rugged, rocky appearance of the oceanfront bluff up to elevation 85 where it meets the new Pad A elevation.

4.304 Vallemar Looking West. This viewpoint is seen by residents of the Vallemar District. The main focus will be to eliminate the steep quarried slopes and to create a more gradual 2:1 slope so that the profile of the Main Face looks more consistent with surrounding hillsides.



EXISTING



FUTURE

HIGHWAY ONE: LOOKING NORTH

6a

FIGURE

RENDERINGS: REIF–CHOW ARCHITECTS

PACIFICA QUARRY RECLAMATION

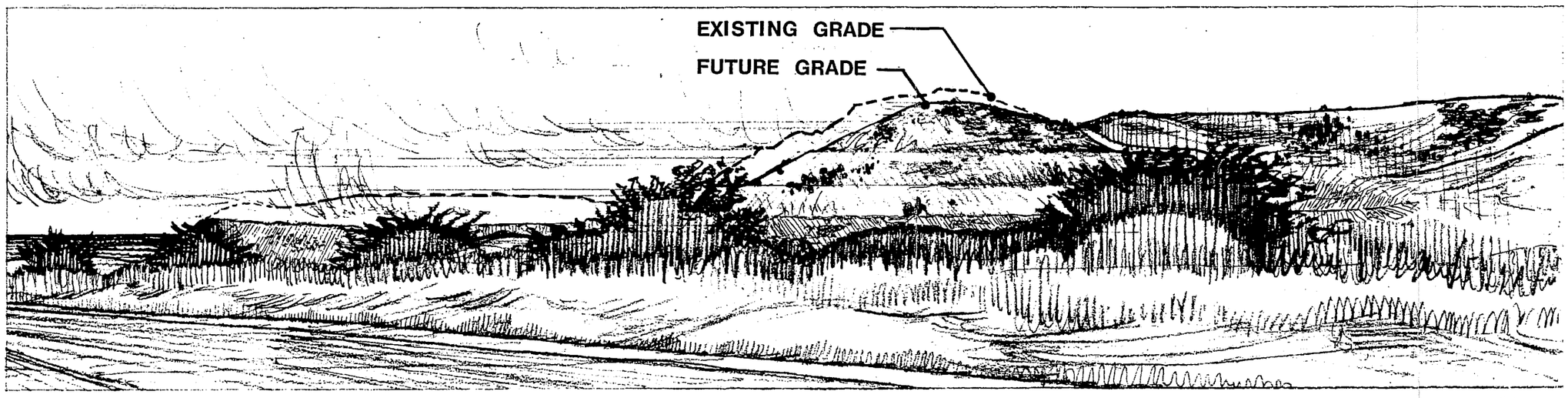
ULTIMATE APPEARANCE

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837–3780

TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
351 MONTGOMERY STREET, STE 1300, S.F. CA 94111 (415) 955-9040

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1170 EL CAMINO REAL, COLMA CA 94014 PHONE (415) 992-2200

EXISTING



FUTURE

HIGHWAY ONE: LOOKING SOUTHWEST

6b
FIGURE

RENDERINGS: REIF—CHOW ARCHITECTS

PACIFICA QUARRY
RECLAMATION

ULTIMATE APPEARANCE

DEBOLT CIVIL ENGINEERING
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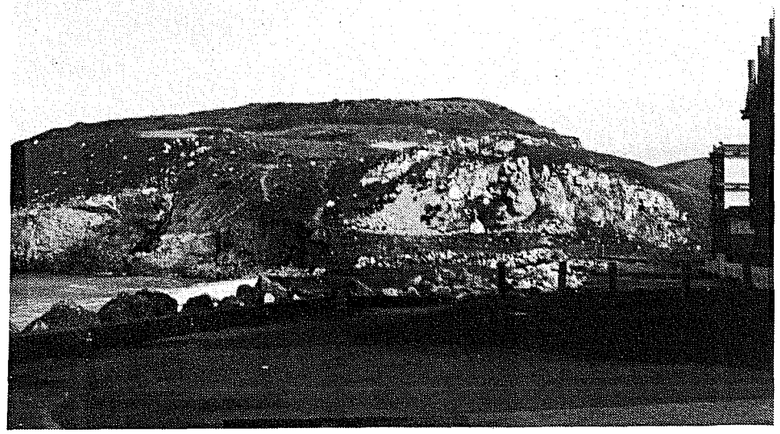
TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9040

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1196 EL CAMINO REAL, COLMA CA 94014 PHONE (415) 992-2500



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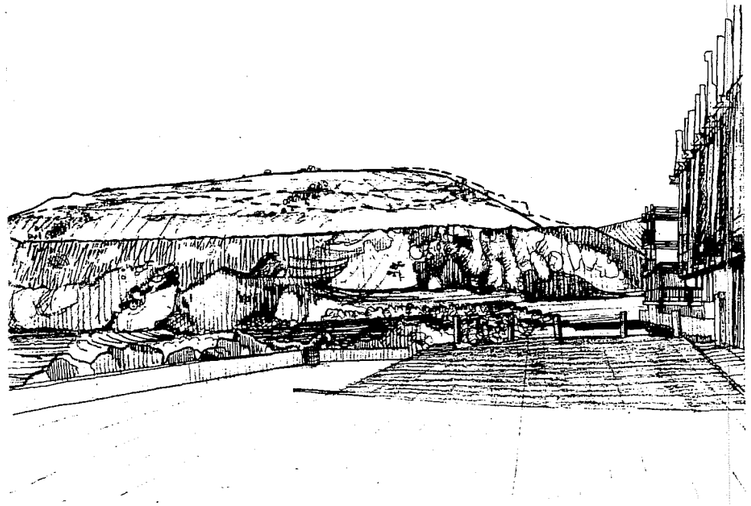
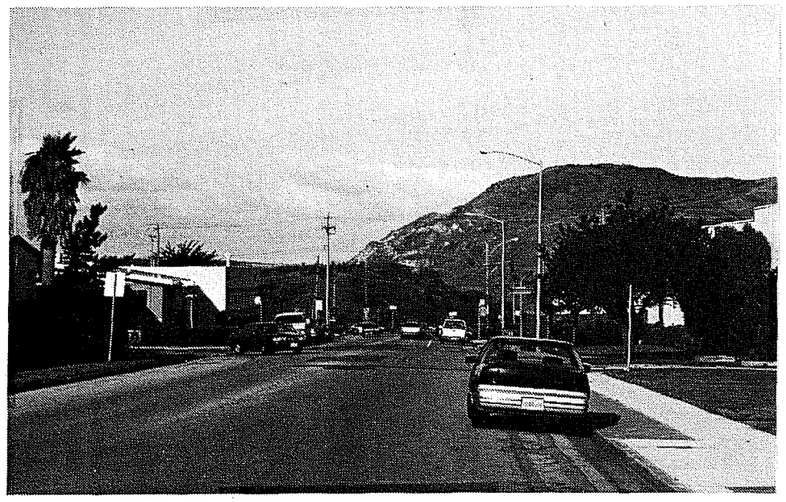


FUTURE

ROCKAWAY BEACH: LOOKING NORTH



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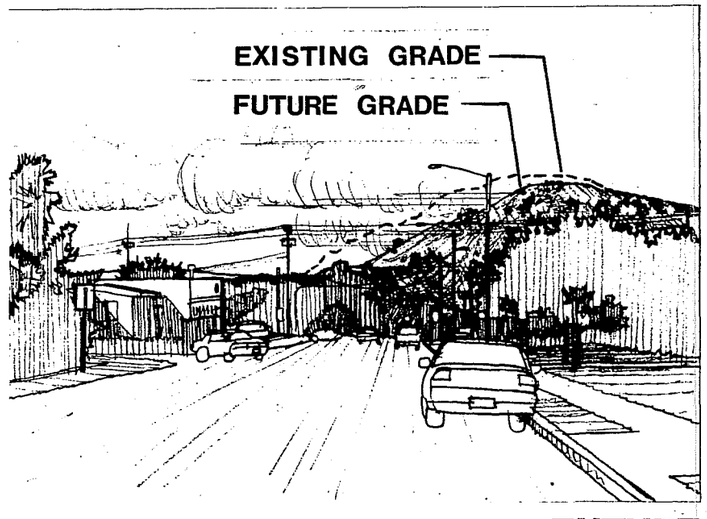

FUTURE

VALLEMAR: LOOKING WEST

RENDERINGS: REIF–CHOW ARCHITECTS

PACIFICA QUARRY RECLAMATION

ULTIMATE APPEARANCE

6c

FIGURE

DEBOLT CIVIL ENGINEERING
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GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9046

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 992-2600

5.000 RECLAMATION STANDARDS AND PROCEDURES

Reclamation work can be divided roughly into three categories having to do with grading, drainage and revegetation. Grading work involves excavation (cut), fill placement and resoiling. Drainage work involves construction of subdrainage below fill, construction of enclosed culverts, construction of erosion and sediment control facilities and surface drainage. Revegetation work includes reseeding and hand planting.

5.100 GRADING

5.110 Final Grading Plan and Sections

The final grading configuration is shown on the Final Grading and Drainage Plan, Exhibit 7. This Plan reflects a balance between cut and fill. Representative section drawings, showing existing and final grades, are included in Exhibits 8a and 8b.

The final graded slopes will have a gradient of 2:1 (two feet horizontal for each one foot of vertical slope) or flatter. The slopes will be continuous above Pads A and B except for two mid-slope benches necessary for slope stability.

5.120 Stripping

Areas to be graded currently have some low growing grass and shrub cover. This vegetation will be stripped from areas to be graded using a bulldozer blade. Engineering specifications do not allow vegetation to be mixed into or left below compacted fill. Stripped vegetation will be removed and hauled from the site.

What little topsoil is available will also be stripped. Topsoil will be taken directly from the East Flank to the top of the hill for Phase I resoiling. Topsoil will be taken from the East Flank and stockpiled on Pad A, outside of the area being graded, for Phase II resoiling.

5.130 Grading Equipment and Technique

Final quarry slopes will be cut primarily by bulldozer using the ripper teeth at the back of the bulldozer and the blade on the front. In locations such as the East Flank where fill material is to be moved, the work may be done by bulldozer or large earth moving scrapers. Final grades on top of the hill, on the access road and on Pads A and B will be finished with a motor grader.

5.140 Blasting

When extremely hard pockets of rock are encountered that cannot be moved by bulldozer, limited blasting will be done to fracture the rock before it is ripped. A sequential blasting technique will be employed involving a pneumatic drill to create a matrix of holes to the depth of the area to be excavated. Into each hole is put a blasting cap, ammonium nitrate

(fertilizer) and a plug of pea gravel. Each blasting cap contains a delay so that the charge in each hole can be detonated milliseconds apart from the others. The effect is a fracturing of the rock without creating significant ground vibration or air blast overpressure (sound waves).

If blasting becomes necessary the work will be done by a state certified blaster. The matrix of blasting holes will be drilled with a pneumatic drill during normal business hours. Noise will be masked by traffic noise on Highway One and other equipment operating at the site. The charge in each hole will be limited so that the scaled distance, as defined by the following formula, will not be less than 30. $D_s = \frac{D}{\sqrt{W}}$

where D = scaled distance

D_s = distance in feet from the blast area to any residential structure

W = explosive weight in pounds per delay of nine milliseconds or greater.

Prior to any use of explosives, proper permits will be obtained from the Fire Department and the Fire Department will be notified 24 hours in advance of any blasting. Blasting will be restricted to the hours between 10:00 A.M. and 3:00 P.M. on weekdays.

5.150 Grading Control

Cut and fill slopes are defined by the Final Grading and Drainage Plan, Figure 7. A Staking Plan will be prepared by the project civil engineer at the beginning of each grading phase in order to provide field control and monitoring of grading operations. Wooden grade stakes will be installed by the engineer's survey team indicating the depth of cut or fill to be achieved. The equipment operators then follow the instructions noted on the grade stakes.

5.160 Contour Grading

Important to the grading process are the verbal instructions from the applicant's project supervisor to the equipment operators. These instructions ensure that the final contours are rounded rather than leaving an abrupt, engineered looking transition at the outer edges of graded slopes.

5.170 Fill Compaction

The project geotechnical engineer is responsible for observing the placement of fill and for regular testing to ensure that the recommended compaction is achieved. Specifications for fill placement and compaction are included in the Geotechnical Report, Appendix E.

5.180 Grading for Drainage Facilities

Locations for subdrains, drainage culverts and surface drainage ditches will be identified by wooden stakes or chalk lines on the ground. Bulldozers and backhoe operators then follow the instruction on the stakes or the verbal instructions of the field engineer in cutting trenches for these facilities.

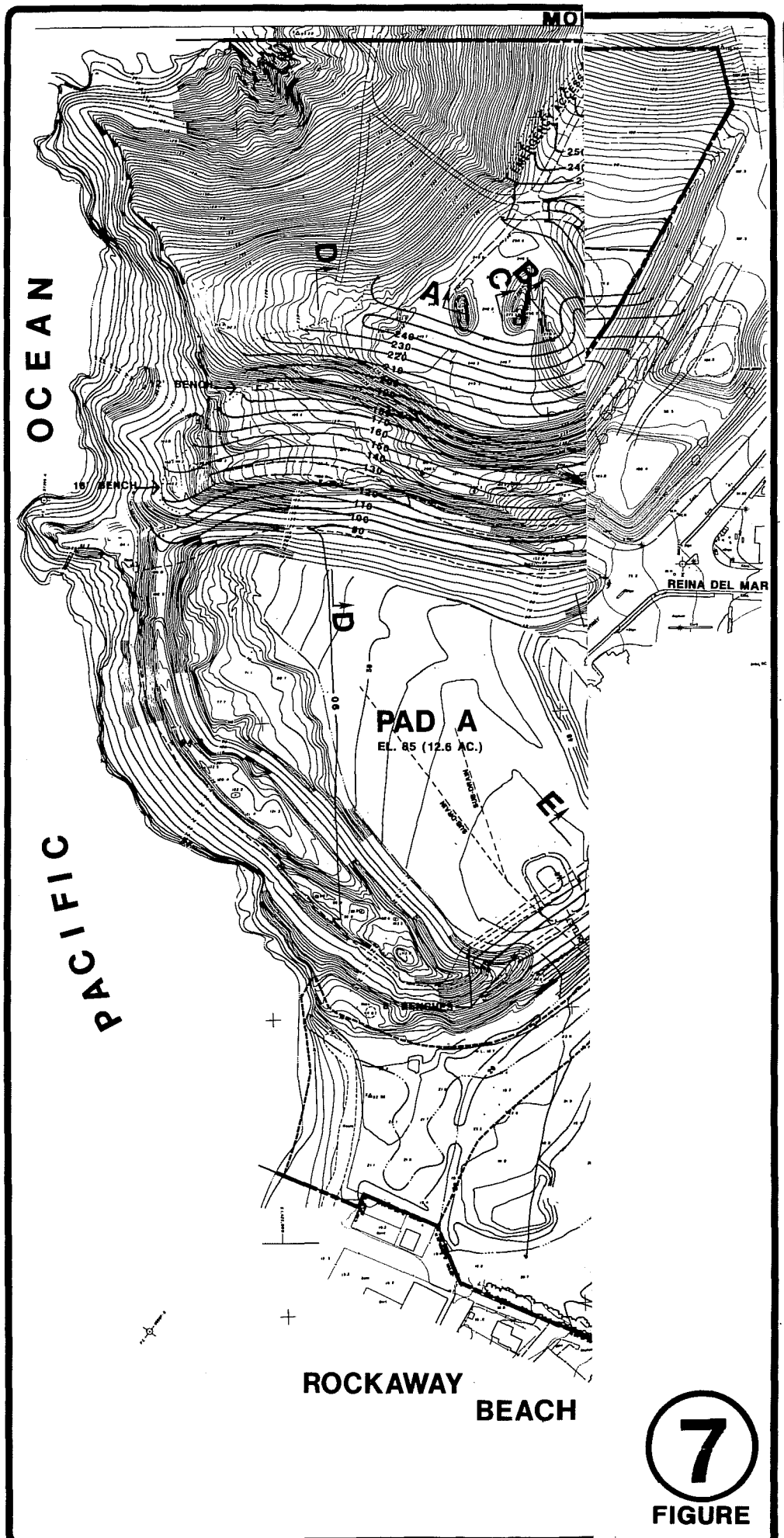
5.190 Scarification and Resoiling

Final ground surfaces will be prepared for revegetation by contour grading, scarification and resoiling, where appropriate, to facilitate plant propagation. All cut slopes, except those with hard rock surfaces, will be regraded so that the slope is notched horizontally (slope-stepping) and then resoiled to create a uniform slope surface. Quarry cut slopes with hard rock surfaces will be scarified by tracking the bulldozer up and down the final slope to minimize the amount of smooth rock surface. The practice of scarification will complement the normal fractures in the rock to create crevices and niches for seeds and plants to become established. The geotechnical engineer recommends against attempts to resoil the scarified slopes as they can result in visible erosion gullies and mud flow. Benched areas will not be resoiled. A four foot wide drainage ditch will be constructed at the back of the bench and the remainder available for equipment access.

Relatively flat ground surfaces at the top of the hill and the tops of the filled pads will be resoiled by placing a four to eight inch layer of topsoil over the final, rough-graded surface. The rough graded surface will be ripped to a depth of 24 inches to avoid compaction before adding soil.

5.200 SLOPE STABILIZATION BENCHING

The Main Face reveals a greenstone deposit at the top of the slope and a limestone deposit at the bottom of the slope with a zone of sheared rock in between. Due to the discontinuity of the durable rock and weakness of the shear zone the project Geotechnical Engineer has specified 2:1 final slopes with an intermediate bench above and one below the shear zone. A 12' wide bench will be constructed above the shear zone at elevation 180 to intercept downslope runoff and to capture rock that may fall as the slope weathers over time. The bench will also facilitate access to the slope for purposes of revegetation. An 18' wide bench will be constructed below the shear zone at elevation 120 for the same purposes. The benches are the minimum widths considered by the Geotechnical Engineer to satisfactorily intercept rolling rock and provide minimum width necessary and safe for equipment operation. The benches will include a four foot wide concrete lined drainage ditch at the back of the bench to control erosion. Benches will facilitate equipment access for debris cleanup. Benches will have a five percent slope into the hill and a three percent longitudinal slope to facilitate self cleaning.



PACIFICA QUARRY RECLAMATION

FINAL GRADING

LEGEND

LOCATION OF SECTIONS

A

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-8700

TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 956-9040

MAP SCALE IN FEET

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1199 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 992-2500

FIGURE 7

PACIFICA QUARRY RECLAMATION

FINAL GRADING

MORI POINT RIDGE

OCEAN

PACIFIC

PAD B
EL. 75 (2.3 AC.)

PAD A
EL. 85 (12.6 AC.)

12' BENCH

16' BENCH

EMERGENCY ACCESS

CITY OF PACIFICA WASTEWATER TREATMENT PLANT SITE

MAINTENANCE ROAD

CREEK WORK AREA

GRADING BY CITY

CALERA CREEK

REINA DEL MAR

CAMILLO

HIGHWAY 1

ROCKAWAY BEACH

LEGEND

A — LOCATION OF SECTIONS

KEYWAY FOR RECONSTRUCTED SLOPE BUTTRESS, IF WARRANTED SEE DETAIL 1 ON EXHIBIT 8B

BUTTRESS KEYWAY

PAD B

PAD A

EXISTING BUTTRESS

CREEK WORK AREA

GRADING BY CITY

BUTTRESS KEYWAY LOCATION MAP

NOT TO SCALE

MAP SCALE IN FEET

FIGURE 7

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-8780

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GEOTECHNICAL ENGINEERING
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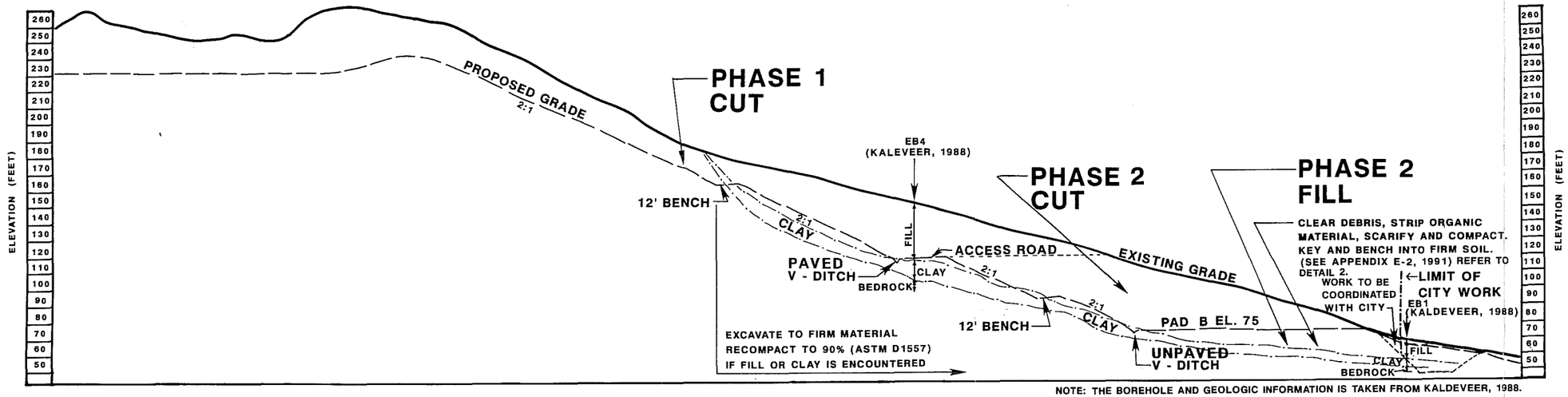
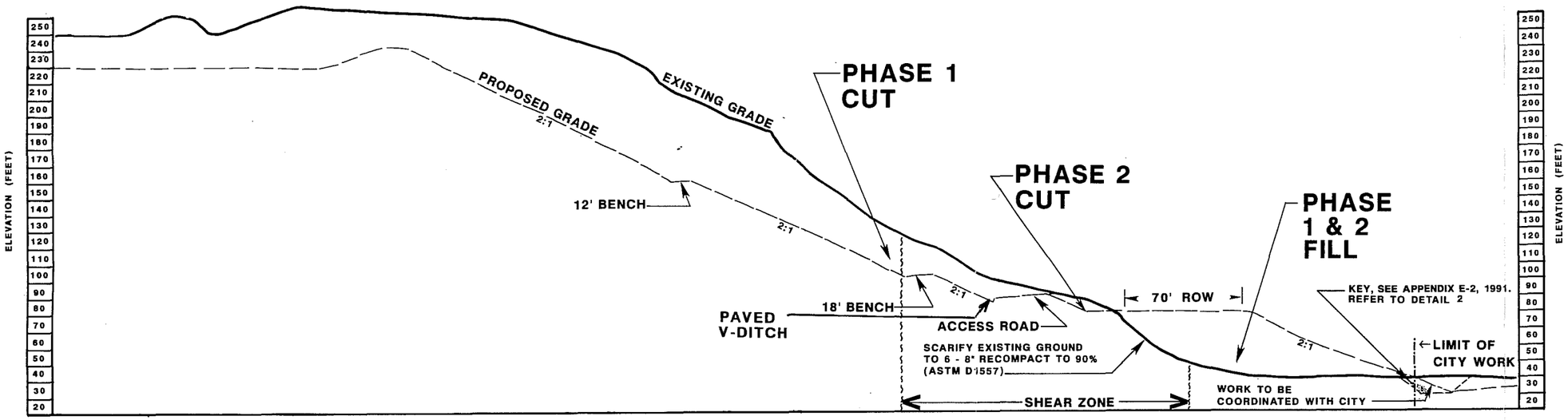
MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 992-2596

8/84

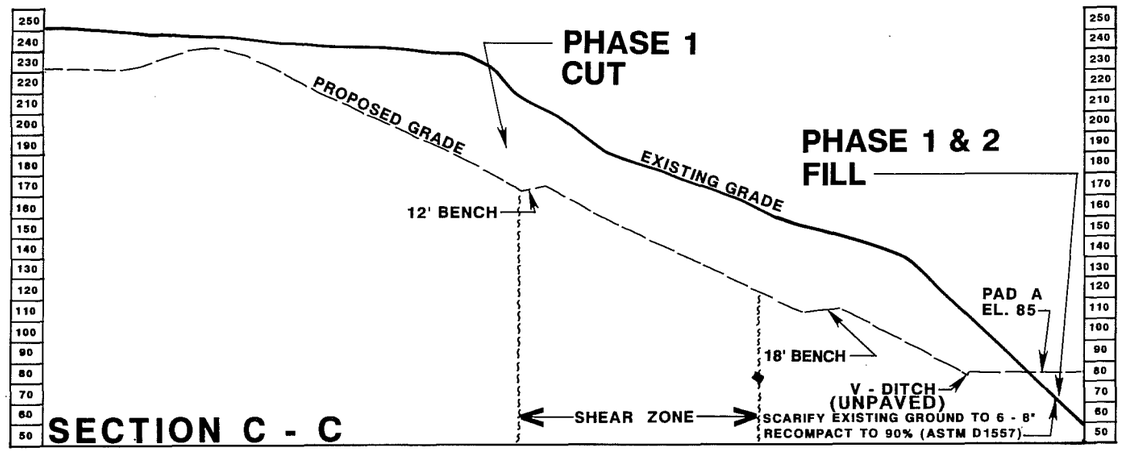


NOTE: THE BOREHOLE AND GEOLOGIC INFORMATION IS TAKEN FROM KALDEVEER, 1988.

SECTION A - A



SECTION B - B



SECTION C - C

PACIFICA QUARRY RECLAMATION

SECTIONS

LEGEND

SEE FIGURE 7 FOR LOCATION OF SECTIONS. SEE FIGURE 8B FOR DETAILS

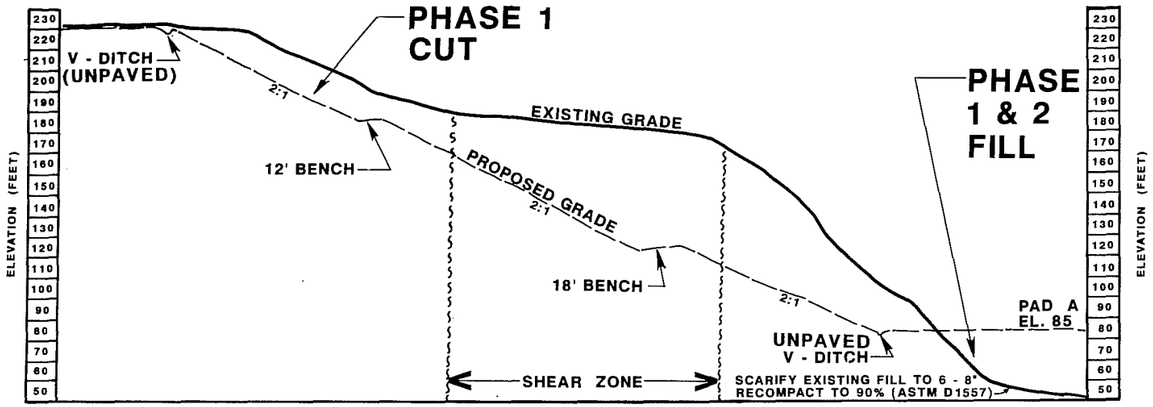
DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-3780

TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9040

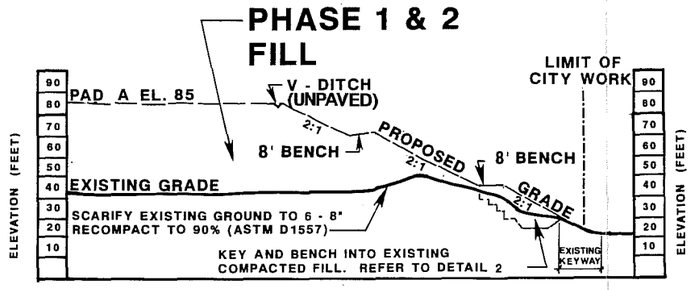
MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 585-2500

8A
FIGURE

8/96

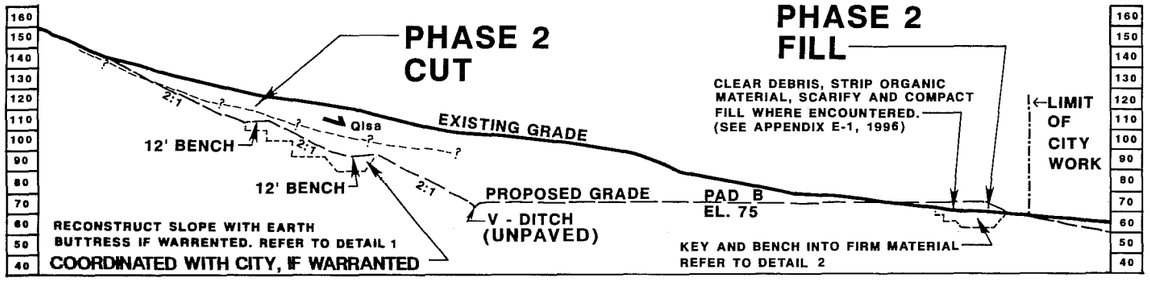


SECTION D - D

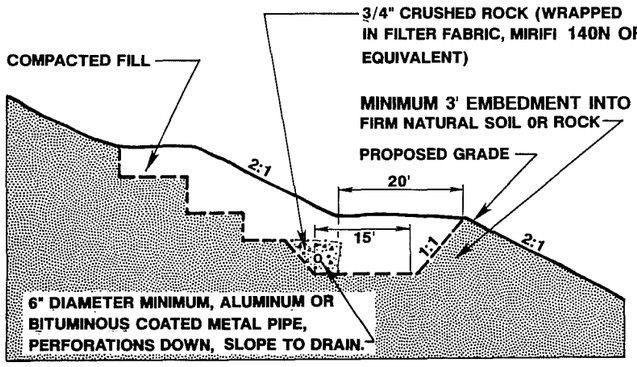


SECTION E - E

NOTE: EXISTING KEYWAY INCLUDES A SUBDRAIN. IF ENCOUNTERED DURING EXCAVATION, CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING INTEGRITY OF DRAIN.

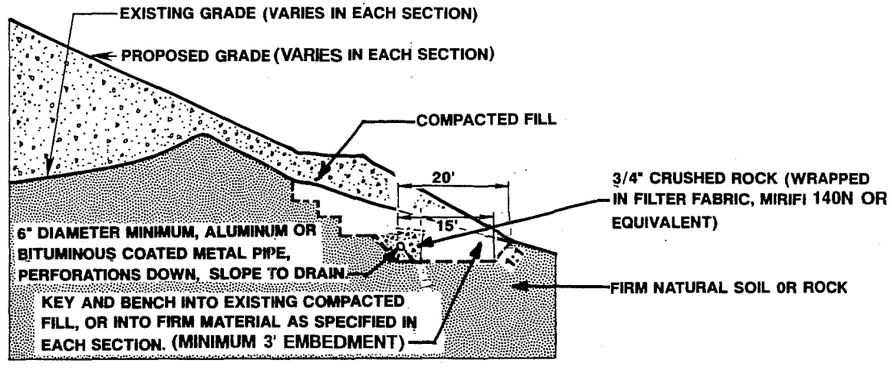


SECTION F - F



DETAIL 1 - BUTTRESS DETAIL

SCALE: 1" = 10'



DETAIL 2 - KEY DETAIL

SCALE: 1" = 10'

8B
FIGURE

PACIFICA QUARRY RECLAMATION

SECTIONS

LEGEND

SEE FIGURE 7 FOR LOCATION OF SECTIONS

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-3780

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MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 992-2500

8/96

5.300 DRAINAGE

5.310 Subdrains

Subdrains are required under areas of deep fill. Drain pipes are typically perforated to facilitate the collection of moisture and they are usually placed in drain rock and protected by filter fabric to prevent fine soil particles from clogging the drain rock and pipe. In the present case subdrains will be placed in the keyway that is parallel to the creek work area and extends from Pad B to Pad A as shown on Figure 9.

5.320 Slope Drainage

Rainfall on the quarry slopes will collect on the benches and be conveyed by concrete lined ditches to culvert inlets. Benches will be graded back toward the slope a minimum of five percent to minimize erosion resulting from drainage over the face of the slope. Inlets at the terminus of each bench will direct water into a culvert within the access road right-of-way. A concrete lined ditch at the bottom of the slope will receive runoff from the lower quarry slopes, drainage from the culvert described above and water from subdrains placed below the deep fill pad. The Final Drainage Plan (Storm Drainage Plan) is included as Figure 9. The Drainage Plan shows that special care is taken to grade away from the top of the quarry face. This will direct runoff to the access road and minimize concentration of runoff across the Main Face which could cause erosion. Care is also taken to grade away from Calera Creek so that the creek is protected against erosion and siltation. Drainage and Erosion Control Details are shown on Figure 11.

5.330 Sediment Control

All of the runoff from the quarry slopes will flow into sediment ponds to be constructed on Pad A and Pad B. Locations and sizes of the sediment ponds are shown on the Interim Erosion Control Plan, Figure 10. Runoff calculations are contained in Appendix C. When all of the erosion control and revegetation work is completed, the temporary sediment basins will be filled in. Runoff will then flow directly from the concrete lined ditches to the culvert to Calera Creek.

5.340 Calera Creek Outfall

Calera Creek is the major drainage course through the quarry property. Work to be done by the City will result in the creek being realigned to a location adjacent to the toe of the quarry slopes. Runoff from the quarry slopes will be collected and conveyed through culverts into the box culvert beneath the main access road.

5.350 Erosion Control

Erosion is substantially controlled by the combination of planned drainage and revegetation improvements. Construction of benches, vee ditches and culverts shown in the Final

PACIFICA QUARRY RECLAMATION

STORM DRAINAGE PLAN

LEGEND

MORI POINT RIDGE

OCEAN

PACIFIC

PAD A
EL. 85 (12.6 AC.)

PAD B
EL 75 2.3 AC.

EMERGENCY ACCESS

CITY OF PACIFICA - WASTEWATER TREATMENT PLANT SITE

STRUCTURE #12
GRATE 74.00
INV 66.50

STRUCTURE #5
GRATE 159.0
INV 154.0

STRUCTURE #6
GRATE 137.50
INV 132.50

STRUCTURE #14
GRATE 74.00
INV 69.0

STRUCTURE #11
GRATE 74.00
INV 63.78 THRU
INV 66.50

STRUCTURE #10
GRATE 61.80
INV 54.8

STRUCTURE #9
GRATE 57.50
INV 49.50

STRUCTURE #8
GRATE 79.58
INV 74.58

STRUCTURE #7
GRATE 90.98
INV 73.90

STRUCTURE #16
GRATE 87.00
INV 80.26

STRUCTURE #17
GRATE 88.50
INV 83.50

STRUCTURE #18
GRATE 45.00
INV 41.90

STRUCTURE #19
GRATE 45.00
INV 42.00

CONNECT TO BOX CULVERT
INV IN 37.0

CONNECT TO BOX CULVERT
INV IN 35.0

CONNECT TO BOX CULVERT
INV IN 25.90

10' BENCH

18' BENCH

EARTH SWALE

RIDGE LINE

MAINTENANCE ROAD

CREEK WORK AREA

GRADING BY CITY

CALERA CREEK

REINA DEL MAR

HIGHWAY 1

ROCKAWAY BEACH

KEYWAY FOR RECONSTRUCTED SLOPE BUTTRESS IF WARRANTED. SEE DETAIL 1 ON EXHIBIT 8B.

CLEANOUT (TYP.)

CLOSED DRAIN PIPE TO V-DITCH AT TOE OF SLOPE.

6" DIAMETER MINIMUM, ALUMINUM OR BITUMINOUS COATED METAL PIPE, PERFORATIONS DOWN, SLOPE TO DRAIN

KEYWAY IN COMPACTED FILL DOES NOT NEED DRAINAGE

EXISTING SUBDRAIN

EXISTING KEYWAY BUTTRESS

CLOSED DRAIN PIPE

CREEK WORK AREA

GRADING BY CITY

NOTE: EXISTING BUTTRESS KEYWAY INCLUDES A SUBDRAIN. IF ENCOUNTERED DURING NEW KEYWAY EXCAVATION, CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING INTEGRITY OF DRAIN.

BUTTRESS KEYWAY DRAINAGE FACILITIES

9
FIGURE

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (510) 837-8780

TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9040

0 100 200
MAP SCALE IN FEET

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 965-2906

JOB# 83107 9/95

Grading and Storm Drainage Plans will minimize the opportunity for runoff to be concentrated across bare ground. Revegetation with grassland and coastal shrub species will serve to bind the soil particles together and break up the erosive energy of raindrops. Before all of the drainage improvements have been constructed and revegetation has taken hold, there is a need to provide interim erosion protection. Interim erosion protection is accomplished by placing hay bales across drainage courses to slow the velocity of water and placement of silt fences following slope contours to slow sheet flow and prevent runoff concentration. Interim control to facilitate revegetation is accomplished by using mulch to hold in moisture for seed propagation. Mulch forms barriers to runoff movement, decreases raindrop impact on the ground surface and slows the velocity of runoff so that more moisture can infiltrate the soil. Interim erosion control measures are shown on Figure 10 and Details on Figure 11. Revegetation is described in Section 5.400.

5.360 Flood Protection

Runoff from the 100-year storm is expected to overtop the planned sediment basins. An emergency spillway has been designed for the sediment basins so that runoff from extreme storms can flow safely down the main access road to the realigned Calera Creek. Erosion potential will be minimized by compaction of the roadway and installation of an all-weather crushed rock roadway surface.

PACIFICA QUARRY RECLAMATION

INTERIM EROSION CONTROL PLAN

MORI POINT RIDGE

OCEAN

PACIFIC

PAD B
EL. 75 (2.3 AC.)

PAD A
EL. 85 (12.6 AC.)

EMERGENCY ACCESS

CITY OF PACIFICA - WASTEWATER TREATMENT PLANT SITE

SEDIMENTATION BASIN
PAD 'B'

EMERGENCY SPILLWAY
SEE NOTE #6

SEDIMENTATION BASIN
PAD 'A'

EMERGENCY SPILLWAY
SEE NOTE #6

MAINTENANCE ROAD

CREEK - WORK AREA

GRADING BY CITY

CALERA CREEK

REINA DEL MAR

CAMPILLO

HIGHWAY 1

ROCKAWAY BEACH

10' BENCH

FOR SILT FENCE LOCATION
SEE SILT FENCE LOCATION DETAIL

ENCIRCLE DITCH BASIN WITH HAYBALES PER DETAIL BELOW (TYPICAL)

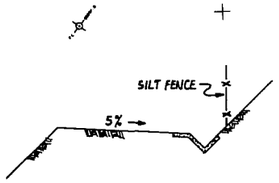
A A' B B' C D E

LEGEND

- LOCATION OF SECTIONS
- HAYBALES
- PRE-ASSEMBLED SILT FENCE
- PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED STORM DRAIN LINE
- INDICATES DIRECTION OF FLOW
- INDICATES EARTH SWALE/CONCRETE DITCH (EARTH SWALE DURING CONSTRUCTION, CONC DITCH AFTER GRADING WORK COMPLETE)

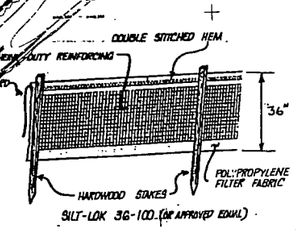
EROSION SEDIMENT CONTROL NOTES

1. TEMPORARY EROSION CONTROL DEVICES SHOWN ON THIS PLAN WHICH INTERFERE WITH THE WORK SHALL BE RELOCATED OR MODIFIED AS AND WHEN THE INSPECTOR SO DIRECTS.
2. EXCEPT AS OTHERWISE DIRECTED BY THE INSPECTOR, ALL DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FORECAST OF RAIN PROBABILITY EXCEEDS 40% AND MAINTAINED DURING THE RAINY SEASON (OCTOBER 1 TO APRIL 15).
3. HAY BALES SHALL BE STOCKPILED AT LOCATIONS SHOWN ON EROSION PLANS, READY TO BE PLACED IN POSITION WHEN RAIN FORECAST IS 40% OR WHEN DIRECTED BY THE INSPECTOR.
4. ALL CATCH BASINS MUST BE ENCIRCLED WITH HAY BALES AS SHOWN IN THE DETAIL.
5. ALL GRADED SLOPES SHALL BE HYDRO-MULCHED IN ACCORDANCE WITH THE LATEST QUARRY RECLAMATION PLAN.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION WILL BE MINIMIZED. STATE AND LOCAL LAWS CONCERNING POLLUTION ABATEMENT SHALL BE COMPLIED WITH.
7. WHEN TEMPORARY STRUCTURES HAVE SERVED THEIR INTENDED PURPOSE AND THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED, THE EMBANKMENT AND RESULTING SEDIMENT DEPOSITS SHALL BE LEVELED OR OTHERWISE DISPOSED OF IN ACCORDANCE WITH THIS EROSION AND SEDIMENT CONTROL PLAN.
8. EMERGENCY SPILLWAY SHALL BE A 6-INCH LAYER OF CRUSHED ROCK ON NATIVE MATERIAL MINIMUM RELATIVE COMPACTION SHALL BE 90%.
9. SEDIMENTATION BASINS SHALL BE CLEANED WHEN SEDIMENT ACCUMULATES TO RED PAINT LINE ON RISER.
10. CITY OF PACIFICA TYPE 'A' CONCRETE-LINED DITCH TO BE USED WHEN LONGITUDINAL SLOPE EXCEEDS 5%. CONCRETE DITCHES PER TYPICAL BENCH SECTION TO BE USED ON BENCHES. EARTH DITCHES TO BE USED ON PADS WHEN SLOPE IS LESS THAN 5%.

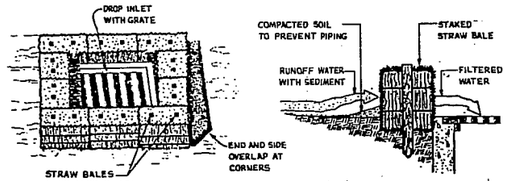


SILT FENCE BENCH LOCATION DETAIL
N.T.S.

NOTE: ELEVATIONS, GRADES, AND IMPROVEMENTS SHOWN ON THIS PLAN ARE FOR GENERAL INFORMATION ONLY. CONTRACTOR SHALL REFER TO OTHER DRAWINGS FOR ALL WORK OTHER THAN EROSION CONTROL DEVICES.



PRE-ASSEMBLED SILT FENCE
N.T.S.



CATCH BASIN W/STRAW BALES
N.T.S.

10
FIGURE

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (510) 837-8780

TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9040

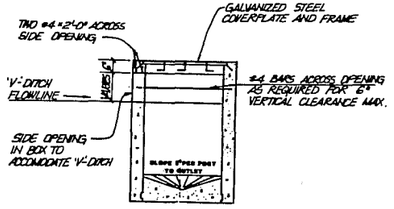
MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1190 EL CAMINO REAL, COLMA CA 94014 PHONE: (415) 992-2500

0 100 200
MAP SCALE IN FEET

JOB# 83107 8/96

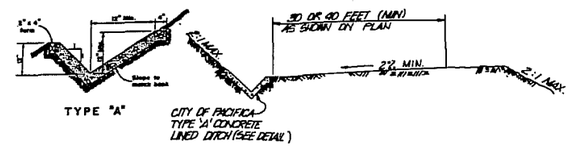
GENERAL NOTES

1. BENCHMARK: SAN MATEO COUNTY BENCHMARK X-124, DISK AT CATCH BASIN, ELEVATION: 60.362; SAN MATEO COUNTY BENCHMARK X-125, DISK IN ISLAND AT REINA DEL AVENUE, ELEVATION: 78.733
2. EXISTING CONTOURS BASED ON AERIAL SURVEY FLOWN BY CARTWRIGHT AERIAL SURVEY, INC. ON DECEMBER 7, 1987.
3. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF PACIFICA GRADING ORDINANCE AND THE SOIL REPORT PREPARED BY TREADWELL AND ASSOCIATES, INC. GEOTECHNICAL ENGINEERING.
4. ROUND CUT AND FILL SLOPES INTO EXISTING CONTOURS TO ACHIEVE A NATURAL EFFECT.
5. ALL GRADING, SITE PREPARATION, AND COMPACTION OF FILL TO BE DONE IN ACCORDANCE WITH CITY OF PACIFICA GRADING ORDINANCE.
6. CONCRETE DITCHES TO BE INSTALLED IN PHASES AFTER THE GRADING HAS BEEN COMPLETED FOR EACH PARTICULAR PHASE.

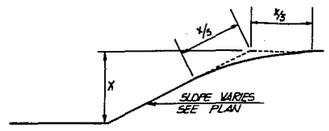


TYPICAL INLET DETAIL
N.T.S.

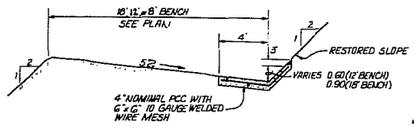
NOTES:
1) PROVIDE SIDE OPENING ON TWO SIDES OF BOX WHEN REQUIRED.
2) BOXES TO HAVE HEAVY DUTY TRAFFIC GRATES.
3) BOX TO BE CHRISTY U-23 OR APPROVED EQUAL.



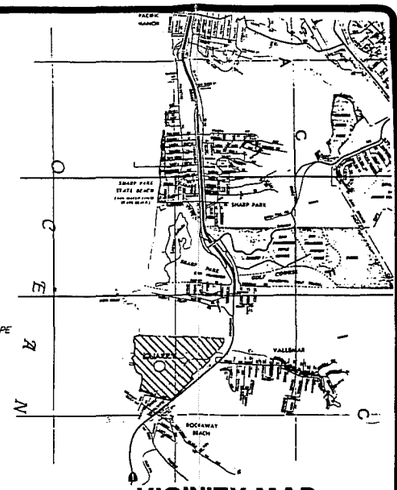
TYPICAL ROAD SECTION
N.T.S.



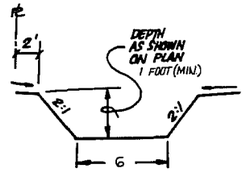
SLOPE ROUNDING DETAIL
NO SCALE



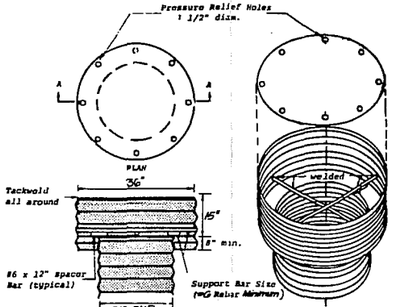
TYPICAL BENCH
NO SCALE



VICINITY MAP
N.T.S.



OVERFLOW DITCH TYPICAL SECTION
N.T.S.



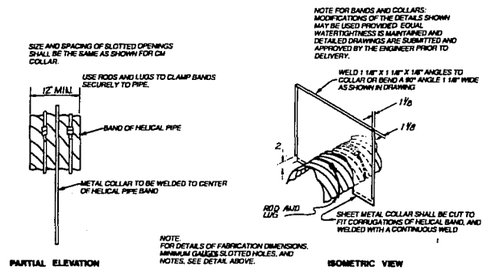
CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE
N.T.S.

1. TOP IS 14 GAUGE CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN CORRUGATED TOP IS WELDED TO CYLINDER.
2. CYLINDER IS 16 GAUGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.
3. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.
4. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO THE TOP OF THE RISER.

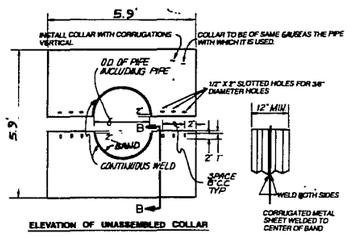
SEDIMENTATION NOTES

1. THE EMBANKMENT AND EMERGENCY SPILLWAY SHALL BE STABILIZED WITH VEGETATION IMMEDIATELY FOLLOWING CONSTRUCTION.
2. THE PRINCIPAL SPILLWAY RISER SHALL BE SECURELY ATTACHED TO THE DISCHARGE PIPE BY WELDING ALL AROUND AND ALL CONNECTIONS SHALL BE WATERTIGHT. THE PIPE AND RISER SHALL BE PLACED ON A FIRM, SMOOTH SOIL FOUNDATION. THE CONNECTION BETWEEN THE RISER AND THE RISER BASE SHALL BE WATERTIGHT. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL, OR CRUSHED STONE SHALL NOT BE USED AS BACKFILL AROUND THE PIPE OR ANTI-SEEP COLLARS. THE FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE PLACED IN 4-INCH LAYERS AND COMPACTED UNDER THE SHOULDERS AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. A MINIMUM OF 2 FEET OF HAND-COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. STEEL BASE PLATES SHALL HAVE AT LEAST 2½ FEET OF COMPACTED EARTH, STONE OR GRAVEL PLACED OVER THEM TO PREVENT FLOTATION.
3. STATE AND LOCAL REQUIREMENTS SHALL BE MET CONCERNING FENCING AND SIGNS WARNING THE PUBLIC OF HAZARDS OF SOFT SEDIMENT AND FLOODWATER.
4. SEDIMENT BASINS SHALL BE CLEANED OUT WHEN THE STORAGE VOLUME IS FULL. UNEXPECTED HIGH-INTENSITY STORMS CAN GENERATE HIGHER QUANTITIES OF SEDIMENT THAN PREDICTED BY THE UNIVERSAL SOIL LOSS EQUATION. THEREFORE, SEDIMENT BASINS SHALL BE INSPECTED FOR CLEANOUT AFTER EVERY MAJOR STORM.

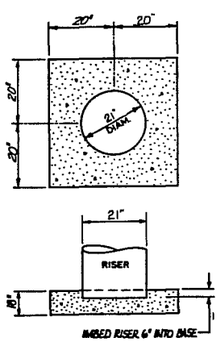
   THIS CLEANOUT SHALL RESTORE THE SEDIMENT BASIN TO ITS ORIGINAL DESIGN VOLUME. THE ELEVATION CORRESPONDING TO THE MAXIMUM ALLOWABLE SEDIMENT LEVEL SHALL BE DETERMINED, SHALL BE STATED IN THE DESIGN DATA AS A DISTANCE BELOW THE TOP OF RISER, AND SHALL BE CLEARLY MARKED ON THE RISER. IN NO CASE SHALL THIS SEDIMENT LEVEL BE LESS THAN 2 FEET BELOW THE TOP OF THE RISER.
5. MAINTENANCE AND REPAIRS SHALL BE CARRIED OUT AS FOLLOWS:
   (A) ALL DAMAGES CAUSED BY SOIL EROSION OR CONSTRUCTION EQUIPMENT SHALL BE REPAIRED BEFORE THE END OF EACH WORKING DAY.
   (B) SEDIMENT SHALL BE REMOVED FROM THE BASIN WHEN IT REACHES THE SPECIFIED DISTANCE BELOW THE TOP OF THE RISER. THIS SEDIMENT SHALL BE PLACED IN SUCH A MANNER THAT IT WILL NOT ERODE FROM THE SITE. THE SEDIMENT SHALL NOT BE DEPOSITED DOWNSTREAM FROM THE EMBANKMENT OR IN CALERA CREEK.



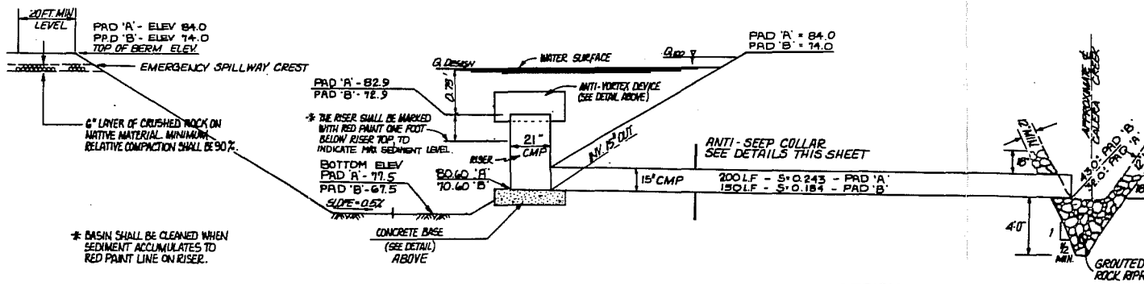
DETAILS OF HELICAL PIPE ANTI-SEEP COLLAR
NTS



DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR
N.T.S.



CONCRETE BASE DETAIL
N.T.S.



PIPE SPILLWAY DESIGN
N.T.S.

LIMITS OF RIP-RAP SHALL EXTEND 3 FEET UPSTREAM AND DOWNSTREAM FROM CENTERLINE OF OUTFALL

PACIFICA QUARRY RECLAMATION

NOTES & DETAILS

11

APPROVED RECLAMATION PLAN AND QUARRY USE PERMIT (CUP 706-92). APPROVED NOVEMBER 2, 1992.

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SCALE AS SHOWN

MARTIN · CARPENTER · ASSOCIATES
CITY AND REGIONAL PLANNERS
1640 LAUREL STREET, SAN CARLOS, CA 94070 (415) 595-1981

JOB # 83107 8/96

5.400 REVEGETATION

Plans for revegetation were worked out in consultation with Ralph Osterling Consultants, revegetation specialists. Principals of the firm are state licensed foresters. The firm specializes in revegetation of difficult sites and has experience with successful revegetation of numerous quarry properties and geothermal properties in the San Francisco Bay Area.

5.410 Present Soil Condition

Successful revegetation of the quarry site will require soil amendments to boost soil fertility. For the most part the former quarried slopes will have minimal soil cover. The ability to retain moisture will be minimal and there will be a lack of nutrients.

Two samples were taken of surface soil materials: one from the area of predominant limestone and one from the area of predominant greenstone. Laboratory test results are reported in Appendix D. Recommended soil amendments have been prepared by Ralph Osterling Consultants, revegetation specialists.

5.420 Existing Vegetation

Hillsides abutting the quarry are generally classified as grassland with some clusters of coastal scrub vegetation. Most of the existing cover has been heavily colonized by exotic species and includes soft brome (Bromus mollis), wild oat (Avena barbata), sweet clover (Melilotus), curly dock (Rumex crispus), coastal buckwheat (Erigonium latifolium), California poppy (Eschscholtzia californica), bush lupin (Lupines arboreus) and various thistles. Coastal scrub species include coyote bush (Baccharis pulularis) and sagebrush (Artemesia californica).

5.430 Revegetation Procedure

Revegetation will be done in two stages. Initial treatment will consist of hydraulic mulching between October 15 and November 15 with wood fiber mulch, and seed. Seed mixtures are varied according to slope condition. Wildflower seeds are included for color.

The second planting stage will follow between December 15 and February 15 with hand planting of seedling sized coyote bush, sagebrush and lupin in clusters.

5.440 Seeding Specifications

Seeding locations are shown on the Revegetation Plan, Figure 12. Specifications are given below. All materials are to be applied by commercial hydromulch equipment. Wood fiber mulch shall cover at least 50 percent of the ground surface.

A. In "A" Areas (Slopes)

- 16-20-0 Fertilizer: 400 pounds per acre
- Blando Brome: 20 pounds per acre
- Wimmera #62 Rye Grass: 10 pounds per acre
- Lana Vetch: 15 pounds per acre
- Crimson Clover: 5 pounds per acre
- Wildflower Mix 1 pounds per acre
- Wood Fiber Mulch 2500 pounds per acre
- Tackifier: 70 pounds per acre

B. In "B" Areas (Flat Ground)

- 16-20-0 Fertilizer: 400 pounds per acre
- Blando Brome: 25 pounds per acre
- Lana Vetch: 15 pounds per acre
- Wood Fiber Mulch 2500 pounds per acre
- Tackifier: 70 pounds per acre

C. In "C" Areas (Slopes With Elevations Below 85)

- Bromus carinatus 10 pounds per acre
- Elymus glaucus "Anderson" 4 pounds per acre
- Eschscholzia californica 2 pounds per acre
- Hordeum californicum 8 pounds per acre
- Layia platyglossa 1 pound per acre
- Lupinus succulentus 4 pounds per acre
- Nasella pulchra 6 pounds per acre
- Vulpia machrostachya 6 pounds per acre
- Wood Fiber Mulch 2000 pounds per acre
- Tackifier 100-200 pounds per acre

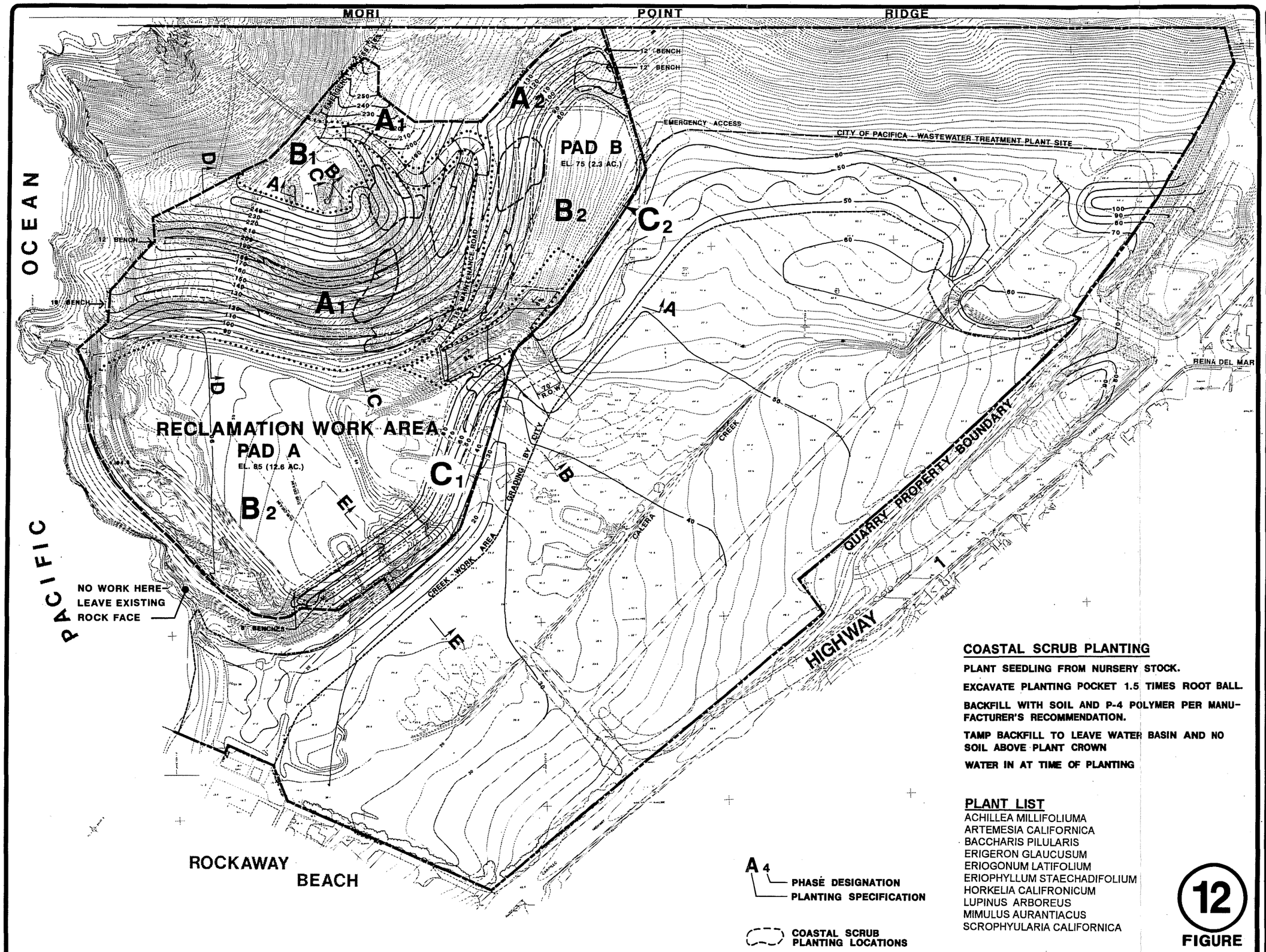
5.450 Hand Planting Specifications

Coastal scrub seedlings, available from nursery stock, will be planted in random shaped clusters of 40 plants each with plants spaced approximately eight feet apart. Planting holes will be formed approximately 1-1/2 times the size of the root ball of the plant seedling and then backfilled. Backfill will consists of site soil mixed with P-4 Polymer in accordance with manufacturer's recommendations. The backfill will be tamped around the plant so that the crown of plant is at the ground surface and a shallow water basin created around each plant.

Achillea millifoliuma
Artemesia californica
Baccharis pilularis
Erigeron glaucusum
Eriogonum latifolium
Eriophyllum staechadifolium
Horkelia californicum
Lupinus arboreus
Mimulus aurantiacus
Scrophyularia californica

PACIFICA QUARRY RECLAMATION

REVEGETATION



A 4 — PHASE DESIGNATION / PLANTING SPECIFICATION

COASTAL SCRUB PLANTING LOCATIONS

COASTAL SCRUB PLANTING

PLANT SEEDLING FROM NURSERY STOCK.

EXCAVATE PLANTING POCKET 1.5 TIMES ROOT BALL.

BACKFILL WITH SOIL AND P-4 POLYMER PER MANUFACTURER'S RECOMMENDATION.

TAMP BACKFILL TO LEAVE WATER BASIN AND NO SOIL ABOVE PLANT CROWN

WATER IN AT TIME OF PLANTING

PLANT LIST

ACHILLEA MILLIFOLIUMA
ARTEMESIA CALIFORNICA
BACCHARIS PILULARIS
ERIGERON GLAUCUSUM
ERIOGONUM LATIFOLIUM
ERIOPHYLLUM STAECHADIFOLIUM
HORKELIA CALIFRONICUM
LUPINUS ARBOREUS
MIMULUS AURANTIACUS
SCROPHYULARIA CALIFORNICA

FIGURE 12

PLANTING SPECIFICATIONS
COMMERCIAL HYDROMULCH

A AREA (SLOPES)
- 16-20-0 FERTILIZER 400 LBS./ACRE
- BLANDO BROME 20 LBS./ACRE
- WIMMERA # 62 RYE GRASS 10 LBS./ACRE
- LANA VETCH 15 LBS./ACRE
- CRIMSON CLOVER 5 LBS./ACRE
- WILDFLOWER MIX 1 LBS./ACRE
- WOOD FIBER MULCH 2500 LBS./ACRE
- TACKIFIER 70 LBS./ACRE

B AREA (FLAT GROUND)
- 16-20-0 FERTILIZER 400 LBS./ACRE
- BLANDO BROME 25 LBS./ACRE
- LANA VETCH 15 LBS./ACRE
- WOOD FIBER MULCH 2500 LBS./ACRE
- TACKIFIER 70 LBS./ACRE

C AREA (SLOPES W/ ELEV. BELOW 85)
- BROMUS CARINATUS 10 LBS./ACRE
- ELYMUS GLAUCUS "ANDERSON" 4 LBS./ACRE
- ESCHSCHOLZIA CALIFORNICA 2 LBS./ACRE
- HORDEUM CALIFORNICUM 8 LBS./ACRE
- LAYIA PLATYGLOSSA 1 LBS./ACRE
- LUPINUS SUCCULENTUS 4 LBS./ACRE
- NASSELLA PULCHRA 6 LBS./ACRE
- VULPIA MACROSTACHYA 6 LBS./ACRE
- WOOD FIBER MULCH 2000 LBS./ACRE
- TACKIFIER 100-120 LBS./ACRE

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0 100 200
MAP SCALE IN FEET

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
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5.460 Revegetation Maintenance

Plant vitality will be monitored for a three year period following planting. Slopes will be reseeded as necessary. Dead plants will be replaced. Hydroseed areas will be maintained to achieve 50 percent cover on A areas and 75 percent cover on B. Hand planted areas will be maintained to achieve 65 percent survival rate. Weeds will be removed from woody plant clusters by hand or with a weed cutting machine.

5.470 Access Control

Fencing exists around the perimeter of the quarry property and will be retained to limit public access.

5.480 Dust Control

A water truck will be brought in during grading operations to spray the quarry floor and work areas to minimize dust. Final revegetation, following grading will provide long term dust control.

5.500 Related Topics

Reclamation work will result in visual and physical improvements to the property. All of the work is aimed at making the site safe, stable and readily adaptable to alternate land uses.

Grading activities will result in noise from construction equipment and the possibility that dust will be generated. The sale of stockpiled rip rap boulders will result in truck traffic on Highway One. Topographical changes will result in minor localized alterations of wind patterns. These potential impact topics are described below.

5.510 Construction Noise Mitigation

Reclamation activities, on-site, may involve bulldozers, scrapers, compactors motor graders, front end loaders, earth haulers and employee vehicles. If blasting is required it will involve a rock drill to prepare the matrix of holes for sequential blasting. The following schedule describes the noise levels associated with the types of equipment identified above. The figures in the table represent the noise generated while the equipment is working; the noise levels generated while equipment idling are 20 to 30 decibels less.

SOURCE	SOUND LEVEL (dBA) MEASURED 50' FROM SOURCE
Bulldozer	85-92
Scraper	83-88
Compactor	83-86
Motor Grader	80-83
Loader	83-86
Earth Hauler	83-88
Rock Drill	88-90
Crusher/Screen	83-89
Haul Trucks	70-80

Noise from construction equipment is mitigated in several ways:

Operation Schedule: All work will limited to week days (M-F) between the hours of 7:00 A.M. and 5:00 P.M.

Distance: Noise levels are reduced by approximately 3 decibels for each doubling of distance between the noise source and the receptor. Work on the Main Face is approximately 1200 feet from the property line on the Rockaway Beach side, and approximately 1800 feet from the property line on the Highway One side. At these distances the noise levels from construction equipment will be reduced by 12 to 15 dBA at the property line.

Intervening Topography: There is an existing berm along Highway One. Haul trucks leaving the quarry would be shielded by the highway berm until they enter the traffic stream on Highway One at the signalized Reina del Mar intersection. The barrier effect of these intervening berms will reduce noise impact by up to 10 decibels.

Background Noise: The quarry property is bracketed between Highway One on the east and the Pacific Ocean on the west. Traffic noise on Highway One is estimated at approximately 70 dBA measured 50 feet from the roadway. This figure is typical of major urban roadways. Haul trucks and other equipment noise will be masked by the existing highway noise environment. Noise from Pacific Ocean wave crashed will tend to mask equipment noise in the vicinity of Rockaway Beach.

5.520 Construction Dust Mitigation

Dust can be generated by the dynamic force of vehicle tries or tracks over bare ground and during the transfer of soil and rock materials from loaders to trucks. Dust can be an inconvenience to construction workers on-site and it can settle on plants. If there is substantial wind the dust can be carried off-site. Small particles have the potential to be inhaled while larger particles have the potential to settle on plants, cars and buildings. A

wind study was done as part of the quarry EIR in 1973 which included setting up a wind measuring device. Results of that study by James A. Roberts Associates, Inc. concluded that the ultimate destination of most of the dust generated by quarry activities is in the immediate vicinity of the work area.

Construction dust is mitigated in several ways:

Distance: The reclamation work area is approximately 1200 feet from the property boundary on the south and 1800 feet from the property boundary on the east.

Water Truck: A water truck will be used during all grading operations to spray the ground and maintain a moist work surface. The water truck will treat areas where rock is being excavated, areas where it is being compacted and the access roads in between. A well exists in the area just north of the former quarry scale office. This is the intended water source.

5.530 Truck Traffic Mitigation

Haul trucks will be utilized to transport rip-rap that will be sold while reclamation is underway. Approximately 20,000 cubic yards are stockpiled. Large, double trucks with a 25-ton capacity are the most practical size for this purpose. For estimate purposes the weight of rock is calculated at 1.5 tons per cubic yard. Consequently the transport of rip-rap will result in 1,200 loaded trucks leaving the quarry and 1,200 empty trucks returning. At an average rate of four trucks per hour over an eight hour day the hauling process would take about 1-1/2 months to complete.

Truck traffic impacts are mitigated in several ways:

Operation Schedule: Truck travel will be limited to week days (M-F) between the hours of 7:00 A.M. and 5:00 P.M.

Highway Access: Haul trucks need not utilize any local streets to conduct hauling from the quarry site. The haul route allows direct access to Highway One through the signalized intersection at Reina del Mar Avenue.

5.540 Wind Pattern Mitigation

Reclamation work will result in regrading the existing, oversteepened quarry slopes to achieve a more gentle final configuration. The westerly bluff along the ocean will be lowered and the former quarry Pit filled. These modifications will alter localized wind patterns on the quarry property but will not have a discernible effect off-site.

A wind study was performed by James A. Roberts Associates, Inc. in 1973 as part of the quarry EIR. The Roberts study concluded that grading at the quarry face does not appear to affect wind patterns beyond the immediate vicinity of the cut. A second evaluation of wind

effects was prepared by Donald Ballanti, Certified Consultant Meteorologist, in conjunction with the 1983 Reclamation Plan for the quarry, which is essentially the same as the current plan. Ballanti concluded that the topographic modifications would have minor effects on wind patterns and that the effects would be restricted to within the quarry property due to the distance from the work area to the quarry property boundary.

5.550 Spill Prevention

Mechanical equipment to be used during reclamation will be fueled and oiled by a mobile service truck. These operations will be conducted on level ground in the Quarry Pit. The service truck is operated by experienced personnel. Fire extinguishers, absorbent rags and disposal drums are carried on the truck. Mechanical equipment will be stored in the Quarry Pit when not in use.

6.000 RECLAMATION COST ESTIMATE

WORK DESCRIPTION	EQUIPMENT (E)							LABOR (L)					MATERIALS (M)															INDIRECT COSTS					
	BULLDOZER	SCRAPER	GRADER	WATER TR.	SHEEPS FT.	BACKHOE	EQPT.	SUPERVISOR	OPERATOR	LABORER	ENGR.	LABOR	PLANTS	SEED	SILT FENCE	SUBDRAIN	15" CMP	12" RCP	15" RCP	18" RCP	24"RCP	INLETS	OUTLETS	SWALES	DITCHES	STRAW	FENCING	MATERIALS	CONTINGENCY	SUPERVISON	MOBILIZE	PROFIT & OH	INDIRECT	TOTAL
	$60/HR	$82/HR	$30/HR	$13/HR	$140/HR	$25/HR	SUBTOTAL	$30/HR.	$25/HR	$28/HR	$34/HR	SUBTOTAL	$10/EA	$2,000/AC	$1/FT	$20/FT	$30/FT	$30/FT	$37/FT	$45/FT	$60	$1,500/EA	$1,000/EA	$0	$20/FT	$35/UNIT	$5/FT	SUBTOTAL	7% (E + L + M)	5% (L)	5% (E + L)	9.5% (E + L + M)	COSTS	COST
PHASE I																																		
GRADING 541,400 C.Y.	2 X 262	3 X 210	1 X 26	1 X 210	1 X 26		77,850	1 X 210	1 X 1,206	1 X 210	2 X 26	41,524																	8,342	2,076	5,959	11,322	27,899	146,873
SUBDRAIN & CLEAN OUTS						1 X 9	225	1 X 7	1 X 9	2 X 9		624				890												17,800	1,305	31	43	1,772	3,151	21,800
DITCHES (SWALE & PAVED)						1 X 54	1,350	1 X 43	1 X 54	2 X 54		2,694												1,470	3,960			79,200	5,827	135	202	7,908	14,072	97,316
CULVERT						1 X 6	150	1 X 5	1 X 6	2 X 5		426					190	360										16,500	1,197	21	29	1,622	2,867	19,943
DRAINAGE STRUCTURES								1 X 4		2 X 5		220										4	1					7,000	505	11	11	686	1,213	8,433
SEDIMENT CONTROL								1 X 20		1 X 39		955			3,830											4		3,970	345	48	48	468	909	5,834
REVEGETATION								1 X 25		1 X 50		1,250	200	14														31,500	2,314	62	62	3,140	5,578	38,828
SUBTOTAL																																		338,827
PHASE II																																		
GRADING 265,800 C.Y.	2 X 128	2 X 102	1 X 13	1 X 102	1 X 13		37,868	1 X 128	1 X 716	1 X 102	2 X 12	24,292																	4,351	1,215	3,108	5,905	14,579	76,739
SUBDRAIN & CLEAN OUTS						1 X 7	175	1 X 6	1 X 7	2 X 7		502				730												14,600	1,069	25	34	1,451	2,579	17,856
DITCHES (SWALE & PAVED)						1 X 49	1,225	1 X 39	1 X 49	2 X 49		2,450												2,860	2,060			41,200	3,141	123	184	4,263	7,710	52,585
CULVERT						1 X 30	750	1 X 24	1 X 30	2 X 30		2,100					150	1,380	575	300	555							113,975	8,178	105	143	11,098	19,524	138,349
DRAINAGE STRUCTURES								1 X 14		2 X 17		760										15	2					24,500	1,768	38	38	2,400	4,244	29,504
SEDIMENT CONTROL								1 X 11		1 X 25		580			2,140											15		2,665	227	29	29	308	593	3,838
REVEGETATION								1 X 20		1 X 40		1,000	160	18.4														41,280	2,960	50	50	4,017	7,077	49,357
SUBTOTAL																																		366,228
MAINTENANCE																																		
WEED CONTROL (4 YRS.)								1 X 12		1 X 24		600												42	30	30	57	159	759					
SECURITY FENCING (4 YRS.)								1 X 4		2 X 8		280												20	14	14	27	75	355					
SUBTOTAL																																		1,114
GRAND TOTAL																																		706,169

APPENDICES

APPENDIX A

PROPERTY LEGAL DESCRIPTION

Form No. 1056-4
All Policy Forms

SCHEDULE C

The land referred to in this policy is situated in the State of California
County of San Mateo, City of Pacifica and is described as follows:

A tract of land located within the Rancho San Pedro Land Grant lying Easterly of the Ordinary High Tide Line of the Pacific Ocean under natural conditions, and being more particularly described as follows:

BEGINNING at a point which is common to the Ordinary High Tide Line of the Pacific Ocean under natural conditions, and the Northwest corner of Parcel No. 2 of that certain tract of land described in the Deed from the Ideal Cement Company to the Ocean Shore Sanitary District, dated April 2, 1954 and recorded in Book 2611 of Official Records at page 68, said point also being the Southwest corner of the tract of land being herewith described; thence from said point of beginning South 64° 07' 59" East along the North line of said Ocean Shore Sanitary District tract, 218.81 feet to the most Westerly corner of that tract deeded by Ideal Cement Company to the City of Pacifica by Quitclaim Deed dated March 16, 1967; thence along the Westerly, Northerly and Northeasterly boundaries of said quitclaimed tract the following bearings and distances: North 25° 52' 01" East 25.00 feet, South 64° 07' 59" East 135.20 feet, South 19° 07' 59" East 106.07 feet to the Southeasterly corner of said quitclaimed tract; thence South 64° 07' 59" East 606.92 feet to the Westerly right of way line of State Highway No. 1; thence running Northeasterly along said right of way line North 52° 24' 17" East 1184.09 feet to a point which is the Southeast corner of the tract of land granted by Ideal Cement Company to the State of California by Deed dated October 7, 1963, recorded in Book 4603 of Official Records at page 469, Records of San Mateo County, California; thence North 35° 58' 57" West 114.65 feet; thence Northeasterly along a curve to the left with a radius of 5975 feet through an angle of 5° 20' 04" an arc distance of 556.29 feet; thence North 48° 40' 59" East 271.83 feet; thence along a tangent curve to the left with a radius of 1975 feet through an angle of 5° 03' 48" an arc distance of 174.53 feet; thence North 43° 37' 11" East 45.31 feet; thence North 62° 21' 43" West 23.36 feet; thence North 38° 35' 50" East 397.94 feet; thence North 31° 07' 49" East 410.27 feet; thence North 10° 55' 07" West 101.40 feet; thence North 88° 01' 51" West 3022 feet, more or less, to the Ordinary High Tide Line of the Pacific Ocean, under natural conditions; thence Southerly along said Ordinary High Tide Line to the point of beginning.

APPENDIX B

COMMUNITY DEVELOPMENT & SERVICES DEPARTMENT
DEVELOPMENT PERMIT APPLICATION
(Please type or print clearly)

I. TYPE OF APPLICATION AND FILE NUMBER

Permit for Site Development	PSD#_____	Heritage Tree Permit	HTP#_____
Use Permit	UP# _____	Development Plan	DP# _____
General Plan Amendment	GPA#_____	Specific Plan	SP# _____
Coastal Development Permit	CDP#_____	Tentative Subdivision Map	SUB#_____
Sign Permit	S# _____	Variance	PV# _____
Sign Exception	SE# _____	Minor Modification	MM# _____
Historic Landmark Preservation	HLD#_____	Mod.to Subdivision Regs.	MOD#_____
Historic Preservation Permit	HP# _____	Transfer of Dev. Rights	TDR#_____
Zoning Text Amendment	TA# _____	Parking Exception	PE# _____
Rezoning	RZ# _____	Stream Development Permit	SDP#_____
		Other: Quarry Reclamation Plan	QUP X

II. APPLICANT INFORMATION

X A. Applicant	X Owner	X Agent
Name W.F. Bottoms, Trustee	Name Same as Applicant	Name Malcolm C. Carpenter
Address 61 Laurel Lane	Address _____	Address 1190 El Camino Real
City El Sobrante	City _____	City Colma
State/Zip CA 94803	State/Zip _____	State/Zip CA 94014
Phone # (510) 222-0886	Phone # _____	Phone # (415) 985-2590
home ~~business~~	home business	~~home~~ business

X B. Authorization for Agent

I hereby authorize M.C. Carpenter to act as my Agent and to bind me in all matters concerning this development permit application. _____ 2/6/96
Applicant's Signature Date

X III. PROJECT INFORMATION

Project Street Address Pacifica Quarry Assessor's Parcel Number 018-150-050 & 070
Project Description Request for approval of a revised Reclamation Plan to co-ordinate with City of Pacifica Wastewater Treatment Plant and Calera Creek improvements.

X Total Lot Area	117 Acres ~~sq.ft.~~	Height	_____ft.
Building Coverage	_____sq.ft.	Gross Living Area(residential)	_____sq.ft.
Paved Area Coverage	_____sq.ft.	Gross Floor Area(commercial)	_____sq.ft.
Landscaped Area	_____sq.ft.	Parking	_____total

Usable Open Space (not exceeding 10% slope) _____sq.ft.

IV. INFORMATION REQUIRED FOR COMPLETE APPLICATION

In order to have a complete application, you must submit the following application materials where indicated by a checkmark.

Required	Date Received	
X	_____	The filing fee. $1500.00 Deposit
X	_____	Environmental Information Form (copy attached).
X	_____	Evidence of legal interest on the part of the applicant in the property proposed to be developed (Deed, Title, Lease, Escrow Instructions, or Tax Statement).
X	_____	A legal description of the property to be developed.
X	_____	14 copies of the site plan showing: (a) Exterior boundaries of the subject property and property dimensions. (b) Existing topography and proposed grading. (c) Location and dimensions of existing and proposed structures, including location of nearest adjacent buildings. (d) Location, design, dimensions of proposed parking and loading facilities. (e) Location, height, design and type of fencing. (f) Dimensions of setbacks and building separations. (g) Location & dimensions of existing & proposed street improvements, including, but not limited to, gutters, curbs, sidewalks, street centerlines, alleys & easements.
X	_____	14 copies of floor plans, elevations (front, rear and all sides), grading plans, sectional plans and preliminary landscape plan.
_____	_____	Street elevation(s) showing height and massing of project and adjacent buildings.

FOR STAFF USE ONLY:

Date Submitted:	_____	Date complete:	_____	CEQA Status:	_____
Fee Deposit:	_____	General Plan:	_____	Coastal Zone Status:	_____
Receipt No:	_____	Zoning:	_____	Permit Allocation Status:	_____

Required	Date Received	
X	_____	One 8-1/2" x 11" transparency or reduction of all plans or maps.
X	_____	Photographs of the property.
X	_____	Address labels and property owner information for all property owners within 300 feet of the subject property boundary lines (see attachment).
X	_____	Stamps for all address labels.
_____	_____	For SIGN PERMIT(S), design, including materials, colors, shape, location, size, area, copy, and illumination of all proposed and/or existing signs; street frontage of lot and building.
_____	_____	For DEVELOPMENT PERMIT (DP) APPLICATIONS, the additional material required by Pacifica Municipal Code Section 9-4.2205 (copy attached).
_____	_____	For SPECIFIC PLAN (SP) APPLICATIONS, the additional material required by Pacifica Municpal Code Section 9-4.2208 (copy attached).
_____	_____	For TENTATIVE SUBDIVISIONS (SUB) or PARCEL MAP AND SUBDIVISION MODIFICATION (MOD) APPLICATIONS, the additional material required by Pacifica Municipal Code Sections 10-1.401 through 10-1.405 (copy attached). 21 copies of the tentative or parcel map are required.
_____	_____	For COASTAL DEVELOPMENT PERMITS (CDP): (A) a typed list and address labels of residents within 100 feet of the boundary lines of the property proposed to be developed; (B) a written statement showing whether the project is (1) consistent with the policies of the Coastal Land Use Plan, and (2) involves no significant adverse environmental, effects or manner in which any anticipated effects will be mitigated.
_____	_____	For VARIANCES (PV) and MINOR MODIFICATIONS (MM), a written statement, plans and evidence showing that the special circumstances and criteria of Pacifica Municpal Code Section 9-4.3404 are met (copy attached).
_____	_____	For HERITAGE TREE PERMITS (HTP), the additional material required by Pacifica Municipal Code Section 9-4.1201 (copy attached).
_____	_____	For HISTORIC LANDMARK DESIGNATIONS (HLD) and HISTORIC PRESERVATION PERMITS (HPP), the additional material required by Pacifica Municipal Code, Chapter 7 (copy attached).
_____	_____	For TRANSFER OF DEVELOPMENT RIGHTS (TDR), the additional material required by Pacifica Municipal Code Section 9-4.4207 (copy attached).
_____	_____	For STREAMSIDE DEVELOPMENT PERMIT (SDP). The additional material required by Pacifica Municipal Code.

V. ADDITIONAL INFORMATION REQUIRED FOR FINAL ACTION ON APPLICATION

In order to complete final action on this application, the City of Pacifica may require you to submit other drawings, plans, reports or information which are necessary to clarify, amplify, correct or supplement the information required for your application, or which are necessary for the Planning Administrator, Planning Commission or City Council to make a final determination on your project. This will include information and documents necessary for completion of a negative declaration or environmental impact report, unless your project is exempt from CEQA. This may also include, but not be limited to, soils and geotechnical reports, renderings, perspectives, landscaping plans and arborist reports. Other information which will be required: * Three copies of Geotechnical Report

VI. ACKNOWLEDGEMENT

* I, _____, (applicant ~~or agent~~) hereby declare under penalty of perjury that the foregoing is, to the best ~~of my~~ knowledge, true and correct and I understand that failure to provide complete, truthful and accurate information necessary to process the permit application, or to provide public notice as required, may result in delay in processing the application or may consititue grounds for denial or revocation of the permit requested herein.

* DATE: February 5, 1996

* M J Bettencourt
Signature: Applicant/~~Agent~~

ENVIRONMENTAL INFORMATION FORM
(To Be Completed By Applicant)

Date Filed _____

General Information

1. Name and address of developer or project sponsor: W.F. Bottoms, Trustee
   Bottoms Family 1989 Trust, 61 Laurel Lane, El Sobrante, CA 94803

2. Address of project: Pacifica Quarry - Highway 1 at Reina del Mar Avenue
   Assessor's Block and Lot Number: APN 018-150-050 & 070

3. Name, address, and telephone number of person to be contacted concerning this project:
   W.F. Bottoms, 61 Laurel Lane, El Sobrante, CA 94803, (510) 222-0886, **OR**
   M.C. Carpenter, 1190 El Camino Real, Colma, CA 94014, (415) 985-2590

4. Indicate number of the permit application for the project to which this form pertains:

5. List and describe any other related permits and other public approvals required for this project, including those required by city, regional, state and federal agencies:
   Coastal Permit

6. Existing zoning district: Commercial with HPD Overlay (C-3/HPD)

7. Proposed use of site (Project for which this form is filed):
   Quarry reclamation

Project Description **SEE QUARRY RECLAMATION PLAN**

8. Site size. !17 Acres Total; 34 Acres subject to reclamation

9. Square footage. N/A

10. Number of floors of construction. N/A

11. Amount of off-street parking provided. N/A

12. Attach plans. INCLUDED

13. Proposed scheduling. INCLUDED

14. Associated project. None by Applicant

15. Anticipated incremental development. INCLUDED

16. If residential, include the number of units, schedule of unit sizes, range of sale prices or rents, and type of household size expected. N/A

17. If commercial, indicate the type, whether neighborhood, city or regionally oriented, square footage of sales area, and loading facilities. N/A

18. If industrial, indicate type, estimated employment per shift, and loading facilities. N/A

19. If institutional, indicate the major function, estimated employment per shift, estimated occupancy, loading facilities, and community benefits to be derived from the project. N/A

20. If the project involves a variance, conditional use or rezoning application, state this and indicate clearly why the application is required. N/A

Are the following items applicable to the project or its effects? Discuss below all items checked yes (attach additional sheets as necessary).

Grading, earth moving and other construction activities related to reclamation are addressed in the previously approved EIR for the Quarry.

	Yes	No
21. Change in existing features of any bays, tidelands, beaches, lakes or hills, or substantial alteration of ground contours.	X	
Project involves recontouring of previously quarried slopes.		
22. Change in scenic views or vistas from existing residential areas or public lands or roads.	X	
Improved visual condition will result from reclamation.		
23. Change in pattern, scale or character of general area of project.		X
24. Significant amounts of solid waste or litter.		X
25. Change in dust, ash, smoke, fumes or odors in vicinity.		X
26. Change in ocean, bay, lake, stream or ground water quality or quantity, or alteration of existing drainage patterns.		X
27. Substantial change in existing noise or vibration levels in the vicinity.		X
28. Site on filled land or on slope of 10 percent or more.	X	
Quarry slopes exceed 10 percent.		
29. Use of disposal of potentially hazardous materials, such as toxic substances, flammables or explosives.	X	
Possible use of sequential blasting during grading of hard rock.		
30. Substantial change in demand for municipal services (police, fire, water, sewage, etc.).		X
31. Substantially increase fossil fuel consumption (electricity, oil, natural gas, etc.).		X
32. Relationship to a larger project or series of projects.		X

Environmental Setting

33. Describe the project site as it exists before the project, including information on topography, soil stability, plants and animals, and any cultural, historical or scenic aspects. Describe any existing structures on the site, and the use of the structures. Attach photographs of the site. Snapshots or polaroid photos will be accepted.

SEE RECLAMATION PLAN

34. Describe the surrounding properties, including information on plants and animals and any cultural, historical or scenic aspects. Indicate the type of land use (residential, commercial, etc.), intensity of land use (one-family, apartment houses, shops, department stores, etc.), and scale of development (height, frontage, set-back, rear yard, etc.). Attach photographs of the vicinity. Snapshots or polaroid photos will be accepted.

SEE RECLAMATION PLAN

Certification

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this initial evaluation to the best of my ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

February 5, 1996
Date


Signature

~~For~~ Bottoms Family 1989 Trust

(Note: This is only a suggested form. Public agencies are free to devise their own format for initial studies.)

APPENDIX C-1

DESIGN CALCULATIONS

FOR

PACIFICA QUARRY SEDIMENTATION BASIN

Prepared by

DE BOLT CIVIL ENGINEERING
811 SAN RAMON VALLEY BOULEVARD
DANVILLE, CA 94526
(510) 837-3780

JANUARY, 1996

PACIFICA QUARRY
SEDIMENT YIELD

We have evaluated the soils losses from the quarry operation using the Universal Soils Loss Equation. The general form of the equation is:

A = RKSLCP

The terms are defined as follows:

A = computed soil loss per unit area

R = rainfall factor

K = soil erodibility

S = slope-gradient factor

L = slope-length factor

C = cropping-management factor

P = erosion control practice factor

1.) Determine the rainfall factor, "R"

The value of R at a given location in California may be obtained directly from one of the curves in Figure 1. Areas of application of the curves are delineated on the map in Figure 2. The appropriate curve is entered with the value of the 2 year, 6 hours rainfall intensity for the site, which is 2.2 inches (per ABAG, assuming 25 inches per year). The value of R is 98 tons per acre per year.

2.) Determine soil erodibility factor, "K"

The Wischmeier's nomograph shown in Figure 4 was used to determine the value of K. The permeability and soil descriptions were estimated using Appendix B of the USDA Soil Conservation Service guide for "Erosion and Sediment Control." Silt, 30%;

sand, 70%; organic matter content, 2%; soil structure, 4%; and permeability, 1%.

Resultant: K = 0.20

3.) Determine the slope length gradient factor, "LS"

The value of the factor (LS) for the Pacifica Quarry has been determined from the curves in Figure 5 that relate it to given values of (L) and (SL. Selection of the proper set of curves was done according to soil moisture, soil temperature regime indicated on the map in Figure 3, which is A-3. The slope length is 2,400 feet with a steepness of 10%. The LS factor has been determined to be 3.5.

4.) Determine the cropping-management factor, "C"

The procedure computes an average C value for any cropping system. There is not cultivation of the quarry site expected; therefore, the C factor should be set to 1.0 unity since application of this crop management practice would be inconsistent with the classification of land as undisturbed.

5.) Determine the erosion-control practice factor, "P"

Using Table 8, "Practice Factor P_C for Construction Sites," the numerical evaluation of P is 1.0.

The computed soils loss per unit area of the Pacifica Quarry is calculated as follows:

$$A = RKSLCP$$

$$= (98)(0.20)(3.5)(1)(1.0)$$

$$A = 68.6 \text{ tons per acre per year}$$

Using an average weight of 110 lbs. per cubic foot, this converts to 46.2 cubic yards per acre per year. Studies made by ABAG have determined that sediment storage volumes in the Bay Area can range from 30 to 120 cubic yards per acre every year based on annual cleanout. The results of their study substantiate our findings.

SIZING THE SEDIMENTATION BASIN FOR PAD 'A'

The design of the sedimentation basin for the Pacific Quarry was determined using the standards established by the Association of Bay Area Governments (ABAG). The methods described in the manual are standard techniques in current use.

1.) Determine Runoff:

tributary area	=	21.6 acres	
rainfall intensity	=	25 inches	Average = 0.37
runoff coefficient	=	.6	

$$Q = CIA$$
$$= (.6)\ (0.37)(21.6)$$
$$= 4.79 \text{ cfs}$$

2.) Setting Velocity

For the ABAG recommended particle size of 0.02 millimeters, the settling velocity is 0.00096 ft./sec.

3.) Minimum Surface Area:

$$A_S = \frac{Q(cfs) \times 1.2}{V_S}$$

A_S = 6,000 sq. ft.

4.) Settling Depth:

The minimum settling depth is two (2) feet.

5.) Minimum Storage Depth:

Based upon ABAG Studies, sediment storage volumes in the Bay Area range from 30 to 120 cubic yards per acre, assuming an annual cleanout of the basin. We have determined soils losses for this site to be 47 cubic yards per acre.

$$\text{Storage Depth} = \frac{[\text{Area (47)}]\ 27(E)}{A_S}$$

E = 0.75 using ABAG's recommended particle size of 0.02 mm, approximately 75% by weight of the soil is greater than or equal to this particle size.

$$\text{Storage depth} = \frac{(21.6)(47)(27)(0.75)}{6000} = 3.43 \text{ feet}$$

6.) Required Volume of Basin:

$$V = A_S\ (2 + \text{Storage Depth})$$
$$= A_S\ (2 + 3.43)$$
$$= 32{,}560 \text{ cubic feet}$$

The size and depth of the basin can vary; however, the minimum surface area is 6,000 square feet and the minimum depth is 5.43 feet.

The sedimentation basin is a temporary facility and will remain in place only until the slope vegetation has matured and the disturbed area is stabilized.

The proposed basin configuration is designed to conform with the natural fall of the property. The basin has been designed as a below ground storage facility to minimize earthquake hazards.

SIZING THE SEDIMENTATION BASIN FOR PAD 'B'

The design of the sedimentation basin for the Pacific Quarry was determined using the standards established by the Association of Bay Area Governments (ABAG). The methods described in the manual are standard techniques in current use.

1.) Determine Runoff:

tributary area	=	4.0 acres	
rainfall intensity	=	25 inches	Average = 0.37
runoff coefficient	=	.6	

$$Q = CIA$$
$$= (.6)\ (0.37)(4.0)$$
$$= 0.90 \text{ cfs}$$

2.) Setting Velocity

For the ABAG recommended particle size of 0.02 millimeters, the settling velocity is 0.00096 ft./sec.

3.) Minimum Surface Area:

$$A_S = \frac{Q(\text{cfs}) \times 1.2}{V_S}$$

$$A_S = 1{,}125 \text{ sq. ft.}$$

4.) Settling Depth:

The minimum settling depth is two (2) feet.

5.) Minimum Storage Depth:

Based upon ABAG Studies, sediment storage volumes in the Bay Area range from 30 to 120 cubic yards per acre, assuming an annual cleanout of the basin. We have determined soils losses for this site to be 47 cubic yards per acre.

$$\text{Storage Depth} = \frac{[\text{Area (47)}]\ 27(E)}{A_S}$$

E = 0.75 using ABAG's recommended particle size of 0.02 mm, approximately 75% by weight of the soil is greater than or equal to this particle size.

$$\text{Storage depth} = \frac{(4.0)(47)(27)(0.75)}{1125} = 3.4 \text{ feet}$$

6.) Required Volume of Basin:

$$V = A_S\ (2 + \text{Storage Depth})$$
$$= A_S\ (2 + 3.4)$$
$$= 6{,}075 \text{ cubic feet}$$

The size and depth of the basin can vary; however, the minimum surface area is 1,125 square feet and the minimum depth is 5.4 feet.

The sedimentation basin is a temporary facility and will remain in place only until the slope vegetation has matured and the disturbed area is stabilized.

The proposed basin configuration is designed to conform with the natural fall of the property. The basin has been designed as a below ground storage facility to minimize earthquake hazards.

PAD 'A' SEDIMENT BASIN
SPILLWAY DESIGN

The capacity of the principal spillway was designed to meet the peak flow expected from the design storm. In this project, the principal spillway will be used in combination with an emergency spillway.

The principal spillway of this basin consists of a vertical pipe joined at a watertight connection to a pipe extended through the embankment and outlet beyond the downstream toe of the fill. The outlet is such that it provides a means of conveying the discharge in an erosion-free manner to Caldera Creek. Protection against scour at the discharge end of the pipe will be provided.

The principal spillway design was done in accordance with the ABAG manual. the pipe sizes and details are shown on the detail sheet of the civil drawings.

According to the ABAG manual, the minimum capacity of the emergency spillway shall be that required to pass the peak rate of runoff from a 10-year frequency storm. The peak runoff is calculated using the Rational Method and 50% of the 10 year, 6 hour rainfall.

$$Q_{10} = CIA$$

$$= (0.6)(2.2)(21.6)$$

$$Q_{10} = 28.5 \text{ cfs}$$

Peak Runoff = 50% of 28.5 cfs = 14.25 cfs

PAD 'B' SEDIMENT BASIN
SPILLWAY DESIGN

The capacity of the principal spillway was designed to meet the peak flow expected from the design storm. In this project, the principal spillway will be used in combination with an emergency spillway.

The principal spillway of this basin consists of a vertical pipe joined at a watertight connection to a pipe extended through the embankment and outlet beyond the downstream toe of the fill. The outlet is such that it provides a means of conveying the discharge in an erosion-free manner to Caldera Creek. Protection against scour at the discharge end of the pipe will be provided.

The principal spillway design was done in accordance with the ABAG manual. the pipe sizes and details are shown on the detail sheet of the civil drawings.

According to the ABAG manual, the minimum capacity of the emergency spillway shall be that required to pass the peak rate of runoff from a 10-year frequency storm. The peak runoff is calculated using the Rational Method and 50% of the 10 year, 6 hour rainfall.

$$Q_{10} = (.6)(2.2)(4.0)$$

$$Q_{10} = 5.28 \text{ cfs}$$

Peak Runoff = 50% of 5.28 cfs = 2.64 cfs

ANTI - SEEP COLLAR

Assume entire length of pipe spillway for both sediment basins are within the saturated zone. Based upon this, we propose to use four collars 5.9' x 5.9'.

Figure 1: Relation Between Annual Average Erosion Index and 2 yr., 6 hr. Rainfall in California

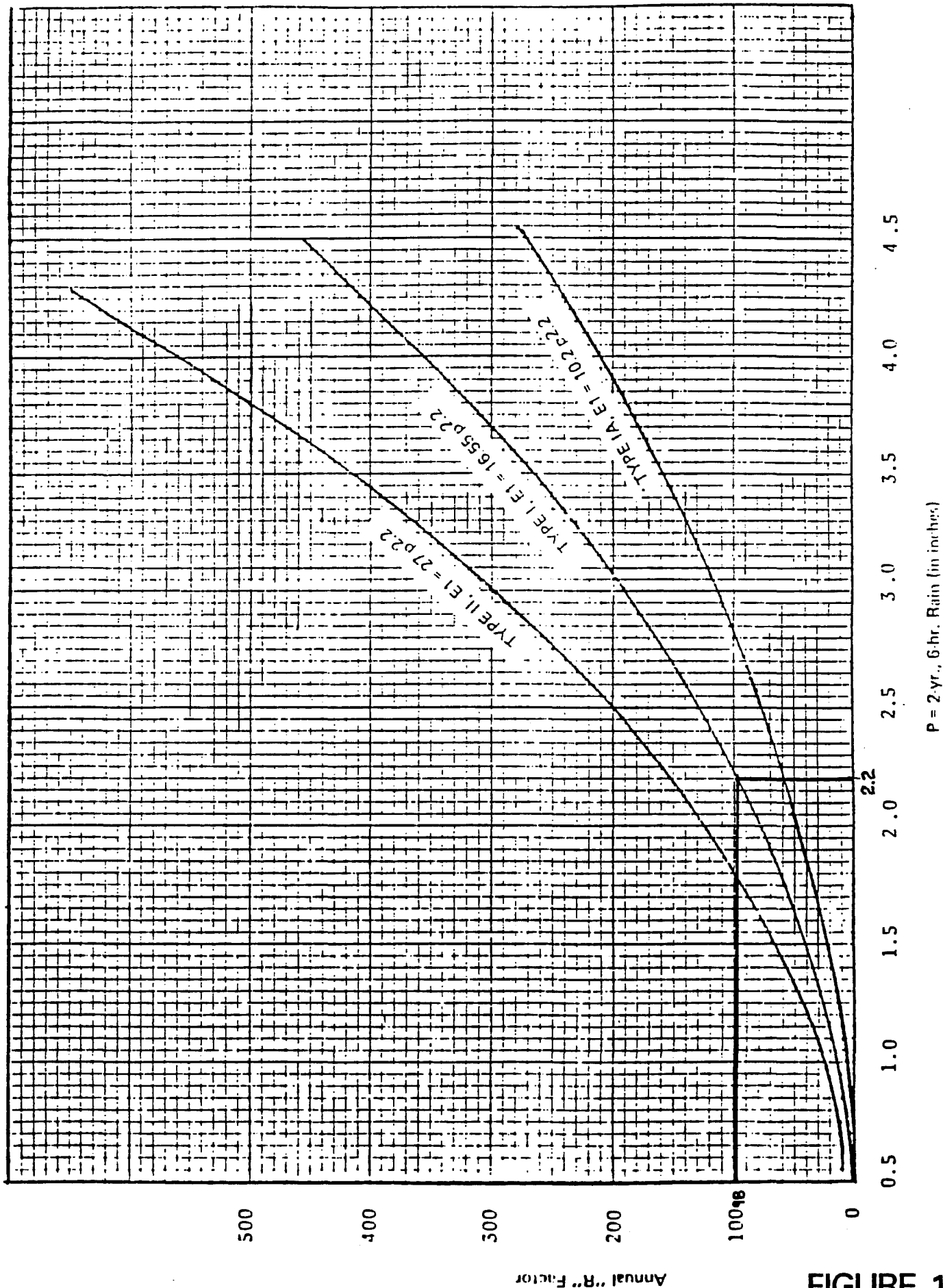


FIGURE 1

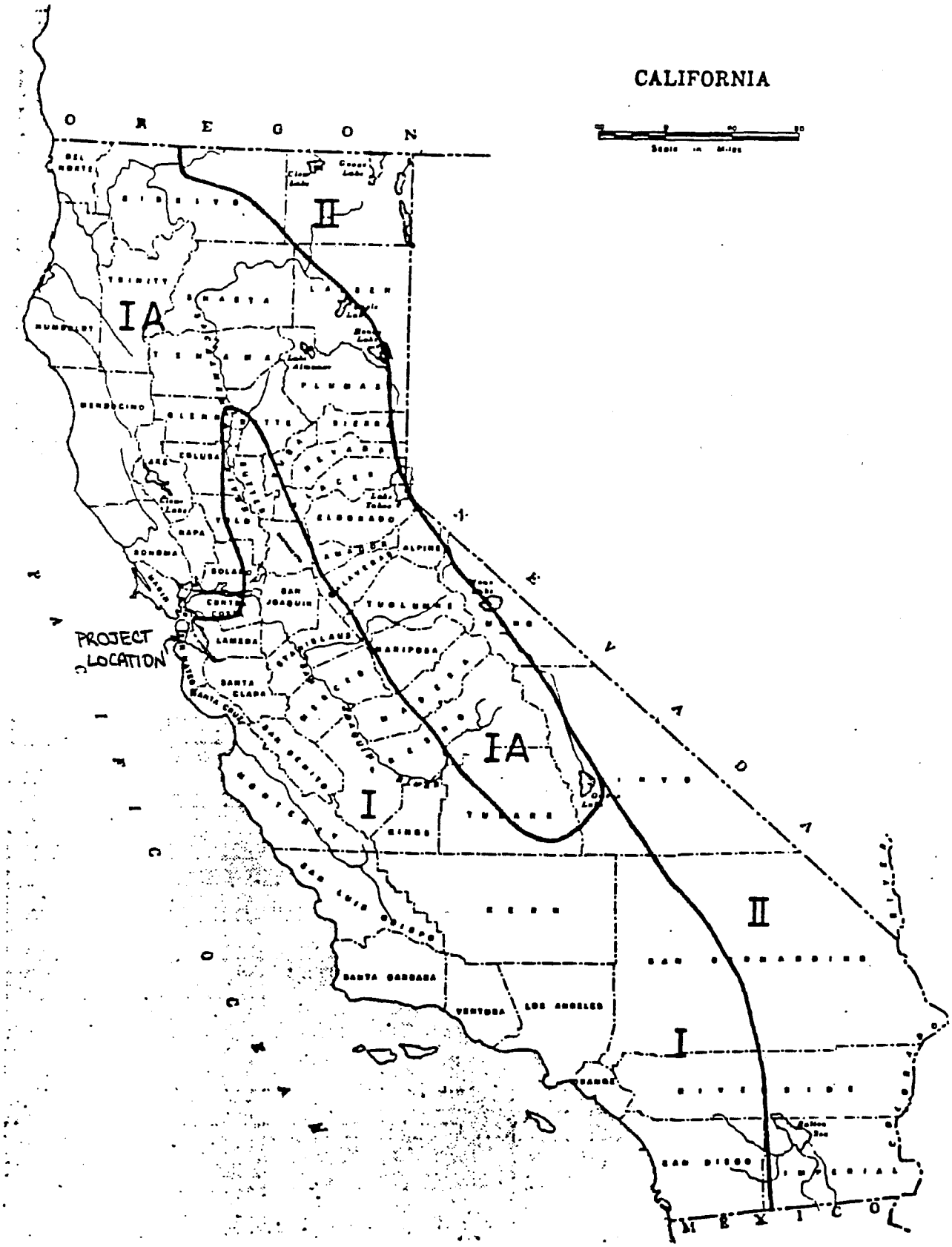


Figure 2: Storm Distribution Regions in California

FIGURE 2

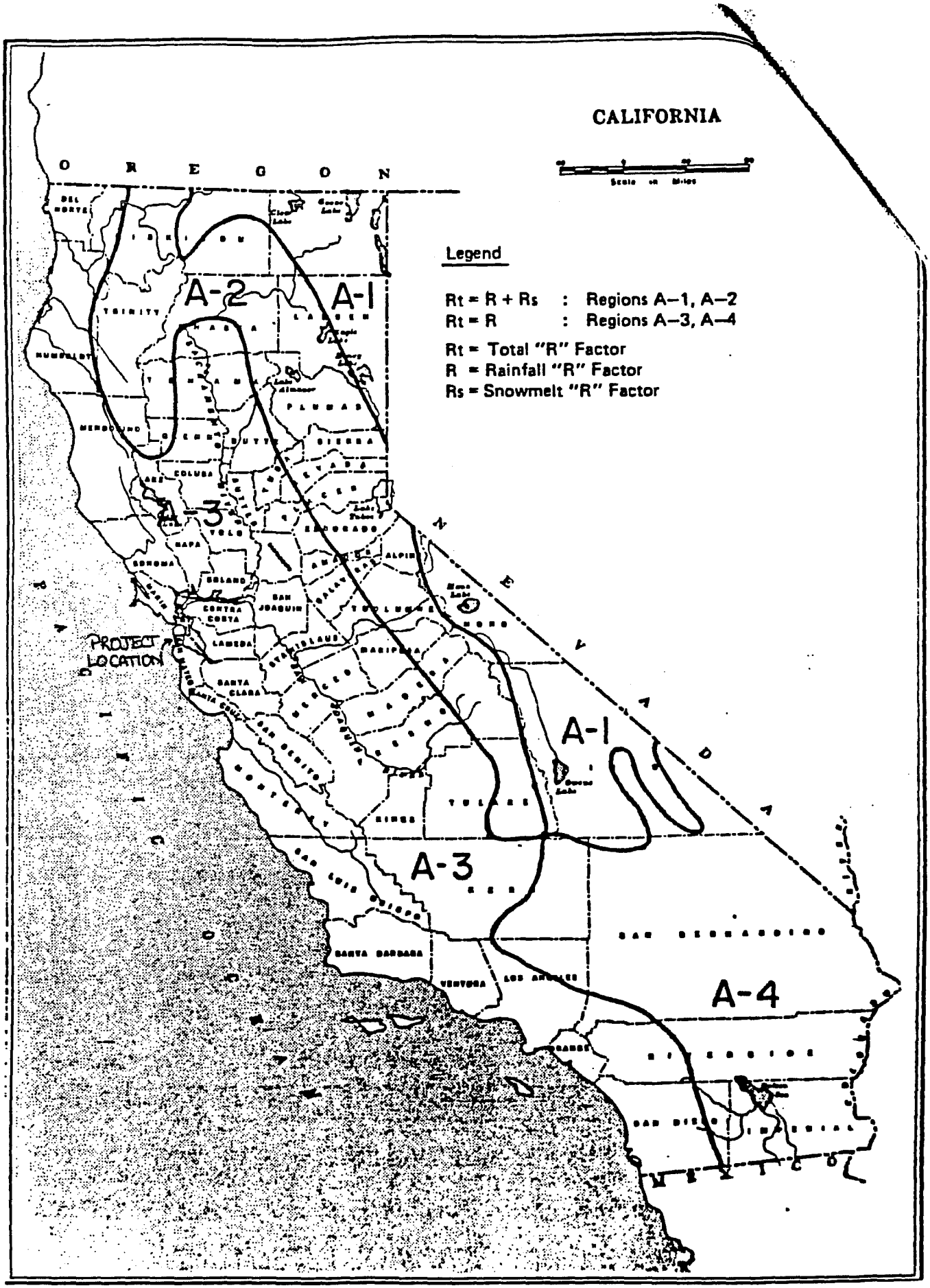
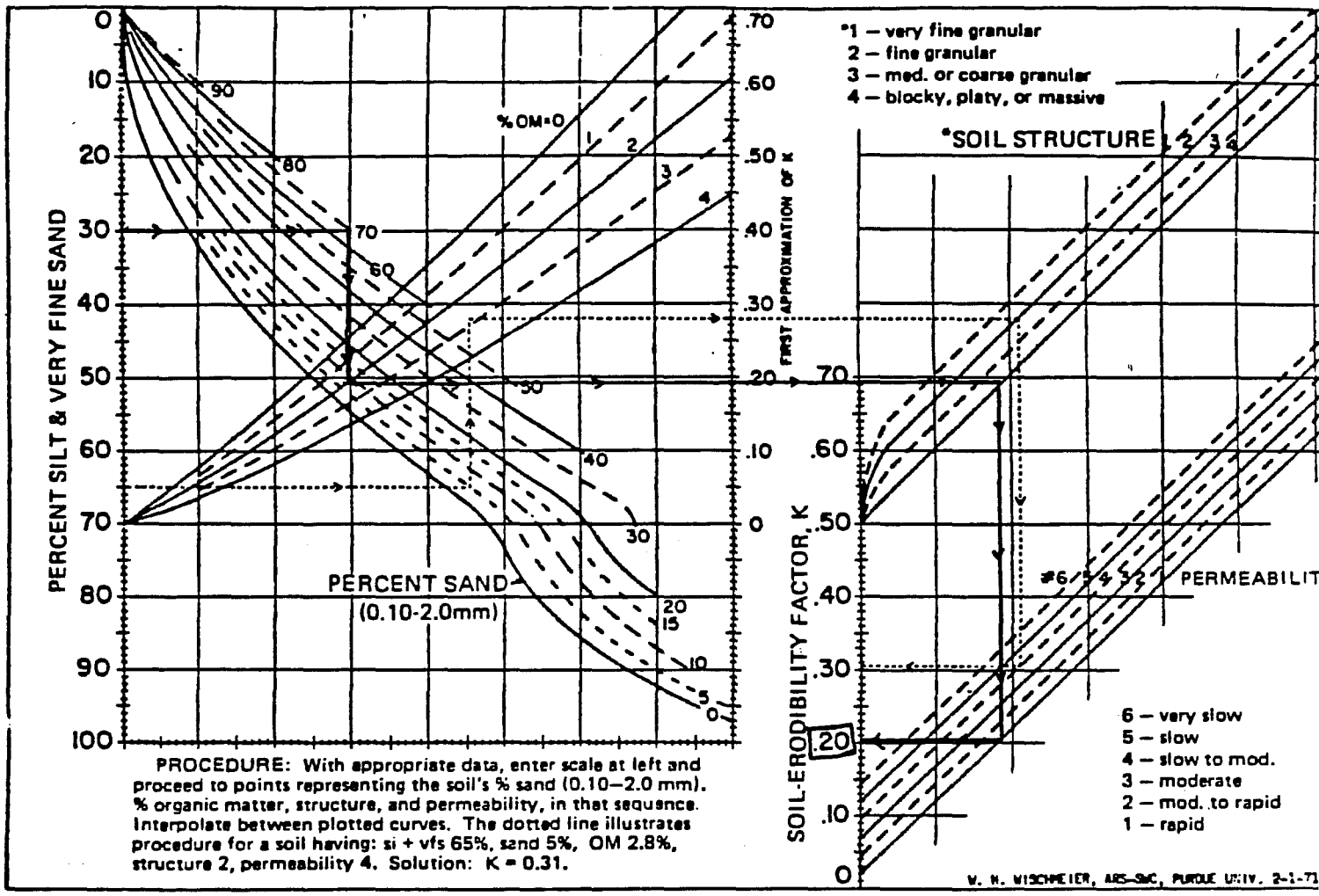


Figure 3: Soil Moisture – Soil Temperature Regime Regions in California

FIGURE 3

Figure 4: Soil Erodibility Nomograph



Reprinted from the Journal of Soil and Water Conservation
September – October 1971, Volume 26, Number 5

FIGURE 4

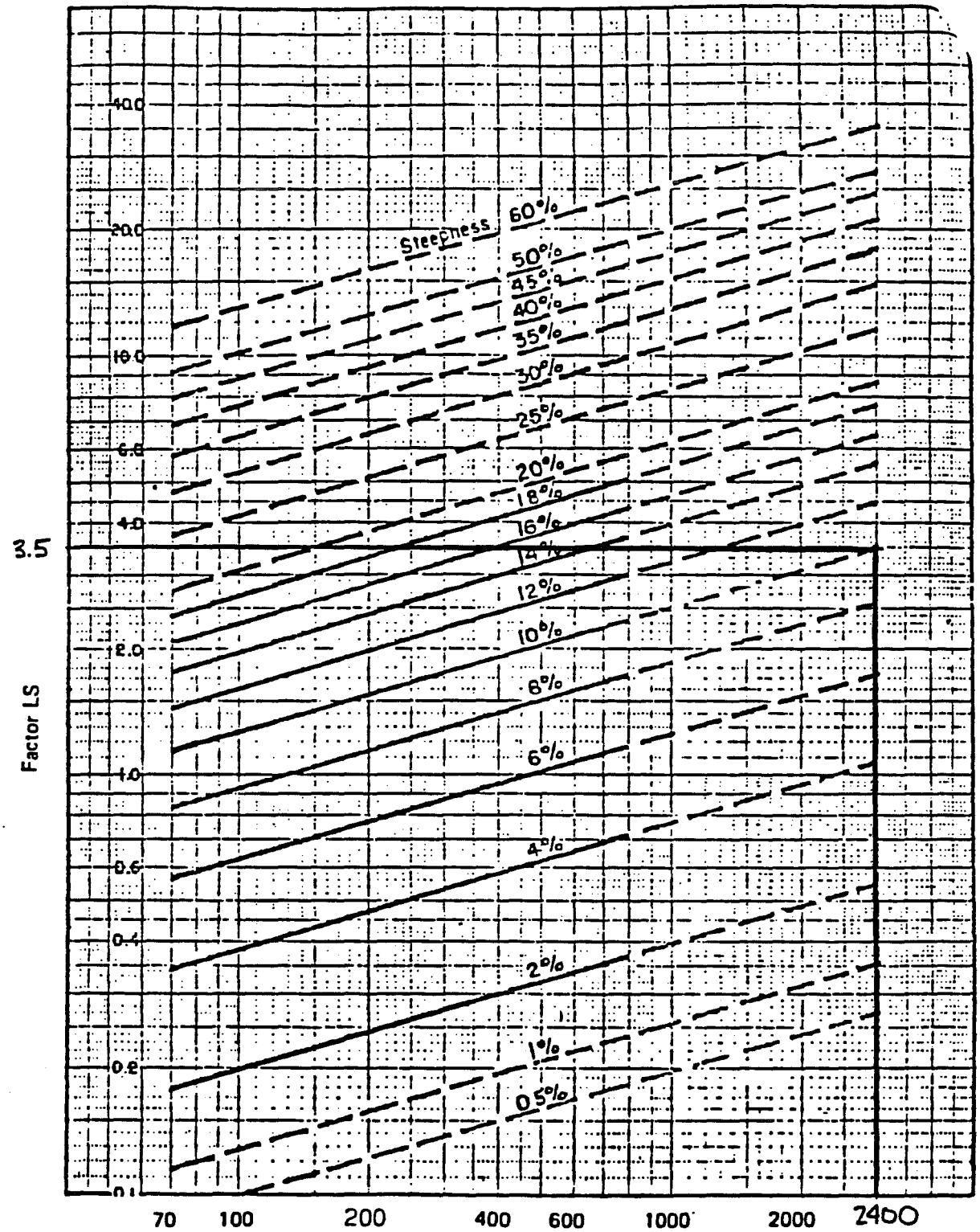


Figure 5: Slope Length in Feet

Applicable to Soil Moisture – Soil Temperature Regime Region A–3

Note: Dashed lines are extensions of LS Formulae beyond values tested in studies

FIGURE 5

TABLE 3. PRECIPITATION INTENSITY ("i") VALUES
SAN FRANCISCO BAY AREA (10)

Duration	P_{MA} / Recurrence interval (years)	Storm precipitation, in inches, corresponding to indicated values of mean annual precipitation (P_{MA}), in inches											
		10	12	14	16	18	20	30	40	50	60	70	80
5 minutes	2	0.08	0.10	0.11	0.12	0.13	0.14	0.16	0.19	0.21	0.23	0.26	0.28
	5	.12	.14	.15	.16	.17	.18	.21	.24	.27	.30	.33	.36
	10	.15	.17	.18	.19	.20	.21	.24	.28	.31	.35	.38	.41
	25	.17	.19	.21	.23	.24	.25	.29	.32	.36	.40	.44	.48
	50	.19	.21	.23	.24	.26	.27	.31	.35	.39	.43	.47	.51
	100	.21	.23	.25	.26	.28	.29	.33	.38	.42	.46	.51	.55
10 minutes	2	.13	.15	.17	.18	.20	.22	.25	.29	.32	.36	.40	.43
	5	.19	.21	.23	.25	.26	.27	.32	.37	.41	.46	.51	.56
	10	.23	.26	.28	.30	.32	.33	.38	.43	.49	.54	.58	.64
	25	.27	.30	.33	.35	.37	.39	.45	.50	.56	.62	.68	.74
	50	.30	.33	.36	.38	.40	.42	.48	.54	.61	.67	.73	.80
	100	.32	.36	.38	.41	.43	.45	.52	.58	.65	.72	.79	.86
15 minutes	2	.16	.19	.21	.23	.26	.27	.32	.36	.41	.46	.50	.55
	5	.25	.27	.29	.31	.33	.35	.41	.47	.52	.59	.65	.71
	10	.30	.32	.35	.38	.40	.42	.48	.55	.62	.68	.74	.81
	25	.34	.38	.42	.44	.47	.49	.56	.64	.71	.79	.86	.93
	50	.38	.42	.45	.48	.51	.53	.61	.69	.77	.85	.93	1.01
	100	.41	.45	.48	.52	.55	.57	.66	.74	.83	.91	1.00	1.08
30 minutes	2	.22	.26	.29	.32	.36	.38	.44	.51	.57	.63	.70	.76
	5	.34	.37	.40	.43	.46	.48	.57	.65	.73	.81	.90	.98
	10	.41	.45	.49	.52	.55	.58	.66	.76	.85	.94	1.03	1.12
	25	.47	.53	.58	.62	.65	.68	.78	.88	.99	1.09	1.19	1.30
	50	.52	.58	.62	.66	.70	.73	.85	.96	1.07	1.18	1.29	1.40
	100	.57	.62	.67	.72	.76	.79	.91	1.03	1.15	1.26	1.38	1.50
1 hour	2	.28	.33	.37	.41	.45	.48	.56	.64	.72	.80	.88	.96
	5	.43	.47	.51	.55	.58	.61	.72	.82	.92	1.03	1.14	1.24
	10	.52	.57	.62	.66	.70	.73	.84	.96	1.08	1.19	1.30	1.42
	25	.60	.67	.73	.78	.82	.86	.99	1.12	1.25	1.38	1.51	1.64
	50	.66	.73	.79	.84	.89	.93	1.07	1.21	1.35	1.49	1.63	1.77
	100	.72	.79	.85	.91	.96	1.00	1.15	1.30	1.45	1.60	1.75	1.90
2 hours	2	.45	.51	.56	.61	.66	.70	.85	1.00	1.15	1.30	1.45	1.60
	5	.67	.72	.76	.80	.84	.88	1.07	1.26	1.45	1.64	1.83	2.02
	10	.74	.79	.84	.89	.93	.97	1.18	1.39	1.60	1.81	2.02	2.23
	25	.90	.94	.99	1.03	1.08	1.12	1.34	1.56	1.78	2.00	2.22	2.44
	50	.98	1.03	1.07	1.12	1.16	1.21	1.44	1.67	1.90	2.13	2.36	2.59
	100	1.05	1.10	1.15	1.20	1.25	1.30	1.55	1.80	2.05	2.30	2.55	2.80
3 hours	2	.63	.68	.72	.77	.81	.86	1.09	1.32	1.55	1.78	2.01	2.24
	5	.78	.84	.89	.95	1.00	1.06	1.34	1.62	1.90	2.18	2.46	2.74
	10	.91	.97	1.03	1.10	1.16	1.22	1.53	1.84	2.15	2.46	2.77	3.08
	25	1.03	1.10	1.16	1.23	1.29	1.36	1.69	2.02	2.35	2.68	3.01	3.34
	50	1.14	1.21	1.28	1.34	1.41	1.48	1.82	2.16	2.50	2.84	3.18	3.52
	100	1.25	1.32	1.39	1.46	1.53	1.60	1.95	2.30	2.65	3.00	3.35	3.70
6 hours	2	.91	.99	1.07	1.16	1.24	1.32	1.73	2.14	2.55	2.96	3.37	3.78
	5	1.14	1.25	1.36	1.46	1.57	1.68	2.22	2.76	3.30	3.84	4.38	4.92
	10	1.30	1.42	1.54	1.66	1.78	1.90	2.50	3.10	3.70	4.30	4.90	5.50
	25	1.46	1.59	1.72	1.86	1.99	2.12	2.78	3.44	4.10	4.76	5.42	6.08
	50	1.60	1.74	1.88	2.02	2.16	2.30	3.00	3.70	4.40	5.10	5.80	6.50
	100	1.73	1.88	2.02	2.17	2.31	2.46	3.19	3.92	4.65	5.38	6.11	6.84
12 hours	2	1.04	1.18	1.33	1.47	1.62	1.76	2.48	3.20	3.92	4.64	5.36	6.08
	5	1.44	1.61	1.78	1.94	2.11	2.28	3.12	3.96	4.80	5.64	6.48	7.32
	10	1.70	1.88	2.06	2.24	2.42	2.60	3.50	4.40	5.30	6.20	7.10	8.00
	25	1.90	2.10	2.30	2.50	2.70	2.90	3.90	4.90	5.90	6.90	7.90	8.90
	50	2.15	2.36	2.57	2.78	2.99	3.20	4.25	5.30	6.35	7.40	8.45	9.50
	100	2.35	2.57	2.79	3.01	3.23	3.45	4.55	5.65	6.75	7.85	8.95	10.05

FIGURE 6

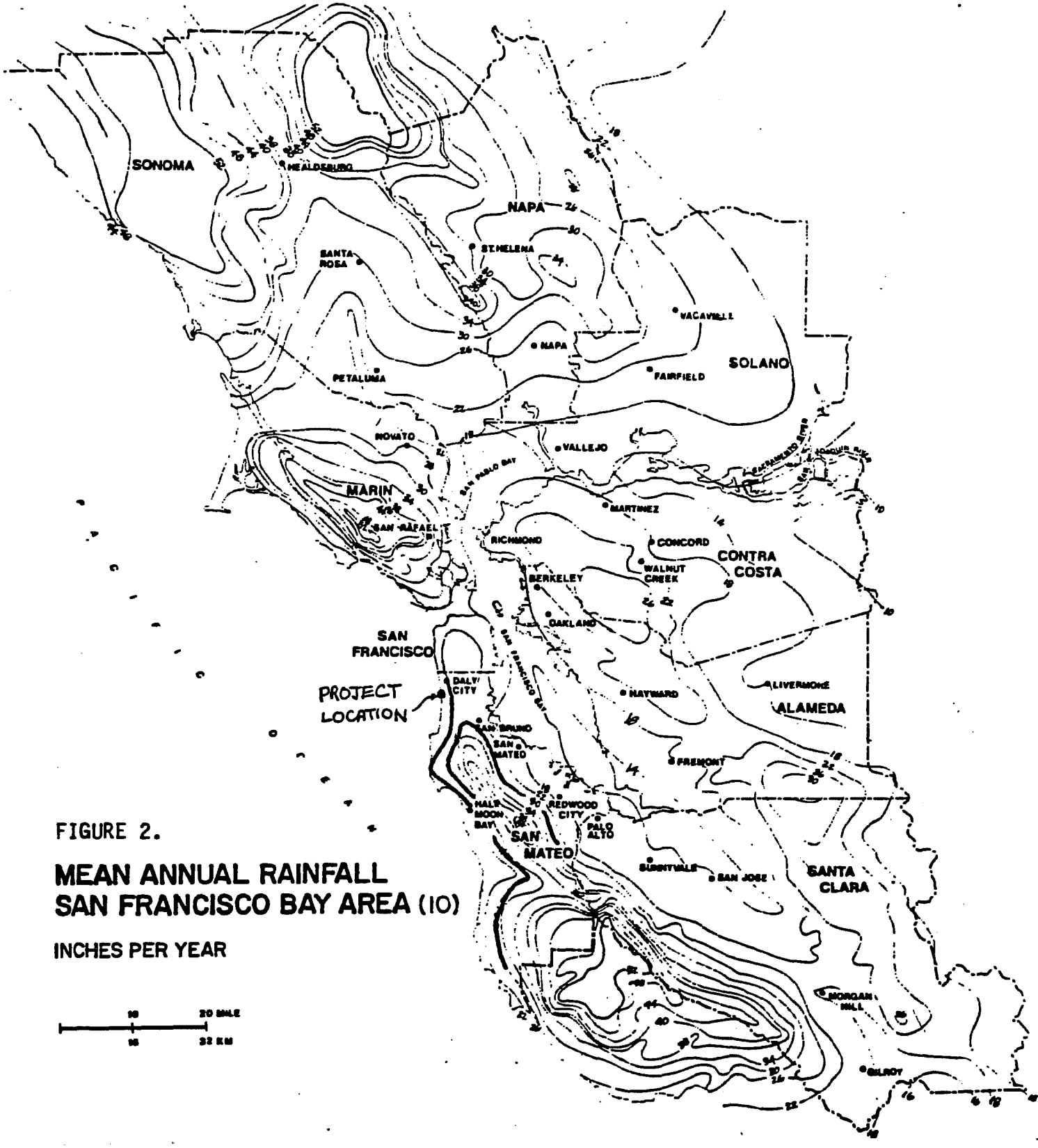


FIGURE 2.

MEAN ANNUAL RAINFALL SAN FRANCISCO BAY AREA (10)

INCHES PER YEAR

FIGURE 7

ANTI-SEEP COLLAR DESIGN

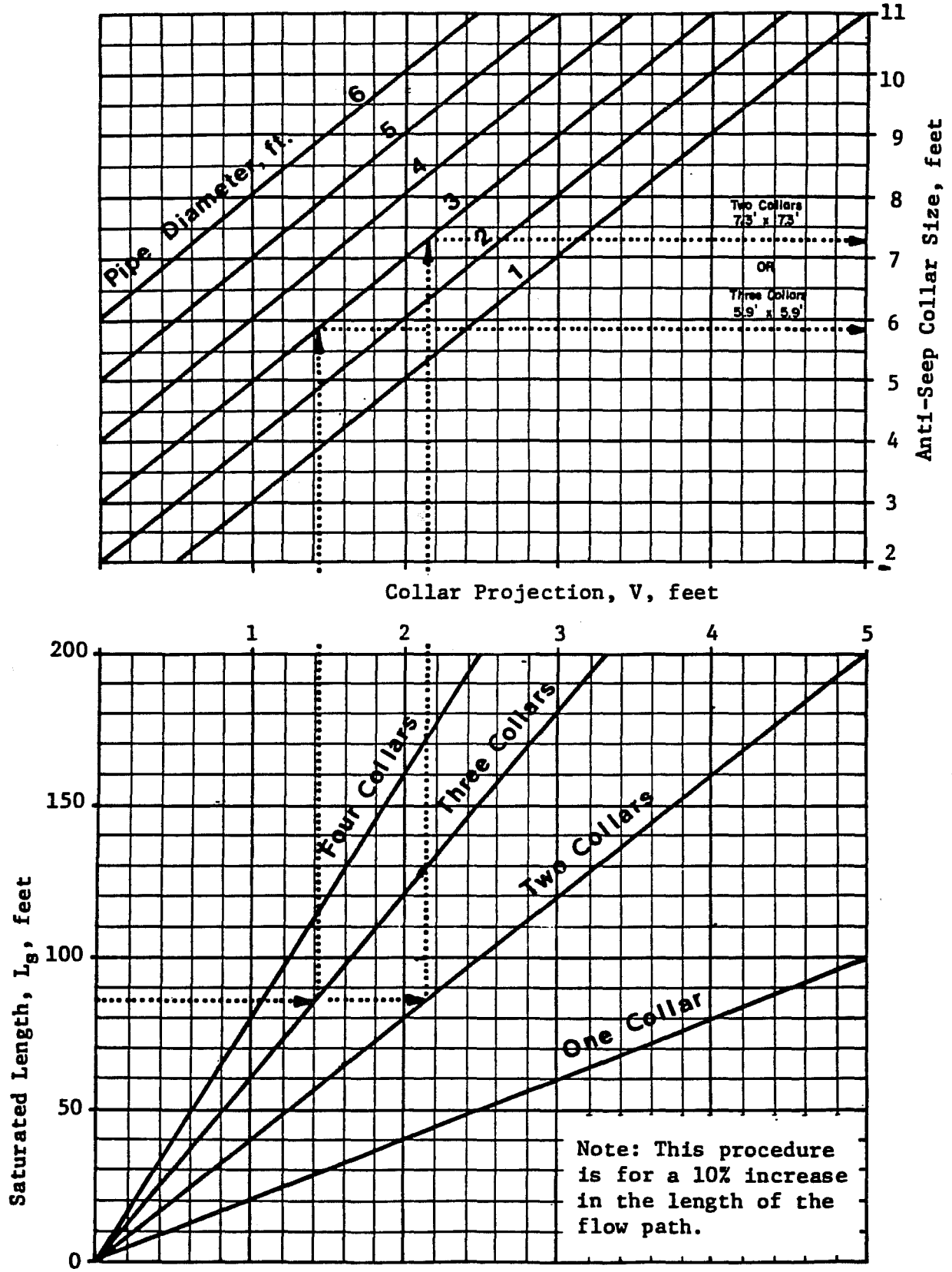


FIGURE 8

PIPE LENGTH IN SATURATED ZONE

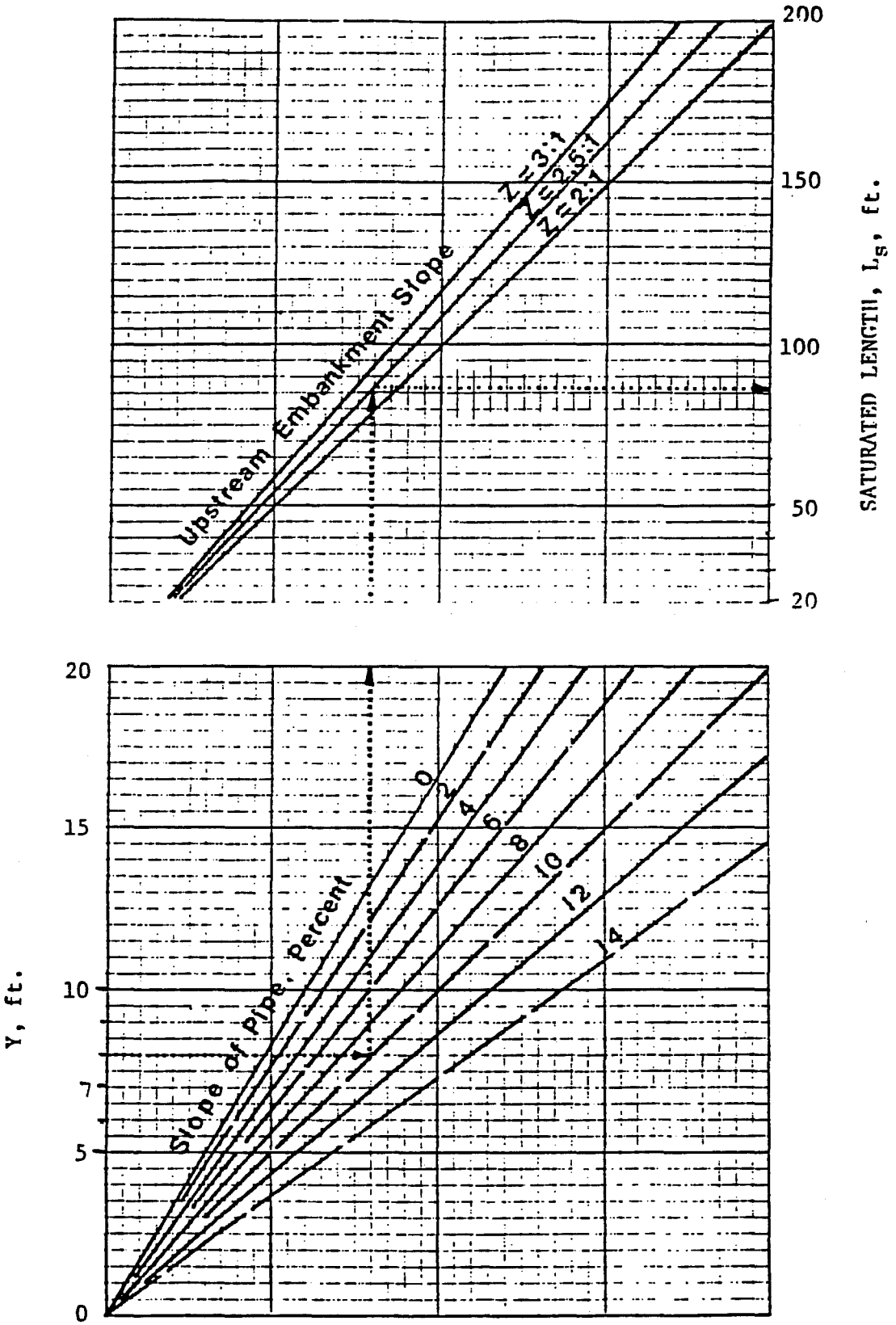


FIGURE 9

PACIFICA QUARRY RECLAMATION

HYDROLOGY MAP

LEGEND

MORI POINT RIDGE

OCEAN

PACIFIC

EMERGENCY ACCESS

EMERGENCY ACCESS

CITY OF PACIFICA --WASTEWATER TREATMENT PLANT SITE

REINA DEL MAR

PAD A
EL. 85 (12.6 AC.)

PAD B
EL. 75 (2.3 AC.)

1 4.27± ACS
2 2.75± ACS
3 2.06± ACS
4 3.6± ACS
5 2.43± ACS
6 2.21± ACS
7 0.82± ACS
8 1.25± ACS
9 0.09± ACS
10 1.3± ACS
11 0.8± ACS
12 0.75± ACS
13 0.50± ACS
14 0.45± ACS
15 1.1± ACS
16 3.4± ACS
17 3.2± ACS
18 1.5± ACS

PIER MAINTENANCE ROAD

GRADING BY CITY

CREEK

CREEK WORK AREA

CALERA

HIGHWAY 1

ROCKAWAY BEACH

C1
FIGURE

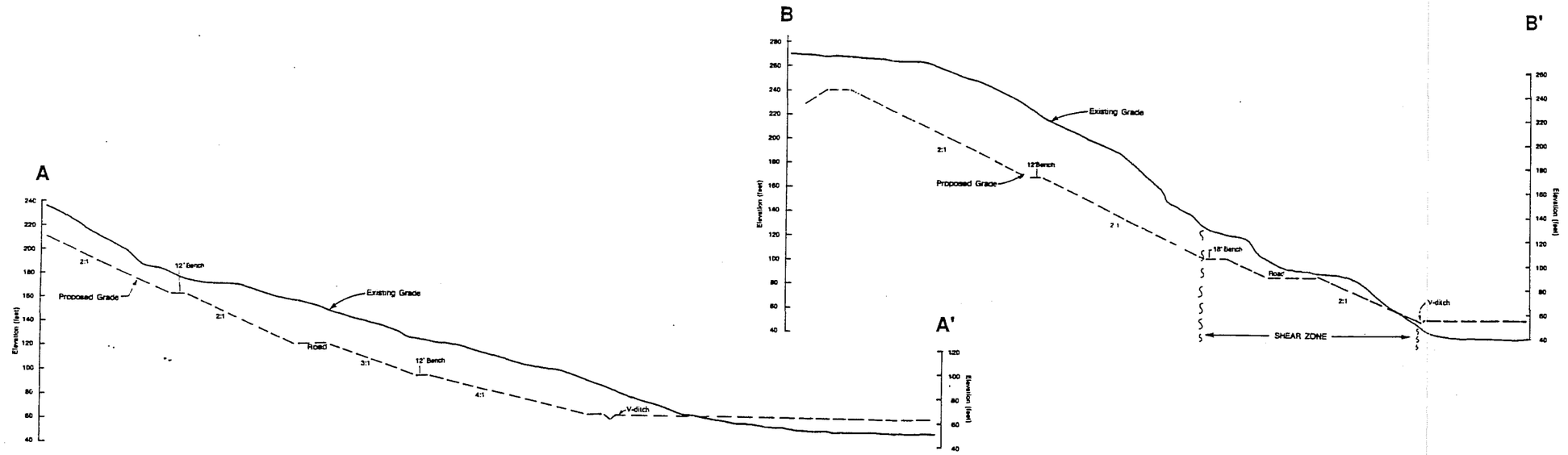
DEBOLT CIVIL ENGINEERING
511 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-3760

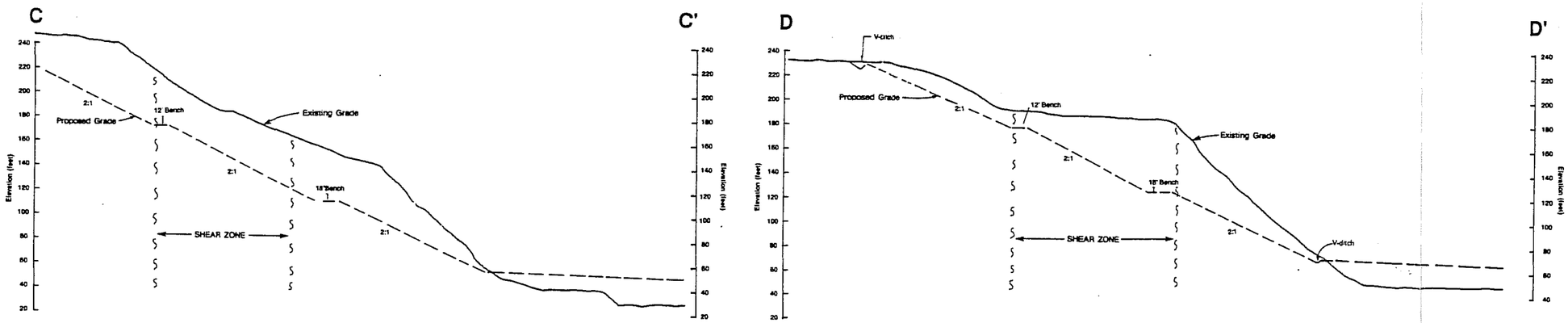
TREADWELL & ROLLO, INC.
GEOTECHNICAL ENGINEERING
555 MONTGOMERY STREET, STE. 1300, S.F. CA 94111 (415) 955-9040

0 100 200
MAP SCALE IN FEET

MALCOLM CARPENTER ASSOCIATES
CITY AND REGIONAL PLANNERS
1100 EL CAMINO REAL, COLMA CA 94015 PHONE: (415) 992-2200

JOB# 83107





NOTES:

1. Section lines shown on Figure 1 of Treadwell & Associates' report dated 27 March 1991.
2. 2:1 denotes inclination of slope, 2 horizontal to 1 vertical.
3. Benches should be constructed with a five percent reverse gradient and sloped to drain laterally. Concrete-lined drainage ditches should be constructed on the inside slope of the benches to drain.

0 20 40 60 80 100

APPROXIMATE SCALE
Horizontal = Vertical

PACIFICA QUARRY RECLAMATION

REVISED CROSS SECTIONS

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-3780

TREADWELL & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING
888 SACRAMENTO STREET, S.F. CA 94111 (415) 989-9848

MARTIN · CARPENTER · ASSOCIATES
CITY AND REGIONAL PLANNERS
1048 LAUREL STREET, SAN CARLOS, CA 94070 (415) 595-1881

4/91

Figure 2

APPENDIX D

March 29, 1991

Mr. Malcolm C. Carpenter
MARTIN-CARPENTER ASSOCIATES
1640 Laurel Street
San Carlos, CA 94070

Dear Mac:

On March 15, 1991 I collected soil samples from the upper and lower slopes of the Pacific Quarry for laboratory soil analysis. The lab results and fertilizer recommendations are attached for your reference. The sample identified as "lower" was taken from the grey limestone at the toe of the slope and the "upper sample was taken from the greenstone portion of the slope.

Based on the laboratory recommendations under Option 3 of the soil analysis, we recommend the following fertilizer and seeding application rates:

SEED MIX

blando brome	15 lbs./ac.
sub clover	10 " "
barley	10 " "
crimson clover	5 " "
lana vetch	5 " "
California poppy	1 " "
TOTAL	**46 lbs./ac.**

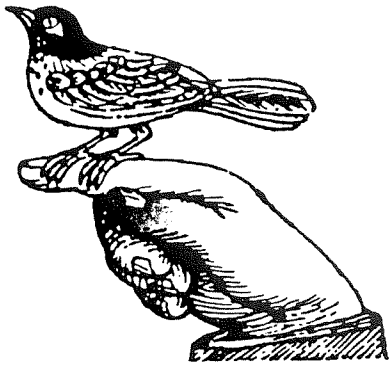
FERTILIZER

16-16-16 (NPK)	200 lbs./ac.

MULCH

Natural wood fiber mulch	2,000 lbs./ac.

Hydroseeding applications should be completed between the end of September and November 15, or immediately following final grading. Shrub planting should be completed between mid December and mid April the year following hydroseeding.



RALPH OSTERLING
CONSULTANTS, INC.
PHONE (415) 573-8733
1650 BOREL PLACE SUITE 204
SAN MATEO, CA 94402

The above seed mix will provide a mixture of grasses and legumes that will provide rapid germination and cover. Nitrogen fixation by the legumes will improve soil nitrogen levels over time.

Should you have any question concerning this report, please give me a call.

Respectfully,

Douglas Nix

Douglas E. Nix, CPSESCS #565
Vice President

enc.

Harris Laboratories, Inc.
624 Peach Street, Box 80837, Lincoln, NE 68501

TRIPLE OPTION
SOIL ANALYSIS

tted By
ALPH OSTERLING CONSULT
650 BOREL PL204
N MATEO CA 94402

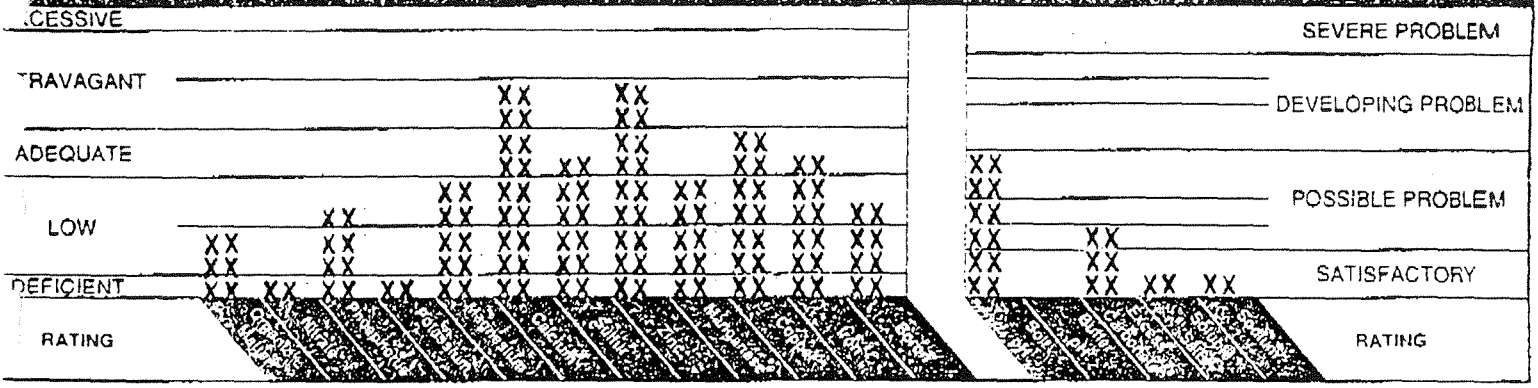
Submitted For
PACIFICA QUARRY
PACIFICA CA

Laboratory Sample #
91399095
Field Identification

Acres Sampled
0

e Reported 27-MAR-91 Laboratory Turnaround 3.7 DAYS Samples Will Be Stored Until 26-APR-91

GRAPHIC SUMMARY OF TEST RESULTS



REPORT OF ANALYSIS

Your Sample Number	UPPER
Soil pH	8.0
Buffer pH	----
xcess rbonate	L
luble Salts mhos/cm)	0.28
odium ppm	92
Organic Matter	1.0
Nitrate N	1
osphorus Bray I aHCO3	6
otassium	65
gnesium	191
Calcium	3459
Sulfate Sulfur	41
Zinc	3.2
nganese	1.8
Copper	1.4
Iron	12.0
Boron	0.1

APPROXIMATE POUNDS ER ACRE, MULTIPLY PPM RESULTS BY TWO.

FERTILIZER GUIDELINES IN LBS PER ACRE

	1st OPTION	2nd OPTION	3rd OPTION
Intended Crop	MIXED GRASS	MIXED GRASS	MIXED GRASS
Yield Goal	2.0 TONS/AC	3.0 TONS/AC	1.0 TONS/AC
Crop Variety			
Plant Population			
Preceding Crop			
Soil Series			

PLANT FOOD GUIDELINE RANGES	1st OPTION	CROP REMOVAL RATES	2nd OPTION	CROP REMOVAL RATES	3rd OPTION	CROP REMOVAL RATES
N	60	70	100	105	25	35
P_2O_5 Build *	40 75	22	50 75	33	30 75	11
K_2O Build *	80 175	60	120 165	90	40 180	30
MgO	15		15		15	
S	0		0		0	
Zn	0		0		0	
Mn	1.5		2.5		0	
Cu	0		0		0	
Fe	0		0		0	
B	1.0		1.3		1.0	

* TO BE ECONOMICAL, BUILD MAY BE SPREAD OVER SEVERAL YEARS

NOTES ACTUAL AND SUGGESTED PERCENT OF TOTAL CEC (BASE SATURATION)

The Guidelines are for 20% Effective Calcium Carbonate (ECC) with a 7" Incorporation Depth.

Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	CEC For Your Soil
9.0	0-5	0.9	2.2-7	9.2	15-20	88.9	65-75	2.1	0-5	19.5

MAR 28 '91 13:55 HARRIS TECH

Harris Laboratories, Inc.

624 Peach Street, Box 80837, Lincoln, NE 68501

TRIPLE OPTION SOIL ANALYSIS

itted By
ALPH OSTERLING CONSULT
550 BOREL PL204
.N MATEO CA 94402

Submitted For
PACIFICA QUARRY
PACIFICA CA

Laboratory Sample #
91399095
Field Identification

Acres Sampled
0

e Reported 27-MAR-91 Laboratory Turnaround 3.7 DAYS Samples Will Be Stored Until 26-APR-91

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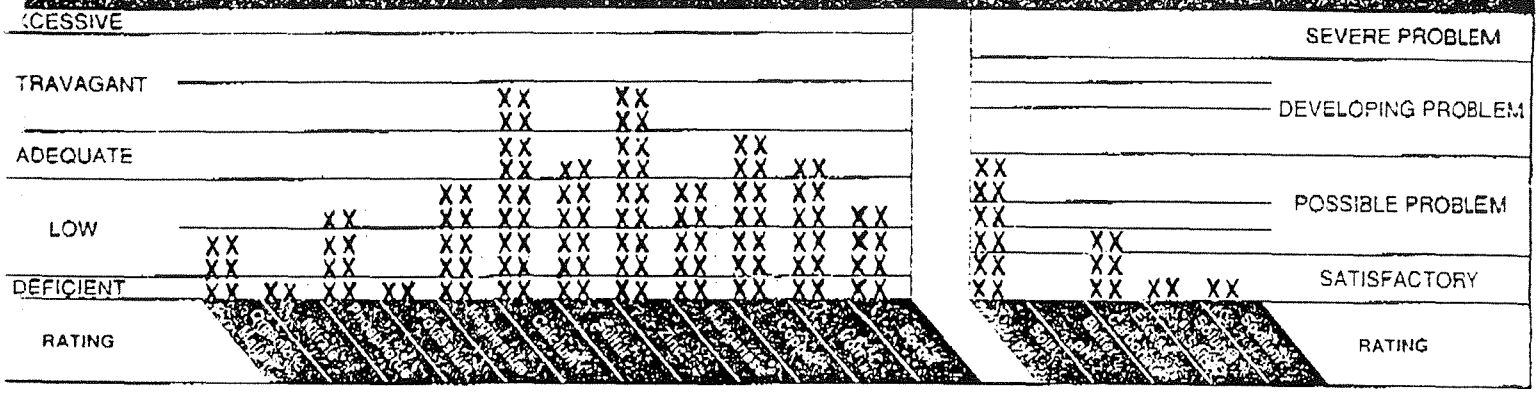

REPORT OF ANALYSIS / FERTILIZER GUIDELINES IN LBS PER ACRE

Your Sample Number	UPPER	1st OPTION	2nd OPTION	3rd OPTION
Intended Crop		MIXED GRASS	MIXED GRASS	MIXED GRASS
Soil pH	8.0	Yield Goal: 2.0 TONS/AC	Yield Goal: 3.0 TONS/AC	Yield Goal: 1.0 TONS/AC
Buffer pH	----	Crop Variety	Crop Variety	Crop Variety
Excess Bonate	L	Plant Population	Plant Population	Plant Population
Soluble Salts (mhos/cm)	0.28	Preceding Crop	Preceding Crop	Preceding Crop
Sodium ppm	92	Soil Series	Soil Series	Soil Series

APPROXIMATE POUNDS PER ACRE, MULTIPLY PPM RESULTS BY TWO.		PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES	PLANT FOOD GUIDELINE RANGES		CROP REMOVAL RATES
Organic Matter	1.0									
Nitrate N	1	N	60	70	N	100	105	N	25	35
Phosphorus (Bray I) HCO3	6	P_2O_5 Build*	40 75	22	P_2O_5 Build*	50 75	33	P_2O_5 Build*	30 75	11
Potassium	65	K_2O Build*	80 175	60	K_2O Build*	120 165	90	K_2O Build*	40 180	30
Magnesium	191	MgO	15		MgO	15		MgO	15	
Calcium	3459									
Sulfate Sulfur	41	S	0		S	0		S	0	
Zinc	3.2	Zn	0		Zn	0		Zn	0	
Manganese	1.8	Mn	1.5		Mn	2.5		Mn	0	
Copper	1.4	Cu	0		Cu	0		Cu	0	
Iron	12.0	Fe	0		Fe	0		Fe	0	
Boron	0.1	B	1.0		B	1.3		B	1.0	

* TO BE ECONOMICAL, BUILD MAY BE SPREAD OVER SEVERAL YEARS

NOTES / ACTUAL AND SUGGESTED PERCENT TARGETS (BASE SATURATION)

The Guidelines are for 75% Effective Calcium Carbonate (ECC) with a Cation Exchange Capacity

Actual % Hydrogen	Suggested Hydrogen	Actual % Potassium	Suggested Potassium	Actual % Magnesium	Suggested Magnesium	Actual % Calcium	Suggested Calcium	Actual % Sodium	Suggested Sodium	Lbs. Per Acre Foot Soil
3.0	0-5	0.9	2.2-7	8.2	15-20	88.9	65-75	2.1	0-5	19.5

Treadwell&Rollo

APENDIX E-1

15 June 1998
Project 1166.03

Mr. Mac Carpenter
Malcolm Carpenter Associates
City and Regional Planners
1190 El Camino Real
Colma, California 94014

Subject: Pacifica Quarry Reclamation

Dear Mr. Carpenter:

We reviewed the geotechnical aspects of the latest Pacific Quarry Restoration Plan dated May 1998. The latest plan indicates a higher Pad A final grade than the previous plan dated December 1996; approximately 20 feet of additional fill will be placed on Pad A. Other geotechnical aspects of the plan remain essentially the same. Therefore, we concur with the geotechnical aspects of the design shown on the drawings.

Sincerely yours,
TREADWELL & ROLLO, INC.

Frank L. Rollo
Geotechnical Engineer

11660303.FLR

Treadwell & Rollo, Inc. *Environmental & Geotechnical Consultants*
555 Montgomery Street, Suite 1300, San Francisco, CA 94111
Telephone (415) 955-9040 Facsimile (415) 955-9041

Treadwell&Rollo

APPENDIX E-2

6 February 1996
Project 1166.03

Mr. William F. Bottoms
61 Laurel Lane
El Sobrante, California 94803

Subject: Final Grading Plan Review
Pacifica Quarry Reclamation
Pacifica, California

Dear Mr. Bottoms:

We have reviewed the Final Grading Plan (Figure 7) of the Pacifica Quarry Reclamation Plan dated January 1996. Reclamation will include excavation of the quarry slopes and placement of fill on the quarry floor. During our review, we referred to the documents included in the Reclamation Plan Report, listed as follows:

- Supplemental Geotechnical Report, Treadwell and Rollo, Inc., 27 March 1991
- Revised Slope Design Criteria, Pacifica Quarry Reclamation, Pacifica, California, Treadwell and Rollo, Inc., 5 August, 1991
- Pacifica Quarry Reclamation Plan, Martin Carpenter Associates, August 1991
- Quarry Fill Site "As-Built" Topography, Renner Group, 23 November 1993
- Reclamation Study for Quarry Products Quarry, Pacifica, California, Peter Kaldveer and Associates, 2 August 1983.

Material excavated from the slopes will be placed in: Pad "A", shown as the Pit area on the Reclamation Site Plan (Figure 3), Pad "B", shown as the East Flank on the Site Plan and the Flats area to the south and east of the Quarry area. We understand the grading in the Flats area will be performed by the City of Pacifica. Fill was previously placed in the Pad "A" area, as shown on as-built drawings by the Renner Group. The fill was generated from cuts

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excavated during the widening of Highway 1. The new fill planned for the Pad "A" area should be placed and compacted in accordance with the requirements outlined in the Treadwell & Rollo report dated 27 March 1991. Prior to fill placement, the existing surface should be scarified to a depth of eight inches and recompacted to 90 percent relative compaction.

In the Pad "B" and Flats areas, the ground surface should be cleared of vegetation and stripped of the upper 3 to 4 inches of soil containing organic matter. Stripped materials should not be used in engineered fills; these materials may be stockpiled for later use in landscaped areas. We understand existing stockpiles of boulders on the flats will be removed prior to grading.

Following stripping and clearing, the Pad "B" area should be excavated to natural soil, approximately 4 to 6 feet below existing grade, then scarified to a depth of at least eight inches, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction.

In the Flats, following stripping and clearing, areas to be filled should be scarified to a depth of at least eight inches, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. Because of the pre-existing 4 to 6 feet of uncompacted fill, settlement can be expected to occur, especially if heavy structures supported on shallow foundations are built on the fill. We understand the concrete slabs for two existing on-site structures in the Flats may be left in place. The intact concrete may interfere with construction of future building foundations or installation of utilities; therefore, these slabs should be clearly marked on the as-built drawings

Construction of Pad "B" near the East Flank slope of the Quarry may be adjacent to landslide-prone slopes (see plan for location.) Because the slope is difficult to access for exploration, we recommend that detailed mapping be performed during excavation. If adverse bedding is exposed, an earth buttress with drainage may be needed (see Final Grading Plan, detail). This decision should be made in the field during grading.

Slopes above Pad "B" may encounter variable thicknesses of clay overlying the bedrock (see cross section A-A', Final Grading Plan); therefore, the slope should be mapped. If potentially unstable materials are exposed at final grade, these materials should be removed and replaced with compacted fill and keyed and benched into firm material.

To intercept surface runoff, concrete V-ditches should be located along the upslope edge of all of the benches and at the tops of graded slopes. The V-ditches should be sloped to drain and runoff collected in a suitably sized metal, closed, pipe connected to the storm sewer system.

The geotechnical aspects of Figure 7 of the Final Reclamation Grading Plan are acceptable, provided the changes outlined in this letter are made and the work is performed in accordance with the Treadwell & Rollo Supplemental Geotechnical Report dated 27 March 1991.

We trust this provides you with the information required. If you have questions or need additional information, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Lou M. Gilpin
Engineering Geologist

Frank L. Rollo
Geotechnical Engineer

11660301.LMG

cc: Mr. Malcolm Carpenter
Malcolm Carpenter Associates
1190 El Camino Real
Colma, California 94014

TREADWELL & ROLLO, INC.
Consulting Engineers and Scientists
353 Sacramento Street, Suite 800
San Francisco, California 94111
(415) 955-9040

5 August 1991
Project 1166A

APPENDIX E-3

Mr. William Bottoms
Middletown Enterprises
2114 Macdonald Avenue
Richmond, California 94801

Attention: Mr. Thomas E. Bradner

Subject: Revised Slope Design Criteria
Pacifica Quarry Reclamation
Pacifica, California

Gentlemen:

This letter presents our revised slope design criteria for the Pacifica Quarry Reclamation project. We previously presented slope design criteria in our supplemental geotechnical investigation report dated 27 March 1991. The revised criteria presented in this letter are the result of various meetings and teleconferences with the City of Pacifica's staff and consultants.

The City of Pacifica's staff and consultants recommended the following revisions to the Final Grading and Drainage Plan:

1. Final slope inclinations be no steeper than 2:1 (horizontal:vertical).

2. An interceptor ditch be constructed at the top of the slope.

3. Benches be constructed with a minimum 5 percent reverse gradient and 3 percent longitudinal gradient.

From a geotechnical standpoint, these revisions are acceptable.

In our report, we recommended the slopes be benched at four locations, with three 12-foot-wide benches and a 25-foot-wide bench below the shear zone. We understand the City of Pacifica staff objected to the construction of four benches on the slope. Recognizing the City's objection to the visual impact of the benches, but at the same

time providing good engineering consistent with sound practice, we recommend that two benches be constructed. The benches should be constructed at approximately Elevations 120 and 180 feet, above and below the sheared rock zone. The minimum acceptable width of the benches are 18 and 12 feet for the benches at Elevations 120 and 180 feet, respectively. These widths are considered sufficient to accommodate equipment for periodic removal of any slope debris that may accumulate. The inside edges of the benches should be paved with concrete to collect runoff and facilitate cleaning. The concrete paving should be at least 4 feet wide, 4 inches thick, and should be nominally reinforced.

To illustrate the revised slope configuration, we have redrawn the cross-sections previously presented on Figure 2 of our 27 March 1991 report. The revised Figure 2 is attached to this letter.

Other recommendations presented in our report concerning site preparation and grading are still applicable. We trust that this letter provides the information you require. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Craig S. Shields
Geotechnical Engineer

Frank L. Rollo
Geotechnical Engineer

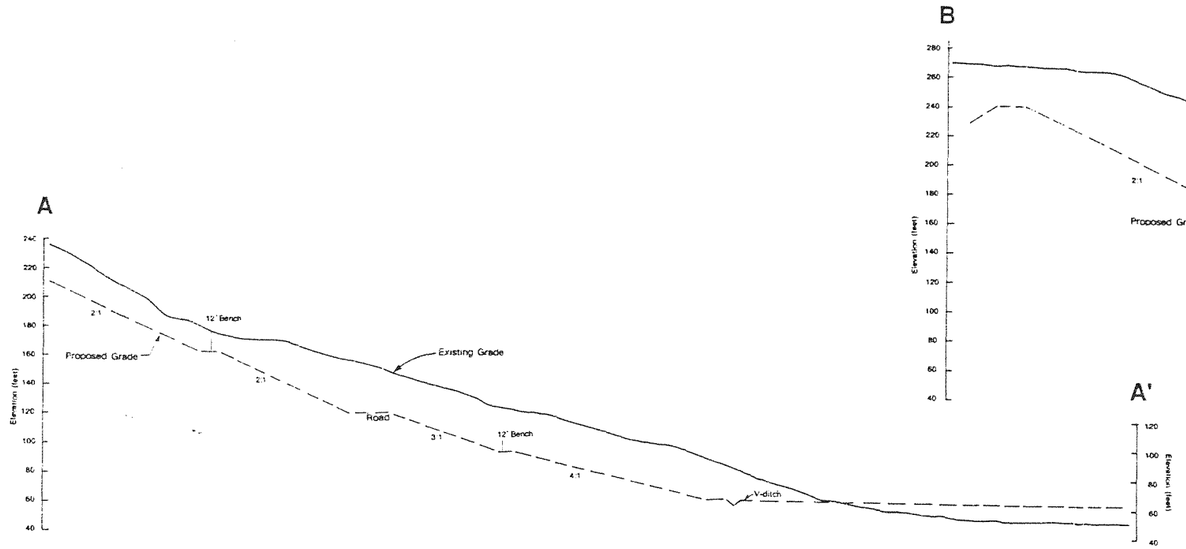
CSS:FLR:cah

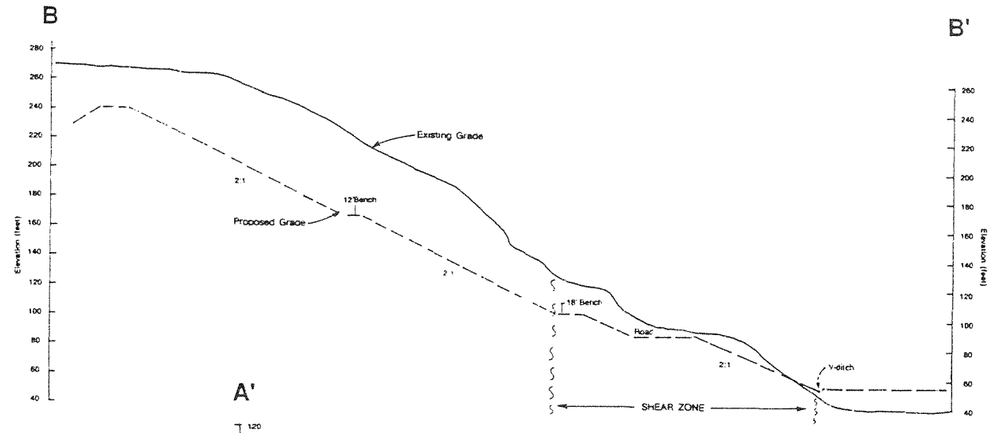
1166A002.CSS

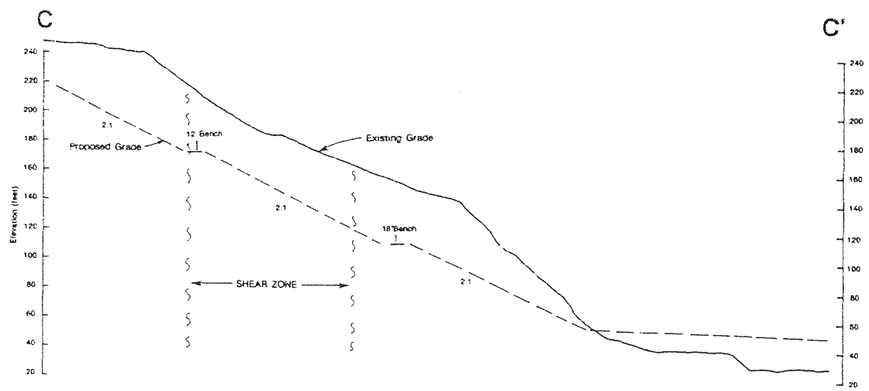
Attachment: Figure 2 - Revised Cross Sections

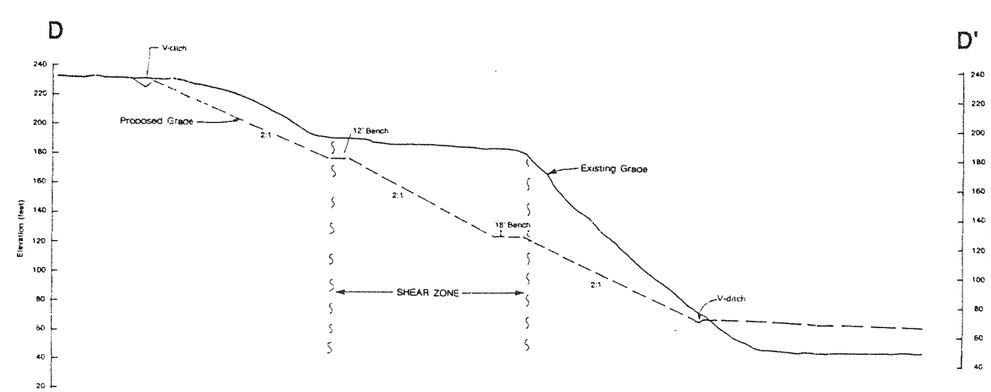
cc: Martin Carpenter Associates
Attention: Mr. Malcolm Carpenter

DeBolt Civil Engineering
Attention: Mr. James Diggins









NOTES:

1. Section lines shown on Figure 1 of Treadwell & Associates' report dated 27 March 1991.
2. 2:1 denotes inclination of slope, 2 horizontal to 1 vertical.
3. Benches should be constructed with a five percent reverse gradient and sloped to drain laterally. Concrete-lined drainage ditches should be constructed on the inside edge of the benches to drain.

0 20 40 60 80 100

APPROXIMATE SCALE
Horizontal = Vertical

PACIFICA QUARRY RECLAMATION

REVISED CROSS SECTIONS

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-2700

TREADWELL & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING
555 SACRAMENTO STREET, S.F. CA 94111 (415) 986-9040

MARTIN · CARPENTER · ASSOCIATES
CITY AND REGIONAL PLANNERS
1048 LAUREL STREET, SAN CARLOS, CA 94070 (415) 595-1881

Figure 2

APPENDIX E-4

SUPPLEMENTAL GEOTECHNICAL INVESTIGATION PACIFICA QUARRY RECLAMATION PACIFICA, CALIFORNIA

Middletown Enterprises
Richmond, California

27 March 1991
Project 1166A

TREADWELL & ASSOCIATES, INC.

A Report Prepared for

Mr. William Bottoms
Middletown Enterprises
2114 Macdonald Avenue
Richmond, California

SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
PACIFICA QUARRY RECLAMATION
PACIFICA, CALIFORNIA

Project 1166A

Craig S. Shields
Geotechnical Engineer

Frank L. Rollo
Geotechnical Engineer

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27 March 1991

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LIST OF FIGURES

SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
PACIFICA QUARRY RECLAMATION

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services during preparation of final grading plans for the Pacifica Quarry Reclamation project. Our services were provided in accordance with our proposal dated 22 February 1991.

The Pacifica quarry is on the west side of Highway 1, north of Rockaway Beach and is currently not in operation. Reclamation of the quarry will be performed over a period of 3-1/2 years and will consist of grading approximately 47 acres of the 117-acre site for future residential and/or commercial development. Grading will include cuts of up to 55 feet and fills of up to 40 feet.

The object of our services was to provide geotechnical input to the design team during preparation of the final grading plans, including providing recommendations regarding allowable slope criteria, subdrain locations, treatment of existing fill areas, and quality and compaction requirements for fills. Our work supplements the previous geologic and geotechnical investigations performed at the site by Kaldveer Associates. The results of Kaldveer's investigations are documented in the following reports:

Geotechnical Feasibility Investigation for Sutter Hill Pacifica Property, Pacifica, California, December 1980

Reclamation Study for Quarry Products Quarry, Pacifica, California, August 1983

Geotechnical Investigation for Pacifica Quarry Reclamation, Pacifica, California, December 1988

We performed a geologic reconnaissance of the site and reviewed aerial photographs to check the geologic conditions presented in the above reports.

Our recommendations were presented verbally to the design team during the course of our work. The Grading and Drainage Plan, dated March 1991, by Debolt Civil Engineering reflects these recommendations.

2.0 FIELD OBSERVATIONS

The topography of the site and the locations of existing improvements are shown on Figure 1, Supplemental Geologic and Geotechnical Plan. To facilitate discussion of our observations and the planned reclamation, we refer to different areas of the site as follows: 1) the Main Face is the high slope on the north side of the quarry bowl, 2) the Arm consists of the northwest-southeast trending bluff bounding the south/southwest side of the quarry, 3) the East Flank is the east-facing slope east of the Main Face, 4) the Nose is at the intersection of the Main Face and the East Flank, and 5) the Flats, which is the alluvial plain east/southeast of the quarry bowl.

On the basis of our reconnaissance, we generally agree with the geologic mapping presented in the Kaldveer reports. Additional features that we mapped during our reconnaissance and important previously mapped features are shown on Figure 1.

Landslides were previously mapped along the sea cliffs in the northwest corner of the site and on the slopes in the northeast corner of the site. Also, based on a review of aerial

photographs, Kaldveer reported that an ancient landslide may underlie the fill on the East Flank. The landslide along the sea cliff is a debris slide that involves primarily quarry waste material previously pushed over the cliff in this area. The previously reported landslide in the northeastern corner of the site is an ancient slump/flow-type slide of moderate depth (10 to 20 feet) that has occurred in a debris-filled swale. The lower portion of this slide is at an inclination of approximately 10 degrees and the slide does not appear to be active, although the surficial soils are subject to creep.

We mapped two additional landslides in the hills along the northern property boundary, adjacent to the East Flank, as shown on Figure 1. Both of these slides are also slump/flow-type slides that extend upslope, beyond the northern property boundary of the site. The easternmost of these two slides appears to be dormant. The lower portion of the westernmost slide, however, has been recently reactivated, probably because of past grading at the toe of the slide. There are several small scarps in various stages of preservation above the reactivated portion of the slide, indicating repeated slope failures within this deposit. The reactivated portion of the slide has maximum plan dimensions (on-site) of about 300 by 300 feet. It is estimated to be on the order of 10 to 15 feet deep.

The landslide along the sea cliff and the slides along the northern site boundary are beyond the limits of the proposed grading.

Pampeyan (1981) mapped a northwest-southeast trending shear zone extending from the shoreline to the flats of the Calera Creek drainage. This shear zone, which ranges in width from about 100 to 200 feet, juxtaposes greenstone and associated shales against the limestone units and is similar to many geologic contacts in

the Franciscan rocks. Its approximate location is shown on Figure 1. The rock quality in the shear zone varies significantly. In the Nose area, it includes complex and incoherent structures typical of the Franciscan melange unit. Locally, the melange consists of isolated blocks of limestone up to 10 feet in diameter that are surrounded by relatively intact shale sequences as well as highly disturbed zones composed mostly of crushed rock. At the western end of the shear zone, the greenstone rocks appear disturbed and locally highly weathered; however, outcrops of the melange unit are not visible.

3.0 CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that the planned reclamation of the quarry is feasible from a geotechnical standpoint. The primary geotechnical concerns for the reclamation of the site are: 1) stability of the final slopes under static and seismic conditions, especially in the shear zone area, 2) treatment of the existing fills across the site, and 3) compaction and drainage of the deep fill in the quarry bottom. Measures to mitigate the above concerns are addressed below. The previous reports prepared by Kaldveer Associates should be referred to for detailed descriptions of the geologic and subsurface conditions.

3.1 Cut Slopes

Representative cross sections of proposed cuts on the different quarry slopes are shown on Figure 2; the locations of the sections are shown on Figure 1. These section locations correspond to sections developed previously by Kaldveer and presented in their 1988 report.

Reclamation of the quarry will include flattening the existing slope comprising the Main Face and the Nose area. The final

slope will rise from about Elevation 68 feet to Elevation 240 feet. In addition, the East Flank slope will be excavated up to 30 feet and recontoured to remove the existing fill and any landslide deposit that may underlie the fill.

The bedding planes in the limestone and greenstone units on the Main Face and Nose generally dip steeply into the slope. Therefore, these units can typically be excavated at steep inclinations without causing instability, as evidenced by existing near-vertical cuts in some parts of the quarry. For permanent slopes, however, we recommend that these units be cut no steeper than 1.5:1 (horizontal:vertical) to reduce the potential for raveling and to allow maintenance. The shear zone which exists between about Elevation 130 and 180 feet on the Main Face and passes through the Nose area is comprised of intensely fractured shale, chert greenstone and limestone. These materials are more susceptible to raveling and erosion than the more coherent rock units above and below the zone. To reduce the potential for sloughing and erosion, we recommend that the inclination of cut slopes in the shear zone not exceed 2:1.

On the basis of the available subsurface information, it is expected that the proposed cuts on the East Flank will remove the existing fill and the ancient landslide that may exist below the fill. This removal will be confirmed during construction. We judge that the cuts will expose a combination of weathered greenstone and stiff natural clayey soils. Considering that soil may remain on the final East Flank cut slope, we recommend that this slope be cut no steeper than 2:1.

Benches are required on the cut slopes at regular intervals to control surface drainage and to provide access for periodic removal of debris (i.e., loosened rocks) that may accumulate on the slopes. We recommend that benches be constructed at

Elevations 100, 130, 180, and 210 feet (Figure 2). The benches should be at least 12 feet wide except for the bench at Elevation 130 feet, which should be at least 25 feet wide. This wider bench corresponds to the bottom of the shear zone and will probably require more cleaning than the other benches. The benches should be constructed with a two percent reverse gradient and concrete-lined drainage ditches should be constructed on the inside edges of the benches to carry water away. The drainage ditches should have a minimum gradient of 1 percent toward the access road where the water should be collected in a controlled drainage system, such as drop inlets and closed pipes.

In addition to the benches, berms should be constructed on the crests of all slopes to reduce flow of water across the slope face. Erosion resistant vegetation should be planted on the slope surfaces where practical. Irrigation and placement of topsoil on the slopes and benches should not be allowed.

In their 1988 report, Kaldveer Associates' recommended construction of a 12-foot-high debris catchment berm at the base of the major quarry slopes and the establishment of setbacks varying from 50 feet (Nose) to 100 feet (Main Face) from the base of the slopes. Considering that: a) the type of debris catchment required at the base of the quarry slopes is dependent on the future site use, b) development setback lines are dependent on the type of debris catchment employed, and c) four benches will be established on the Main Face and Nose, we judge that a debris catchment ditch, rather than a berm, is adequate for the proposed reclamation. The ditch should be at least 10 feet wide and 5 feet deep and should be sloped to drain laterally. Future developers may choose to construct a more elaborate system, such as a berm or retaining wall.

3.2 Fill Slope

The placement of fill in the quarry pit area will create a slope up to about 35 feet high at the southeast end of the pit. The fill material will be generated from the Main Face and the Arm and will therefore be predominantly granular. We recommend that this fill slope be 2:1 or flatter. A bench is not required because of the relatively low slope height.

To reduce the potential for build-up of hydrostatic forces and to increase resistance to fill sliding, we recommend that a key trench and subdrain be incorporated into the fill design. The key trench should be excavated beneath the toe of the proposed slope, as illustrated on Figure 3. The keyway should be bottomed at least 5 feet below the existing ground surface and should extend at least 3 feet into competent bedrock. It should have a base width of at least 20 feet. The bottom of the keyway should be inclined slightly into the slope to resist downslope fill movement. The side slopes of the key trench should be no steeper than 1:1. The key trench should be backfilled with engineered fill as described later in this report. Keyway fill should consist of a well-graded mixture of sand and gravel.

The keyway subdrain, as illustrated on Figure 3, should consist of a 6-inch-diameter perforated pipe (placed with perforations down) surrounded by 3/4-inch crushed rock wrapped in filter fabric, such as Mirafi 140N or equivalent. The perforated pipe should be aluminum or bituminous-coated metal pipe and should be sloped at a gradient of at least two percent to daylight or other suitable catchment. Outlet pipes should consist of 6-inch-diameter solid pipe.

3.3 Site Preparation and Fill Placement

The two major fill areas on the site will be the quarry pit area, where up to about 40 feet of fill will be placed, and the Flats, where up to about 15 feet of fill is planned.

3.3.1 Quarry Area

Prior to fill placement in the quarry pit, all of the existing loose soil and rock covering the quarry bottom should be excavated to undisturbed natural soil or rock. The excavated material can be used as engineered fill provided it meets the material requirements given below.

Following removal of loose material, the exposed subgrade should track-walked with a large bulldozer to provide a firm, nonyielding subgrade. Fill should be placed in lifts no greater than 8 inches in loose thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction.[1] Fill material in the quarry area should be predominantly granular with a liquid limit of less than 40 and a plasticity index less than 15. The fill material should contain no organic material and should generally be free of rocks larger than 12 inches. Rocks larger than 12 inches should be placed at the toe of slopes, away from any potential future building areas. The oversized material should be placed in a manner to avoid nesting and to facilitate compaction. The stockpiled quarry fines and any excavated clayey overburden soil should not be used as fill in the quarry pit area.

---

[1] Relative Compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material as determined by the ASTM D1557-78 laboratory compaction procedure.

3.3.2 Flats Area

Previous test borings in the Flats indicate that this area is presently covered with about 4 to 6 feet of firm to stiff clayey fill, although locally the fill may be deeper. The fill consists of either waste quarry fines or overburden soils removed from the quarry area. Because the 10 to 15 feet of new fill that will be placed in this area will tend to bridge over the existing fill, the owner decided not to overexcavate and recompact the existing fill. The presence of fill of unknown quality beneath the new fill will affect decisions regarding foundation type for future structures on the site. We judge that light, wood-frame structures could still be supported on shallow foundations; however, heavier structures may require a drilled pier and grade beam or driven pile foundation systems that extend through the uncontrolled fill.

In the Flats, the areas to be graded should be cleared of vegetation and stripped of the upper three to four inches of surface soils containing organic matter. Stripped materials from the Flats should not be used in engineered fills; however, these materials can be stockpiled for later use in landscaped areas for future developments. We understand that existing stockpiles of boulders on the Flats will be removed prior to grading.

Following stripping and clearing, areas to be filled should be scarified to a depth of at least 8 inches, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. We understand that the concrete slabs for two existing on-site structures in the Flats may be left in place. Because the intact concrete may interfere with construction of future building foundations or installation of utilities, these materials should be clearly marked on the as-built drawings.

Fill can then be placed in lifts no greater than 8 inches in loose thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. Fill material in the Flats should be free of organic matter and rocks greater than 12 inches in maximum dimension. The upper 3 feet of the fill should be predominantly granular with a low expansion potential (defined by a liquid limit of less than 40 and a plasticity index lower than 15). Some of the quarry waste fines and the existing fill to be excavated from the East Flank may not meet the requirement for low expansion potential. Material that does not meet the requirement should be placed near the bottom of the fill. It should be noted that the quarry waste fines will require drying before this material can be used as engineered fill.

3.4 Subsurface Drainage

To reduce the potential for groundwater buildup and hydrocompression settlement of the deep fill that will be placed in the quarry pit, we recommend that a subdrain be installed in the quarry bottom at the location shown on Figure 1. The subdrain should consist of a six-inch-diameter, perforated, aluminum or bituminous-coated metal pipe installed in the bottom of an 18-inch-wide, 2-foot-deep trench cut into firm soil or bedrock. The trench should be lined on all sides with a filter fabric (Mirafi 140N or equivalent) and filled with 3/4-inch crushed rock. The perforated pipe should be installed with a slope of no less than 2 percent down toward the outlet. A clay plug should be installed in the subdrain trench about 50 feet north of the proposed keyway shown on Figure 1. Solid pipe should be used from the plug to the outlet at the base of the fill slope. The cleanouts, to be located as shown on Figure 1, should consist of solid pipe connected to the drain pipe, with

bends no greater than 45 degrees. The points where cleanouts daylight should be well marked and protected.

Kaldveer's 1988 report noted a seepage zone in the Nose area at about Elevation 140 feet and indicated that subsurface drainage, possibly consisting of drilled, horizontal drains (hydroaugers), could be required in this area. Because of the extended drought, we did not observe this seepage zone during our site reconnaissance. We suggest that this and other cut areas be observed for seepage following excavation of the slopes. We will evaluate whether subsurface drainage is required and provide recommendations for type and extent of the drainage system following our observations.

4.0 GEOTECHNICAL ENGINEERING SERVICES DURING CONSTRUCTION

During construction, we should be on site to observe the following:

1. Final cut slopes to check for seepage and stability
2. Subgrade preparation, including removal of existing fills where recommended
3. Keyway excavations
4. Installation of subdrains
5. Placement and compaction of engineered fill

These services will allow us to check geotechnical aspects of the construction for conformance with the intent of our recommendations, to provide quality control testing, and to make timely suggestions to the contractor should geotechnical-related problems arise.

PACIFICA QUARRY RECLAMATION

SUPPLEMENTAL GEOLOGIC AND GEOTECHNICAL PLAN

MORI POINT RIDGE

OCEAN

PACIFIC

ROCKAWAY BEACH

CALERA CREEK

LIMIT OF GRADING SETBACK 100' FROM CALERA CREEK

Qlsd

Qlsa

A A'

B B'

C C'

D D'

E E'

Subdrain (See detail)

See Figure3 for Keyway Detail

CARRILLO

ELLINAY

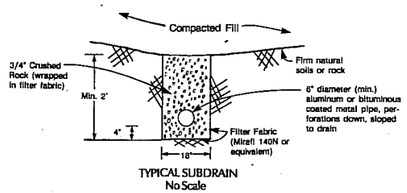
REINA

KEY

- Bedrock Shear Zone
- Qlsd — Landslide with hachures showing scarp and arrows indicating direction of movement. Qlsa - active slide deposit. Qlsd - ancient and dormant slide deposit.
- Line of Section from Kaldveer and Associates (1988).
- Keyway for toe of embankment fill slope.
- Subdrain shown with cleanouts indicated as circles. See detail.

NOTES

1. Topographic sections shown on Figure 2.
2. Topographic base from Cartwright Aerial Survey Photography dated 12/7/87.
3. Proposed grading from DeBoldt Engineers (1991), Grading and Drainage Plan.



TYPICAL SUBDRAIN
No Scale

CARTWRIGHT AERIAL SURVEY #59144 12/7/87

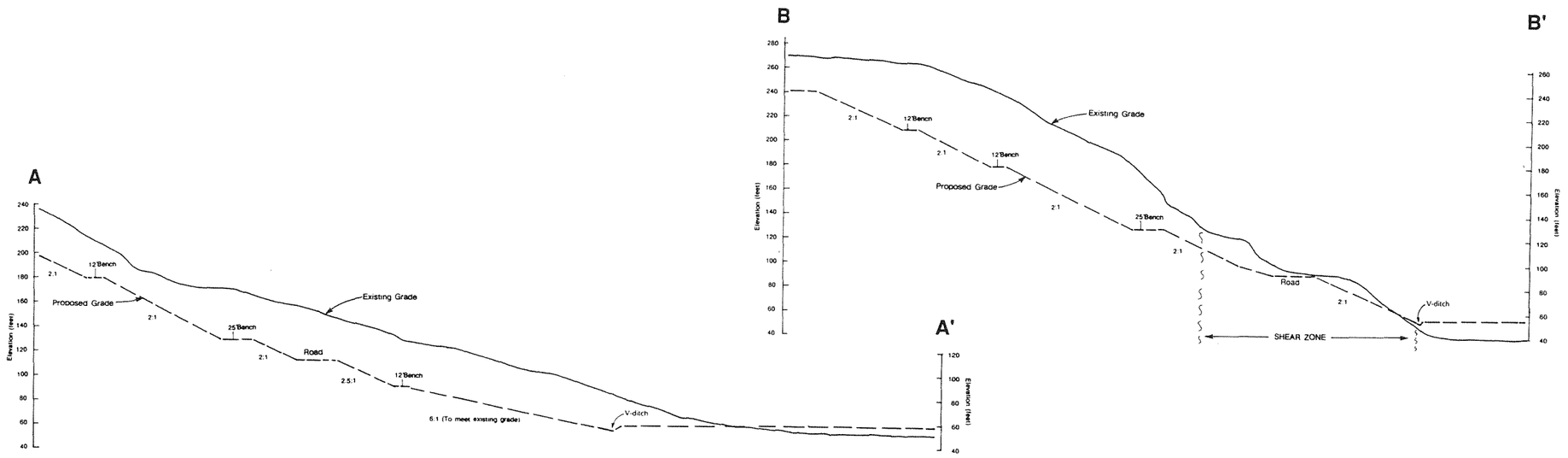
DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 94526 (415) 837-9780

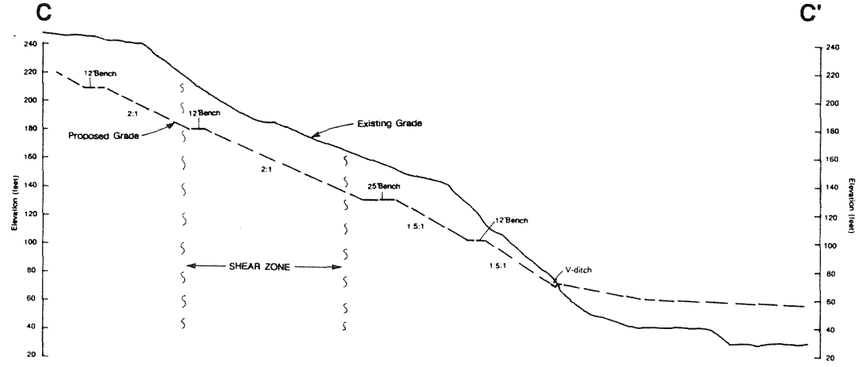
TREADWELL & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING
353 SACRAMENTO STREET, S.F. CA 94111 (414) 956-8040

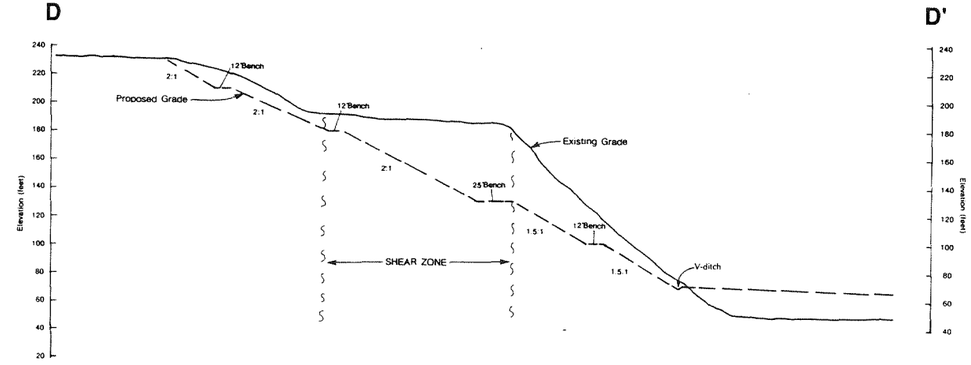
0 100 200
MAP SCALE IN FEET

MARTIN · CARPENTER · ASSOCIATES
CITY AND REGIONAL PLANNERS
1840 LAUREL STREET, SAN CARLOS, CA 94070 (415) 593-1681

JOB# 83107 4/91







NOTES

1. Section Lines shown on Figure 1.
2. 1.5:1 denotes inclination of slope, 1.5 horizontal to 1 vertical.
3. Benches should be constructed with a two percent reverse gradient and sloped to drain laterally. Concrete lined V-ditches should be constructed on the inside edge of the benches to drain.

0 20 40 60 80 100

APPROXIMATE SCALE
Horizontal = Vertical

Fig. 2

PACIFICA QUARRY RECLAMATION

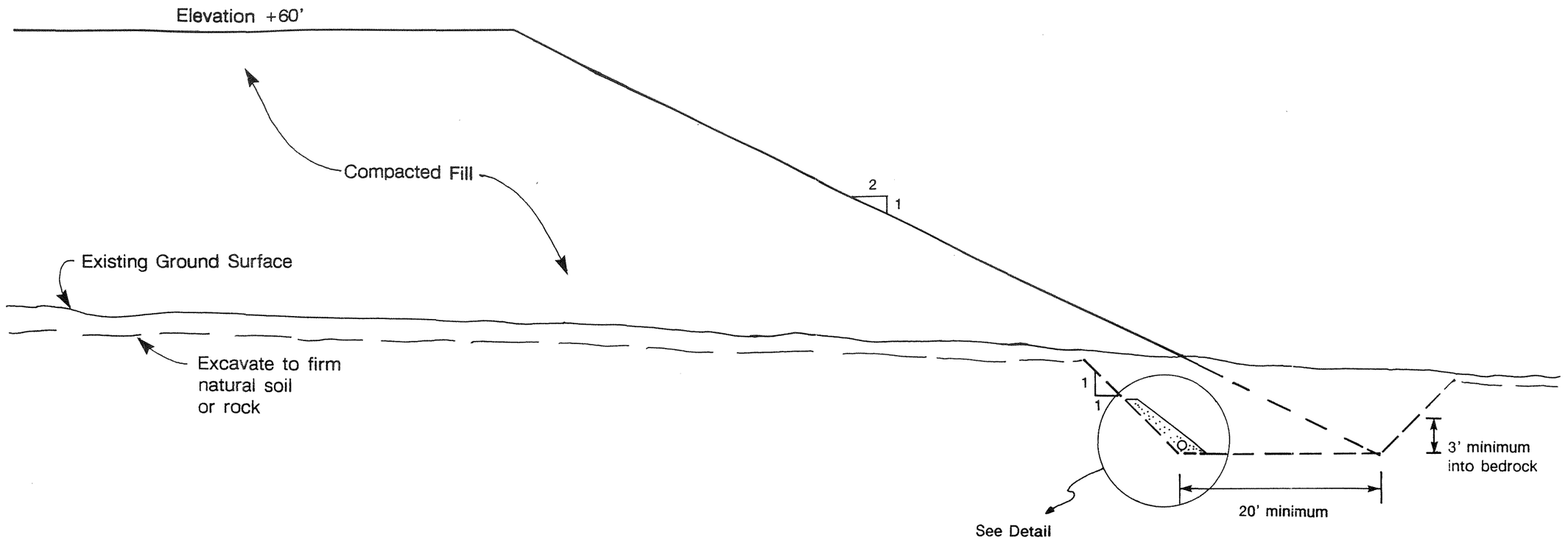
CROSS SECTIONS

DEBOLT CIVIL ENGINEERING
811 SAN RAMON BLVD., DANVILLE CA 74526 (416) 837-3780

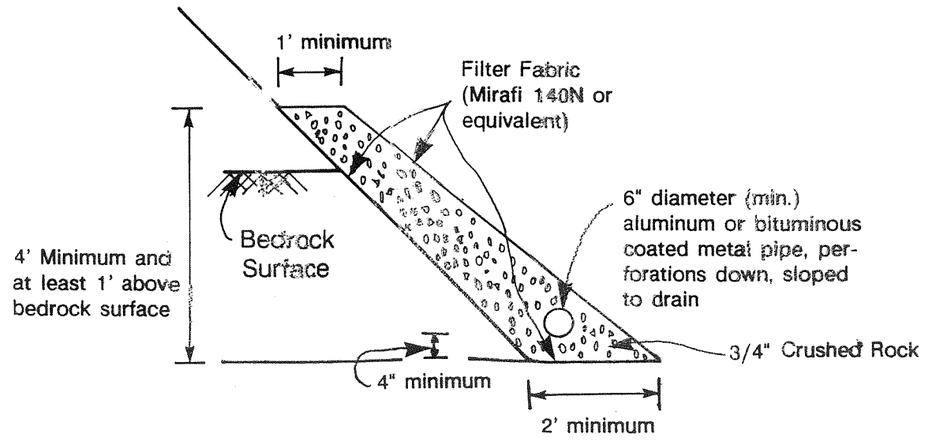
TREADWELL & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING
255 SACRAMENTO STREET, S.F. CA 94111 (414) 955-0940

MARTIN · CARPENTER · ASSOCIATES
CITY AND REGIONAL PLANNERS
1640 LAUREL STREET, SAN CARLOS, CA 94070 (415) 592-1881

4/91



No Scale



Keyway Drain Detail
No Scale

PACIFICA QUARRY RECLAMATION
Pacifica, California

TYPICAL EMBANKMENT SECTION

Project No. 1166A | Figure 3

TREADWELL & ASSOCIATES, INC.
Consulting Engineers and Scientists

APPENDIX F

December 29, 1980 Geotechnical Feasibility Investigation by Peter Kaldveer and Associates, Inc.

This Technical Study provides background information and boring logs. A copy is on file with the Pacifica Community Development Department.

APPENDIX G

August 2, 1983 Reclamation Study for Pacifica Quarry by Peter Kaldveer and Associates, Inc.

This Technical Study provides background information relevant to an earlier reclamation proposal. A copy is on file with the Pacific Community Development Department.

APPENDIX H

December 7, 1988 Geotechnical Investigation of the Pacific Quarry by Peter Kaldveer and Associates, Inc.

This Technical Study provides background information relevant to an earlier reclamation proposal. A copy is on file with the Pacific Community Development Department.

APPENDIX I
SMARA COMPLIANCE SUMMARY

REGULATION SOURCE/REFERENCE	TOPIC	PACIFICA PLAN REFERENCE
SMARA RECLAMATION STANDARDS		
SEC. 3702	Financial Assurances required	SEC. 3.800
SEC. 3703	Protection of wildlife and habitat	SEC. 1.410
SEC. 3704	a. Backfilling for urban use	SEC. 3.503 & 3.602
	b. Backfilling for agriculture & habitat	SEC. 3.507 & 3.604
	c. Stockpiling of backfill	N/A
	d. Final slopes	SEC. 3.500 & 5.110
	e. Fill slopes	SEC. 3.500 & 5.110
	f. Cut slopes	SEC. 3.500 & 5.110
	g. Permanent waste dumps	N/A
SEC. 3705	a. Vegetative cover	SEC. 3.509 & 3.607
	b. Test Plots	SEC. 1.410
	c. Avoiding soil compaction	SEC. 5.190
	d. Elimination of unnecessary access roads	N/A
	e. Soil analysis required	SEC. 5.410
	f. Temporary access for exploration	N/A
	g. Revegetation with natives	SEC. 5.430
	h. Schedule for revegetation	SEC. 5.430
	i. Soil stabilization and plant irrigation	SEC. 5.350
	j. Irrigation of habitat	N/A
	k. Weed management	SEC. 5.460
	l. Protection of habitat planting	SEC. 5.460
	m. Success Criteria	SEC. 5.460
SEC. 3706	a. Protection of surface water quality	SEC. 5.300
	b. Protection of groundwater quality	N/A
	c. Minimize siltation of lakes and watercourses	SEC. 5.300
	d. Provide erosion control	SEC. 5.300
	e. Alteration of natural drainage	N/A
	f. Stream diversions	N/A
	g. Restoration of pre-mining drainage	N/A
SEC. 3707	a. Specification of agricultural fertility level	N/A
	b. Soil profiles to be segregated	N/A
	c. Agricultural productive capacity	N/A
	d. Avoid surface or ground water contamination	SEC. 5.300 & 5.550
SEC. 3708	- Reclamation of non-prime agricultural land	N/A
SEC. 3709	a. Storage of equipment in designated areas	SEC. 5.450
	b. Removal of mining equipment prior to mine closure	N/A
SEC. 3710	In stream protection measures	N/A
SEC. 3711	a. Mining to follow topsoil removal in one year	N/A
	b. Mapping of topsoil required	N/A
	c. Scheduling of topsoil removal and reuse	SEC. 3.507 & 3.604
	d. Maintenance of stockpiled topsoil	N/A
	e. Reuse of topsoil	SEC. 3.507 & 3.604